

P-07-28

Forsmark site investigation

**Revision of borehole deviation
measurements in Forsmark**

Göran Nilsson, GNC AB

Johan Nissen, Malå Geoscience AB

September 2007

Svensk Kärnbränslehantering AB

Swedish Nuclear Fuel
and Waste Management Co
Box 5864
SE-102 40 Stockholm Sweden
Tel 08-459 84 00
+46 8 459 84 00
Fax 08-661 57 19
+46 8 661 57 19



Forsmark site investigation

Revision of borehole deviation measurements in Forsmark

Göran Nilsson, GNC AB

Johan Nissen, Malå Geoscience AB

September 2007

Keywords: Borehole deviation, Bearing, Inclination, Uncertainty, Flexit, Reflex, Maxibor.

This report concerns a study which was conducted for SKB. The conclusions and viewpoints presented in the report are those of the authors and do not necessarily coincide with those of the client.

Data in SKB's database can be changed for different reasons. Minor changes in SKB's database will not necessarily result in a revised report. Data revisions may also be presented as supplements, available at www.skb.se.

A pdf version of this document can be downloaded from www.skb.se.

Abstract

Within the scope of SKB's site investigations, accurate borehole deviation measurements are crucial for allotting data from different surveys of borehole logging correct positions in space. Because full-scale calibration of the deviation logging equipment is normally not possible, the only available measure of quality is repeatability, i.e. a comparison of several deviation loggings in the same borehole.

In connection with a major quality revision (autumn 2006 to early spring 2007) regarding orientation of geological objects (fractures, rock contacts etc) a reassessment of the reliability of deviation measurements was made. Some problems with low repeatability and some problems with correct length measurements when using the standard method for deviation measurements caused a decision to introduce a new strategy. This new strategy implies the possibility to combine several deviation measurements.

Another important result of the revision is the introduction of an uncertainty of a deviation measurement. The uncertainty is presented both as uncertainties of inclination and bearing, and in geometrical terms as an "uncertainty cone" around each borehole.

This document reports the results gained by the revision of the borehole deviation measurements in Forsmark.

Sammanfattning

I SKB:s platsundersökningar är noggranna krökningsmätningar av borrhål avgörande för en geometrisk korrekt placering av resultaten från olika borrhålsundersökningar. Eftersom en instrumentkontroll i full skala inte har varit möjlig, återstår en jämförelse av upprepade mätningar i samma borrhål som det enda kvalitetsmättet.

I samband med en revision (hösten 2006 och våren 2007) kring orienteringen av geologiska objekt (sprickor, bergkontakter m m), omvärderades tillförlitligheten av krökningsmätningarna. Den hittills använda standardmetoden för krökningsmätningar visade sig ha problem med låg repeterbarhet och problem med längdmätningen. Detta föranledde introduktionen av en ny strategi, som möjliggör en kombination av flera oberoende krökningsmätningar.

Ett annat viktigt resultat av revisionen är introduktionen av ett mått på onoggrannheten av krökningsmätningar. Onoggrannheten presenteras som en individuell onoggrannhet av inklinations och bäring, men också i geometriska termer som en konisk "strut" kring borrhålsaxeln.

I denna rapport presenteras resultatet av revisionen av krökningsmätningar utförda inom Platsundersökning Forsmark.

Contents

1	Introduction	7
1.1	Nomenclature	9
2	Objective and scope	11
3	Equipment	13
3.1	Description of equipment/interpretation tools	13
3.1.1	Description and principles of magnetometer/accelerometer based tools	13
3.1.2	Description and principles of the optical tool	13
4	Execution	15
4.1	Preparations	15
4.2	Execution of field work	15
4.2.1	Logging with Flexit Smart Tool	15
4.2.2	Logging with Reflex EZ-AQ/EMS	15
4.2.3	Logging with Maxibor	15
4.3	Data handling/post processing of measured data	16
4.3.1	Magnetometer/accelerometer methods	16
4.3.2	Optical method	19
4.4	Borehole deviations	19
4.4.1	“Initial” procedure (before revision) for calculation of borehole deviation	19
4.4.2	New procedure (after revision) for calculation of borehole deviation	19
4.4.3	Estimation of uncertainties in borehole deviation loggings	22
5	Results	25
Appendices on CD		
Appendix A	Details of the core-drilled boreholes	
Appendix B	Details of the percussion-drilled boreholes	

1 Introduction

Within the scope of SKB's site investigations, accurate borehole deviation measurements are crucial for allotting data from different surveys of borehole logging correct positions in space.

Full-scale calibration of the deviation logging equipment has not been possible, except for some minor verification tests in a short borehole located on Äspö (KAS13), extending from the ground surface to 256 m borehole length where the break through was located in the Äspö-tunnel. As a result of this fact, the only available measure of quality is repeatability, i.e. a comparison of several deviation loggings in the same borehole.

Within the site investigation project (from 2002 to 2007) two types of instrumentation for borehole deviation measurements have routinely been applied:

- Optical tool.
- Magnetometer/accelerometer based tools.

In most core-drilled boreholes in Forsmark both methods have been applied. Furthermore, repeated measurements with both types of instruments have been performed in many of the boreholes. In a few rare cases, deviation data from other equipment (e.g. Acoustic Televiewer) has been used. Regarding percussion-drilled boreholes in Forsmark, almost all have been measured with one magnetometer/accelerometer-logging.

Initially, the deviation measurements based upon the optical tool were used for calculating the resulting deviation files for the core-drilled boreholes. In connection with a major quality revision (autumn 2006 to early spring 2007) regarding orientation of geological objects (fractures, rock contacts etc) a reassessment of the reliability of deviation measurements was made. Some problems with low repeatability and some problems with length measurements when using the optical tool, caused a decision to introduce a new strategy. This new strategy implies the possibility to combine several deviation measurements and gives a quantification of the uncertainty. An example of measurements with low repeatability is given in Figure 1-1, which shows two deviation measurements in KFM05A based on the optical tool. Both measurements are now ERROR-marked in SKB's primary database Sicada.

This document reports the results gained by the revision of the borehole deviation measurements in Forsmark.

As a result of the revision, a new strategy is applied in Sicada for handling borehole deviation data: several deviation logging activities can now be combined through a "running median algorithm" to define new deviation data. The recipe for combining different logging files is given in an "EG154-file", which describes which borehole length intervals from different deviation loggings that should be included in the calculation.

Another important result of the revision is the introduction of an uncertainty of measurement. All deviation loggings which are not ERROR-marked are used to calculate the differences from the new calculated deviation file. This implies that the uncertainty calculation may be based on more deviation loggings than those specified in the "EG154"-file. The 90th percentile value of these differences is used as a measure of the uncertainties of inclination and bearing.

The new deviation calculations, based upon this revision, are all stored in Sicada, and they are traceable by the borehole ID codes.

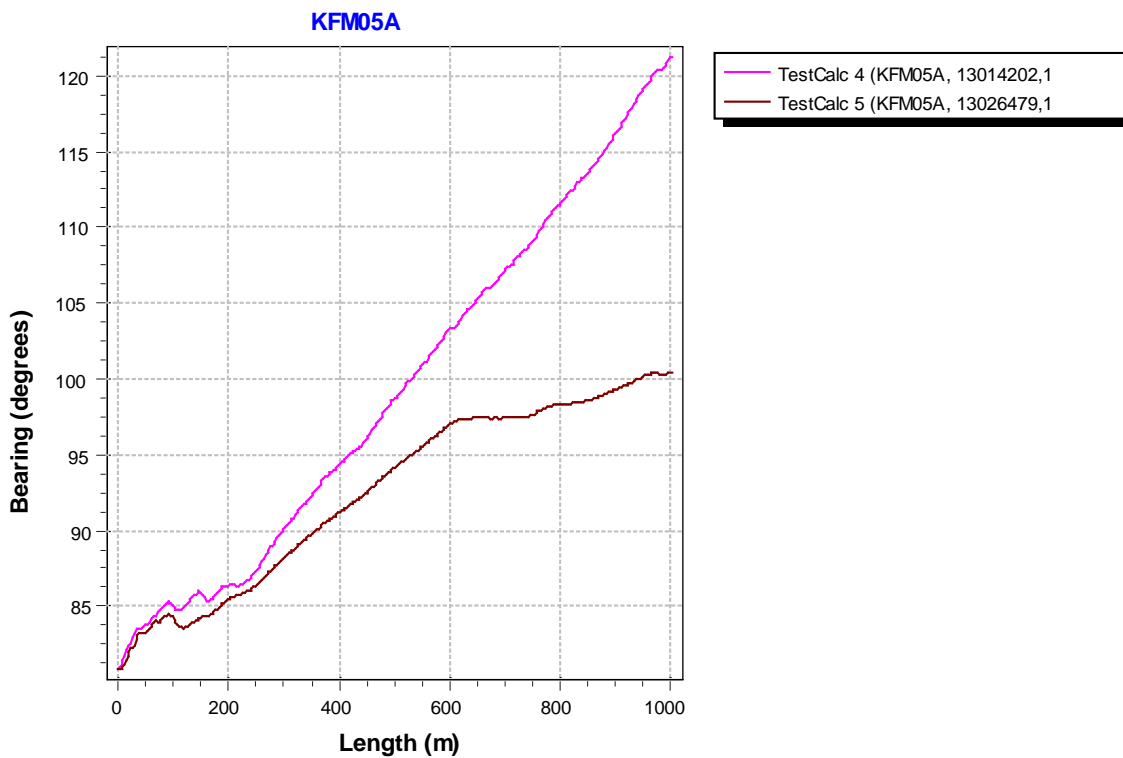
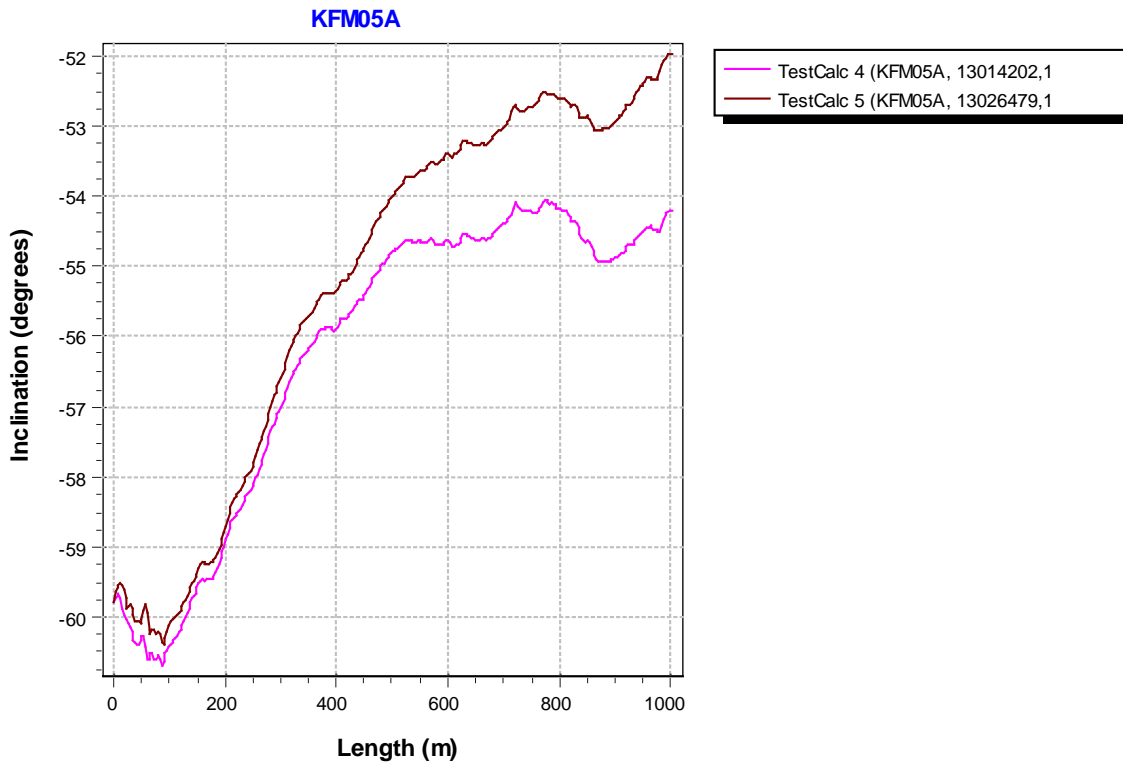


Figure 1-1. Two deviaton loggings performed in KFM05A with the optical tool, demonstrating poor repeatability. The difference between the two loggings is more than 2 degrees for the inclination (upper diagram) and more than 20 degrees for the bearing (lower diagram). Both loggings are now ERROR-marked in Sicada.

Original data from the reported activity are stored in the primary database Sicada, where they are traceable by the borehole ID codes. Only data in SKB's databases are accepted for further interpretation and modelling. The data presented in this report are regarded as copies of the original data. Data in the databases may be revised, if needed. Such revisions will not necessarily result in a revision of the P-report, although the normal procedure is that major data revisions entail a revision of the P-report. Minor data revisions are normally presented as supplements, available at www.skb.se.

1.1 Nomenclature

Table 1-1 describes the nomenclature used in this report and Table 1-2 presents some symbols and abbreviations.

Table 1-1. Nomenclature used in this report.

Inclination	In this context, the angle between the borehole length axis and the horizontal plane. Another term sometimes used is Dip.
Bearing	In this context, the direction of the borehole in relation to geographic north. Another term sometimes used is Azimuth.
Declination	In this context the magnetic declination, which at any point on the Earth is the angle between the local magnetic field (compass north) and geographic north.
Sicada	The database of SKB.
ERROR-marked	A term used in Sicada to indicate that data are not accessible.
In_Use-flagged	Among several activities in Sicada only one can be In_Use-flagged (e.g. one deviation logging per borehole). Only data from this particular activity can be used.

Table 1-2. Symbols, definitions and abbreviations used in this report.

I	Inclination of borehole, measured in degrees.
ΔI	Inclination uncertainty, measured in degrees.
B	Bearing of the borehole, measured in degrees.
ΔB	Bearing uncertainty, measured in degrees.
Δr	Radius uncertainty, defined as the radial uncertainty (in metres) of the borehole coordinates (perpendicular to the borehole axis) at a particular borehole length.
ΔZ	Elevation uncertainty, defined as the vertical uncertainty (in metres) of the borehole coordinates at a particular borehole length.
BHL	Borehole length. Sometimes also denoted L (e.g. equation 4-1 and 4-2)
$Elev.$	Elevation, measured in metres above sea level according to RHB70.
TOC	Top Of Casing.

2 Objective and scope

The objective with deviation measurements is to calculate the deviation of a borehole as a function of borehole length to achieve geometrical data of the borehole, e.g. X-, Y-, and Z-coordinates for points with a predetermined interval along the borehole. As it is possible to assign coordinates only to a limited number of points, the intermediate borehole sections are interpolated between the coordinates of the points and extrapolated to the end of the borehole from the last point assigned coordinates.

Accurate deviation measurements are crucial for the interpretation of other borehole investigations. In an internal PM (SKB ID 1063373), sources of errors were identified, and it was recommended to access an estimate of uncertainties as well. As a result, a review of all borehole deviation measurements was initiated.

This report describes the outcome of the revision.

3 Equipment

3.1 Description of equipment/interpretation tools

3.1.1 Description and principles of magnetometer/accelerometer based tools

Table 3-1 lists the specifications of the tools used for magnetometer/accelerometer based deviation logging, together with the quantities measured. The Flexit Multi Smart equipment is manufactured by the company Flexit AB¹, and the Reflex EZ-AQ/EMS (only used at very few occasions) by the company Reflex Instrument AB¹.

Only the two parameters Inclination and Bearing are relevant in the deviation measurements. The other quantities are used internally in the software. The magnetic field strength and the magnetic field inclination are used to identify and eliminate readings affected by magnetic disturbances.

Data handling and quality assurance for Flexit Multi Smart is performed in the software MeasureIT version 2.0, and the software DisplayIT version 2.0 is used for presentation of deviation loggings.

Data handling, quality assurance and presentation of deviation loggings from Reflex EZ-AQ/EMS are performed in the software Reflex SProcess Software version 1.70.

3.1.2 Description and principles of the optical tool

The optical tool used by SKB is denoted “Maxibor I” and is manufactured by the company Reflex Instrument AB¹. The Maxibor tool measures the curvature of consecutive borehole segments by optical principles. In this way, the derivative of the borehole deviation is measured. It is claimed by the manufacturer that the resulting accuracy of the deviation logging is 1:1000.

Data handling, quality assurance and presentation of deviation loggings for Reflex Maxibor are performed in the software MAXIBOR MX PC, version 1.23.

Table 3-1. Specifications of the magnetometer/accelerometer based tools used.

	Flexit multi smart*	Reflex EZ-AQ/EMS
Diameter	31.7 mm	25.0 mm
Probe length	840 mm	931 mm
Inclination	0° to -90°	0° to -90°
Bearing	0° to 360°	0° to 360°
Magnetic field strength	50,000 to 100,000 nT	No limits specified
Magnetic field inclination	0° to 90°	0° to 90°
Gravity roll angle (rotation of probe in inclined boreholes)	0° to 360°	0° to 360°
Magnetic toolface angle (rotation of probe in near-vertical boreholes)	0° to 360°	0° to 360°
Inclination accuracy	± 0.2°	± 0.35°
Bearing accuracy	± 0.3°	± 0.35°
Magnetic field strength accuracy	± 50 nT	± 50 nT
Tool face accuracy (grav/mag)	± 0.2° / ± 0.3°	± 0.25°

* Specifications for Flexit taken from SKB PIR-04-03, SKB internal document.

¹ Flexit AB and Reflex Instrument AB are both owned by the Australian company Imdex Limited.

4 Execution

4.1 Preparations

Before performing deviation logging, the TOC (Top Of Casing) of the borehole needs to be surveyed for the coordinates (Northing, Easting and Elevation) in RT90/RHB70. The coordinates are used in calculating the borehole deviation.

Furthermore, before performing Maxibor measurements, the inclination and bearing at TOC and at 3 m BHL need to be determined. These are used as starting values in the Maxibor survey.

4.2 Execution of field work

In general, two deviation loggings are performed with 3 m point interval, one in downward and one in upward direction. Furthermore, as a general principle in the core-drilled boreholes, at least two independent measurement methods were applied to allow for quality checking.

In accordance with the method description SKB MD 224.001 ver 1.0², the optical method (Maxibor) should be used for deviation logging of core-drilled boreholes, and a magnetic/accelerometer method (Flexit or Reflex) in percussion-drilled holes. Until December 2006, this was the procedure applied at the site investigations at Forsmark and Simpevarp/Laxemar in Oskarshamn.

4.2.1 Logging with Flexit Smart Tool

Initially, the Flexit Smart Tool is set up with the predefined borehole parameters, e.g. borehole ID, date and time, reading interval, time interval between readings etc. The equipment is hanging in a wire and is lowered into the borehole with an electrically powered winch.

The probe and the hand held computer have internal electronic clocks that synchronise with each other. When the probe is positioned at a predefined length, the operator waits for the measurement to be executed before lowering to the next length position. In general, deviation logging is performed every 3 m in both downward and upward direction.

Figure 4-1 shows a photography of the equipment.

4.2.2 Logging with Reflex EZ-AQ/EMS

The logging with this tool is similar to logging with the Flexit tool (Section 4.2.1).

4.2.3 Logging with Maxibor

In the boreholes KFM01A, KFM01B, KFM02A, KFM03A, KFM03B, KFM04A, KFM05A, KFM06A, KFM06B, KFM07A, KFM08A and KFM08B the Maxibor tool was centralized and lowered inside the drill string, using a wire. Furthermore, the starting point for the loggings was the TOC. From August 2005 the Maxibor was centralized in the borehole by a barrel, mounted on the lower end of the drill string, and the starting point for the Maxibor logging was at 3 m borehole length. This procedure gives more accurate length measurements and makes it possible to rotate the instrument between the measuring points, which is believed to improve the quality of the logging.

² Internal SKB document.



Figure 4-1. Flexit Smart Tool System.

Data communication in the Maxibor system is similar as for the Flexit Smart Tool System. Initially, the Maxibor probe is set up with the predefined borehole parameters, e.g. borehole ID, date and time, time interval between readings etc. When mounting the complete probe consisting of accumulator, camera and lenses, the measuring interval is defined, normally 3 m.

The Maxibor probe and the computer have internal electronic clocks that synchronise with each other, and when the probe is positioned at a predefined length, the operator is waiting for the measurement to be executed before lowering to the next 3 m station. In general, deviation logging is performed every 3 m in both downward and upward direction.

4.3 Data handling/post processing of measured data

4.3.1 Magnetometer/accelerometer methods

For magnetometer/accelerometer deviation measurements it is crucial to eliminate anomalies, caused by e.g. magnetic disturbances.

Figure 4-2 illustrates an example of the quality checking of Flexit data from KFM02B. At locations where the magnetic field intensity deviates more than 1,000 nT from the mean value in Forsmark (51,000 nT) or if the magnetic dip deviates more than 1.5° from the mean value (73°), data are excluded and replaced by a linear interpolation.

Figures 4-3 and 4-4 show Flexit raw data respectively data adjusted for magnetic disturbances in borehole KFM02B.

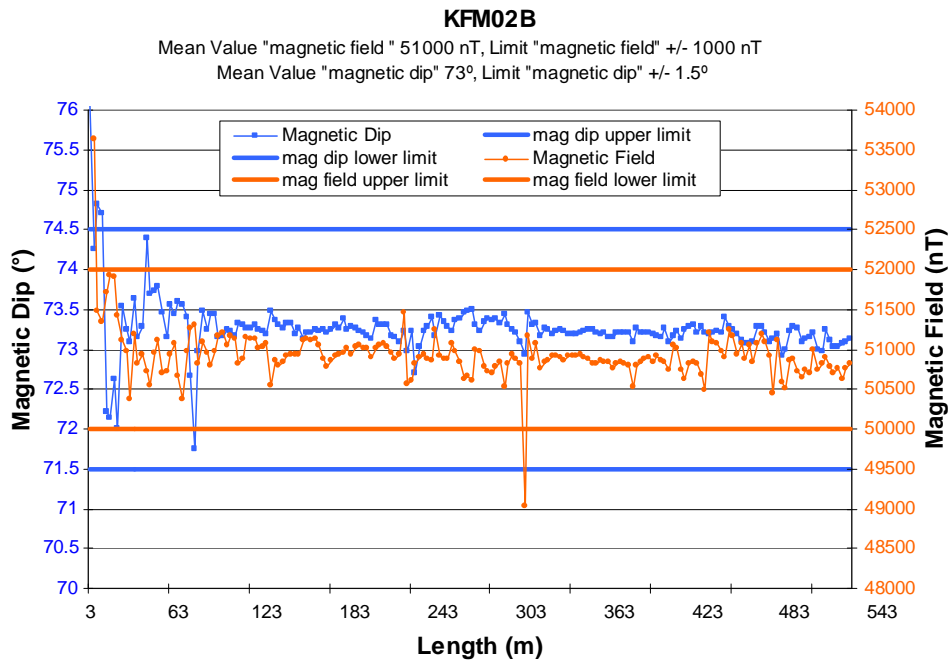


Figure 4-2. Example of quality checking of Flexit data from KFM02B. Readings exceeding the threshold values are excluded from the calculations.

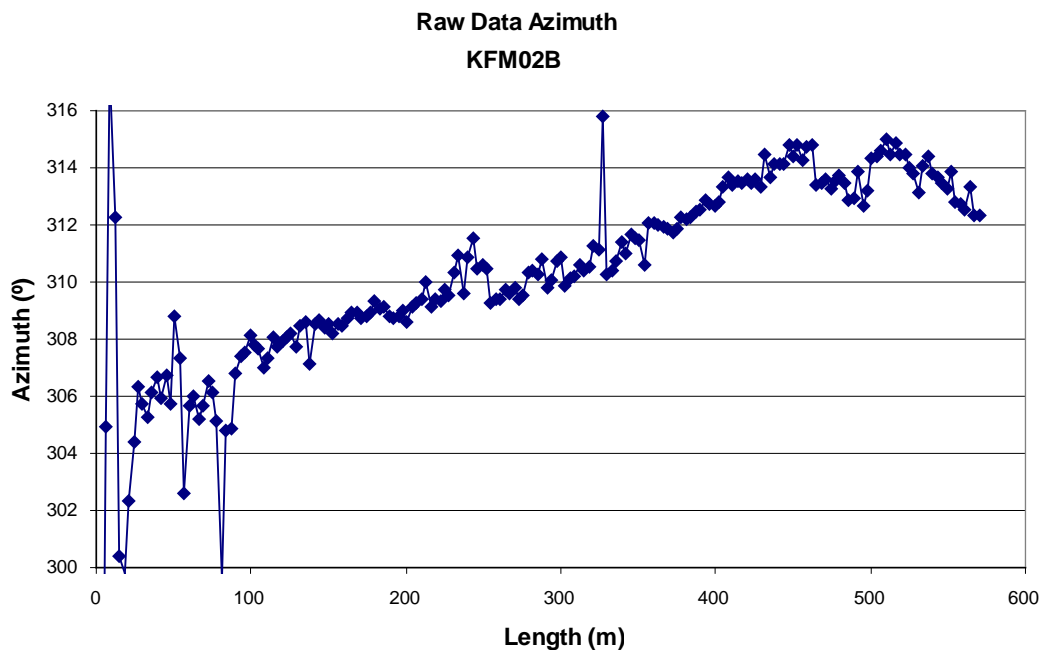


Figure 4-3. Raw data (bearing) from KFM02B.

The metallic casing in the upper part of the boreholes makes magnetic measurements unreliable. Therefore, bearing readings in the casing are always excluded from TOC to at least 3 m below the casing, and replaced by a linear interpolation. Processing is performed with the software described in Section 3.1.1. The data measured with the Reflex EZ-AQ/EMS are processed and adjusted in a very similar way.

Measurements with magnetic/accelerometer tools are effected not only by magnetic anomalies in the rock surrounding the borehole, but also by external sources to varying magnetic field. The geomagnetic field is normally considered as constant over time, but in fact contains disturbances. The most common disturbance is fluctuations caused by storms of charged

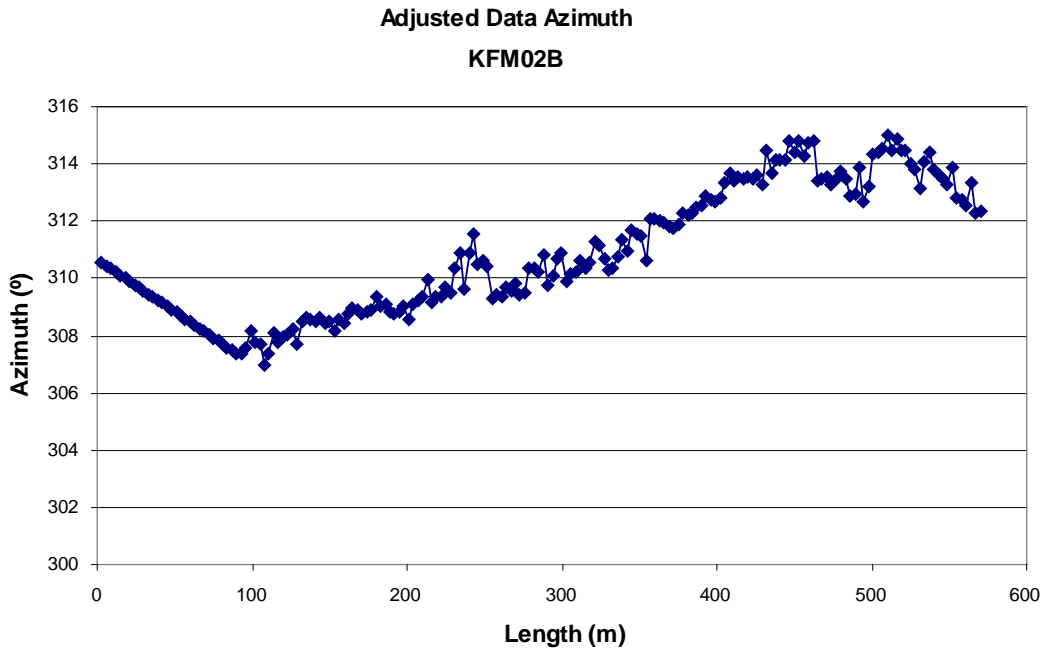


Figure 4-4. Adjusted data (bearing) from KFM02B.

particles from the sun. These storms cause large current loops in the earth ionosphere, and as a consequence of that, magnetic field variations on the earth surface. These variations can cause variations of the magnetic declination of several degrees, and need to be taken into account when measuring the bearing with magnetometer based methods.

Figure 4-5 shows data from the geomagnetic observatory in Uppsala from a day with strong disturbances and from a “quiet” day with only very small disturbances.

The geomagnetic data are available at www.intermagnet.org with a delay of one day. The procedure is to accept a magnetometer/accelerometer logging if the fluctuations in the declination of the geomagnetic data do not exceed 0.5 deg. If the fluctuations exceed 0.5 deg the deviation logging should be ERROR-marked, and a new logging has to be conducted. The geomagnetic data are displayed in the appendices for each magnetometer/accelerometer logging.

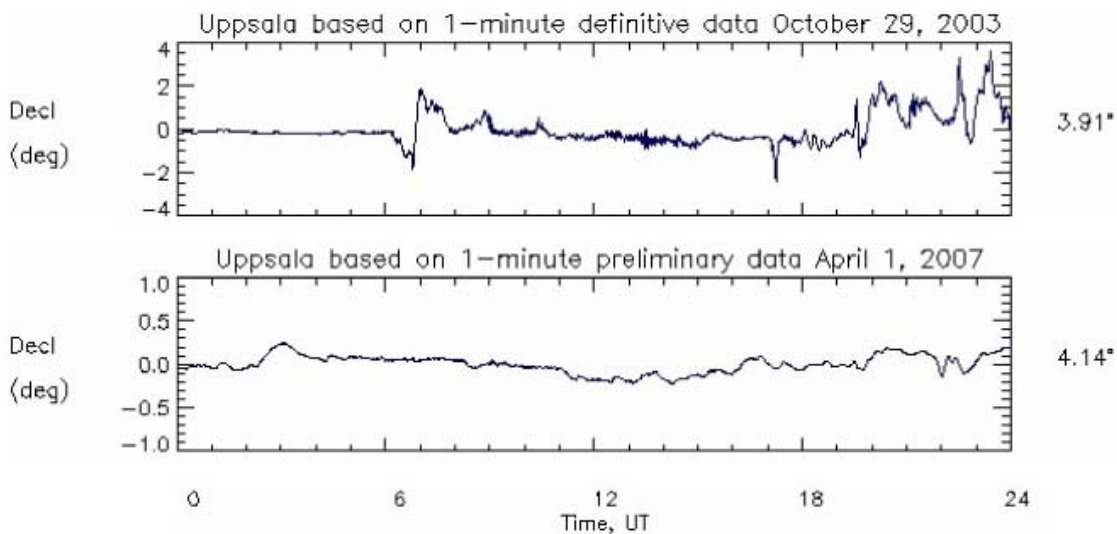


Figure 4-5. The magnetic declination as observed at the geomagnetic observatory in Uppsala. The upper diagram shows data from a day with considerable disturbances, whereas the lower diagram displays data from a typical day with only small variations. Diagrams are taken from www.intermagnet.org.

4.3.2 Optical method

When applying the optical method, the calculation of the deviation file needs not only the TOC coordinates, but also the directions (bearing and inclination) of the instrument at TOC are needed. After implementation of the improved logging procedure in May 2005, the starting direction values for the Maxibor (at 3 m borehole length) were calculated from the TOC direction values (from the borehole direction survey), in accordance with SKB ID 1037594³.

In some boreholes several deviation measurements have been performed during the drilling. Some of these “partial” measurements start at a certain borehole length, and become a continuation of an earlier deviation logging. The starting coordinates and directions for the new partial logging are taken from the last value of the former deviation logging for the corresponding borehole length.

4.4 Borehole deviations

A borehole deviation file is a list of coordinates (X, Y, Z), normally given for every 3rd metre along the borehole. The coordinates are calculated from the bearing and inclination readings along the borehole, by means of simple geometrical formulas. The basis for the calculation is the coordinates (X₀, Y₀, Z₀) at TOC.

4.4.1 “Initial” procedure (before revision) for calculation of borehole deviation

Before the revision, one of the actual deviation loggings was selected as the In_Use-flagged file. In the core-drilled boreholes normally the deviation logging measured with the optical tool was used.

As an example, Table 4-1 shows the deviation logging activities in Sicada before the revision. The activity with ID 12961063 was In_Use-flagged (Flag = I), and thereby used for calculating the borehole coordinates.

4.4.2 New procedure (after revision) for calculation of borehole deviation

As a result of the deviation data revision, a new procedure for calculating deviation data of a borehole, based on one or several measurements performed in the borehole, has been applied. The resulting deviation file is calculated as the median value of the inclination- and bearing-values in the deviation activities specified in the EG154-file.

Table 4-1. Deviation logging activities in KFM02A before the revision. The deviation logging with the optical tool, activity ID 12961063, was In_Use-flagged.

Activity ID	Activity Type code	Activity	Start date	Secup (m)	Seclow (m)	Flags
12976564	EG156	Maxibor measurement	2003-01-13 22:00	0.00	99.00	
13121506	EG156	Maxibor measurement	2003-01-21 22:00	0.00	216.00	
12976573	EG156	Maxibor measurement	2003-02-13 09:00	0.00	633.00	
12961063	EG156	Maxibor measurement	2003-03-18 00:00	0.00	999.00	I
13135168	EG157	Magnetic – accelerometer measurement	2005-04-26 13:30	3.00	993.00	CF*

* The meaning of the flag codes in this and other Sicada tables are as follows: I (In_use), F (data in the Sicada file archive), C (a written comment is saved in Sicada).

³ Internal SKB document.

A general strategy for including deviation activities in the EG154-specifications has been specified by a working group⁴, responsible for the implementation of the revision of the deviation measurements. This general strategy is as follows:

- Inclination values from all approved magnetic/accelerometer based loggings are included, from TOC to the bottom of the borehole.
- Bearing values from all approved magnetic/accelerometer based loggings are included from 3–12 metres below the end of the casing to the bottom of the borehole.
- Bearing values from all approved optical tool measurements are included from 3 m below TOC to the bottom of the borehole.
- In boreholes where no magnetic/accelerometer based deviation logging exists, one or multiple approved loggings with the optical tool are used.

The decision of which measurements to be included is however always subject to an expert judgment. In the appendices the details for each borehole are specified.

As an example, Table 4-2 shows the deviation logging activities in KFM02A after the revision. The newly constructed EG154-activity is now In_Use-flagged. The content of this file is shown in Table 4-3. As seen, in this example the logging with the magnetic/accelerometer tool is used from 105 m borehole length (below the casing). An automatic interpolation in Sicada is performed between TOC and 105 m. The resulting bearing and inclination from this example are shown in Figure 4-6. In most of the boreholes, however, the inclination readings from the magnetometer/accelerometer tool are used in the upper part of the borehole with casing, and only the bearing readings are replaced by interpolated values.

The median values for inclination and bearing are calculated as the median values from the specified activities at each 3 m borehole length, including the surrounding values within ± 4.5 m borehole length. As an example, if the EG154-file specifies three logging activities, then each new value is calculated as the median value of 9 readings of inclination and bearing respectively. This procedure is implemented in Sicada.

Table 4-2. Deviation logging activities in KFM02A after the revision. The constructed deviation “EG154” is In_Use-flagged.

Activity ID	Activity Type code	Activity	Start date	Secup (m)	Seclow (m)	Flags
12976564	EG156	Maxibor measurement	2003-01-13 22:00	0.00	99.00	
13121506	EG156	Maxibor measurement	2003-01-21 22:00	0.00	216.00	
12976573	EG156	Maxibor measurement	2003-02-13 09:00	0.00	633.00	
12961063	EG156	Maxibor measurement	2003-03-18 00:00	0.00	999.00	F
13135168	EG157	Magnetic – accelerometer measurement	2005-04-26 13:30	3.00	993.00	CF
13140518	EG154	Borehole deviation multiple measurements	2006-12-13 19:00			IC

Table 4-3. The EG154-specification in borehole KFM02A.

Deviation activity ID	Deviation angle type	Approved secup (m)	Approved seclow (m)
13135168	Bearing	105.00	993.00
13135168	Inclination	105.00	993.00

⁴ The group was headed by Karl-Erik Almén. The other participants were Lennart Ekman, Nils Håkansson, Göran Nilsson, Johan Nissen, Stefan Sehlstedt, Leif Stenberg and Martin Stigsson.

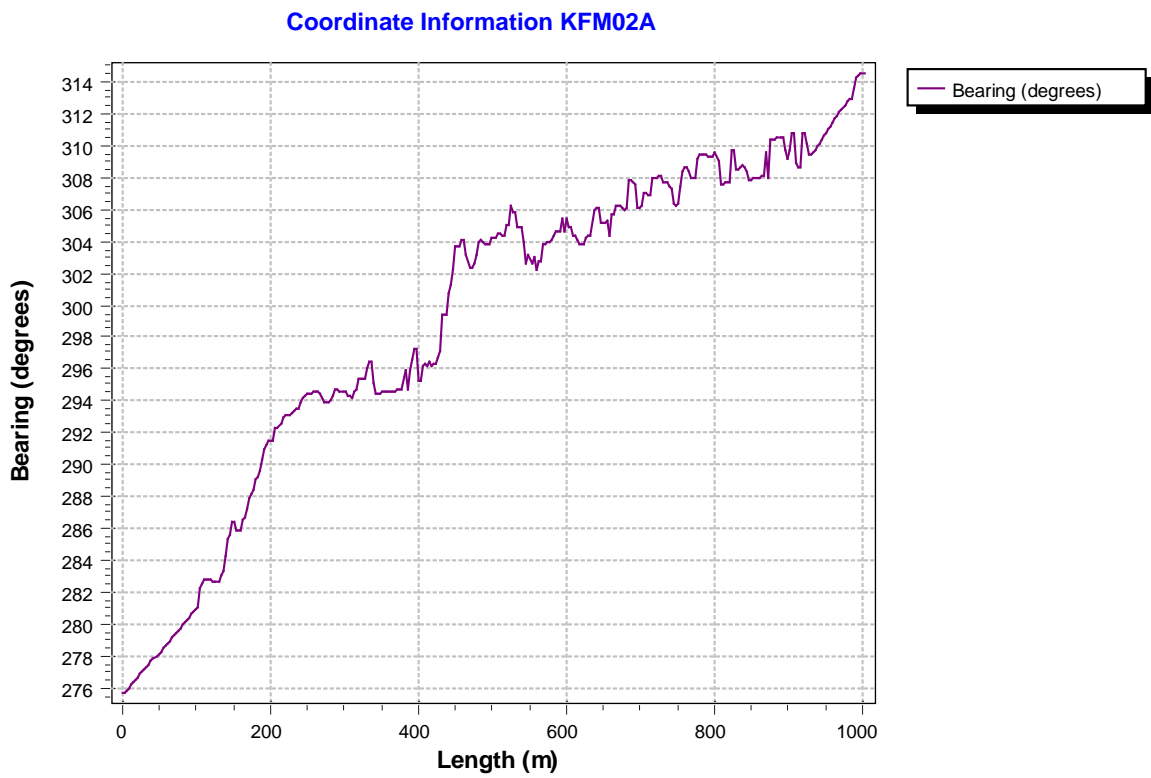
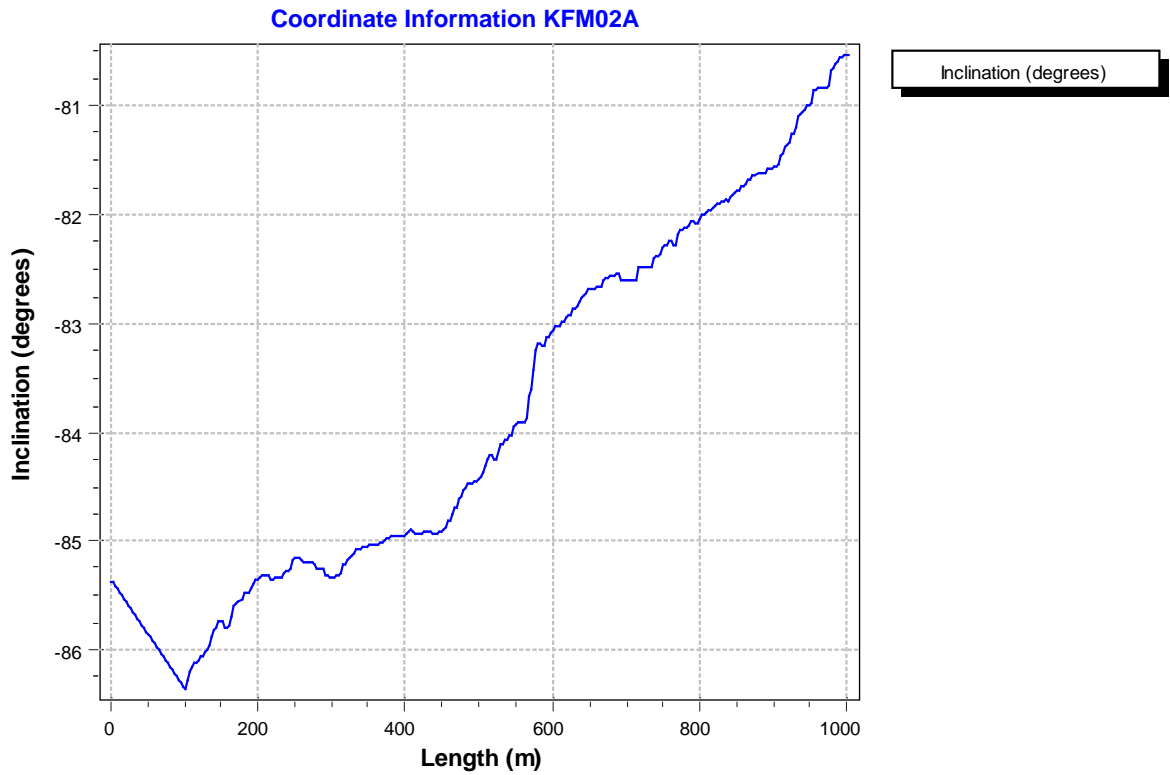


Figure 4-6. Resulting deviation (inclination and bearing) in KFM02A after the revision.

4.4.3 Estimation of uncertainties in borehole deviation loggings

The starting point in the calculation of deviation logging uncertainties is an estimate of the uncertainties of the measured quantities. The inclination- and bearing uncertainties are calculated as the 90th percentile of the whole population of differences between the new calculated deviation file (EG154 according to Section 4.4.2) and all other deviation activities which are not ERROR-marked. This procedure is also included in Sicada. In boreholes with only one deviation activity, these uncertainties cannot be calculated. In these cases fixed values, defined as the maximum values from all core-drilled boreholes at Forsmark (except KFM02B, KFM08D and KFM12A which have been drilled after the revision) of the inclination uncertainty and the bearing uncertainty respectively are used. The values used are $\Delta I = 1.8^\circ$ and $\Delta B = 4.9^\circ$.

A useful representation of the uncertainties involved in deviation logging is the “radius uncertainty”, defined as the radius (of a circle located in a plane perpendicular to the borehole axis) corresponding to the inclination- and bearing uncertainties. This quantity is a direct measure (in metres) of the uncertainty of the borehole location, and defines the shape of a cone surrounding the borehole.

The radius uncertainty is estimated as stated in equation (4-1)

$$\Delta r_n = \sum_{i=1}^n (L_i - L_{i-1}) \cdot \text{MAX} \{ \sin(\Delta I); \sin(\Delta B) \cdot \cos(I_i) \} \quad (4-1)$$

where L_i is the borehole length at measurement position i . This quantity is calculated automatically in Sicada.

Figure 4-7 shows the resulting radius uncertainty in KFM02A, as calculated by equation (4-1). Figure 4-8 illustrates the interpretation of the radius uncertainties as “uncertainty cones” around the borehole axis in four boreholes.

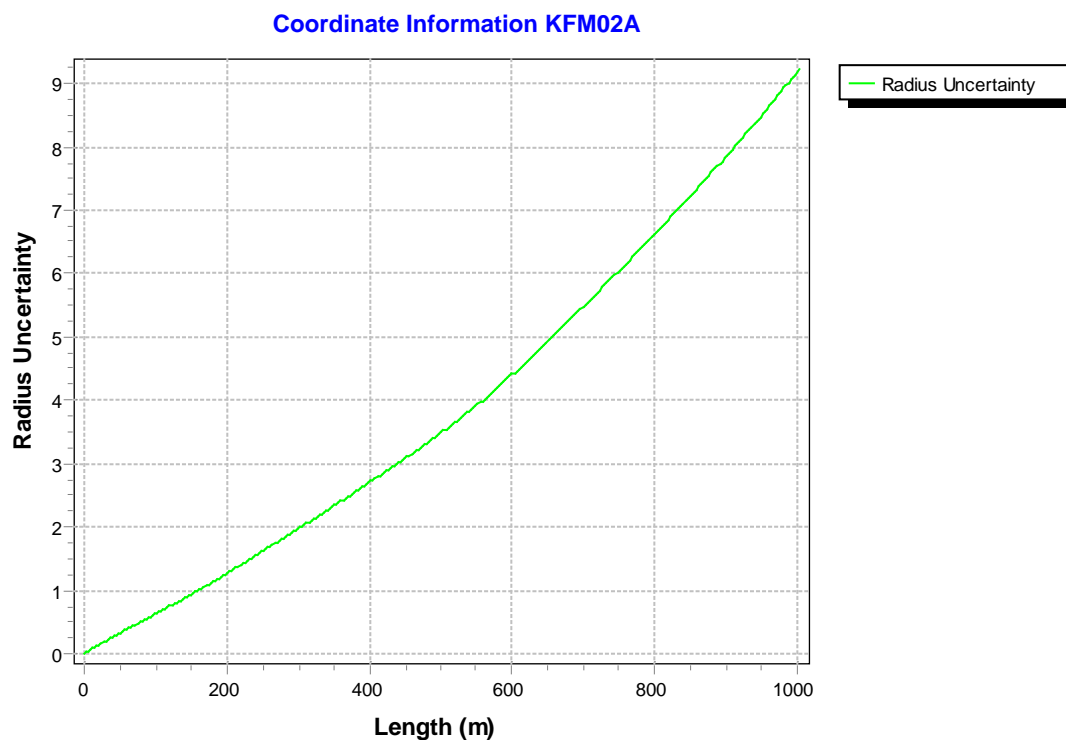


Figure 4-7. The calculated radius uncertainty in KFM02A according to equation (4-1).

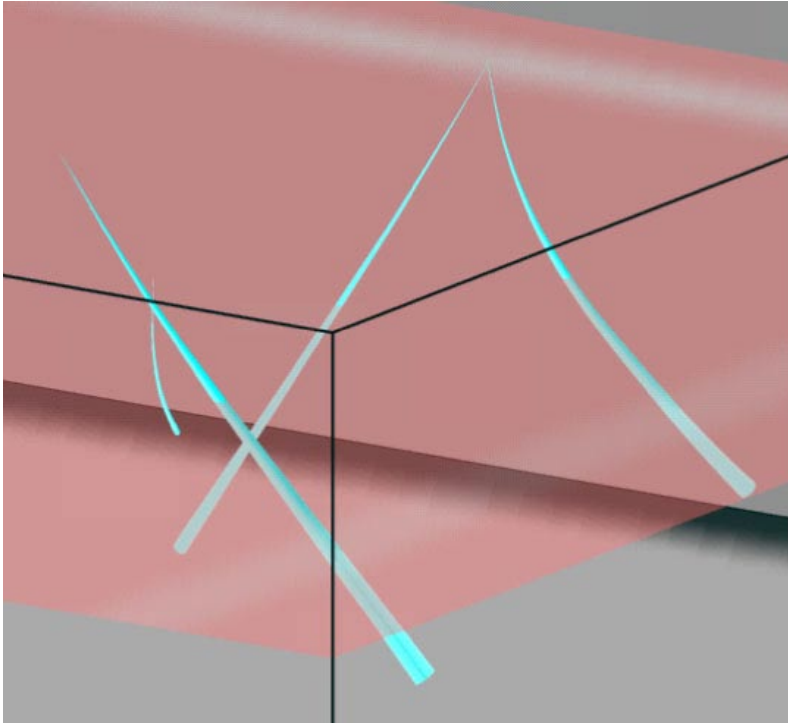


Figure 4-8. Example showing four different boreholes. The radius uncertainties are represented as “uncertainty cones” around each borehole axis.

Another useful quantity is the elevation uncertainty. Although it can be calculated by projecting the radius uncertainty (4-1) onto the vertical plane, this is however a rather pessimistic estimate. Due to the fact that the elevation uncertainty only depends upon the inclination uncertainty, a more realistic estimate can be calculated as equation (4-2)⁵.

$$\Delta Z_n = \sum_{i=1}^n (L_i - L_{i-1}) \cdot \sin(\Delta I) \cdot \cos(I_i) \quad (4-2)$$

The elevation uncertainty is not calculated by Sicada, but is to be calculated by equation (4-2) when needed. In Chapter 5, Tables 5-1 and 5-2, deviation uncertainty values are listed at the bottom of each borehole, and in the appendices values are listed for every approximately 100 m elevation for core-drilled boreholes and every 20 m for percussion drilled boreholes.

⁵ Equation (4-2) can be proved by considering a segment of unit length of the borehole with inclination I_i (measured from horizontal) together with the two “extremes” $(I_i - \Delta I)$ and $(I_i + \Delta I)$. The corresponding extremes in elevation are $Z_1 = \sin(I_i - \Delta I)$ and $Z_2 = \sin(I_i + \Delta I)$. The contribution to elevation uncertainty from this segment is thus $\Delta Z_i = \frac{1}{2} |Z_1 - Z_2|$. Equation (4-2) then follows by applying the trigonometric addition formulas, $\sin(\alpha \pm \beta) = \sin(\alpha)\cos(\beta) \pm \cos(\alpha)\sin(\beta)$.

5 Results

A detailed description of the construction of the revised deviation data for each borehole is shown in Appendix A (core-drilled boreholes) and Appendix B (percussion drilled boreholes). For each borehole a specification of the involved deviation measurements is given, and the resulting deviation file together with the estimated uncertainties are presented.

Tables 5-1 and 5-2 present an overview of the resulting uncertainties for inclination and bearing, together with the radius uncertainty at the bottom of each borehole. Also the elevation uncertainty is calculated and presented. The elevation uncertainty is not calculated in Sicada, but it can be calculated according to equation (4-2). The tables also display the change in position at the bottom of each borehole due to the revision, i.e. between the dates 2006-12-17 and 2007-05-04. As seen, the revision caused considerable changes (more than 10 metres) in five core-drilled boreholes (KFM06C, KFM07A, KFM08A, KFM09A and KFM09B). However, in the percussion-drilled boreholes the revision caused only marginal changes in the position.

In all percussion-drilled boreholes in Forsmark (except HFM23) only one deviation logging has been performed. This explains the fact that the standard estimates of inclination uncertainty and bearing uncertainty (according to Section 4.4.2) are used in these boreholes.

The inclination values listed in Tables 5-1 and 5-2 come from the activity “Borehole direction surveying”. In some of the boreholes (e.g. KFM07A) these values differ slightly from the corresponding values at TOC as listed in Table 3 in the appendices. The reason for this apparent inconsistency is that the values in Table 3 in the appendices are calculated by Sicada as the median value of the readings from the approved deviation logging as well as the reading from the borehole direction surveying (Section 4.4.2).

Table 5-1. Overview of the deviation uncertainties in all core-drilled boreholes. The inclination I is given at TOC, whereas the elevation, the radius uncertainty Δr and the elevation uncertainty ΔZ are given at the bottom of each borehole. The column “Change” displays the change in position at the bottom of each borehole due to the revision. Some very short boreholes (KFM04B, KFM09C and KFM90A–F) are not included. Because the boreholes KFM02B, KFM08D and KFM12A were drilled after the revision, no changes in position are calculated for these boreholes.

BoreholeID	BHL [m]	Elev. [m]	I [deg]	ΔI [deg]	ΔB [deg]	Δr [m]	ΔZ [m]	Change [m]
KFM01A	1,001.49	-982.27	-84.73	1.800	4.900	31.46	5.37	0.33
KFM01B	500.52	-479.34	-79.04	1.800	4.900	15.72	4.14	0.20
KFM01C	450.02	-332.70	-49.61	0.136	0.414	2.16	0.71	0.70
KFM01D	800.24	-612.48	-54.90	0.430	0.755	6.72	3.82	4.98
KFM02A	1,002.44	-988.85	-85.38	0.346	4.903	9.23	0.65	5.10
KFM02B	573.87	-557.89	-80.27	0.185	1.661	2.83	0.31	N/A
KFM03A	1,001.19	-988.17	-85.75	1.800	4.900	31.45	3.01	0.12
KFM03B	101.54	-92.67	-85.30	1.800	4.900	3.19	0.28	0.02
KFM04A	1,001.42	-796.41	-60.08	0.370	0.850	8.70	3.79	3.48
KFM05A	1,002.71	-827.10	-59.80	0.267	1.707	16.60	2.60	0.47
KFM06A	1,000.64	-827.47	-60.25	0.590	1.000	10.38	5.71	3.93
KFM06B	100.33	-95.56	-83.52	1.800	4.900	3.15	0.36	0.02
KFM06C	1,000.91	-781.42	-60.12	0.645	1.159	12.60	6.94	11.03
KFM07A	1,002.10	-820.94	-59.22	0.075	0.598	5.92	0.74	15.58
KFM07B	298.93	-237.91	-53.71	1.725	0.566	9.00	5.31	8.30
KFM07C	500.34	-494.35	-85.40	0.306	3.360	3.01	0.27	3.02
KFM08A	1,001.19	-759.40	-60.89	0.808	0.986	14.12	9.03	11.37
KFM08B	200.54	-166.86	-58.85	0.200	1.736	3.27	0.38	2.58

BoreholeID	BHL [m]	Elev. [m]	I [deg]	ΔI [deg]	ΔB [deg]	Δr [m]	ΔZ [m]	Change [m]
KFM08C	951.08	-780.81	-60.46	0.045	0.790	7.42	0.42	1.13
KFM08D	942.30	-748.28	-55.00	0.030	0.600	5.96	0.30	N/A
KFM09A	799.67	-621.21	-59.46	0.200	1.767	15.20	1.72	10.21
KFM09B	616.45	-472.00	-55.08	1.310	0.820	14.09	8.91	10.46
KFM10A	500.16	-338.08	-50.05	0.425	0.676	4.28	2.69	2.20
KFM11A	851.21	-713.24	-60.86	1.045	0.695	15.53	8.33	0.56
KFM12A	601.04	-501.49	-60.67	1.260	0.865	13.22	6.92	N/A

Table 5-2. Overview of the deviation uncertainties in all percussion-drilled boreholes. The inclination I is given at TOC, whereas the elevation, the radius uncertainty Δr and the elevation uncertainty ΔZ are given at the bottom of each borehole. The column “Change” displays the change in position at the bottom of each borehole due to the revision. Because the boreholes HFM36 and HFM37 were drilled after the revision, no changes in position are calculated for these boreholes.

Borehole ID	BHL [m]	Elev. [m]	I [deg]	ΔI [deg]	ΔB [deg]	Δr [m]	ΔZ [m]	Change [m]
HFM01	200.20	-195.35	-77.51	1.800	4.900	6.29	1.09	0.11
HFM02	100.00	-96.86	-87.79	1.800	4.900	3.14	0.13	0.01
HFM03	26.00	-22.81	-87.28	1.800	4.900	0.82	0.04	0.01
HFM04	221.70	-214.15	-84.26	1.800	4.900	6.96	1.11	0.11
HFM05	200.10	-189.91	-84.96	1.800	4.900	6.29	0.87	0.02
HFM06	110.70	-103.30	-84.60	1.800	4.900	3.48	0.40	0.02
HFM07	122.50	-115.88	-84.52	1.800	4.900	3.85	0.39	0.05
HFM08	143.50	-135.30	-84.44	1.800	4.900	4.51	0.49	0.05
HFM09	50.25	-41.39	-68.90	1.800	4.900	1.64	0.60	0.21
HFM10	150.00	-134.11	-68.70	1.800	4.900	4.93	1.76	0.13
HFM11	182.35	-117.91	-49.32	1.800	4.900	11.27	4.14	0.10
HFM12	209.55	-136.71	-49.05	1.800	4.900	12.98	4.77	0.32
HFM13	175.60	-146.81	-58.85	1.800	4.900	7.44	2.73	0.05
HFM14	150.50	-127.33	-59.81	1.800	4.900	6.29	2.31	0.04
HFM15	99.50	-65.51	-43.70	1.800	4.900	6.09	2.24	0.10
HFM16	132.50	-128.53	-84.22	1.800	4.900	4.16	0.38	0.12
HFM17	210.65	-203.90	-84.19	1.800	4.900	6.62	1.05	0.10
HFM18	180.65	-142.71	-59.36	1.800	4.900	8.87	3.26	0.23
HFM19	185.20	-143.94	-58.10	1.800	4.900	9.54	3.51	0.07
HFM20	301.00	-297.58	-85.45	1.800	4.900	9.45	0.49	0.01
HFM21	202.00	-153.37	-58.48	1.800	4.900	10.75	3.95	0.09
HFM22	222.00	-155.59	-58.85	1.800	4.900	13.17	4.84	0.01
HFM23	211.50	-72.78	-58.48	0.260	0.300	1.03	0.82	0.14
HFM24	151.35	-129.28	-59.56	1.800	4.900	6.14	2.26	0.00
HFM25	187.50	-134.10	-57.81	1.800	4.900	10.74	3.95	0.14
HFM26	202.70	-144.06	-53.75	1.800	4.900	11.91	4.38	0.05
HFM27	127.50	-115.00	-67.83	1.800	4.900	4.24	1.56	0.00
HFM28	151.20	-143.77	-84.76	1.800	4.900	4.75	0.92	0.03
HFM29	199.70	-177.91	-58.57	1.800	4.900	7.04	2.50	0.02
HFM30	200.75	-170.57	-55.50	1.800	4.900	8.54	3.14	0.03
HFM31	200.75	-176.89	-69.23	1.800	4.900	7.05	2.59	0.02
HFM32	202.65	-198.45	-86.06	1.800	4.900	6.37	1.08	0.01
HFM33	140.20	-110.36	-58.97	1.800	4.900	7.08	2.60	0.09
HFM34	200.75	-161.28	-58.65	1.800	4.900	9.87	3.63	0.52
HFM35	200.75	-150.42	-59.19	1.800	4.900	11.12	4.09	0.03
HFM36	152.55	-110.29	-58.91	1.800	4.900	8.16	3.00	N/A
HFM37	191.75	-159.18	-59.15	1.800	4.900	7.47	2.75	N/A
HFM38	200.75	-140.68	-54.45	1.800	4.900	11.97	4.40	0.26

Appendices

Appendix A Details of the core-drilled boreholes

Appendix B Details of the percussion-drilled boreholes

Reading instructions for the appendices

For each borehole the appendix starts with a technical description, followed by a description of the deviation logging activities and the used strategy for including (and excluding) deviation data in the final calculation. Part of the text is identical to the text in the Sicada comments (in Swedish language).

The key in the discussion of deviation logging activities is the ACTIVITY ID code, which is a unique number specifying an activity stored in Sicada. For each borehole Table 1 lists the involved activities. Note, that Table 1 always contains one additional activity compared to the actual number of deviation logging activities in a borehole. This is due to the fact that the activity *Borehole deviation multiple measurements (EG154)* appears in Table 1. It should also be noted, that in many cases some activities are redundant, in the sense that they are based on the same deviation logging. This is the case for most of the percussion drilled boreholes in Appendix B, for which one of the activities is ERROR-marked. This activity was initially stored using wrong corrections for magnetic declination, and was therefore at a later date substituted by a new, correct, data set. Because data cannot be deleted from Sicada, these activities still appear in Table 1, although ERROR-marked.

Table 2 shows the content of the file *EG154 Borehole deviation multiple measurements*, described in Section 4.4.2.

Table 3 contains a subset of the object_location file, which is an output from Sicada. The original object_location file contains coordinate information for every three metres borehole length. In Table 3 the information is reduced to every approximately 100 m elevation (Appendix A) or 20 m elevation (Appendix B). Table 3 contains an additional column ELEVATION_UNCERT which contains the elevation uncertainty calculated by equation (4-2). This parameter is not calculated in Sicada, but added afterwards to the tables.

Details of the core-drilled boreholes

Borehole description KFM01A

Figure 1 gives a technical description of KFM01A.

Technical data Borehole KFM01A

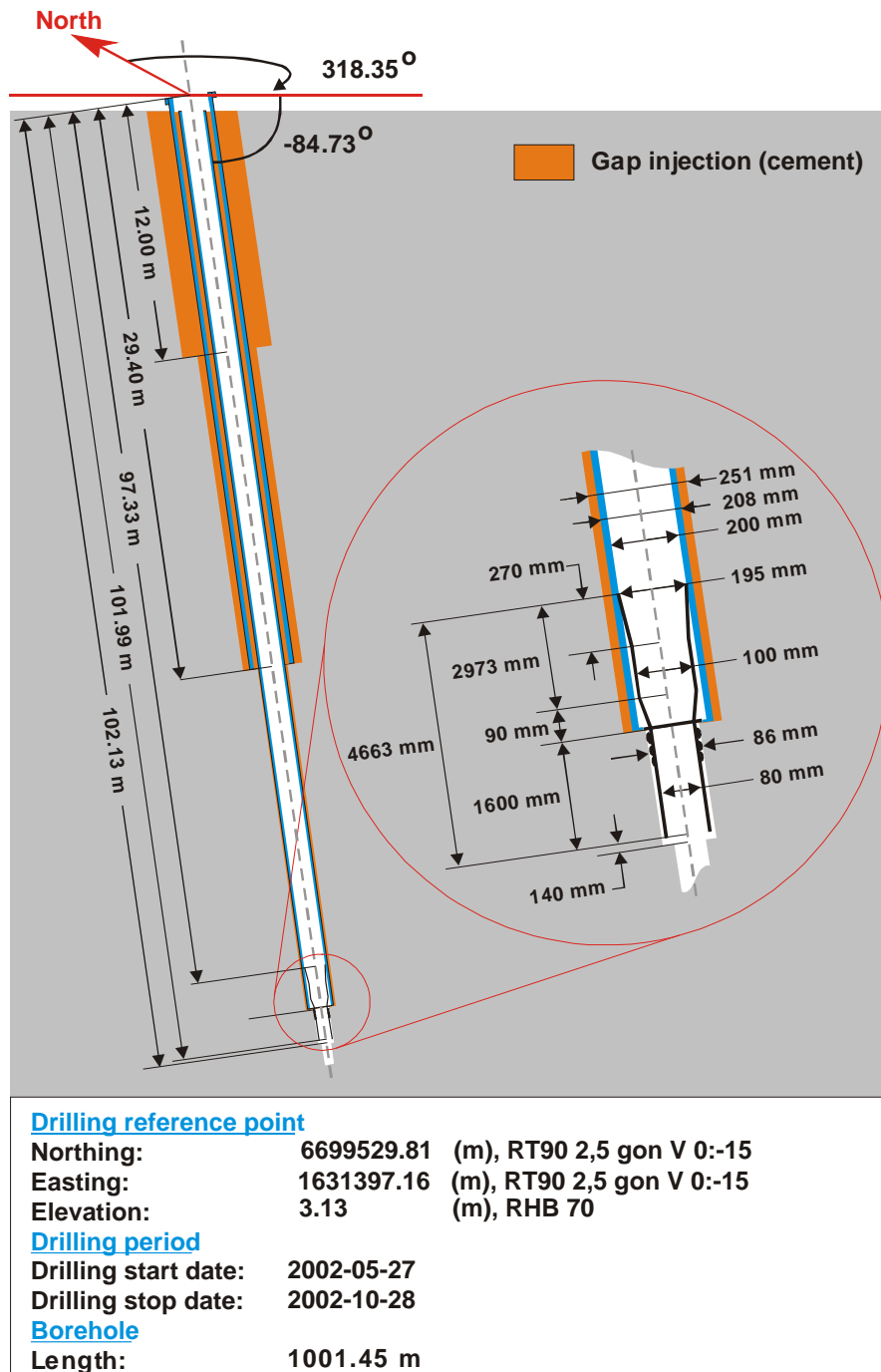


Figure 1. Technical description of KFM01A.

Deviation measurements in KFM01A

In total six deviation measurements were conducted in KFM01A. The deviation logging activities are tabulated in Sicada Activity Log, see Table 1.

There are five partial Maxibor measurements executed in borehole KFM01A (ID 12942791, 12946047, 12945896, 12945933 and 12946046) conducted to different borehole lengths, while the borehole drilling was in progress. All executed with the instrument centralized and hoisted by wire, inside the drill string.

One complete borehole Maxibor measurement (ID 12947310) was executed down to 993 m with the instrument centralized and hoisted by wire, inside the drill string.

The starting values (bearing and inclination) for all Maxibor measurement were obtained from the values surveyed at TOC (Borehole direction surveying).

The Maxibor measurements (ID 12945933 and 12946046) were later error marked as probably, incorrect start values have been used while merging these files. Also the Maxibor measurements (ID 12942791, 12946047) were error marked, because the same data between borehole lengths 0–201 m is used in Maxibor measurement ID 12945896, and would therefore confuse the calculation of the inclination and bearing uncertainties.

Borehole deviation multiple measurements

For the calculation of *Borehole deviation multiple measurements* (ID 13142386) two Maxibor measurements were used, the complete measurements (ID 12947310) and the joined file (12945896) to 318 m, see Table 2.

A subset of the resulting deviation file for every approximately 100 m elevation (from Object_location) is shown in Table 3. Because one of the two deviation activities was very short, it was decided to set the inclination and bearing uncertainties manually to 1.8° and 4.9° respectively (see Section 4.4.2), and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 2 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

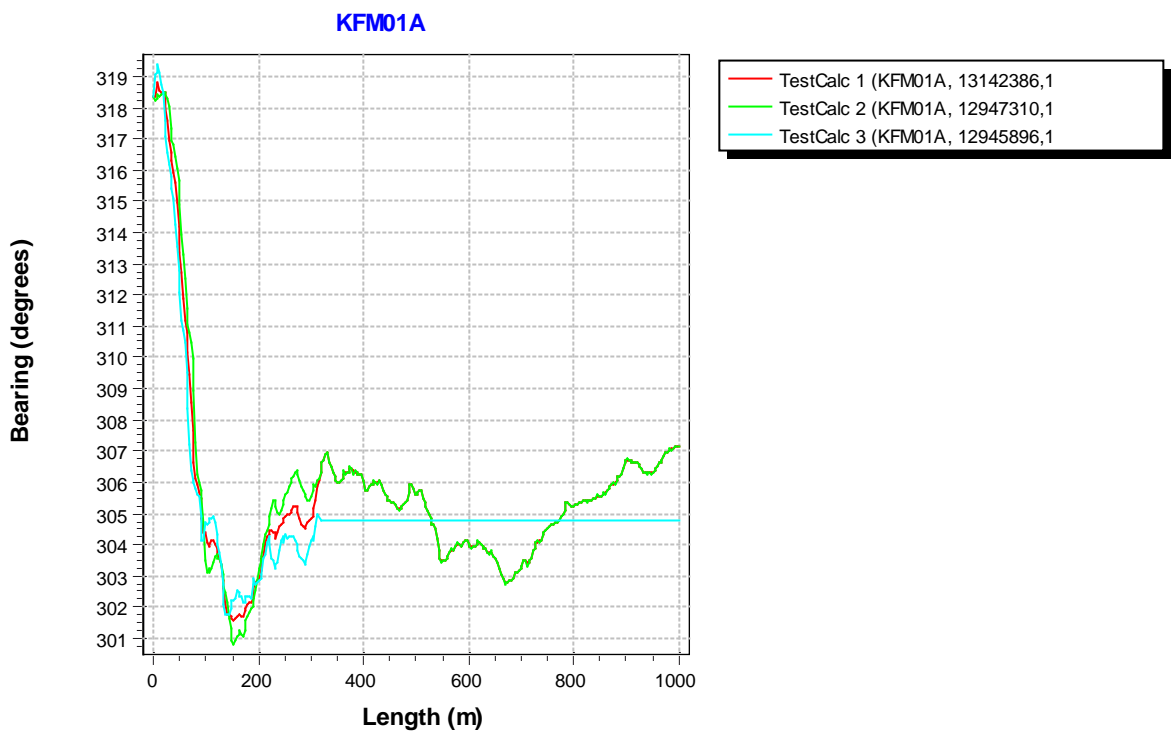
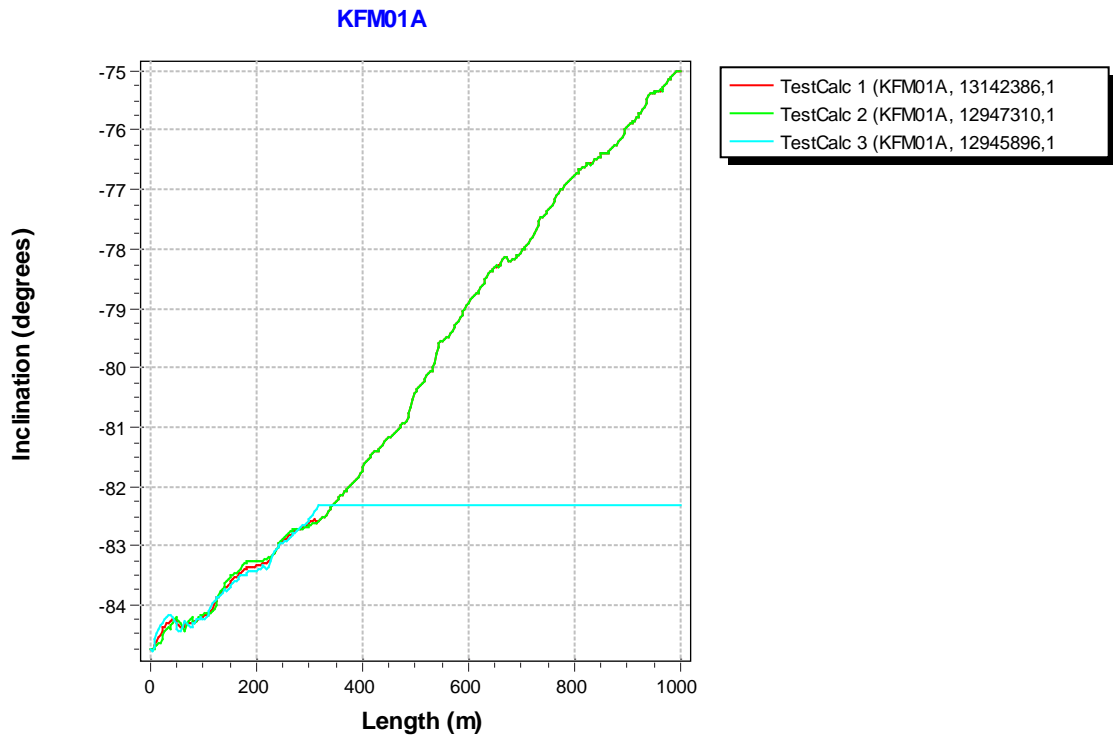


Figure 2. The Borehole deviation multiple measurements data (red line) together with the other, not error marked, deviation activities specified in Table 1. The upper diagram shows the inclination and the lower shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLW (m)	FLAGS	_INDAT
KFM01A	12942791	EG156	Maxibor measurement	2002-06-26 10:00	0.00	96.00	EF	061221 08:06
KFM01A	12946047	EG156	Maxibor measurement	2002-08-08 15:00	0.00	201.00	EF	061221 08:05
KFM01A	12945896	EG156	Maxibor measurement	2002-09-03 03:30	0.00	318.00	F	070425 10:49
KFM01A	12945933	EG156	Maxibor measurement	2002-09-10 15:00	0.00	459.00	ECF	061221 08:06
KFM01A	12946046	EG156	Maxibor measurement	2002-09-19 15:30	0.00	636.00	ECF	070425 10:50
KFM01A	12947310	EG156	Maxibor measurement	2002-10-31 11:00	0.00	993.00	F	061222 12:18
KFM01A	13142386	EG154	Borehole deviation multiple measurements	2007-04-25 11:00			I C	070425 14:54

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
KFM01A	12945896	BEARING	0.00	312.00	4.900
KFM01A	12945896	INCLINATION	0.00	312.00	1.800
KFM01A	12947310	BEARING	0.00	993.00	4.900
KFM01A	12947310	INCLINATION	0.00	993.00	1.800

Table 3. Subset (for every approx. 100 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
KFM01A	6699529.81	1631397.16	3.13	0.00	0.00	-84.73	318.35	1.8	4.9	0.00
KFM01A	6699536.73	1631389.54	-101.36	105	0.33	-84.18	303.98	1.8	4.9	3.30
KFM01A	6699542.63	1631380.28	-199.75	204	0.67	-83.33	303.15	1.8	4.9	6.41
KFM01A	6699549.76	1631369.95	-300.98	306	1.07	-82.57	305.17	1.8	4.9	9.61
KFM01A	6699557.72	1631359.11	-399.06	405	1.49	-81.61	305.72	1.8	4.9	12.72
KFM01A	6699566.93	1631346.26	-499.82	507	1.99	-80.32	305.73	1.8	4.9	15.93
KFM01A	6699577.33	1631330.96	-600.13	609	2.57	-78.81	303.92	1.8	4.9	19.13
KFM01A	6699588.70	1631313.73	-700.02	711	3.22	-77.94	303.42	1.8	4.9	22.33
KFM01A	6699601.52	1631295.17	-799.49	813	3.93	-76.67	305.35	1.8	4.9	25.54
KFM01A	6699615.67	1631275.62	-898.59	915	4.69	-75.86	306.63	1.8	4.9	28.74
KFM01A	6699628.73	1631258.08	-982.27	1001.49	5.37	-75.01	307.13	1.8	4.9	31.46

Borehole description KFM01B

Figure 1 gives a technical description of KFM01B.

Technical data

Borehole KFM01B

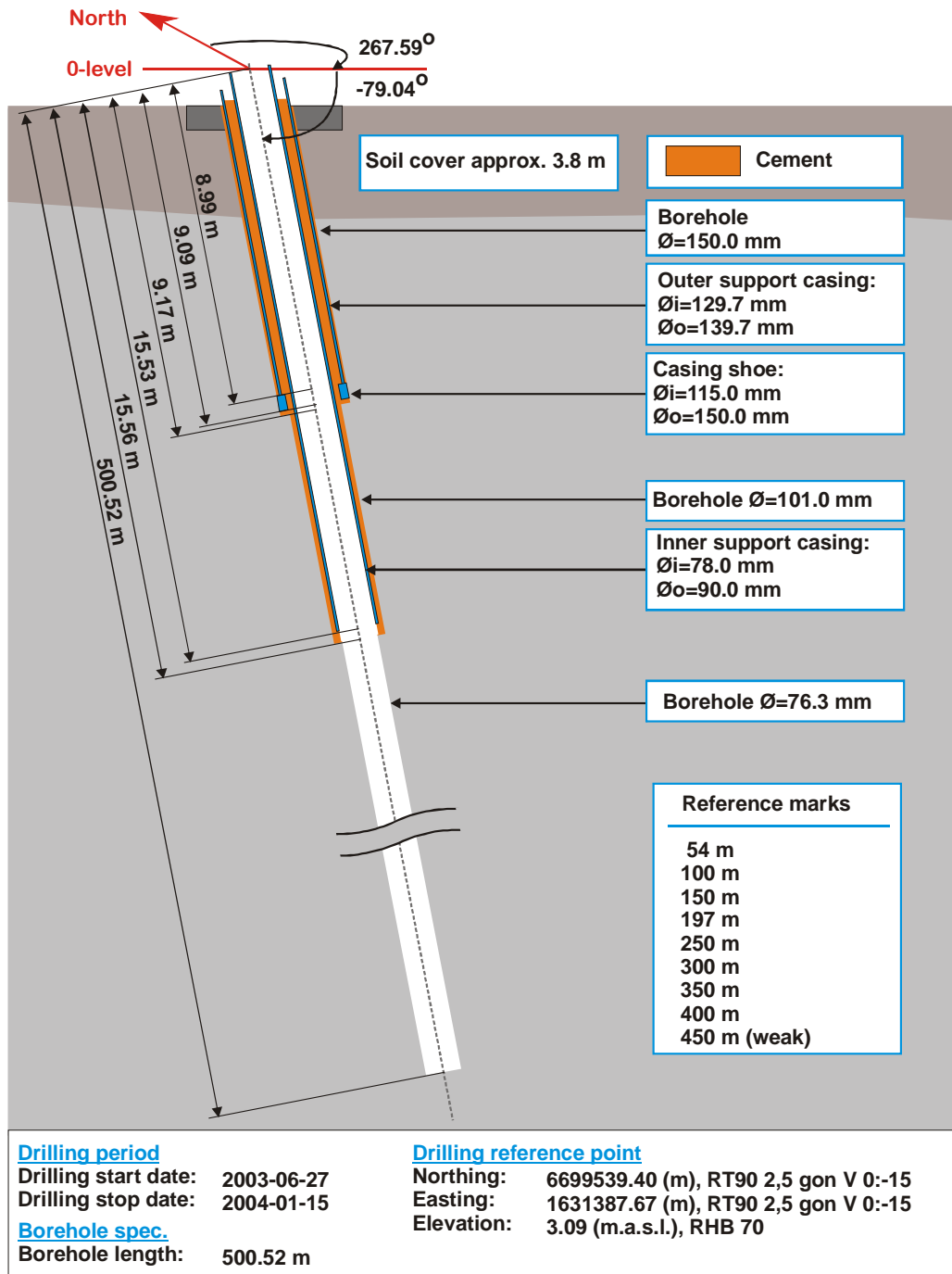


Figure 1. Technical description of KFM01B.

Deviation measurement in KFM01B

One deviation measurement was conducted in KFM01B. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

The complete borehole Maxibor measurement (ID 12994303) was executed down to 495 m with the instrument centralized and hoisted by wire, inside the drill string.

The starting values (bearing and inclination) for the Maxibor measurement were obtained from the values surveyed at TOC (Borehole direction surveying).

Borehole deviation multiple measurements

For the calculation of *Borehole deviation multiple measurements* (ID 13142387) the single Maxibor measurement (ID 12994303) was used, see Table 2.

A subset of the resulting deviation file for every approximately 100 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively, and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 2 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

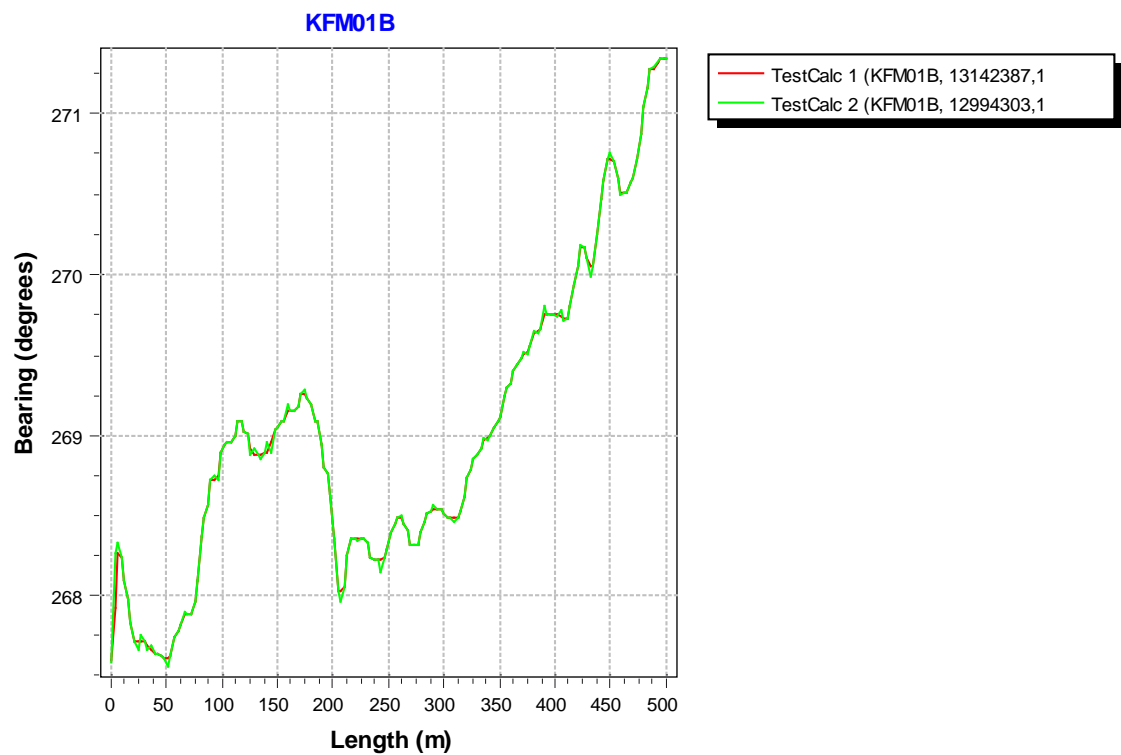
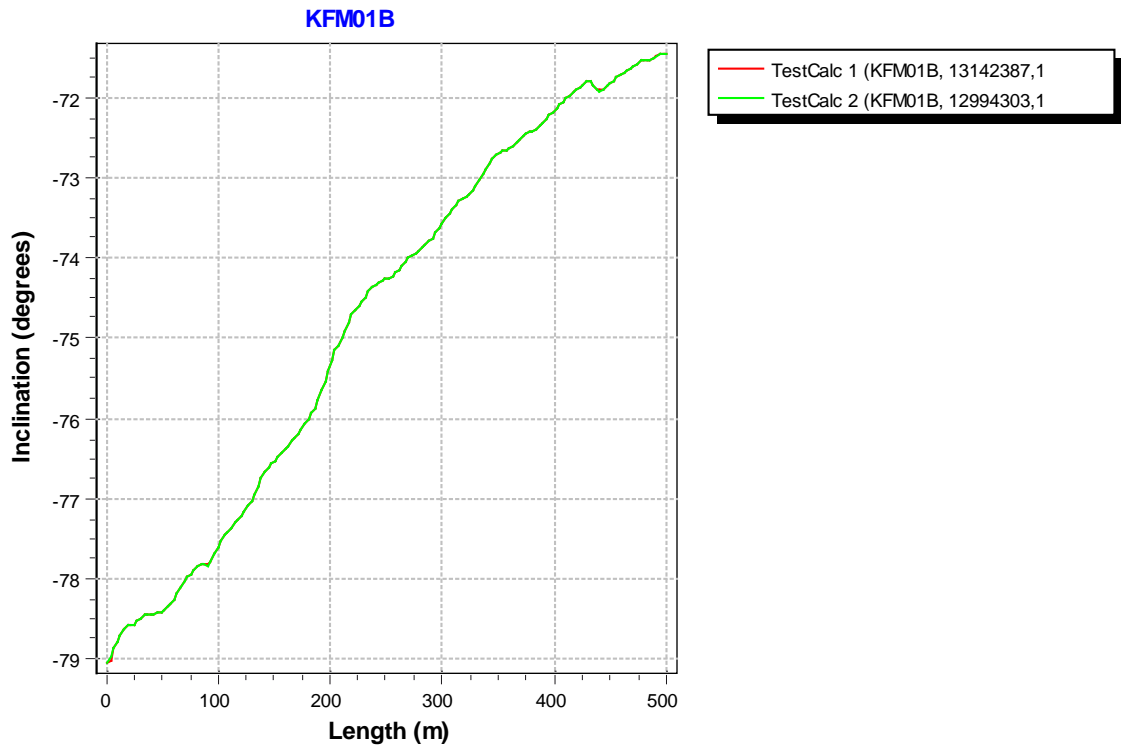


Figure 2. The Borehole deviation multiple measurements data (red line) together with the original deviation activity specified in Table 1. The upper diagram shows the inclination and the lower shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
KFM01B	12994303	EG156	Maxibor measurement	2004-01-16 00:00:00	0.00	495.00		061222 12:20
KFM01B	13142387	EG154	Borehole deviation multiple measurements	2006-12-20 19:10:00			I C	070111 08:13

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_ SECUP (m)	APPROVED_S ECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
KFM01B	12994303	BEARING	0.00	495.00	4.900
KFM01B	12994303	INCLINATION	0.00	495.00	1.800

Table 3. Subset (for every approx. 100 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
KFM01B	6699539.40	1631387.67	3.09	0	0.00	-79.04	267.59	1.8	4.9	0.00
KFM01B	6699538.66	1631366.30	-99.70	105	0.67	-77.45	268.95	1.8	4.9	3.30
KFM01B	6699538.20	1631341.58	-201.74	210	1.45	-75.00	268.05	1.8	4.9	6.60
KFM01B	6699537.41	1631313.68	-299.85	312	2.33	-73.33	268.48	1.8	4.9	9.80
KFM01B	6699537.04	1631282.30	-400.04	417	3.32	-71.93	269.93	1.8	4.9	13.10
KFM01B	6699537.34	1631256.09	-479.34	500.52	4.14	-71.46	271.34	1.8	4.9	15.72

Borehole description KFM01C

Figure 1 gives a technical description of KFM01C.

Technical data Borehole KFM01C

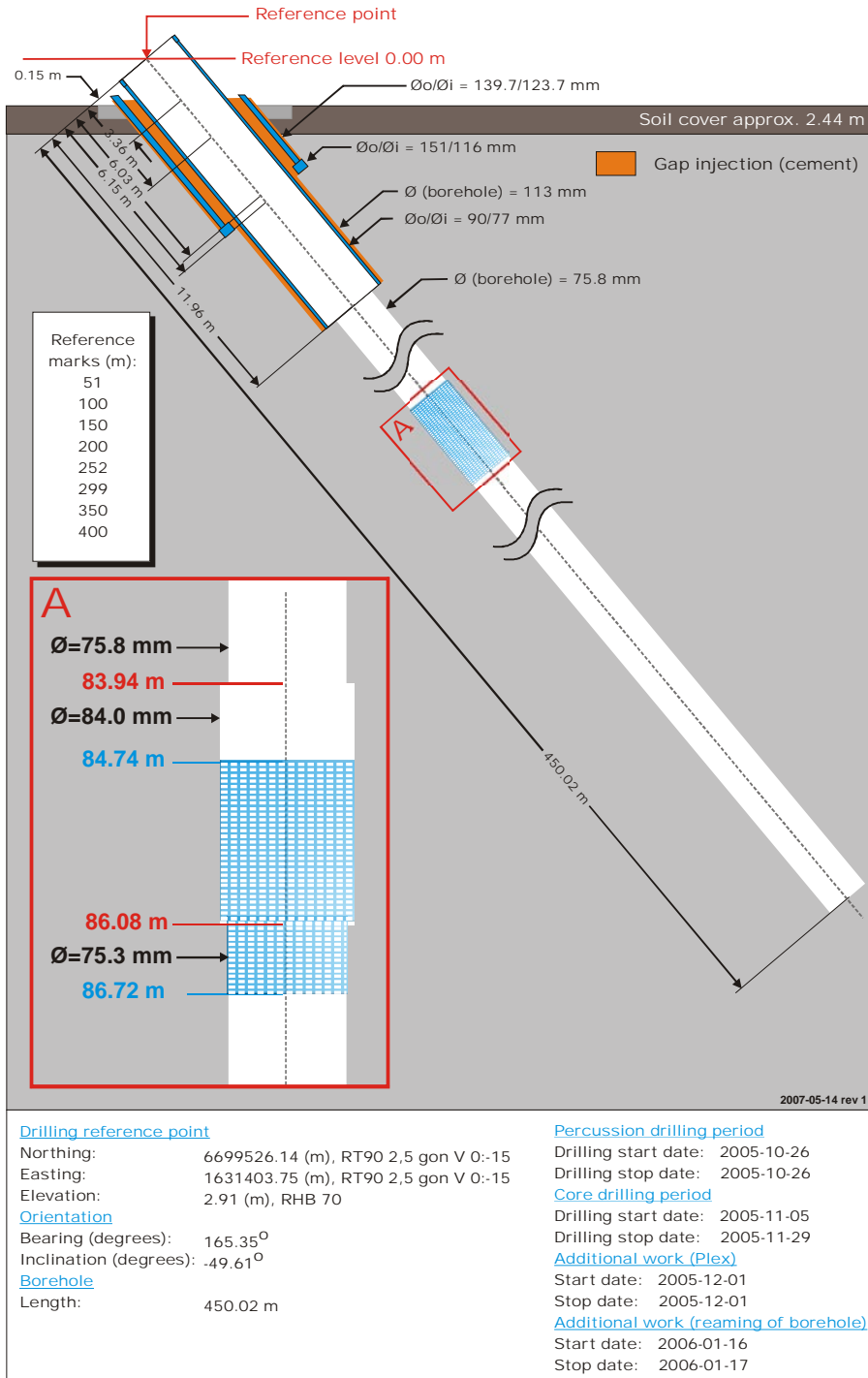


Figure 1. Technical description of KFM01C.

Deviation measurements in KFM01C

In total three deviation measurements were conducted in KFM01C. The deviation logging activities are tabulated in Sicada Activity Log, see Table 1.

One complete Maxibor measurement (ID 13110835) was executed down to 447 m with the instrument mounted inside a barrel which was joined to the lower end of the drill string.

The starting values (bearing and inclination) for the Maxibor measurement were obtained from the values surveyed at TOC (Borehole direction surveying).

One complete Mag/acc measurement (ID 13132007) and one measurement with 30 m interval (ID13132006) were executed down to 448 m length with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for both measurements. No geomagnetic disturbances exceeding 0.5 degrees in declination were observed on the dates of measuring, see Figure 2.

Borehole deviation multiple measurements

For the calculation of *Borehole deviation multiple measurements* (ID 13140599) the two Mag/acc measurements (ID 13132006 and 13132007) were used, see Table 2. Only small differences exist between Maxibor and Flexit.

A subset of the resulting deviation file for every approximately 100 m elevation (from Object_location) is shown in Table 3. The inclination and bearing uncertainties were calculated automatically, and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

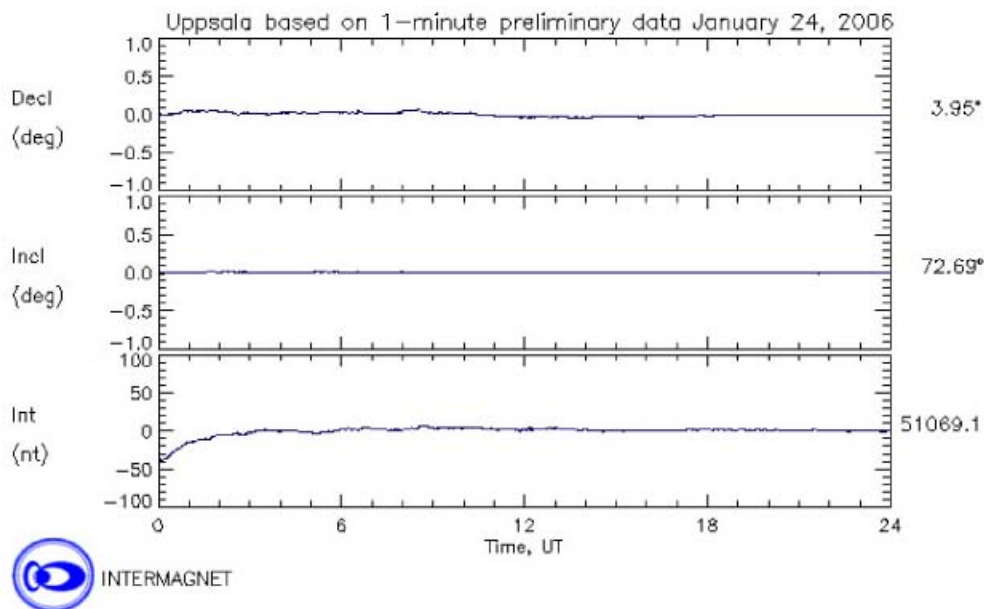


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2006-01-24. The upper curve displays the declination.

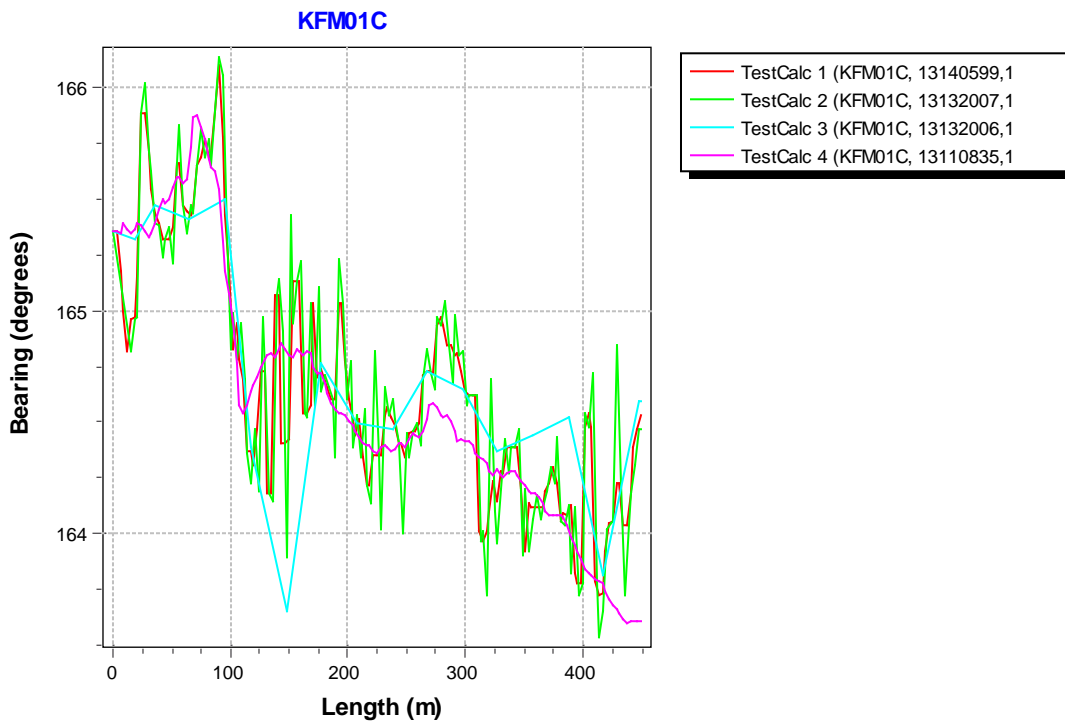
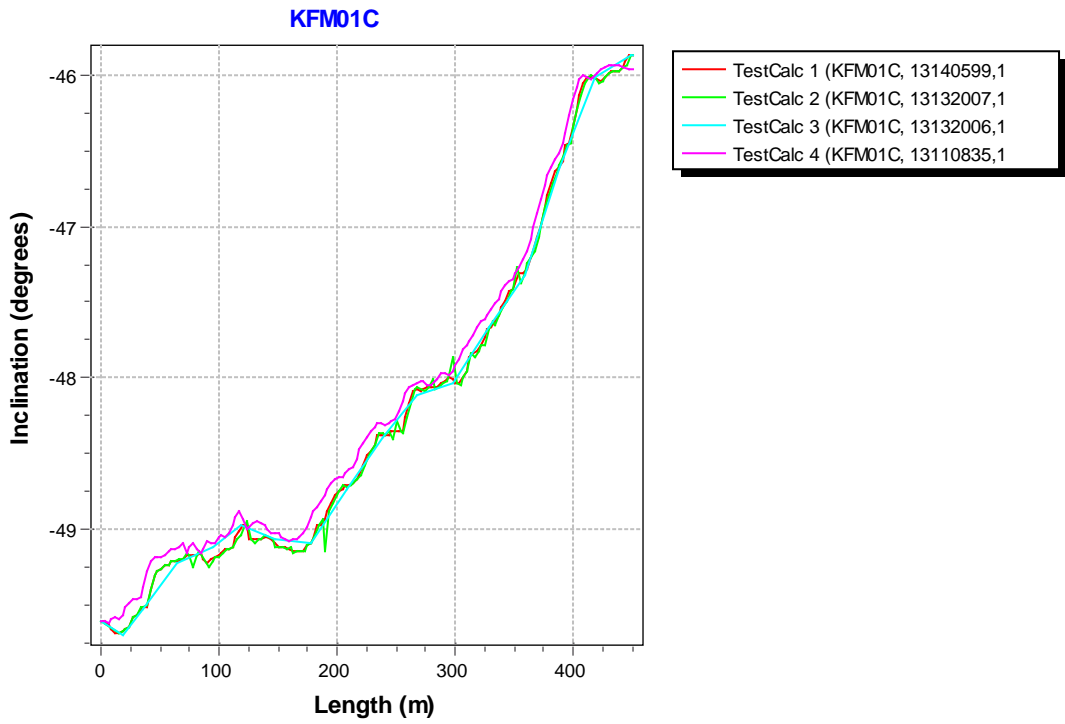


Figure 3. The Borehole deviation multiple measurements data (red line) together with the other, not error marked, deviation activities specified in Table 1. The upper diagram shows the inclination and the lower shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
KFM01C	13110835	EG156	Maxibor measurement	2005-11-30 00:00	0.00	447.00		070813 12:47
KFM01C	13132007	EG157	Magnetic - accelerometer measurement	2006-01-24 12:15	15.00	448.00	CF	061012 09:18
KFM01C	13132006	EG157	Magnetic - accelerometer measurement	2006-01-24 13:55	18.00	448.00	CF	061012 09:15
KFM01C	13140599	EG154	Borehole deviation multiple measurements	2006-12-14 08:00			I C	061222 10:28

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
KFM01C	13132006	BEARING	18.00	448.00	
KFM01C	13132006	INCLINATION	18.00	448.00	
KFM01C	13132007	BEARING	15.00	448.00	
KFM01C	13132007	INCLINATION	15.00	448.00	

Table 3. Subset (for every approx. 100 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_UNCERT	INCLINATION	BEARING	INCLINATION_UNCERT	BEARING_UNCERT	RADIUS_UNCERT
KFM01C	6699526.14	1631403.75	2.91	0	0.00	-49.61	165.35	0.136	0.414	0.00
KFM01C	6699441.01	1631426.18	-99.44	135	0.21	-49.06	164.18	0.136	0.414	0.64
KFM01C	6699355.17	1631449.82	-200.91	270	0.42	-48.09	164.73	0.136	0.414	1.28
KFM01C	6699267.24	1631474.48	-300.33	405	0.64	-46.13	164.54	0.136	0.414	1.94
KFM01C	6699237.16	1631483.03	-332.70	450.02	0.71	-45.87	164.53	0.136	0.414	2.16

Borehole description KFM01D

Figure 1 gives a technical description of KFM01D.

Technical data Borehole KFM01D

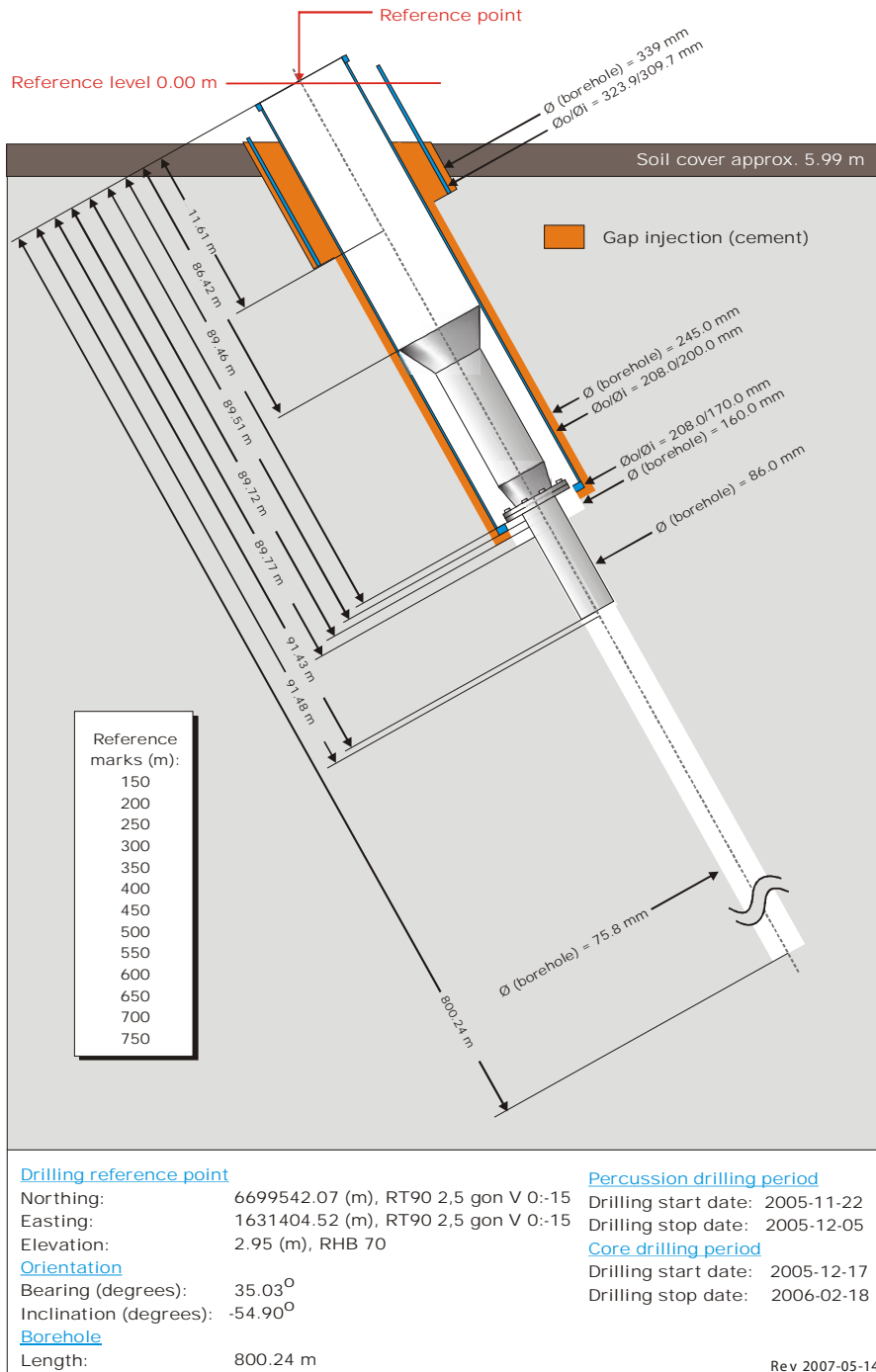


Figure 1. Technical description of KFM01D.

Deviation measurements in KFM01D

In total four deviation measurements were conducted in KFM01D. The deviation logging activities are tabulated in Sicada Activity Log, see Table 1.

One complete Maxibor measurement (ID 13102425) was executed down to 798 m with the instrument mounted inside a barrel which was joined to the lower end of the drill string.

The starting values (bearing and inclination) for the Maxibor measurement were obtained from the values surveyed at TOC (Borehole direction surveying).

The two complete Mag/acc measurements (ID 13132053 and 13138475) and one measurement (ID13132052) with 30 m interval were executed down to 795 m length with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. No geomagnetic disturbances exceeding 0.5 degrees in declination were observed on the dates of measuring, see Figure 2.

Borehole deviation multiple measurements

For the calculation of *Borehole deviation multiple measurements* (ID 13140595) the three Mag/acc measurements (ID 13132053 and 13132052 and 13138475) were used, see Table 2. The Maxibor inclination differs significantly from the Flexit inclination curves.

A subset of the resulting deviation file for every approximately 100 m elevation (from Object_location) is shown in Table 3. The inclination and bearing uncertainties were calculated automatically, and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

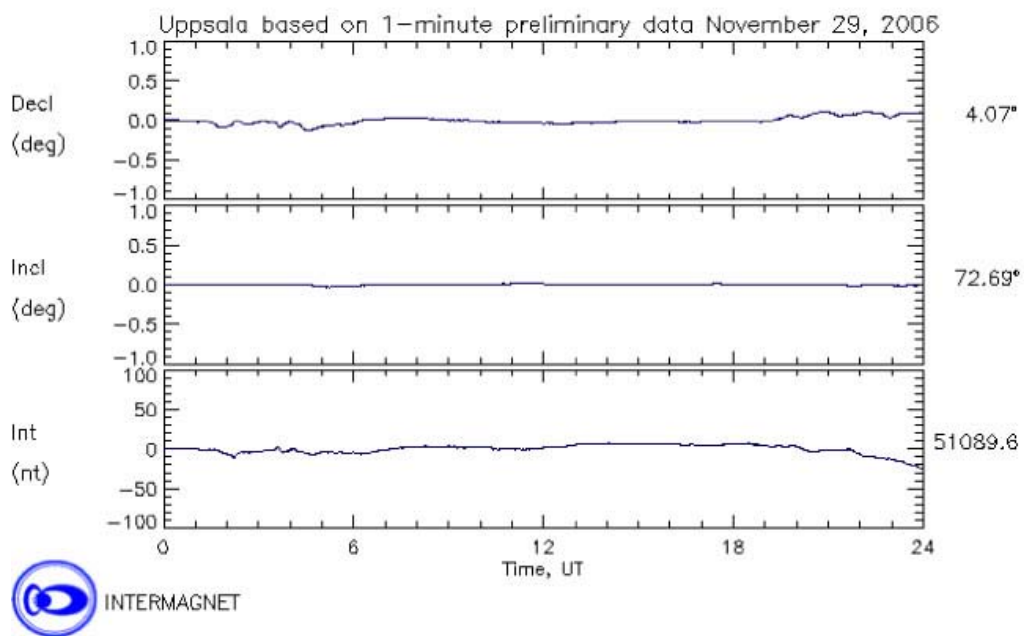
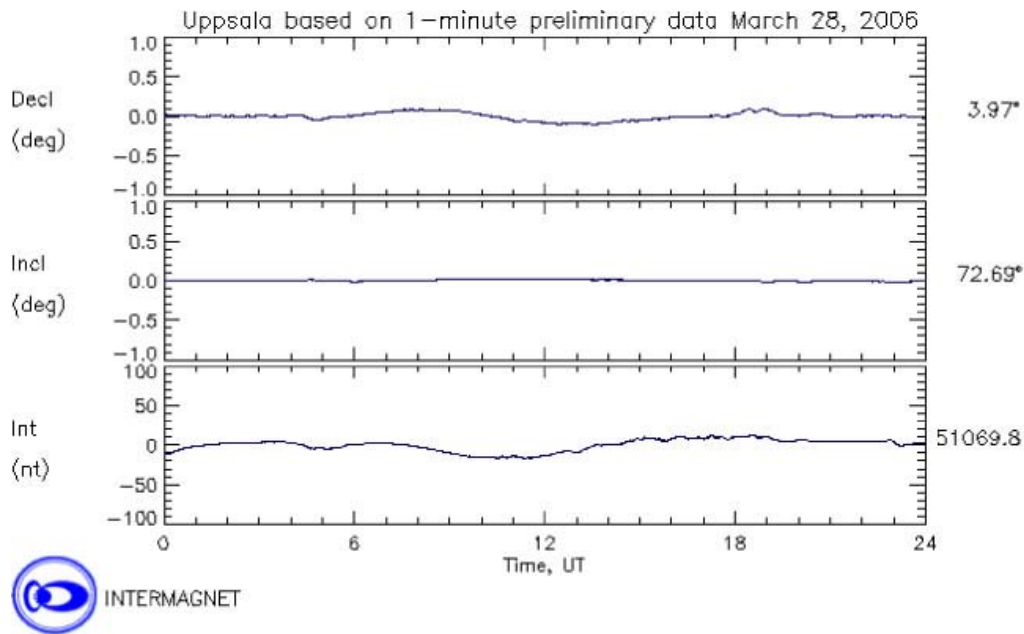


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2006-03-28 (upper diagram) and 2006-11-29 (lower diagram). The upper curve displays the declination.

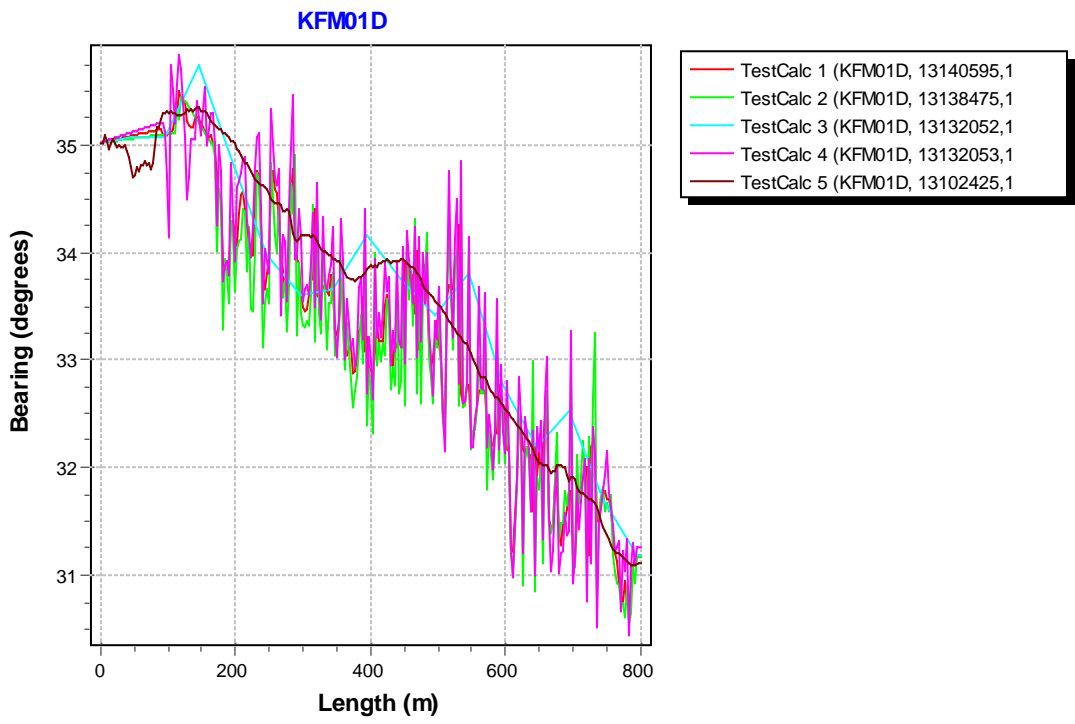
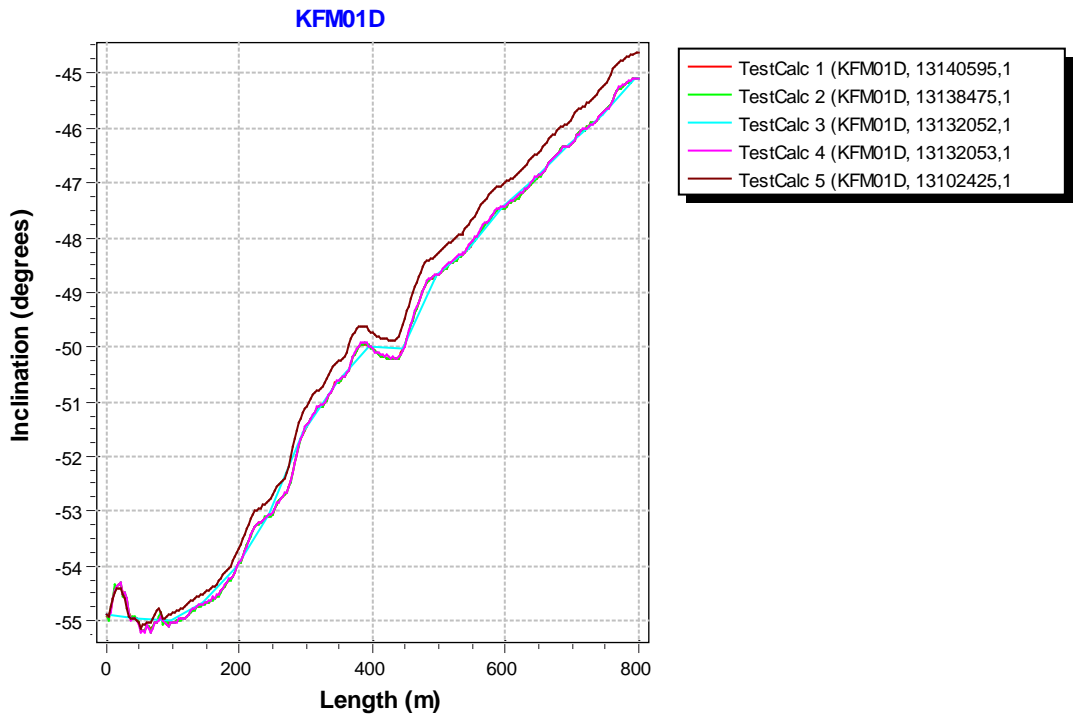


Figure 3. The Borehole deviation multiple measurements data (red line) together with the other, not error marked, deviation activities specified in Table 1. The upper diagram shows the inclination and the lower shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
KFM01D	13102425	EG156	Maxibor measurement	2006-02-21 00:00:00	3.00	798.00		061222 12:20
KFM01D	13132053	EG157	Magnetic - accelerometer measurement	2006-03-28 12:40:00	3.00	795.00	CF	061012 15:28
KFM01D	13132052	EG157	Magnetic - accelerometer measurement	2006-03-28 16:10:00	45.00	795.00	CF	061012 15:28
KFM01D	13138475	EG157	Magnetic - accelerometer measurement	2006-11-29 08:00:00	3.00	795.00	CF	061130 13:52
KFM01D	13140595	EG154	Borehole deviation multiple measurements	2006-12-14 10:00:00			I C	061222 10:29

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_ SECUP (m)	APPROVED_S SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
KFM01D	13132052	BEARING	95.00	795.00	
KFM01D	13132052	INCLINATION	45.00	795.00	
KFM01D	13132053	BEARING	93.00	795.00	
KFM01D	13132053	INCLINATION	3.00	297.00	
KFM01D	13138475	BEARING	93.00	795.00	
KFM01D	13138475	INCLINATION	3.00	795.00	

Table 3. Subset (for every approx. 100 m elevation) of the resulting "Object_location" in Sicada.

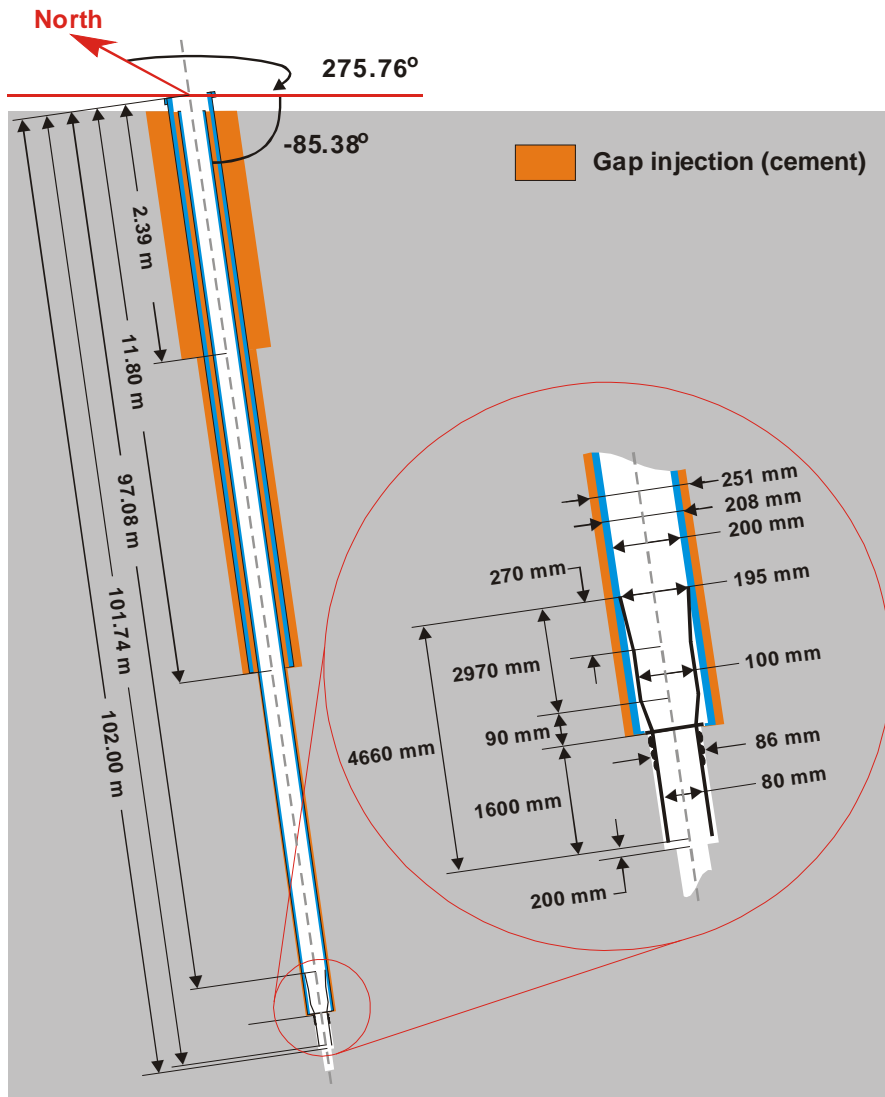
IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
KFM01D	6699542.07	1631404.52	2.95	0	0.00	-54.90	35.03	0.43	0.755	0.00
KFM01D	6699601.32	1631446.22	-100.14	126	0.54	-54.83	35.24	0.43	0.755	0.95
KFM01D	6699660.81	1631487.19	-199.68	249	1.09	-53.04	33.93	0.43	0.755	1.91
KFM01D	6699727.74	1631531.92	-300.46	378	1.69	-49.99	33.02	0.43	0.755	2.97
KFM01D	6699799.26	1631578.89	-400.96	510	2.33	-48.55	32.47	0.43	0.755	4.10
KFM01D	6699875.79	1631627.72	-500.87	645	3.01	-46.93	31.90	0.43	0.755	5.29
KFM01D	6699957.32	1631677.87	-600.26	783	3.73	-45.16	30.74	0.43	0.755	6.56
KFM01D	6699967.75	1631684.15	-612.48	800.24	3.82	-45.09	31.17	0.43	0.755	6.72

Borehole description KFM02A

Figure 1 gives a technical description of KFM02A.

Technical data

Borehole KFM02A



Drilling reference point

Northing: 6698712.50 (m), RT90 2,5 gon V 0:-15
Easting: 1633182.86 (m), RT90 2,5 gon V 0:-15
Elevation: 7.35 (m), RHB 70

Drilling period

Drilling start date: 2003-01-08
Drilling stop date: 2003-03-12

Borehole

Length: 1002.44 m

Figure 1. Technical description of KFM02A.

Deviation measurements in KFM02A

In total five deviation measurements were conducted in KFM02A. The deviation logging activities are tabulated in Sicada Activity Log, see Table 1.

There are three partial Maxibor measurements executed in borehole KFM02A (ID 12976564, 13121506 and 12976573) conducted to different borehole lengths, while the borehole drilling was in progress. All executed with the instrument centralized and hoisted by wire, inside the drill string.

The complete borehole Maxibor measurement (ID 12961063) was executed down to 999 m with the instrument centralized and hoisted by wire, inside the drill string.

The starting values (bearing and inclination) for all Maxibor measurement were obtained from the values surveyed at TOC (Borehole direction surveying).

The complete single Mag/acc measurement (ID 13135168) was executed down to 993 m length with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. No geomagnetic disturbances exceeding 0.5 degrees in declination were observed on the dates of measuring, see Figure 2.

Borehole deviation multiple measurements

For the calculation of *Borehole deviation multiple measurements* (ID 13140518) the single Mag/acc measurement (ID 13135168) was used, see Table 2. The Maxibor inclinations differ significantly from the Flexit inclination curve.

A subset of the resulting deviation file for every approximately 100 m elevation (from Object_location) is shown in Table 3. The inclination and bearing uncertainties were calculated automatically, and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 2 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

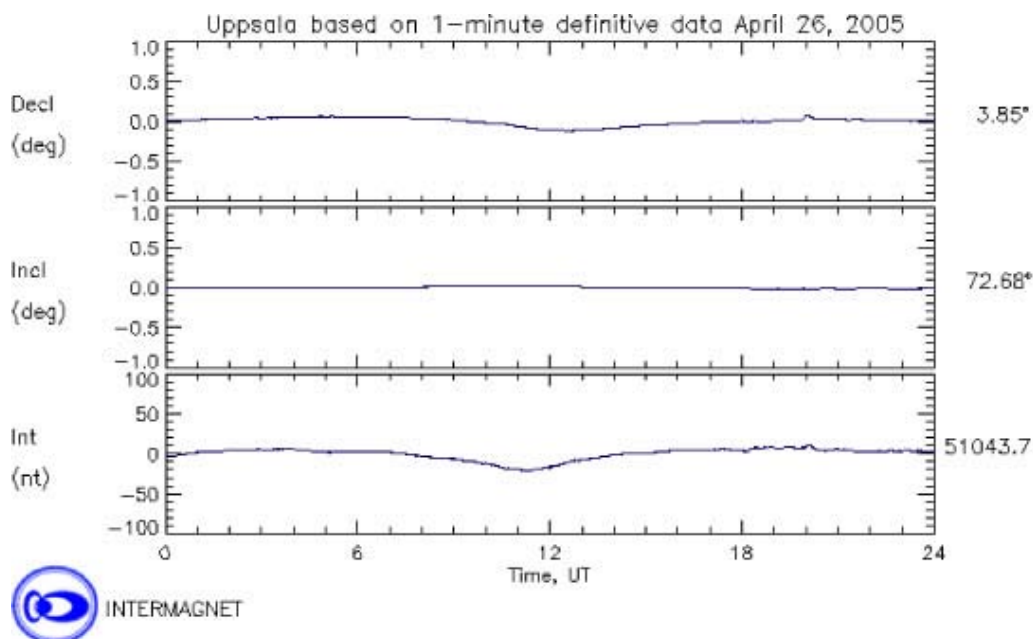


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2005-04-26. The upper curve displays the declination.

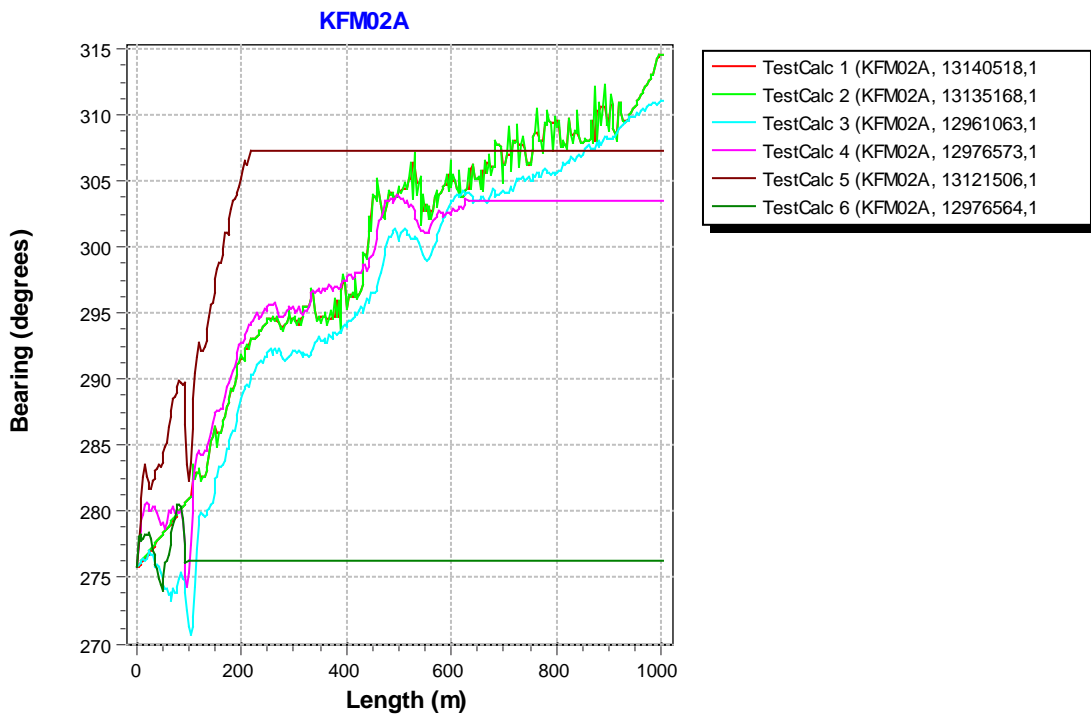
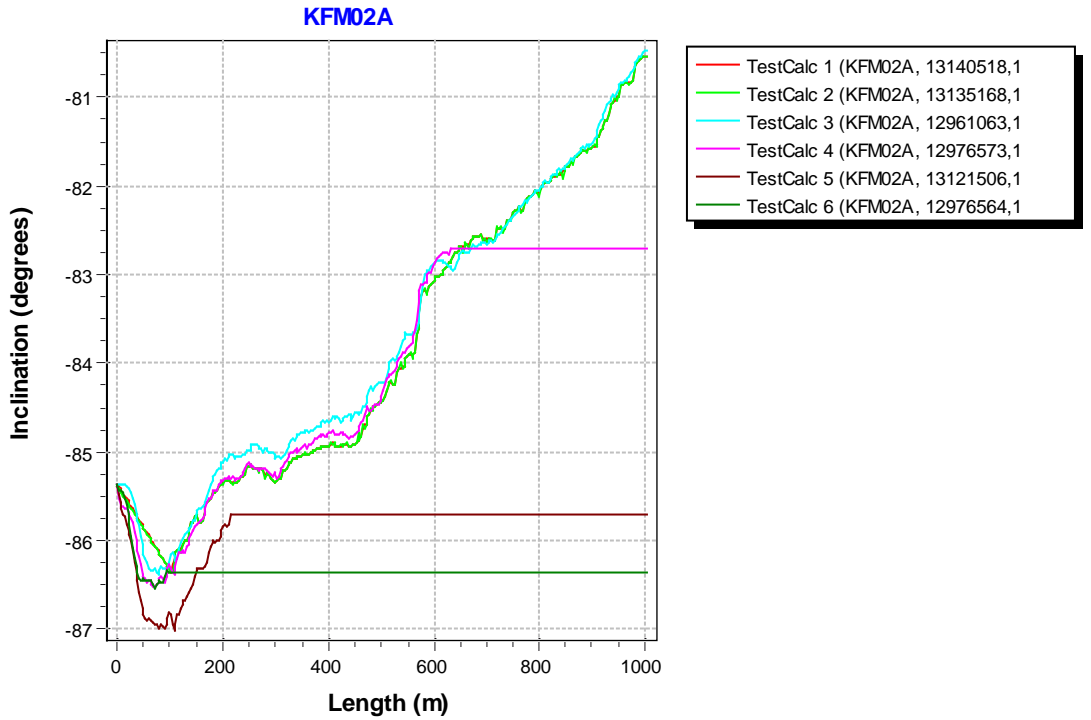


Figure 3. The Borehole deviation multiple measurements data (red line) together with the other, not error marked, deviation activities specified in Table 1. The upper diagram shows the inclination and the lower shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
KFM02A	12976564	EG156	Maxibor measurement	2003-01-13 22:00:00	0.00	99.00		070220 15:57
KFM02A	13121506	EG156	Maxibor measurement	2003-01-21 22:00:00	0.00	216.00		070220 15:57
KFM02A	12976573	EG156	Maxibor measurement	2003-02-13 09:00:00	0.00	633.00		070220 15:57
KFM02A	12961063	EG156	Maxibor measurement	2003-03-18 00:00:00	0.00	999.00	F	061222 12:19
KFM02A	13135168	EG157	Magnetic - accelerometer measurement	2005-04-26 13:30:00	3.00	993.00	CF	061109 09:00
KFM02A	13140518	EG154	Borehole deviation multiple measurements	2006-12-13 19:00:00			I C	061222 10:29

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
KFM02A	13135168	BEARING	105.00	993.00	
KFM02A	13135168	INCLINATION	105.00	993.00	

Table 3. Subset (for every approx. 100 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
KFM02A	6698712.50	1633182.86	7.35	0	0.00	-85.38	275.76	0.346	4.903	0.00
KFM02A	6698713.64	1633175.19	-100.37	108	0.05	-86.20	282.54	0.346	4.903	0.68
KFM02A	6698715.78	1633168.14	-199.09	207	0.09	-85.32	292.26	0.346	4.903	1.32
KFM02A	6698719.19	1633160.45	-300.74	309	0.14	-85.31	294.13	0.346	4.903	2.03
KFM02A	6698722.85	1633152.72	-399.37	408	0.19	-84.90	296.33	0.346	4.903	2.77
KFM02A	6698727.75	1633144.76	-500.94	510	0.25	-84.31	304.44	0.346	4.903	3.57
KFM02A	6698733.88	1633135.77	-599.34	609	0.32	-83.02	304.37	0.346	4.903	4.50
KFM02A	6698741.43	1633125.26	-700.51	711	0.39	-82.61	306.94	0.346	4.903	5.61
KFM02A	6698749.92	1633114.45	-801.58	813	0.48	-81.96	307.69	0.346	4.903	6.78
KFM02A	6698758.89	1633103.38	-899.55	912	0.56	-81.44	308.66	0.346	4.903	8.00
KFM02A	6698768.37	1633092.69	-988.85	1002.44	0.65	-80.53	314.49	0.346	4.903	9.23

Borehole description KFM02B

Figure 1 gives a technical description of KFM02B.

Technical data

Borehole KFM02B

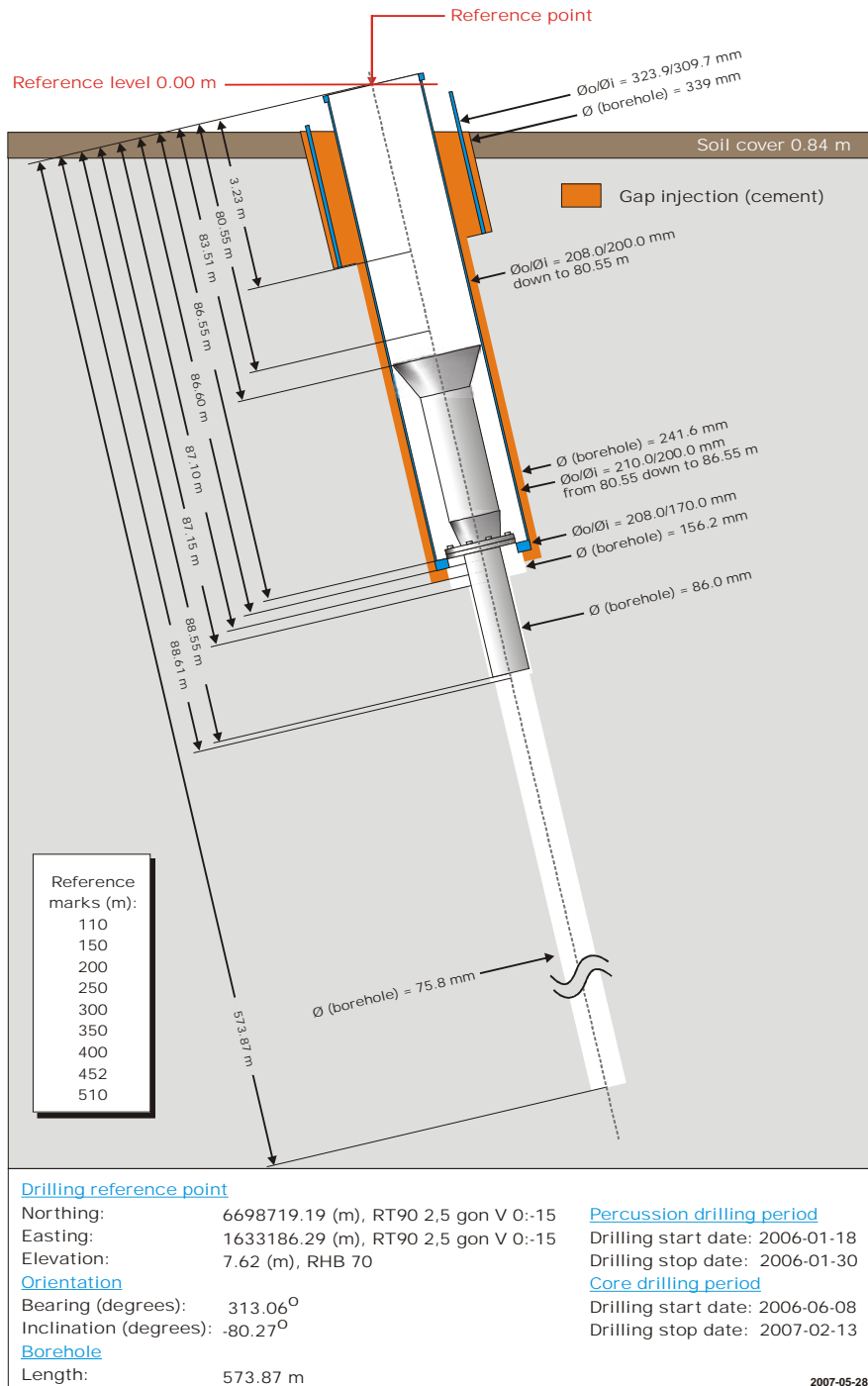


Figure 1. Technical description of KFM02B.

Deviation measurements in KFM02B

In total five deviation measurements were conducted in KFM02B. The deviation logging activities are tabulated in Sicada Activity Log, see Table 1.

There are two full Maxibor measurements executed in borehole KFM02B (ID 13148092 and 13148093) conducted to 567 m, and one (ID 13135859) to 243 m length with the instrument mounted inside a barrel which was joined to the lower end of the drill string.

The starting values (bearing and inclination) for all Maxibor measurements were obtained from the values surveyed at TOC (Borehole direction surveying).

The two Mag/acc measurements (ID 13151874 and 13151886) were executed down to 570 m drilling length, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. No geomagnetic disturbances exceeding 0.5 degrees for the declination were observed on the date of measuring, see Figure 2.

Borehole deviation multiple measurements

For the calculation of *Borehole deviation multiple measurements* (ID 13151926) the two Mag/acc measurements (ID 13151874 and 13151886) and two complete Maxibor measurements (ID 13148092 and 13148093) were used, see Table 2. All these four measurements have minor divergences between each other. The Maxibor part measurement (ID 13135859) is only used for the uncertainty calculations.

A subset of the resulting deviation file for every approximately 100 m elevation (from Object_location) is shown in Table 3. The inclination and bearing uncertainties are calculated automatically, and based on these values the “Radius uncertainty” is calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

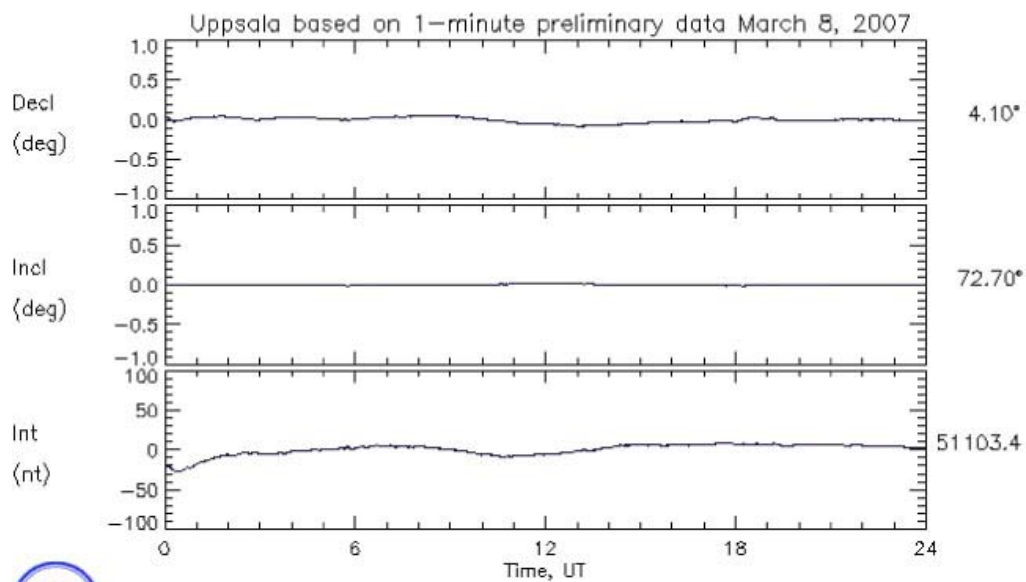
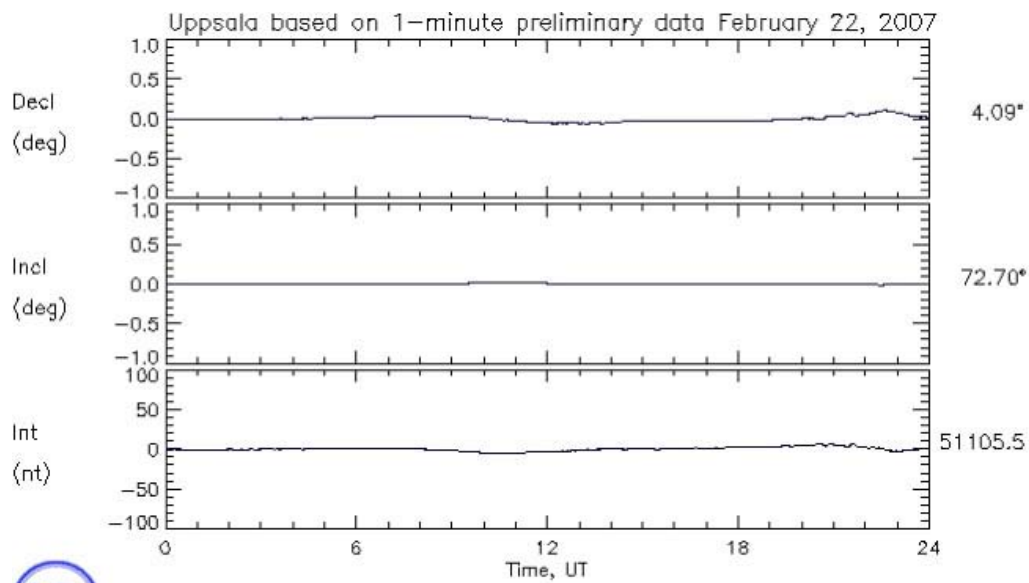


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2007-02-22 and 2007-03-08. The upper curve in each diagram displays the declination.

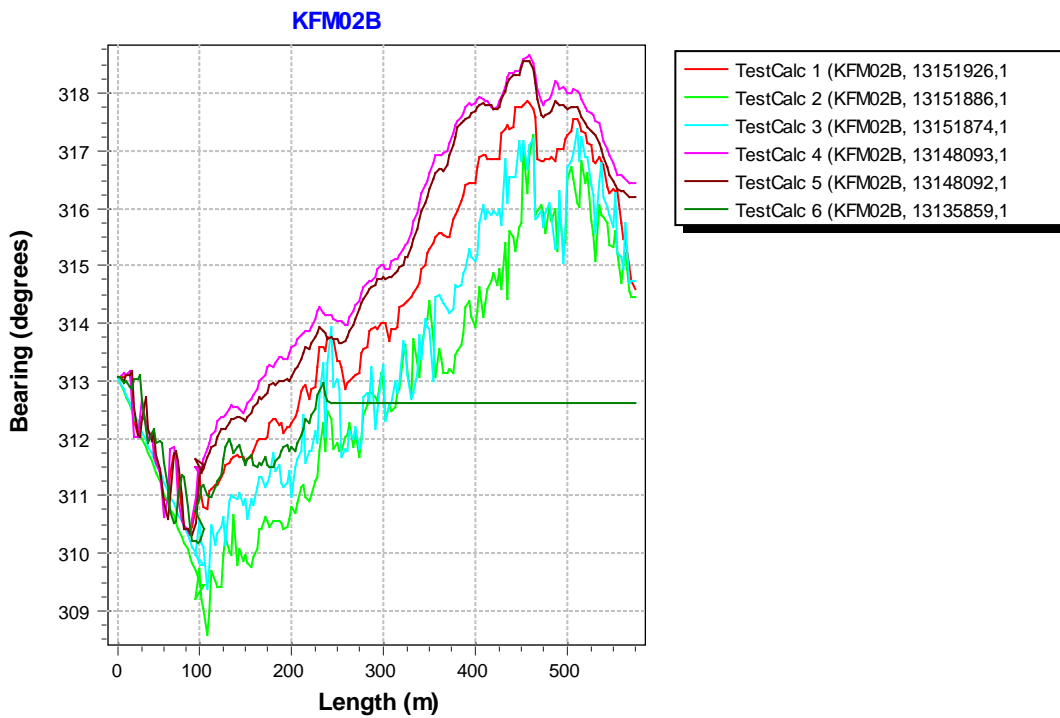
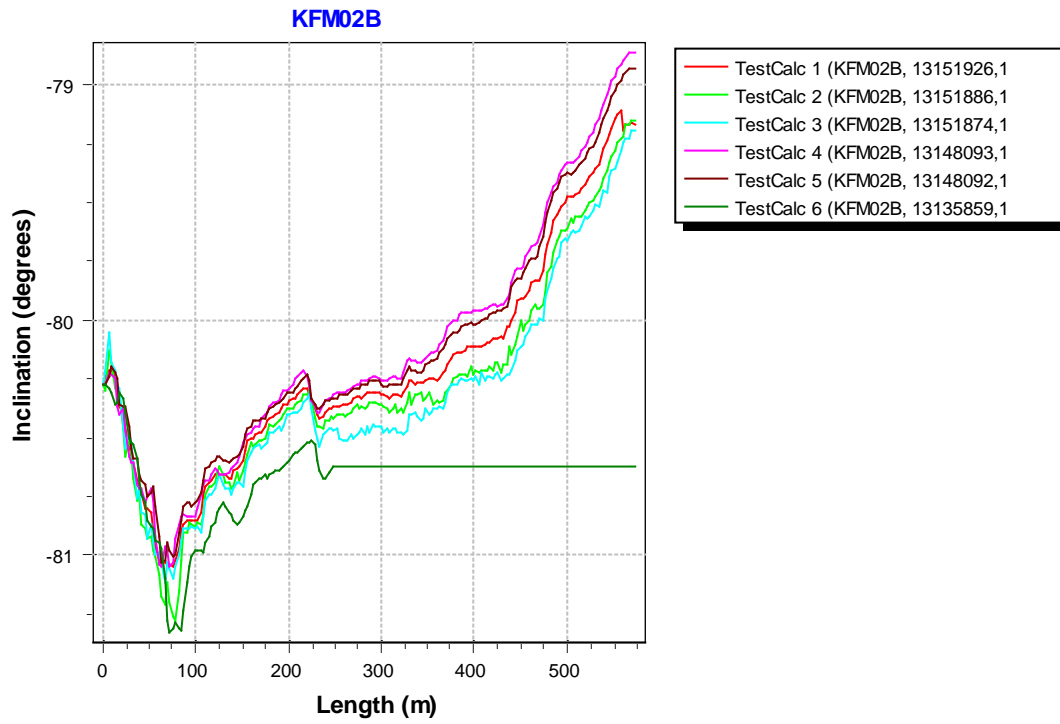


Figure 3. The Borehole deviation multiple measurements data (red line) together with the other, not error marked, deviation activities specified in Table 1. The upper diagram shows the inclination and the lower shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
KFM02B	13135859	EG156	Maxibor measurement	2006-11-07 00:00	3.00	243.00	F	070215 15:22
KFM02B	13148092	EG156	Maxibor measurement	2007-02-14 07:00	3.00	567.00	CF	070215 15:22
KFM02B	13148093	EG156	Maxibor measurement	2007-02-14 11:00	3.00	567.00	CF	070215 15:23
KFM02B	13151874	EG157	Magnetic - accelerometer measurement	2007-02-22 08:15	3.00	570.00	CF	070309 13:04
KFM02B	13151886	EG157	Magnetic - accelerometer measurement	2007-03-08 07:55	3.00	570.00	CF	070309 13:04
KFM02B	13151926	EG154	Borehole deviation multiple measurements	2007-05-28 11:00			I C	070528 13:12

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
KFM02B	13148092	BEARING	3.00	567.00	
KFM02B	13148092	INCLINATION	3.00	567.00	
KFM02B	13148093	BEARING	3.00	567.00	
KFM02B	13148093	INCLINATION	3.00	567.00	
KFM02B	13151874	BEARING	99.00	570.00	
KFM02B	13151874	INCLINATION	3.00	570.00	
KFM02B	13151886	BEARING	99.00	570.00	
KFM02B	13151886	INCLINATION	3.00	570.00	

Table 3. Subset (for every approx. 100 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
KFM02B	6698719.19	1633186.29	7.62	0.00	0.00	-80.27	313.06	0.185	1.661	0.00
KFM02B	6698730.76	1633173.28	-98.97	108	0.06	-80.74	310.77	0.185	1.661	0.50
KFM02B	6698741.96	1633160.77	-199.58	210	0.11	-80.31	312.82	0.185	1.661	0.99
KFM02B	6698753.72	1633148.34	-300.13	312	0.17	-80.31	313.91	0.185	1.661	1.49
KFM02B	6698766.09	1633136.19	-400.65	414	0.22	-80.09	316.85	0.185	1.661	1.99
KFM02B	6698779.37	1633123.92	-501.03	516	0.28	-79.44	317.36	0.185	1.661	2.52
KFM02B	6698787.17	1633116.46	-557.89	573.87	0.31	-79.17	314.60	0.185	1.661	2.83

Borehole description KFM03A

Figure 1 gives a technical description of KFM03A.

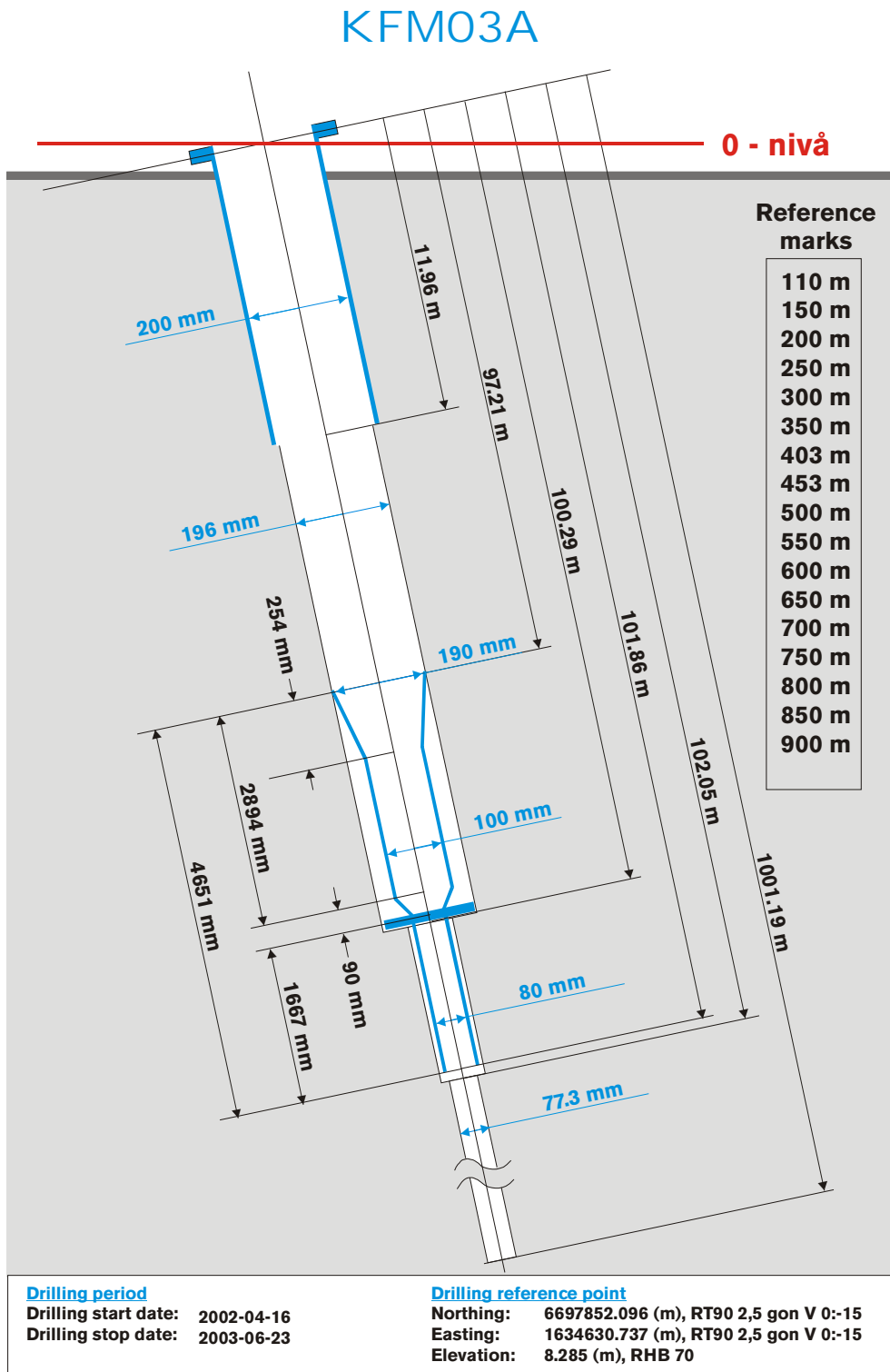


Figure 1. Technical description of KFM03A.

Deviation measurement in KFM03A

One deviation measurement was conducted in KFM03A. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

The complete borehole Maxibor measurement (ID 12973911) was executed down to 996 m with the instrument centralized and hoisted by wire, inside the drill string.

The starting values (bearing and inclination) for the Maxibor measurement were obtained from the values surveyed at TOC (Borehole direction surveying).

Borehole deviation multiple measurements

For the calculation of *Borehole deviation multiple measurements* (ID 13142389) the single Maxibor measurement (ID 12973911) was used, see Table 2.

A subset of the resulting deviation file for every approximately 100 m elevation (from Object_ location) is shown in Table 3. Because only one deviation activity is included in the EG154-file (Table 2) the inclination and bearing uncertainties are set manually to 1.8° and 4.9° respectively, and based on these values the “Radius uncertainty” is calculated for every measuring level.

Figure 2 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

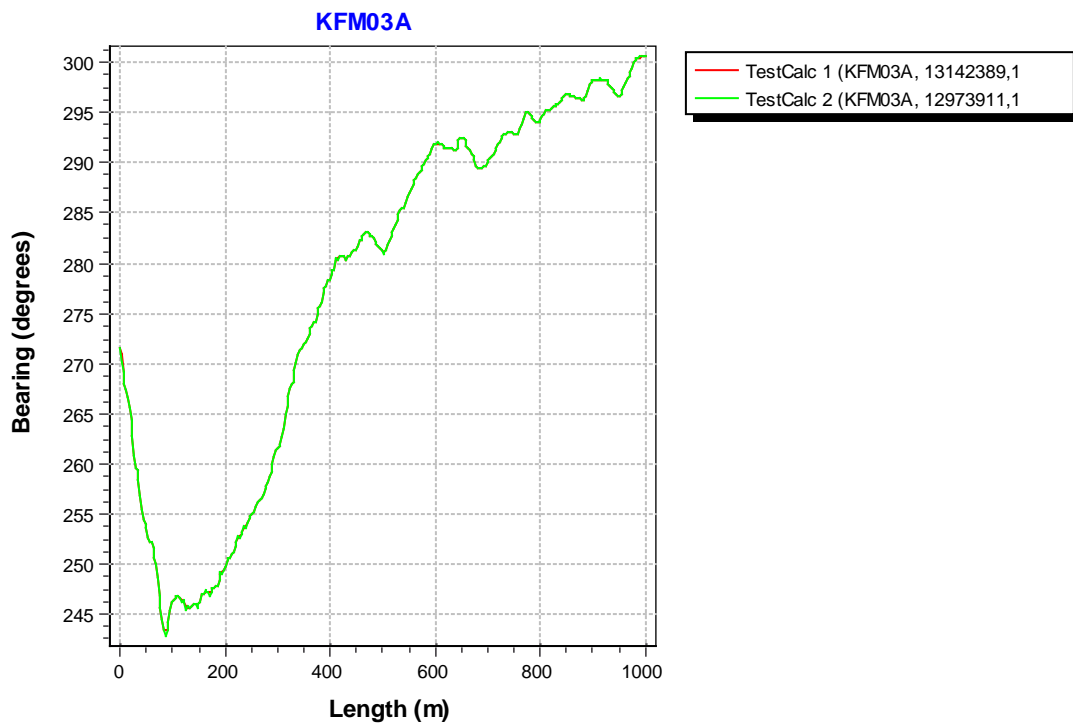
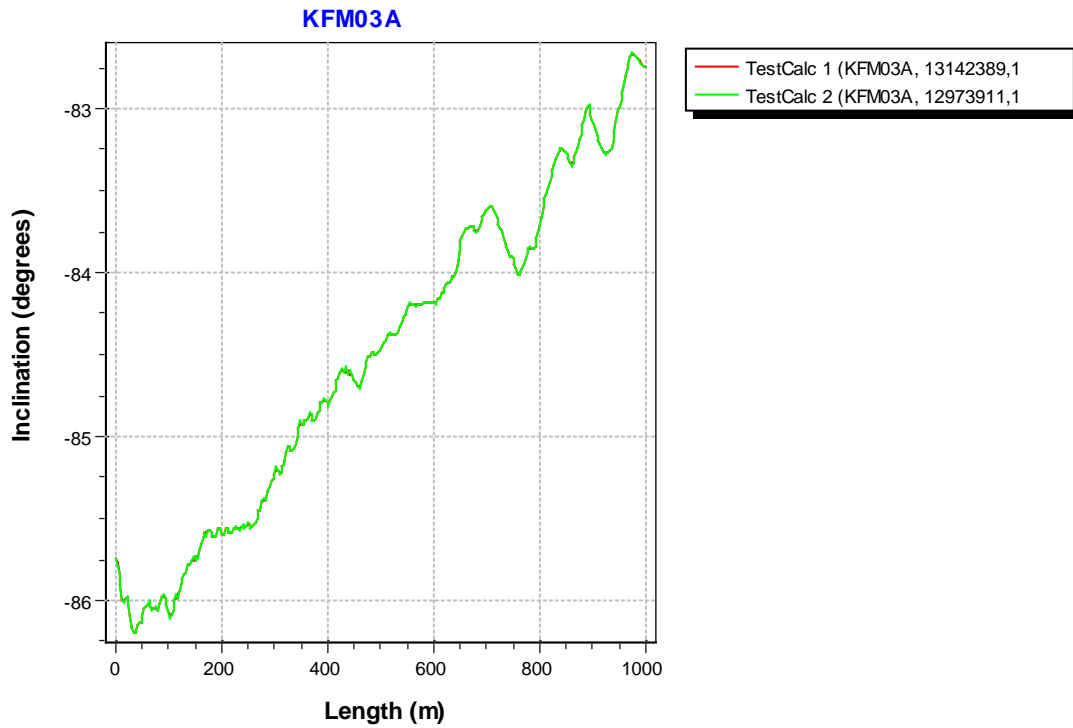


Figure 2. The Borehole deviation multiple measurements data (red line) together with the other, not error marked, deviation activities specified in Table 1. The upper diagram shows the inclination and the lower shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
KFM03A	12973911	EG156	Maxibor measurement	2003-06-24 08:00:00	0.00	996.00	F	061222 12:21
KFM03A	13142389	EG154	Borehole deviation multiple measurements	2006-12-20 19:30:00			I C	070111 08:13

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
KFM03A	12973911	BEARING	0.00	996.00	4.900
KFM03A	12973911	INCLINATION	0.00	996.00	1.800

Table 3. Subset (for every approx. 100 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
KFM03A	6697852.10	1634630.74	8.29	0	0.00	-85.75	271.52	1.8	4.9	0.00
KFM03A	6697850.13	1634623.64	-99.46	108	0.23	-86.06	246.76	1.8	4.9	3.39
KFM03A	6697847.19	1634616.62	-201.17	210	0.47	-85.57	250.67	1.8	4.9	6.60
KFM03A	6697845.33	1634609.02	-299.86	309	0.72	-85.22	262.79	1.8	4.9	9.71
KFM03A	6697845.79	1634600.07	-401.46	411	1.00	-84.74	280.38	1.8	4.9	12.91
KFM03A	6697847.66	1634590.91	-500.02	510	1.30	-84.42	281.96	1.8	4.9	16.02
KFM03A	6697850.68	1634581.49	-598.53	609	1.61	-84.16	291.95	1.8	4.9	19.13
KFM03A	6697854.60	1634571.27	-699.94	711	1.95	-83.60	290.93	1.8	4.9	22.33
KFM03A	6697858.84	1634561.51	-798.36	810	2.29	-83.55	295.19	1.8	4.9	25.44
KFM03A	6697864.22	1634550.79	-899.65	912	2.66	-83.20	298.34	1.8	4.9	28.65
KFM03A	6697869.45	1634541.18	-988.17	1001.19	3.01	-82.74	300.65	1.8	4.9	31.45

Borehole description KFM03B

Figure 1 gives a technical description of KFM03B.

Technical data

Borehole KFM03B

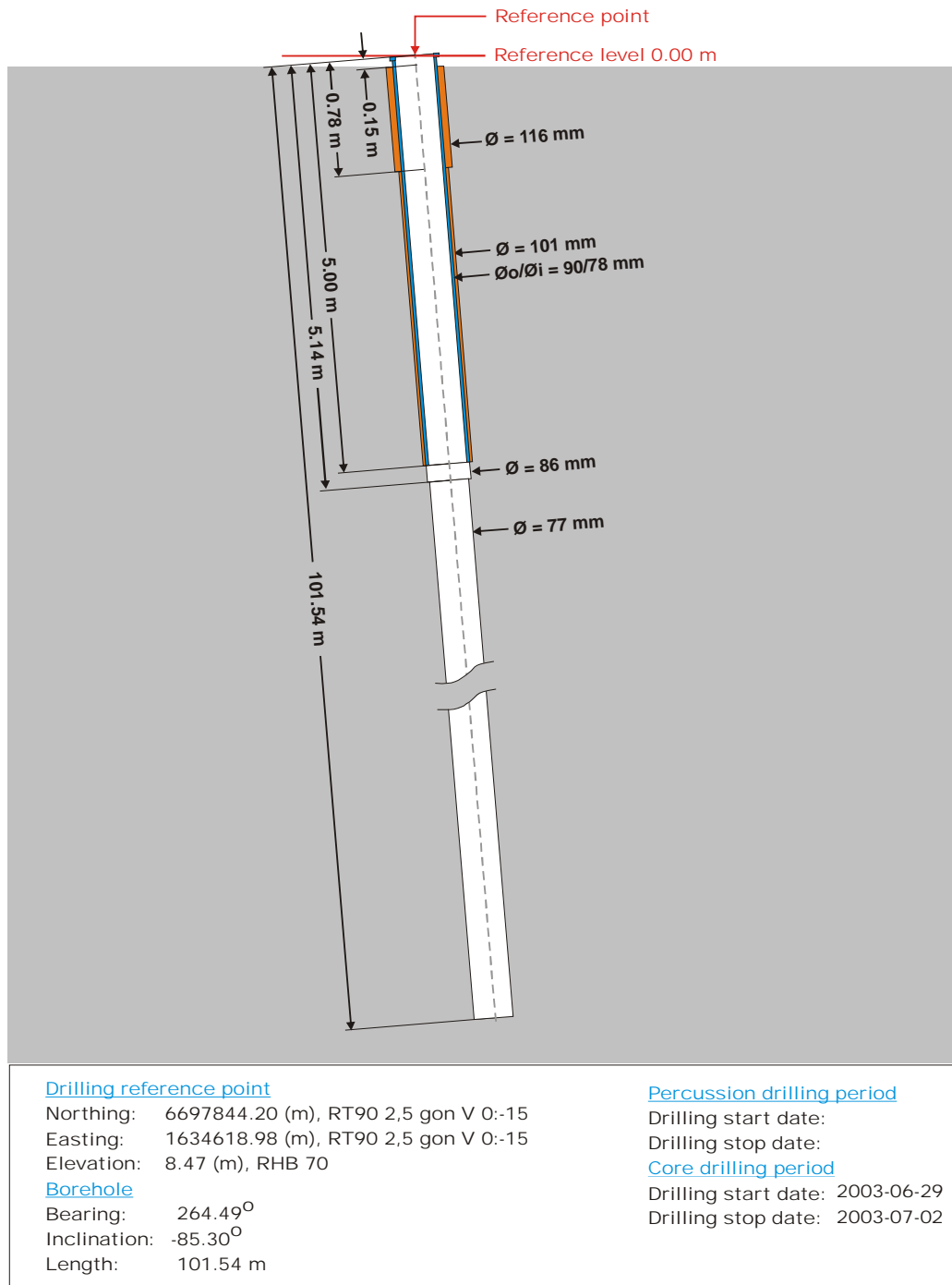


Figure 1. Technical description of KFM03B.

Deviation measurement in KFM03B

One deviation measurement was conducted in KFM03B. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

The complete borehole Maxibor measurement (ID 12985830) was executed down to 96 m with the instrument centralized and hoisted by wire, inside the drill string.

The starting values (bearing and inclination) for the Maxibor measurement were obtained from the values surveyed at TOC (Borehole direction surveying).

Borehole deviation multiple measurements

For the calculation of *Borehole deviation multiple measurements* (ID 13142388) the single Maxibor measurement (ID 12985830) was used, see Table 2.

A subset of the resulting deviation file for every approximately 100 m elevation (from Object_ location) is shown in Table 3. Because only one deviation activity is included in the EG154-file (Table 2) the inclination and bearing uncertainties are set manually to 1.8° and 4.9° respectively, and based on these values the “Radius uncertainty” is calculated for every measuring level.

Figure 2 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

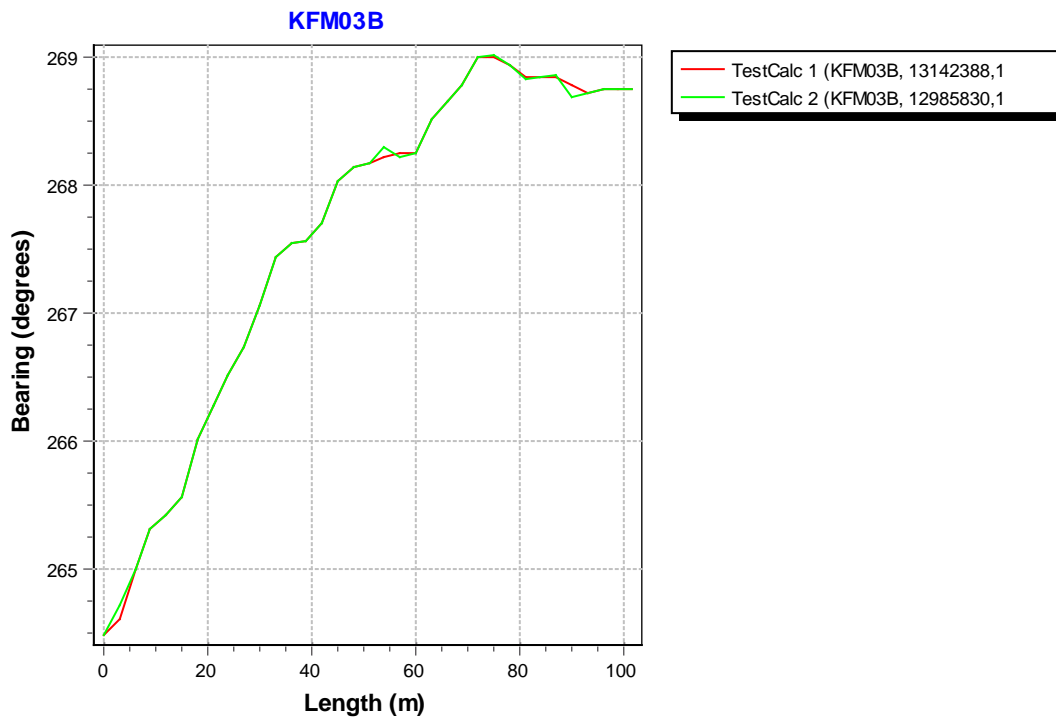
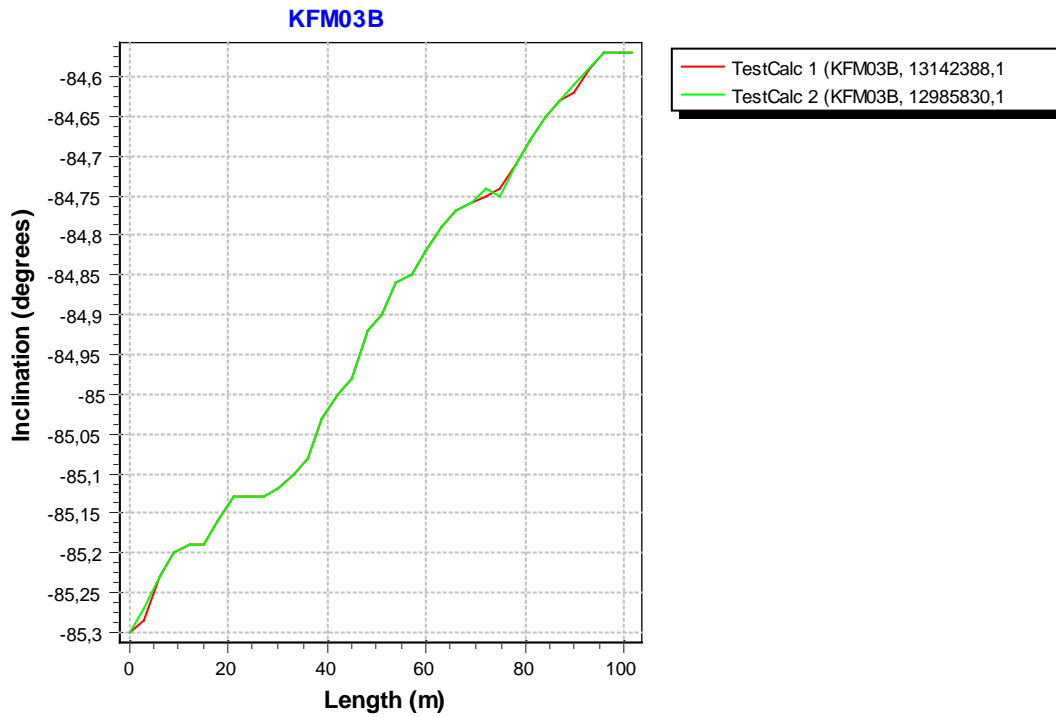


Figure 2. The Borehole deviation multiple measurements data (red line) together with the other, not error marked, deviation activities specified in Table 1. The upper diagram shows the inclination and the lower shows the bearing.

Table 1. The deviation logging activities in Sicada.

Idcode	Activity Id	Activity Type Code	Activity	Start Date	Secup (m)	Seclow (m)	Flags	_Indat
KFM03B	12985830	EG156	Maxibor measurement	2003-07-02 15:30	0.00	96.00	F	070601 12:54
KFM03B	13142388	EG154	Borehole deviation multiple measurements	2006-12-20 19:40			I C	070111 08:13

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLow (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
KFM03B	12985830	BEARING	0.00	96.00	4.900
KFM03B	12985830	INCLINATION	0.00	96.00	1.800

Table 3. Subset (for every approx. 100 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
KFM03B	6697844.20	1634618.68	8.47	0	0.00	-85.30	264.49	1.8	4.9	0.00
KFM03B	6697843.83	1634609.69	-92.67	101.54	0.28	-84.57	268.74	1.8	4.9	3.19

Borehole description KFM04A

Figure 1 gives a technical description of KFM04A.

Technical data

Borehole KFM04A

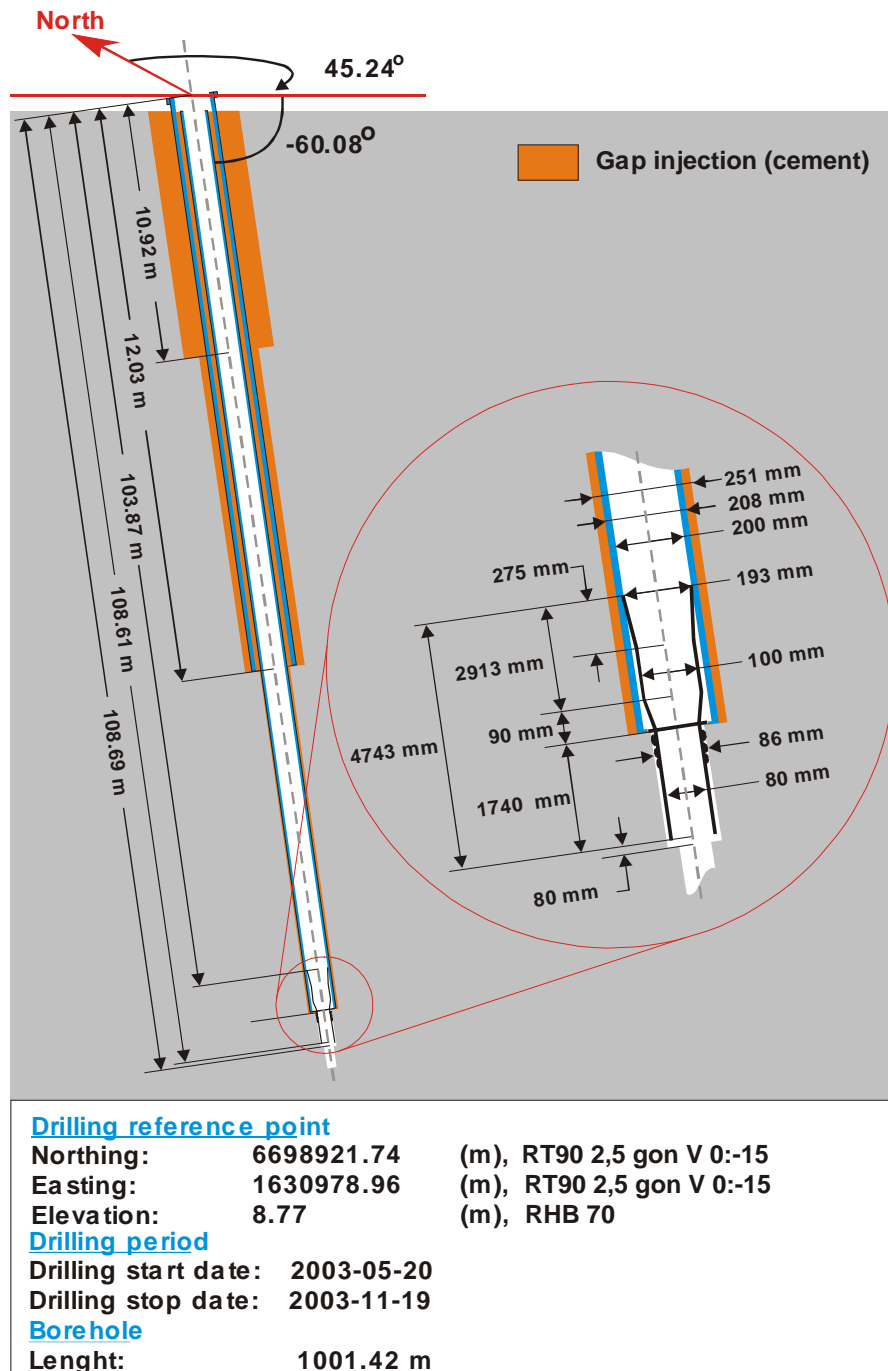


Figure 1. Technical description of KFM04A.

Deviation measurements in KFM04A

In total three deviation measurements were conducted in KFM04A. The deviation logging activities are tabulated in Sicada Activity Log, see Table 1.

There are one full Maxibor measurement executed in borehole KFM04A (ID 12997132) conducted to 990 m length, and one (ID 12981905) to 261 m with the instrument centralized and hoisted by wire, inside the drill string.

The starting values (bearing and inclination) for all Maxibor measurements were obtained from the values surveyed at TOC (Borehole direction surveying).

One Mag/acc measurement (ID 13134872) was executed down to 990 m drilling length, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. No geomagnetic disturbances exceeding 0.5 degrees for the declination were observed on the date of measuring, see Figure 2.

Borehole deviation multiple measurements

For the calculation of *Borehole deviation multiple measurements* (ID 13140435) the Mag/acc measurement (ID 13134872) was used, see Table 2. The Maxibor bearing has a significant difference compared to the Flexit bearing curve.

A subset of the resulting deviation file for every approximately 100 m elevation (from Object_location) is shown in Table 3. The inclination and bearing uncertainties are calculated automatically, and based on these values the “Radius uncertainty” is calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

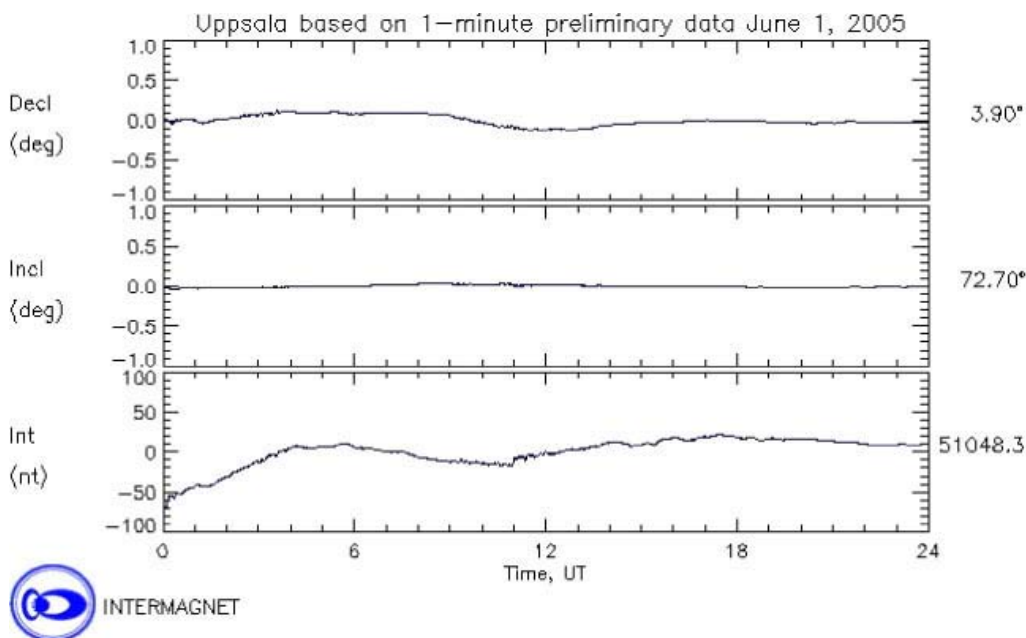


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2005-06-01. The upper curve shows the declination.

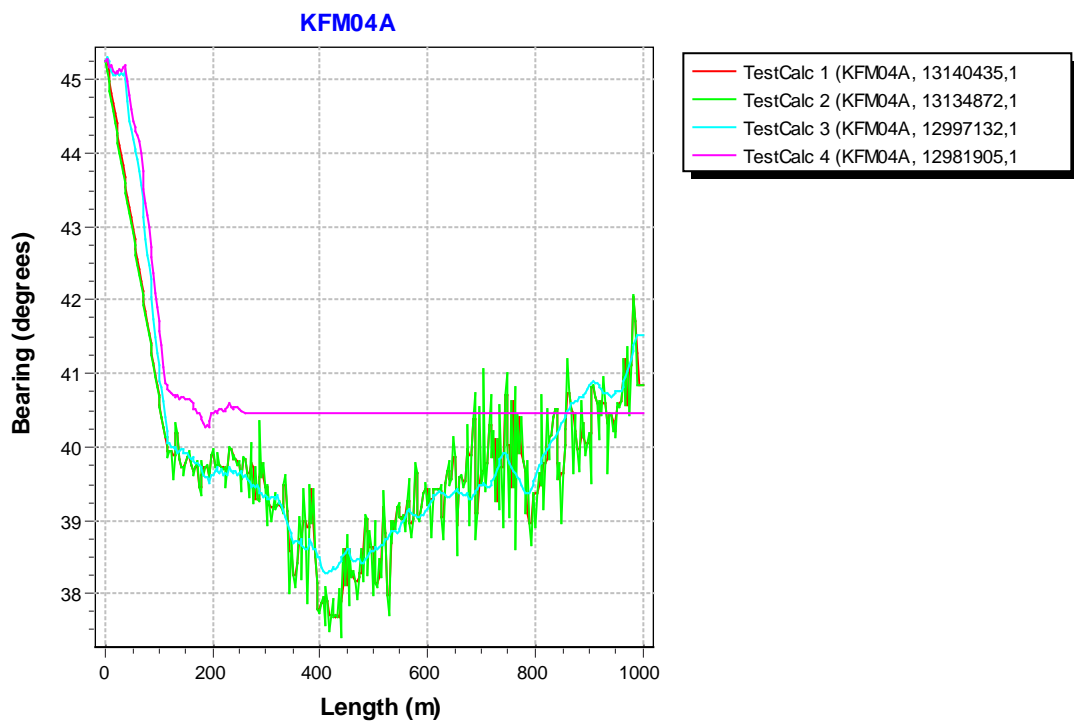
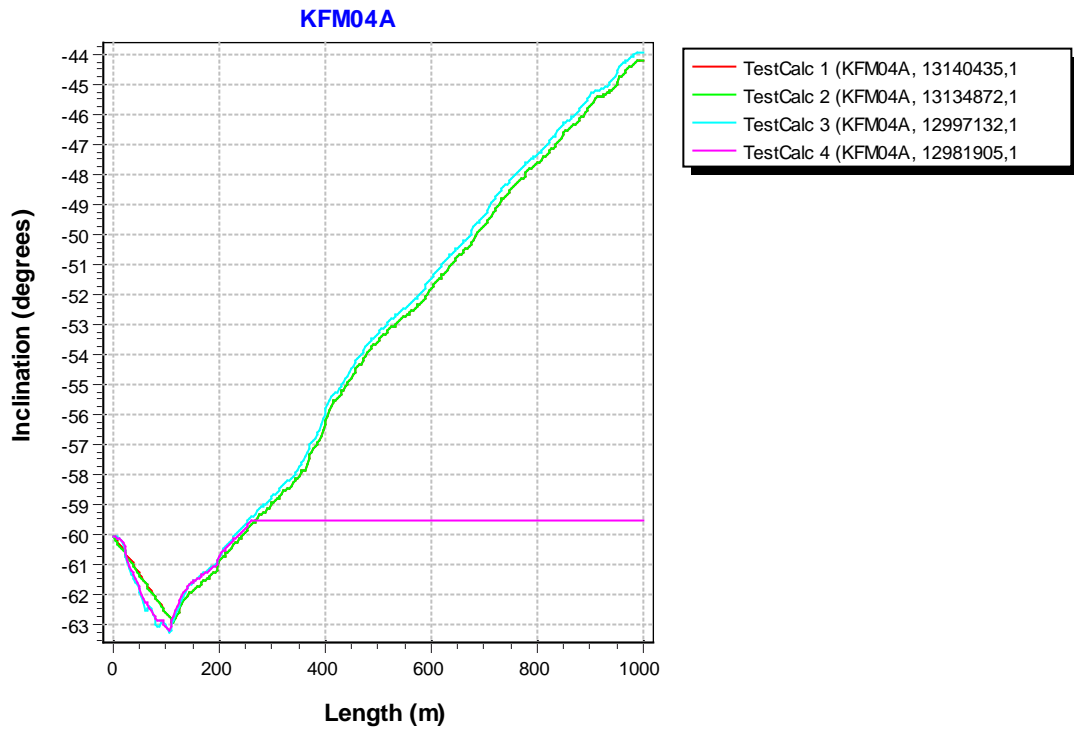


Figure 3. The Borehole deviation multiple measurements data (red line) together with the other, not error marked, deviation activities specified in Table 1. The upper diagram shows the inclination and the lower shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
KFM04A	12981905	EG156	Maxibor measurement	2003-09-04 00:00:00	0.00	261.00	CF	051005 17:14
KFM04A	12997132	EG156	Maxibor measurement	2003-11-11 09:00:00	0.00	990.00		070220 15:57
KFM04A	13134872	EG157	Magnetic - accelerometer measurement	2005-06-01 13:35:00	3.00	990.00	CF	061107 15:13
KFM04A	13140435	EG154	Borehole deviation multiple measurements	2006-12-12 17:00:00			I C	061222 10:29

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
KFM04A	13134872	BEARING	114.00	990.00	
KFM04A	13134872	INCLINATION	114.00	990.00	

Table 3. Subset (for every approx. 100 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
KFM04A	6698921.74	1630978.96	8.77	0	0.00	-60.08	45.24	0.37	0.85	0.00
KFM04A	6698964.87	1631018.52	-99.39	123	0.38	-62.58	39.95	0.37	0.85	0.87
KFM04A	6699006.91	1631053.51	-199.40	237	0.73	-60.13	39.88	0.37	0.85	1.68
KFM04A	6699053.43	1631091.67	-299.73	354	1.12	-57.94	38.24	0.37	0.85	2.57
KFM04A	6699106.23	1631133.30	-399.09	474	1.55	-54.11	38.29	0.37	0.85	3.57
KFM04A	6699165.33	1631180.97	-499.64	600	2.05	-51.80	39.42	0.37	0.85	4.70
KFM04A	6699228.61	1631233.35	-599.08	729	2.58	-48.96	39.26	0.37	0.85	5.92
KFM04A	6699298.38	1631291.61	-698.88	864	3.16	-46.40	40.73	0.37	0.85	7.27
KFM04A	6699371.85	1631354.63	-796.41	1001.42	3.79	-44.18	40.84	0.37	0.85	8.70

Borehole description KFM05A

Figure 1 gives a technical description of KFM05A.

Technical data Borehole KFM05A

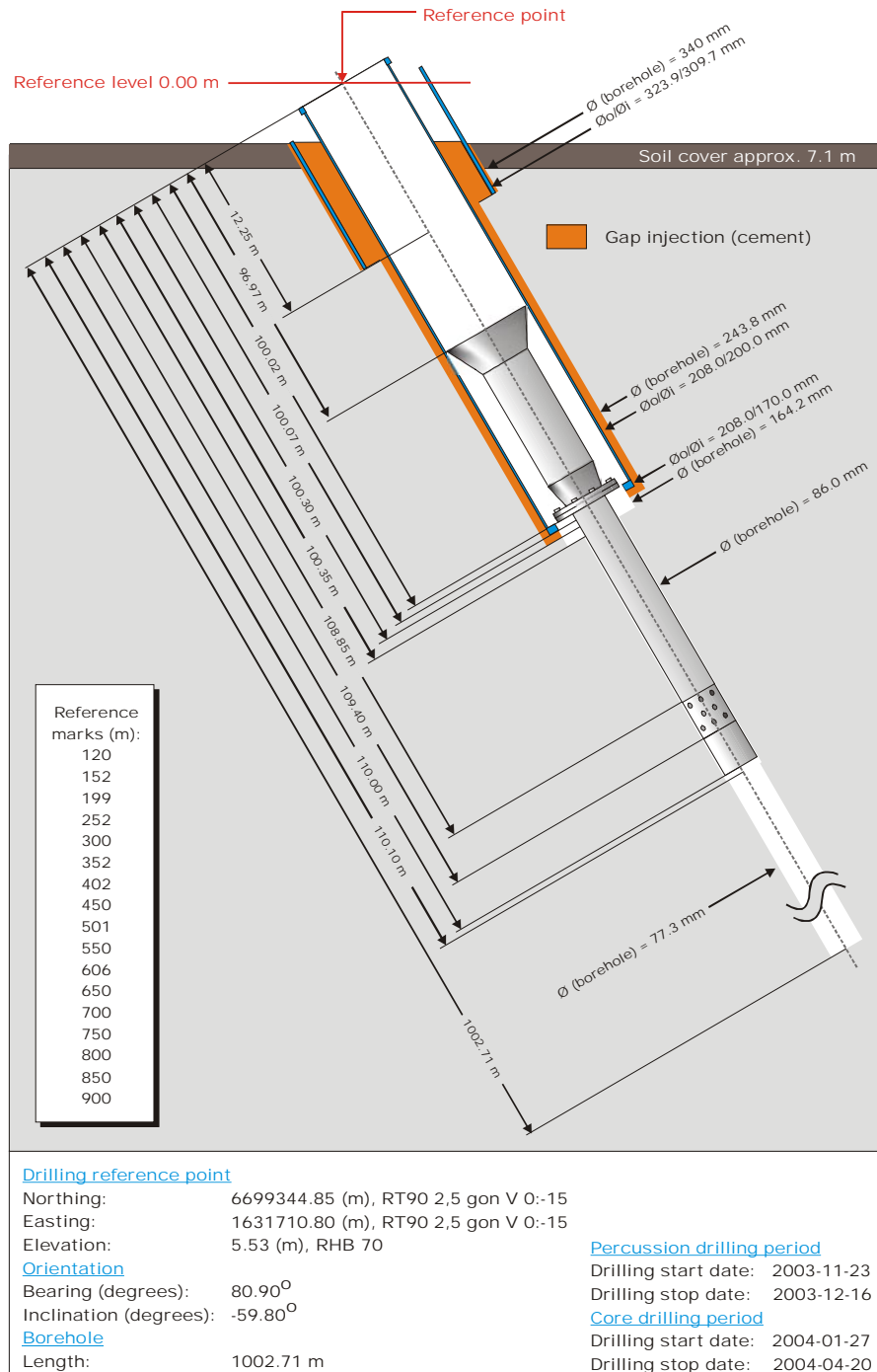


Figure 1. Technical description of KFM05A.

Deviation measurements in KFM05A

In total five deviation measurements were conducted in KFM05A. The deviation logging activities are tabulated in the Sicada Activity Log, see Table 1.

There are two full Maxibor measurements executed in borehole KFM05A (ID 13014202 and 13026479). The first measurement (ID 13014202) was conducted to 999 m and with the instrument centralized and hoisted by wire, inside the drill string, while the second measurement was conducted to 996 m and with the instrument centralized and hoisted by wire, in the open borehole.

The starting values (bearing and inclination) for all Maxibor measurements were obtained from the values surveyed at TOC (Borehole direction surveying).

The Maxibor measurements (ID 13014202 and 13026479) were later error marked as they were not repeatable and therefore not trustable.

The two Mag/acc measurements (ID 13136616 and 13136486) were executed down to 999 m drilling length with the Reflex instrument, and to 996 m drilling length with the Flexit instrument. A third Mag/acc measurement (ID 13118591) performed with the Flexit instrument was later error marked. Corrections of measured data are shown in the File References (Sicada) for the measurements. No geomagnetic disturbances exceeding 0.5 degrees for the declination were observed on the dates of measuring, see Figure 2.

Borehole deviation multiple measurements

For the calculation of *Borehole deviation multiple measurements* (ID 13140438) the two Mag/acc measurements (ID 13136616 and 13136486) were used, see Table 2.

A subset of the resulting deviation file for every approximately 100 m elevation (from Object_location) is shown in Table 3. The inclination and bearing uncertainties are calculated automatically, and based on these values the “Radius uncertainty” is calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

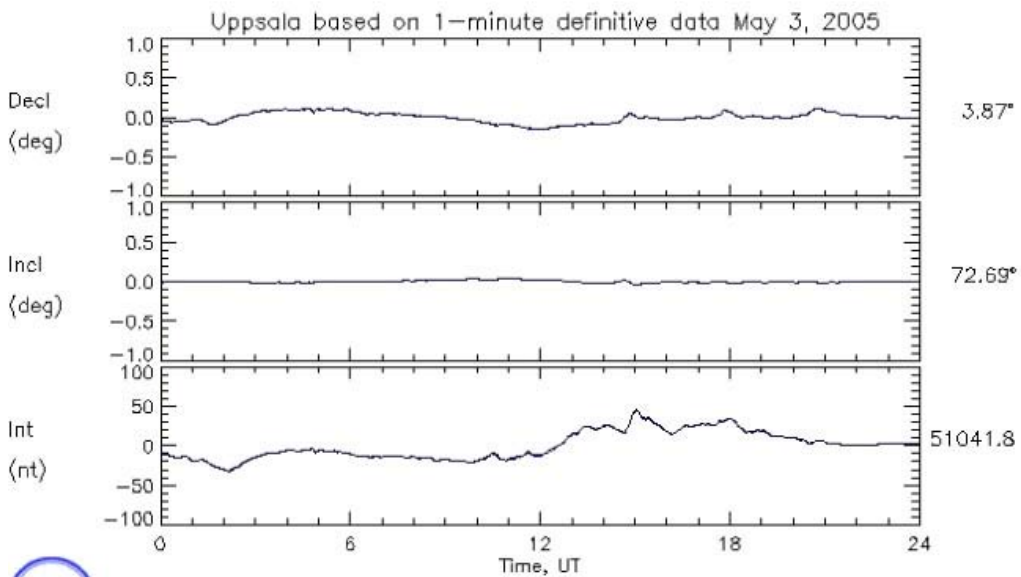
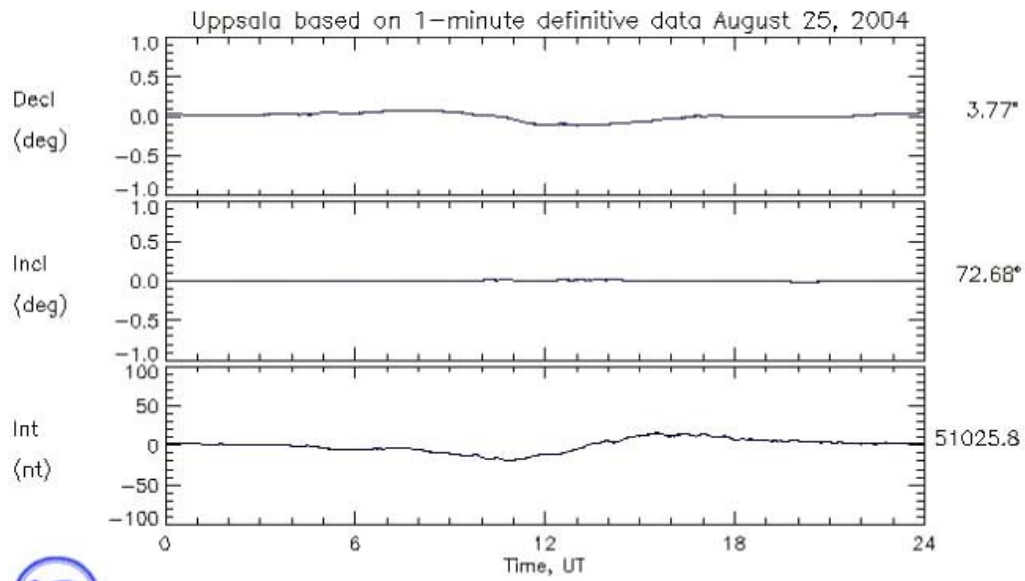


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2004-08-25 and 2005-05-03. The upper curve shows the declination.

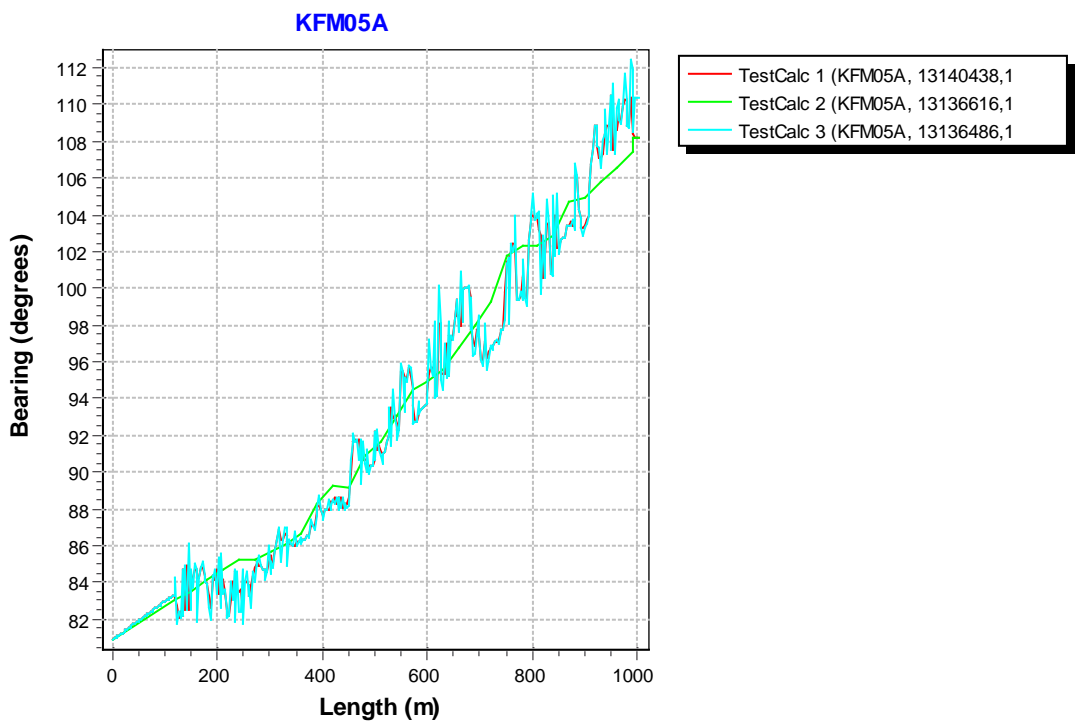
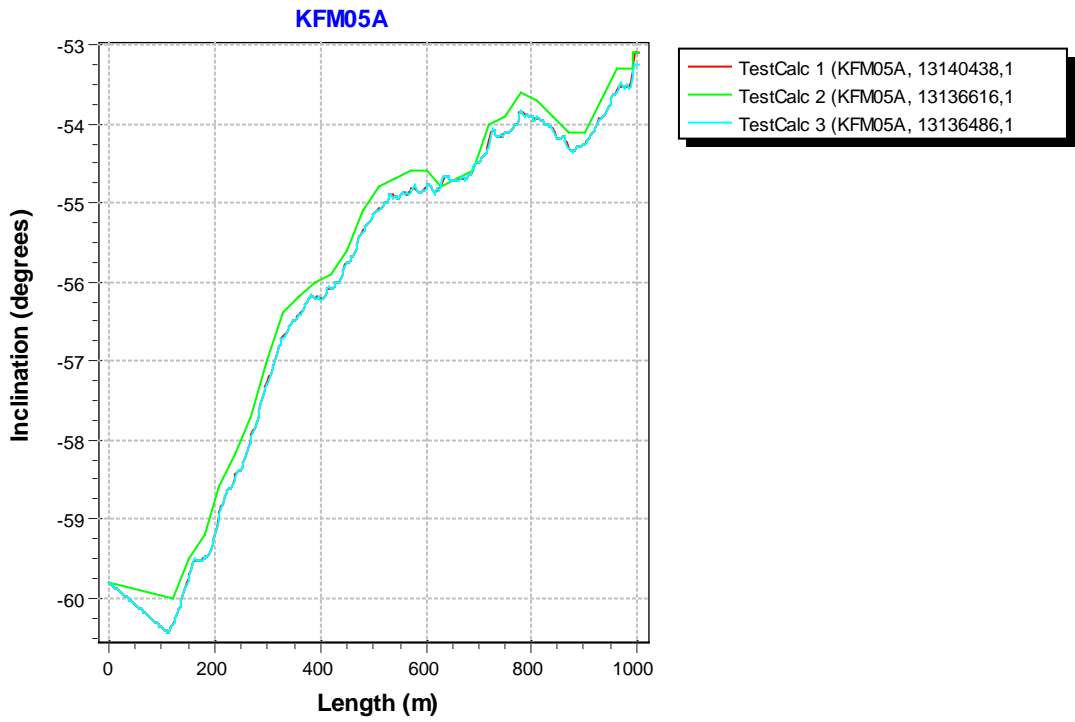


Figure 3. The Borehole deviation multiple measurements data (red line) together with the other, not error marked, deviation activities specified in Table 1. The upper diagram shows the inclination and the lower shows the bearing

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
KFM05A	13014202	EG156	Maxibor measurement	2004-04-20 00:00:00	0.00	999.00	E	061121 15:44
KFM05A	13026479	EG156	Maxibor measurement	2004-08-04 00:00:00	0.00	996.00	EC	061121 15:44
KFM05A	13136616	EG157	Magnetic - accelerometer measurement	2004-08-25 08:00:00	120.00	999.00	F	070109 09:12
KFM05A	13136486	EG157	Magnetic - accelerometer measurement	2005-05-03 07:05:00	3.00	996.00	F	070109 09:12
KFM05A	13118591	EG157	Magnetic - accelerometer measurement	2006-03-05 07:05:00	3.00	996.00	EF	070109 09:13
KFM05A	13140438	EG154	Borehole deviation multiple measurements	2006-12-12 16:00:00			I C	061222 10:30

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
KFM05A	13136486	BEARING	3.00	996.00	
KFM05A	13136486	INCLINATION	3.00	996.00	
KFM05A	13136616	BEARING	120.00	999.00	
KFM05A	13136616	INCLINATION	120.00	999.00	

Table 3. Subset (for every approx. 100 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
KFM05A	6699344.85	1631710.80	5.53	0	0.00	-59.81	80.93	0.267	1.707	0.00
KFM05A	6699353.19	1631771.46	-101.15	123	0.29	-60.29	82.74	0.267	1.707	1.82
KFM05A	6699359.52	1631829.13	-199.27	237	0.56	-58.49	83.52	0.267	1.707	3.55
KFM05A	6699364.95	1631893.54	-300.36	357	0.86	-56.44	86.30	0.267	1.707	5.48
KFM05A	6699366.71	1631960.54	-399.87	477	1.17	-55.39	90.68	0.267	1.707	7.48
KFM05A	6699363.42	1632031.00	-500.62	600	1.50	-54.80	94.32	0.267	1.707	9.58
KFM05A	6699354.52	1632101.59	-600.94	723	1.83	-54.10	96.87	0.267	1.707	11.70
KFM05A	6699340.61	1632172.45	-700.47	846	2.17	-54.20	102.16	0.267	1.707	13.85
KFM05A	6699320.87	1632241.83	-800.04	969	2.50	-53.52	109.22	0.267	1.707	16.00
KFM05A	6699314.29	1632260.83	-827.10	1002.71	2.60	-53.10	108.22	0.267	1.707	16.60

Borehole description KFM06A

Figure 1 gives a technical description of KFM06A.

Technical data

Borehole KFM06A

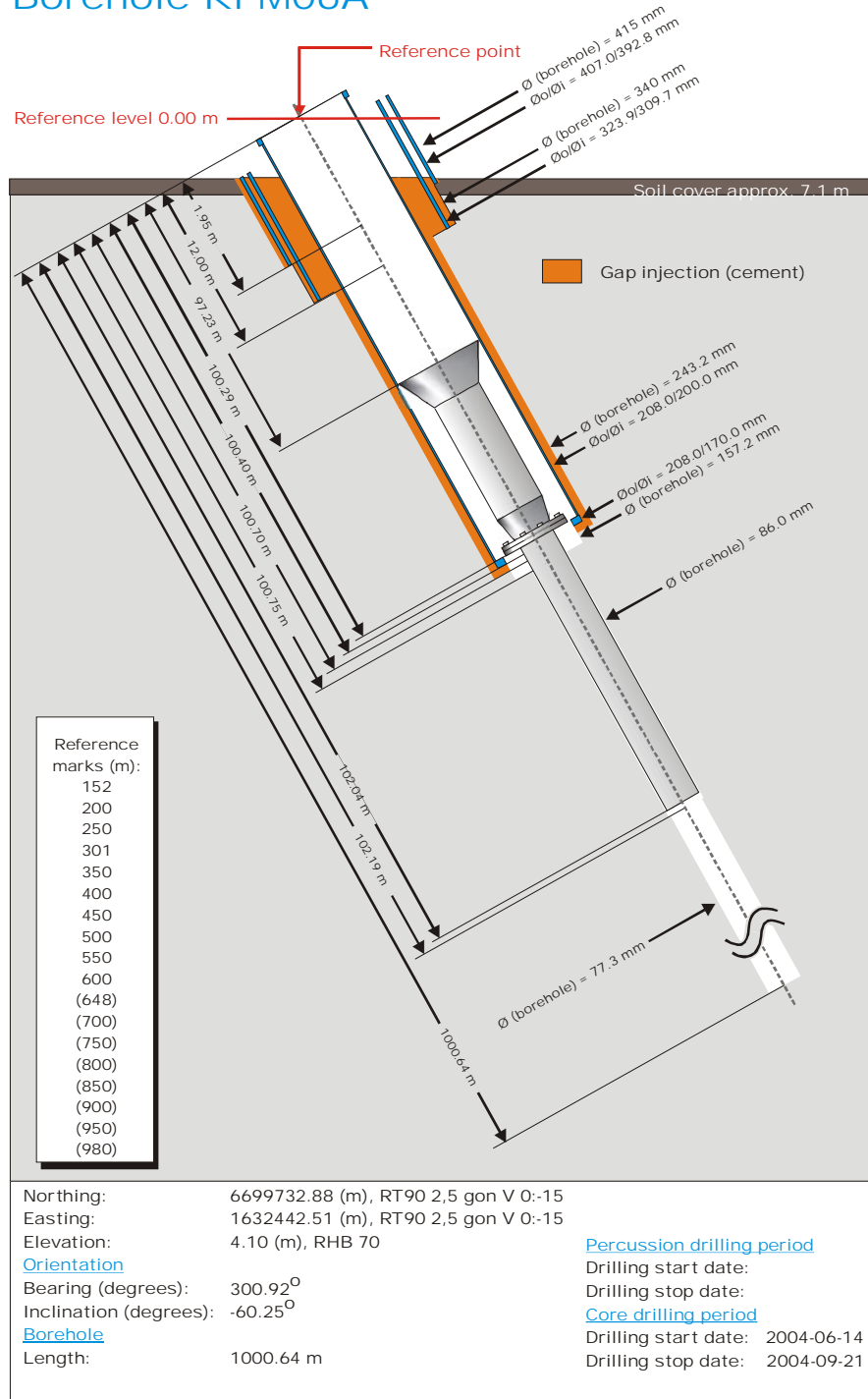


Figure 1. Technical description of KFM06A.

Deviation measurements in KFM06A

In total two deviation measurements were conducted in KFM06A. The deviation logging activities are tabulated in Sicada Activity Log, see Table 1.

There is one full Maxibor measurement executed in borehole KFM06A (ID 13034961) conducted to 990 m length and with the instrument centralized and hoisted by wire, inside the drill string.

The starting values (bearing and inclination) for the Maxibor measurement were obtained from the values surveyed at TOC (Borehole direction surveying).

One Mag/acc measurement (ID 13134895) was executed down to 996 m drilling length, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. No geomagnetic disturbances exceeding 0.5 degrees in the declination were observed on the date of measuring, see Figure 2.

Borehole deviation multiple measurements

For the calculation of *Borehole deviation multiple measurements* (ID 13140440) the two Mag/acc measurements (ID 13134895) were used, see Table 2. The Maxibor inclination differs significantly from the Flexit inclination curve.

A subset of the resulting deviation file for every approximately 100 m elevation (from Object_location) is shown in Table 3. The inclination and bearing uncertainties are calculated automatically, and based on these values the “Radius uncertainty” is calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

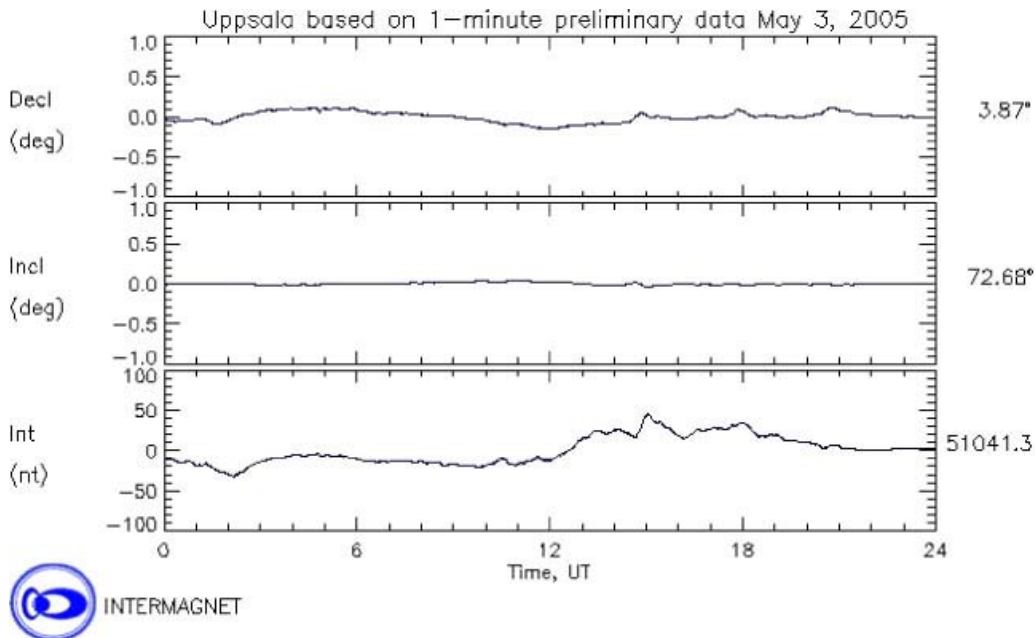


Figure 2. The geomagnetic field was observed at the Observatory in Uppsala on 2005-05-03. The upper curve shows the declination.

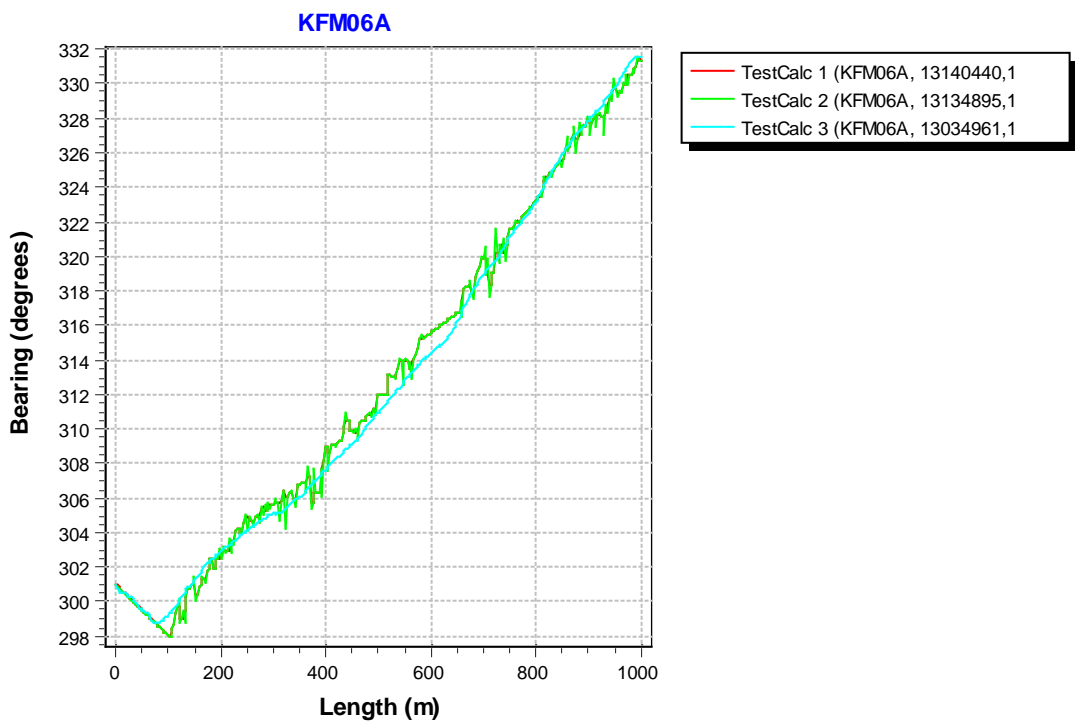
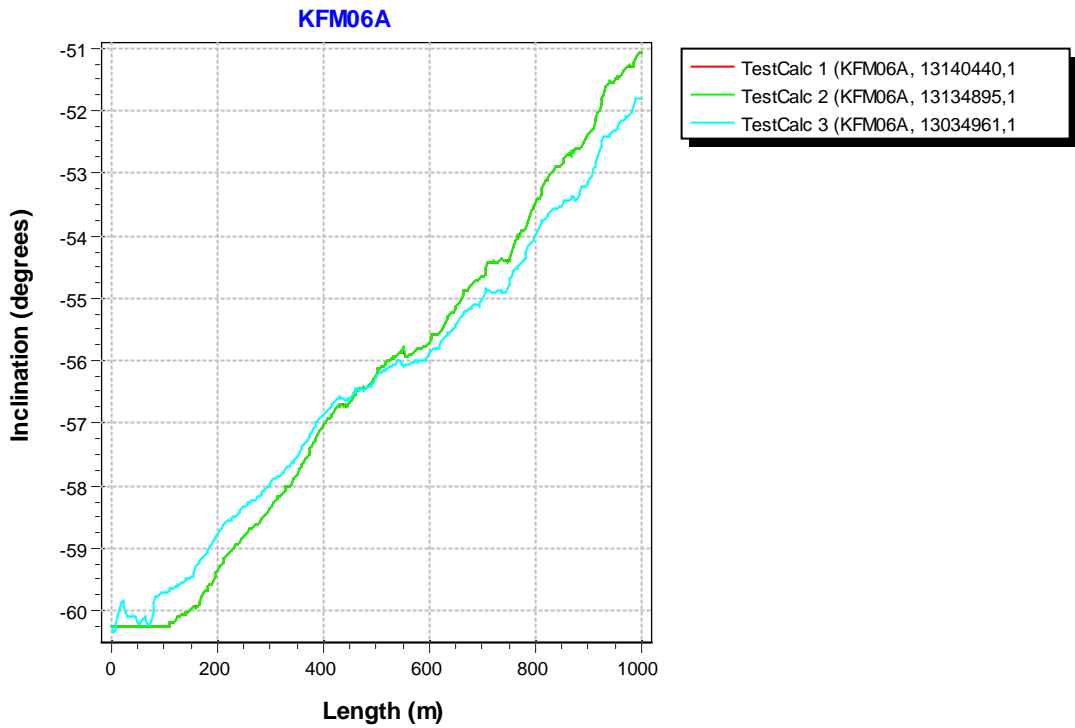


Figure 3. The Borehole deviation multiple measurements data (red line) together with the other, not error marked, deviation activities specified in Table 1. The upper diagram shows the inclination and the lower shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
KFM06A	13034961	EG156	Maxibor measurement	2004-08-23 00:00:00	0.00	990.00		061222 12:22
KFM06A	13134895	EG157	Magnetic - accelerometer measurement	2005-05-03 11:40:00	3.00	996.00	CF	061109 08:50
KFM06A	13140440	EG154	Borehole deviation multiple measurements	2006-12-13 12:00:00			I C	061222 10:30

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
KFM06A	13134895	BEARING	105.00	996.00	
KFM06A	13134895	INCLINATION	3.00	996.00	

Table 3. Subset (for every approx. 100 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
KFM06A	6699732.88	1632442.51	4.10	0	0.00	-60.25	300.92	0.59	1	0.00
KFM06A	6699762.09	1632390.63	-100.09	120	0.61	-60.17	299.65	0.59	1	1.24
KFM06A	6699793.28	1632340.38	-201.02	237	1.22	-58.94	304.01	0.59	1	2.44
KFM06A	6699828.94	1632290.47	-300.65	354	1.85	-57.74	306.90	0.59	1	3.65
KFM06A	6699869.73	1632239.38	-401.26	474	2.53	-56.46	310.53	0.59	1	4.88
KFM06A	6699915.54	1632190.44	-500.77	594	3.22	-55.76	315.44	0.59	1	6.12
KFM06A	6699966.04	1632143.97	-599.20	714	3.93	-54.42	318.33	0.59	1	7.35
KFM06A	6700024.93	1632098.60	-700.90	840	4.69	-52.89	325.35	0.59	1	8.66
KFM06A	6700090.22	1632057.41	-800.46	966	5.49	-51.37	329.93	0.59	1	10.01
KFM06A	6700109.14	1632046.80	-827.47	1000.64	5.71	-51.07	331.36	0.59	1	10.38

Borehole description KFM06B

Figure 1 gives a technical description of KFM06B.

Technical data

Borehole KFM06B

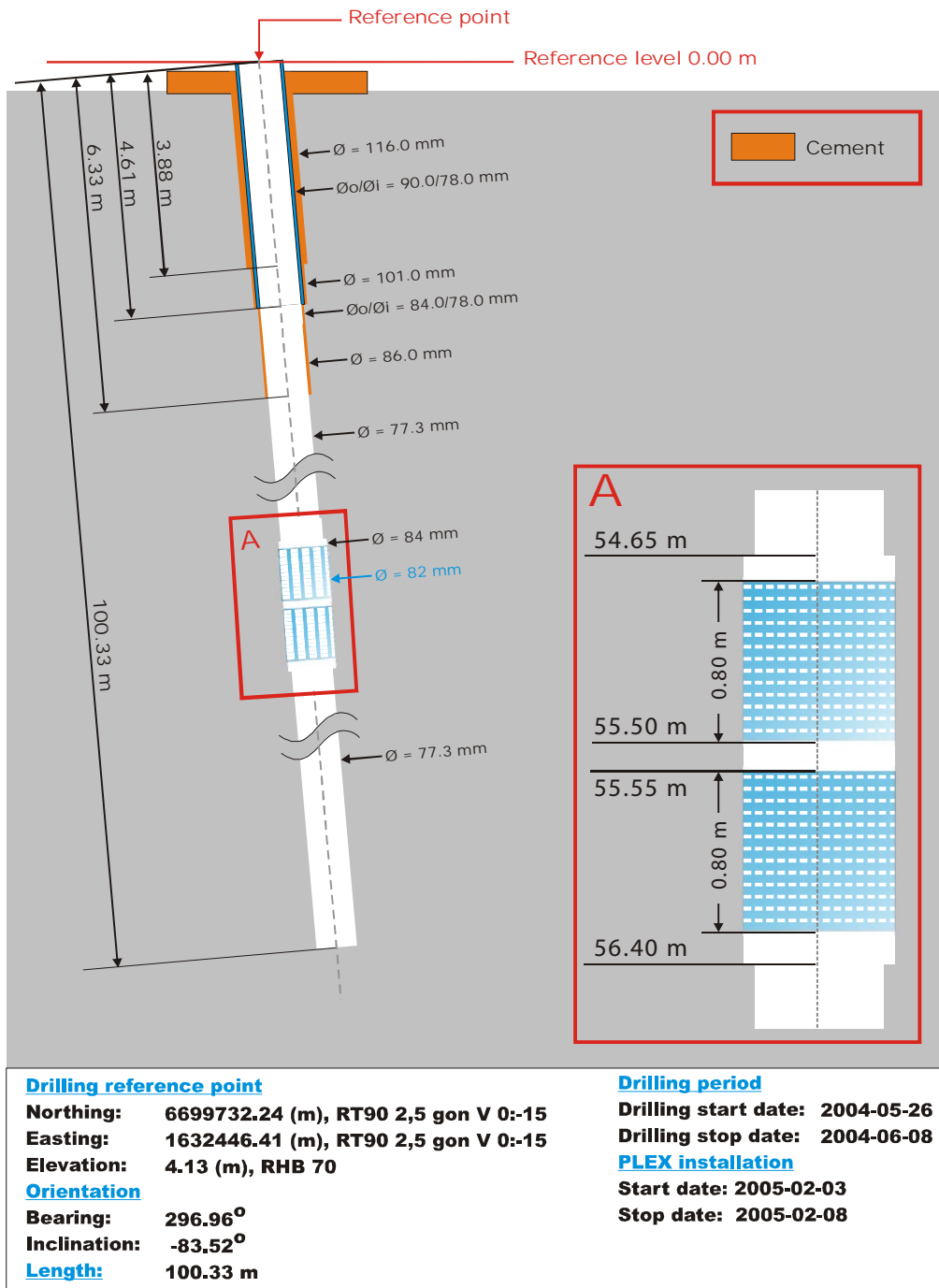


Figure 1. Technical description of KFM06B.

Deviation measurement in KFM06B

One deviation measurement was conducted in KFM06B. The deviation logging activities are tabulated in Sicada Activity Log, see Table 1.

The complete Maxibor measurement (ID 13046223) was executed down to 96 m length with the instrument centralized and hoisted by wire, inside the drill string.

The starting values (bearing and inclination) for the Maxibor measurement were obtained from the values surveyed at TOC (Borehole direction surveying).

Borehole deviation multiple measurements

For the calculation of *Borehole deviation multiple measurements* (ID 13142390) the single Maxibor measurement (ID 13046223) was used, see Table 2.

A subset of the resulting deviation file (from Object_location) is shown in Table 3. Because only one deviation activity is included in the EG154-file (Table 2), the inclination and bearing uncertainties are set manually to 1.8° and 4.9° respectively, and based on these values the “Radius uncertainty” is calculated for every measuring level.

Figure 2 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

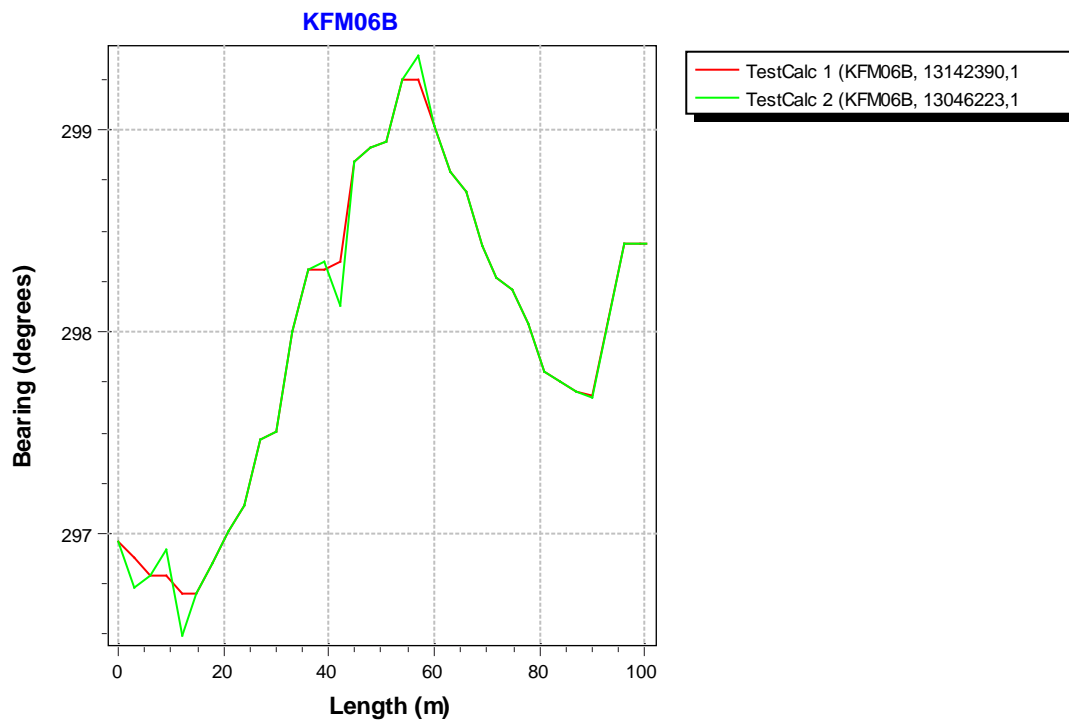
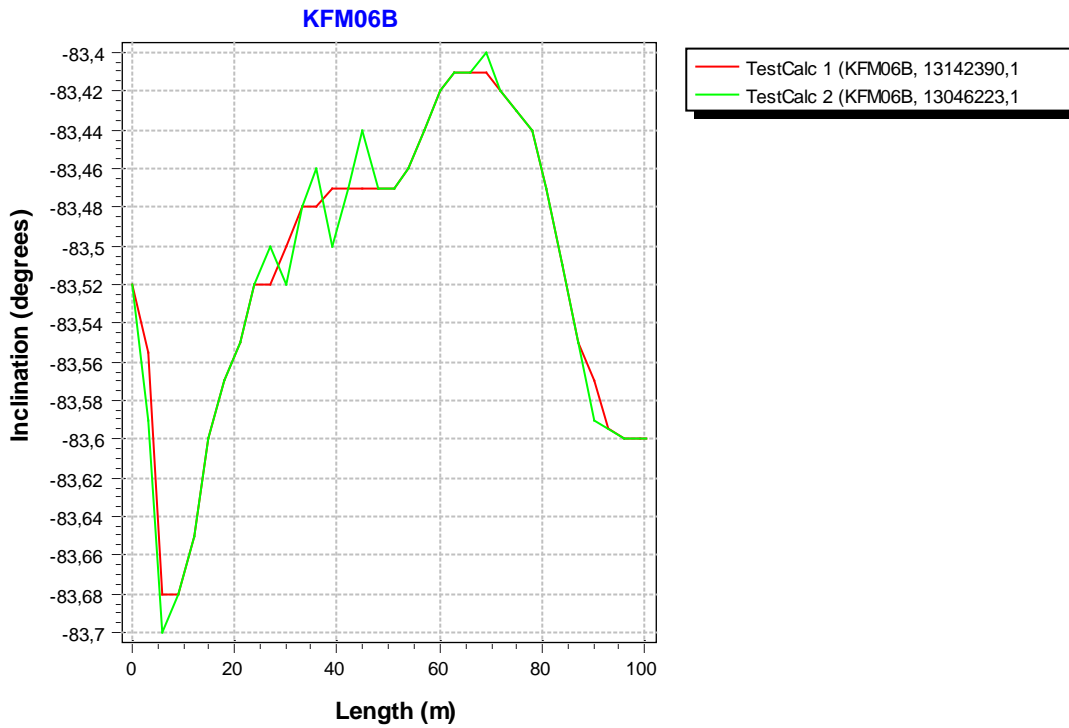


Figure 2. The Borehole deviation multiple measurements data (red line) together with the other deviation activity specified in Table 1. The upper diagram shows the inclination and the lower shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
KFM06B	13046223	EG156	Maxibor measurement	2004-06-08 00:00:00	0.00	96.00		061222 12:22
KFM06B	13142390	EG154	Borehole deviation multiple measurements	2006-12-20 19:20:00			I C	070111 08:13

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
KFM06B	13046223	BEARING	0.00	96.00	4.900
KFM06B	13046223	INCLINATION	0.00	96.00	1.800

Table 3. Subset of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
KFM06B	6699732.24	1632446.41	4.13	0	0.00	-83.52	296.96	1.8	4.9	0.00
KFM06B	6699737.56	1632436.40	-95.56	100.33	0.36	-83.60	298.44	1.8	4.9	3.15

Borehole description KFM06C

Figure 1 gives a technical description of KFM06C.

Technical data

Borehole KFM06C

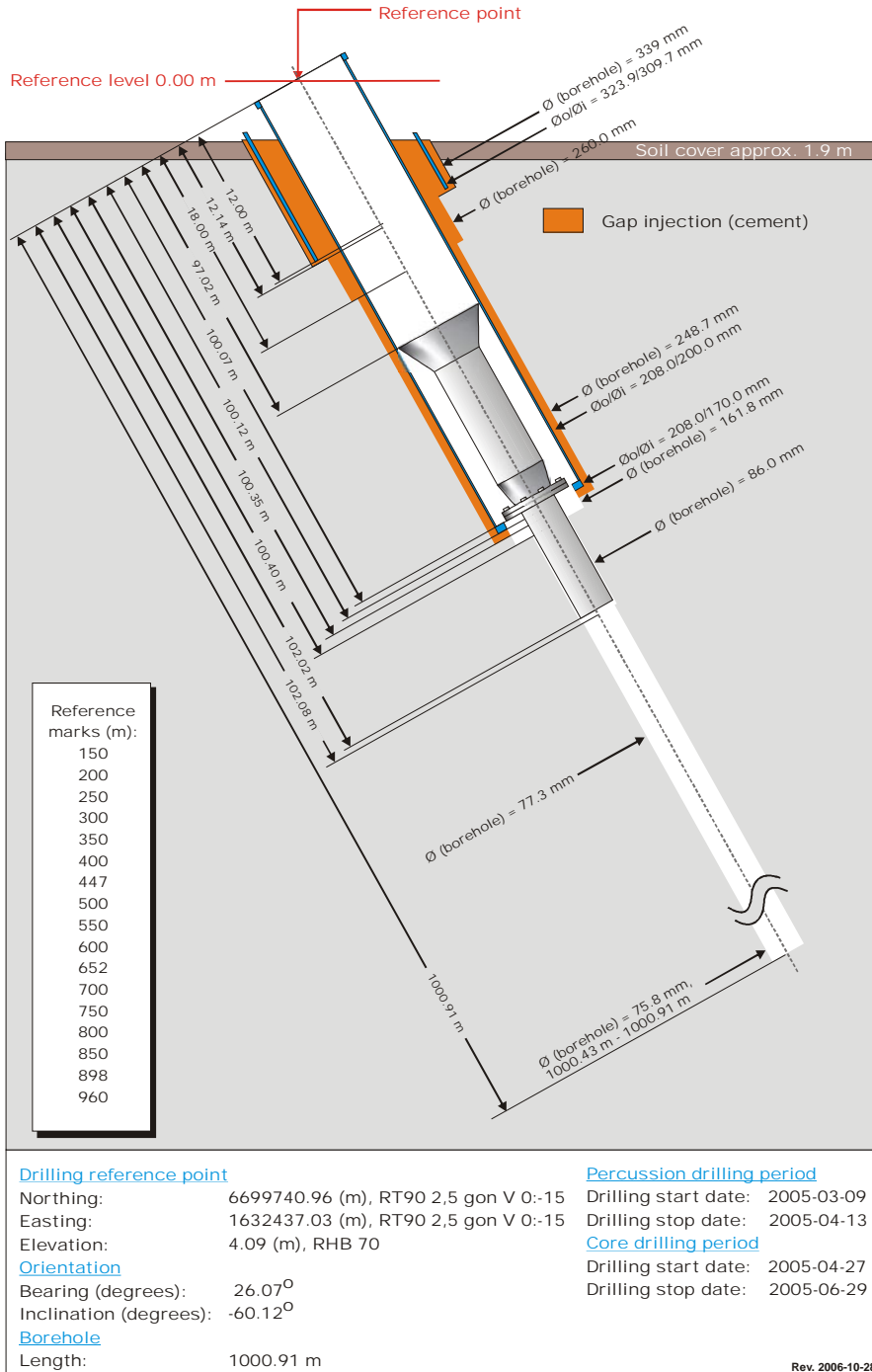


Figure 1. Technical description of KFM06C.

Deviation measurement in KFM06C

In total four deviation measurements were conducted in KFM06C. The deviation logging activities are tabulated in Sicada Activity Log, see Table 1.

There are two full Maxibor measurements executed in borehole KFM06C (ID 13079530, 13079994) conducted to 978 m and 804 m length and with the instrument mounted inside a barrel which was joined to the lower end of the drill string. The Maxibor measurement ID 13079994 was error marked as it deviates significantly from the other measurements.

The starting values (bearing and inclination) for the Maxibor measurements were obtained from the values surveyed at TOC (Borehole direction surveying).

The two Mag/acc measurements (ID 13131734 and 13131736) were executed down to 993 m drilling length, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. No geomagnetic disturbances exceeding 0.5 degrees for the declination were observed on the date of measuring, see Figure 2.

Borehole deviation multiple measurements

For the calculation of *Borehole deviation multiple measurements* (ID 13140443) the two complete Mag/acc measurements (ID 13131734 and 13131736) were used, see Table 2.

The Maxibor measurement (ID 13079530) deviates significantly from the Flexit curves.

A subset of the resulting deviation file for every approximately 100 m elevation (from Object_location) is shown in Table 3. The inclination and bearing uncertainties are calculated automatically, and based on these values the “Radius uncertainty” is calculated for every measuring level.

In Figure 3 the complete set of resulting deviation data is plotted, whereas Table 3 lists a subset of deviation data for approximately every 100 m elevation.

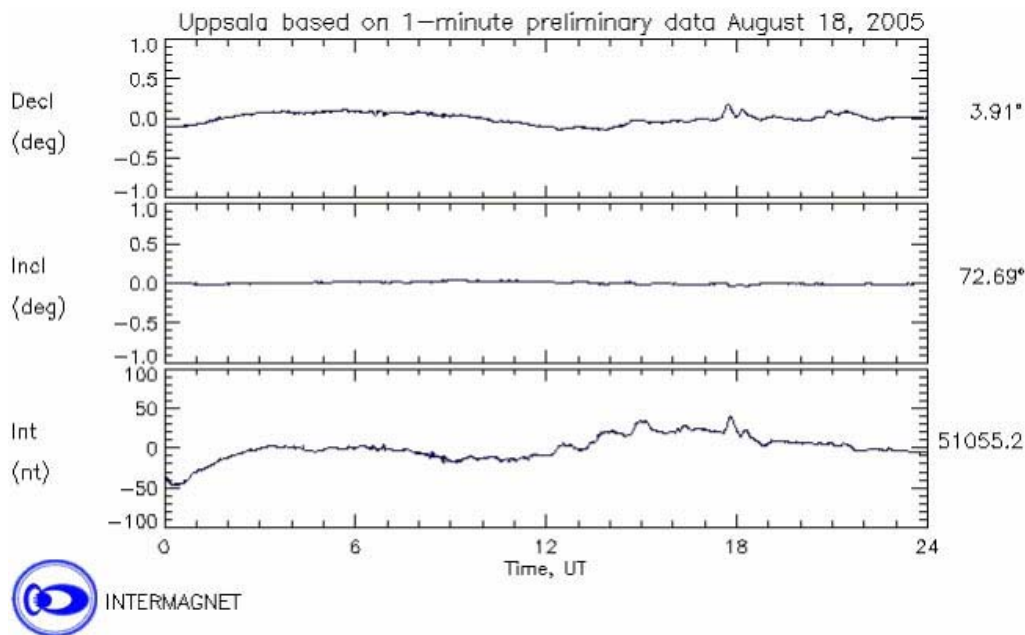


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2005-08-18. The upper curve shows the declination.

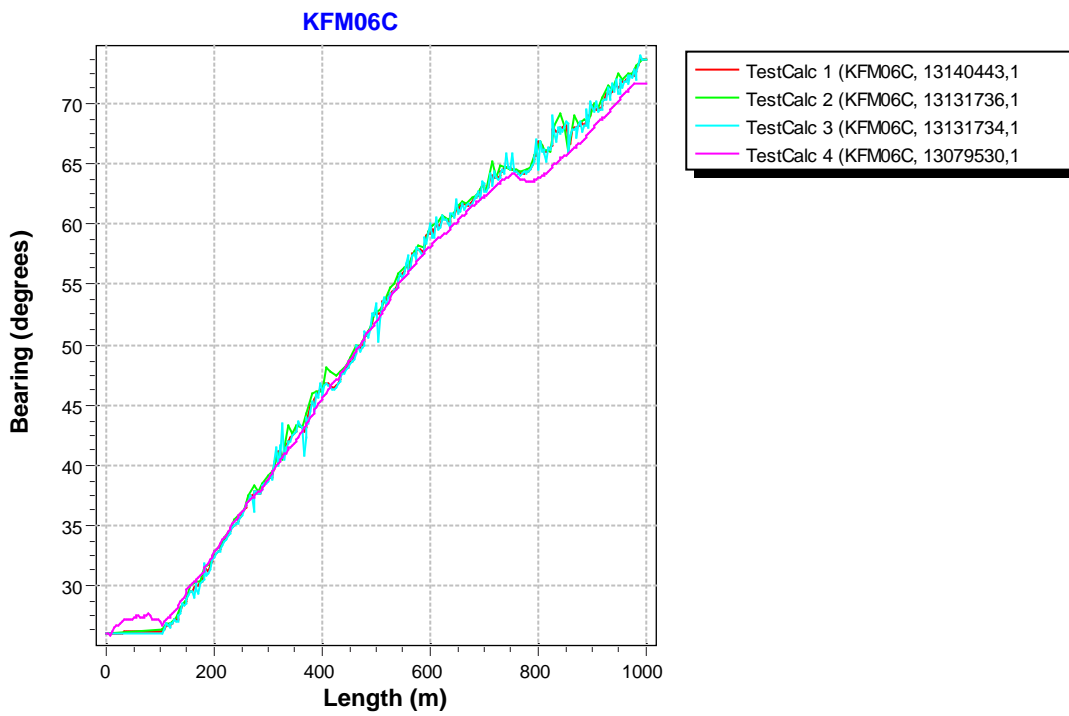
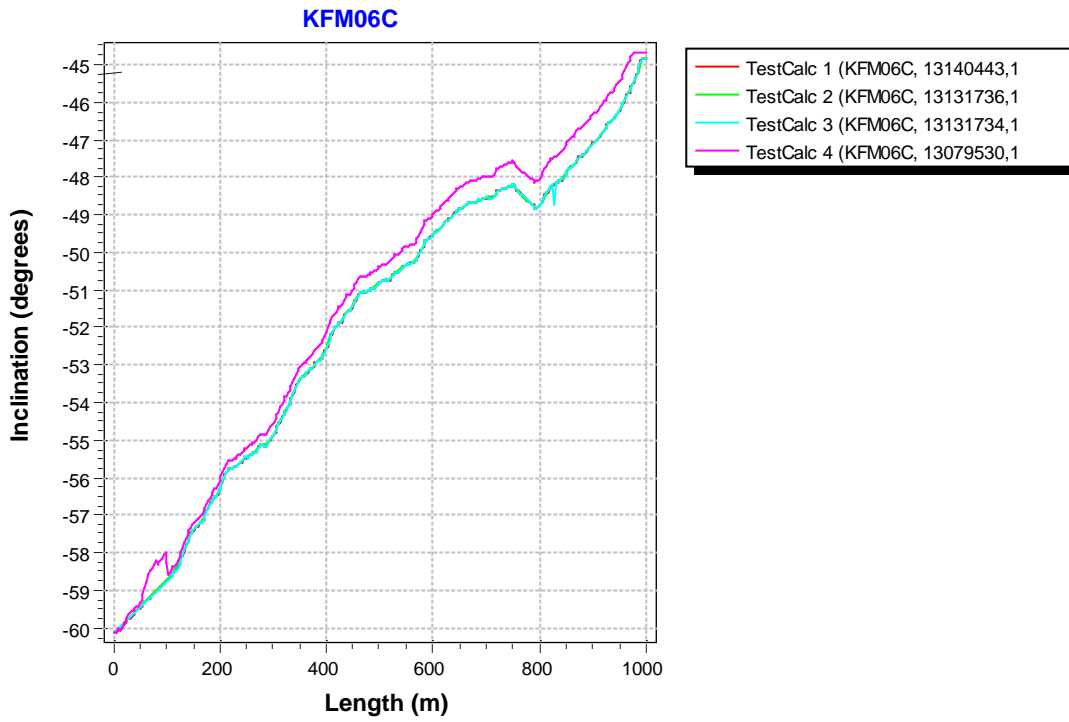


Figure 3. The Borehole deviation multiple measurements data (red line) together with the other, not error marked, deviation activities specified in Table 1. The upper diagram shows the inclination and the lower shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
KFM06C	13079530	EG156	Maxibor measurement	2005-08-02 11:01:00	3.00	978.00		061222 12:22
KFM06C	13079994	EG156	Maxibor measurement	2005-08-02 11:01:00	3.00	804.00	E	050926 15:38
KFM06C	13131734	EG157	Magnetic - accelerometer measurement	2005-08-18 07:40:00	105.00	993.00	F	061012 07:28
KFM06C	13131736	EG157	Magnetic - accelerometer measurement	2005-08-18 11:40:00	105.00	993.00	CF	061012 07:30
KFM06C	13140443	EG154	Borehole deviation multiple measurements	2006-12-13 15:00:00			I C	061222 10:30

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
KFM06C	13131734	BEARING	105.00	993.00	
KFM06C	13131734	INCLINATION	105.00	993.00	
KFM06C	13131736	BEARING	105.00	993.00	
KFM06C	13131736	INCLINATION	105.00	993.00	

Table 3. Subset (for every approx. 100 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
KFM06C	6699740.96	1632437.03	4.09	0	0.00	-60.12	26.07	0.645	1.159	0.00
KFM06C	6699795.94	1632464.10	-99.08	120	0.69	-58.36	26.83	0.645	1.159	1.35
KFM06C	6699852.28	1632497.93	-199.43	240	1.43	-55.58	35.15	0.645	1.159	2.71
KFM06C	6699907.34	1632543.10	-299.66	363	2.23	-53.22	43.14	0.645	1.159	4.15
KFM06C	6699960.00	1632600.12	-398.85	489	3.11	-50.94	51.28	0.645	1.159	5.72
KFM06C	6700006.97	1632670.28	-500.25	621	4.06	-49.20	60.49	0.645	1.159	7.43
KFM06C	6700047.21	1632747.65	-599.31	753	5.04	-48.22	64.53	0.645	1.159	9.20
KFM06C	6700083.12	1632830.13	-699.94	888	6.06	-47.34	68.46	0.645	1.159	11.02
KFM06C	6700108.18	1632904.13	-781.42	1000.91	6.94	-44.86	73.70	0.645	1.159	12.60

Borehole description KFM07A

Figure 1 gives a technical description of KFM07A.

Technical data

Borehole KFM07A

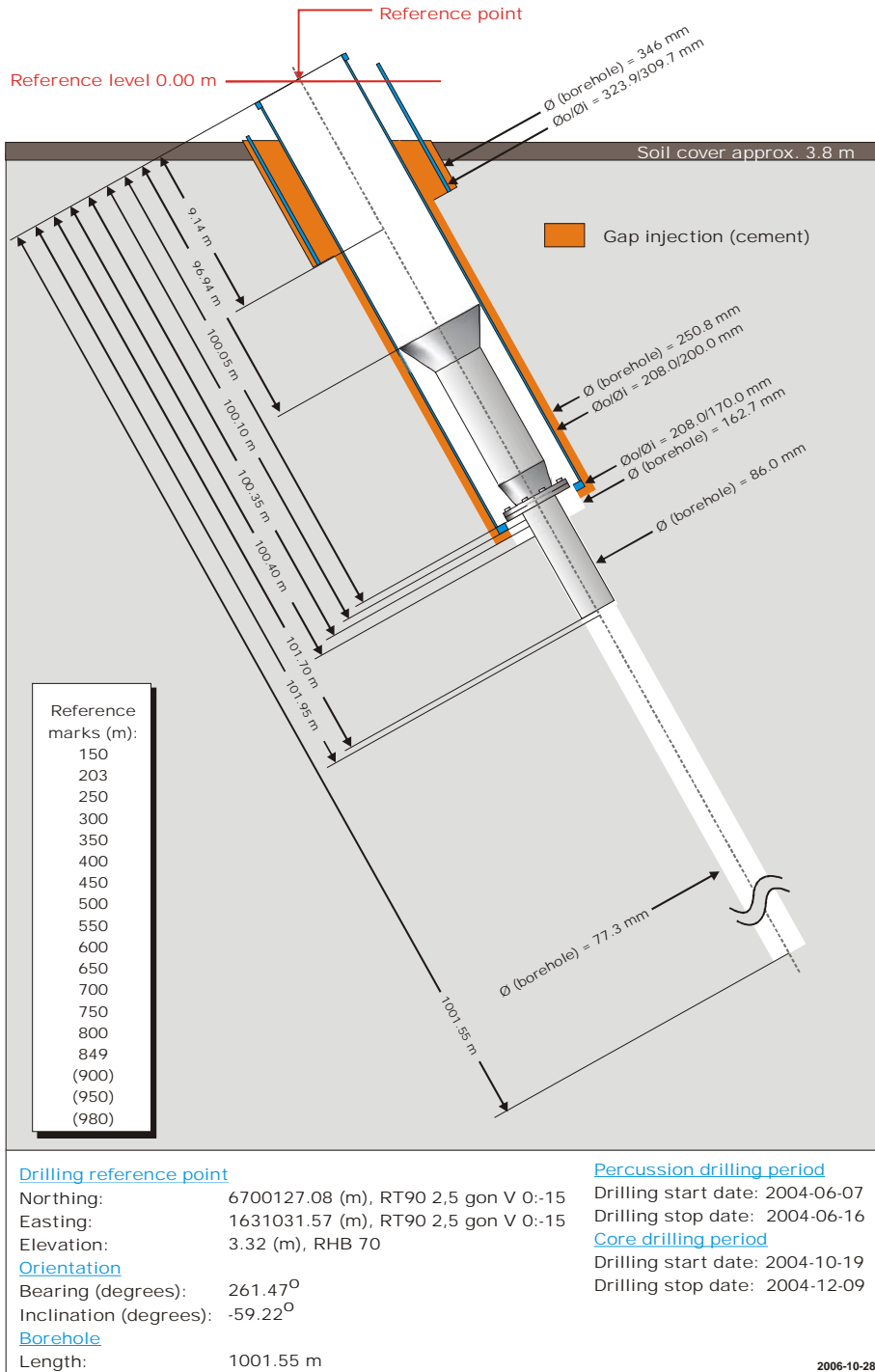


Figure 1. Technical description of KFM07A.

Deviation measurement in KFM07A

In total five deviation measurements were conducted in KFM07A. The deviation logging activities are tabulated in Sicada Activity Log, see Table 1.

One of the complete borehole Maxibor measurements (ID 13059829) was executed down to 996 m with the instrument centralized and hoisted by wire, inside the drill string. The other two Maxibor measurements (ID 13140403, 13140413) were conducted to 993 m and 996 m length respectively and with the instrument mounted inside a barrel which was joined to the lower end of the drill string.

The starting values (bearing and inclination) for the Maxibor measurement were obtained from the values surveyed at TOC (Borehole direction surveying).

The two Mag/acc measurements (ID 13134892 and 13134894) were executed down to 996 m and 936 m drilling length respectively, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. No geomagnetic disturbances exceeding 0.5 degrees for the declination were observed on the dates of measuring, see Figure 2.

Borehole deviation multiple measurements

For the calculation of *Borehole deviation multiple measurements* (ID 13141373) the two Mag/acc measurements (ID 13134892 and 13134894) were used, see Table 2. All the three Maxibor measurements are error marked as they are not repeatable and the deviation differs significantly from the Flexit curves.

A subset of the resulting deviation file for every approximately 100 m elevation (from Object_location) is shown in Table 3. The inclination and bearing uncertainties are calculated automatically, and based on these values the “Radius uncertainty” is calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

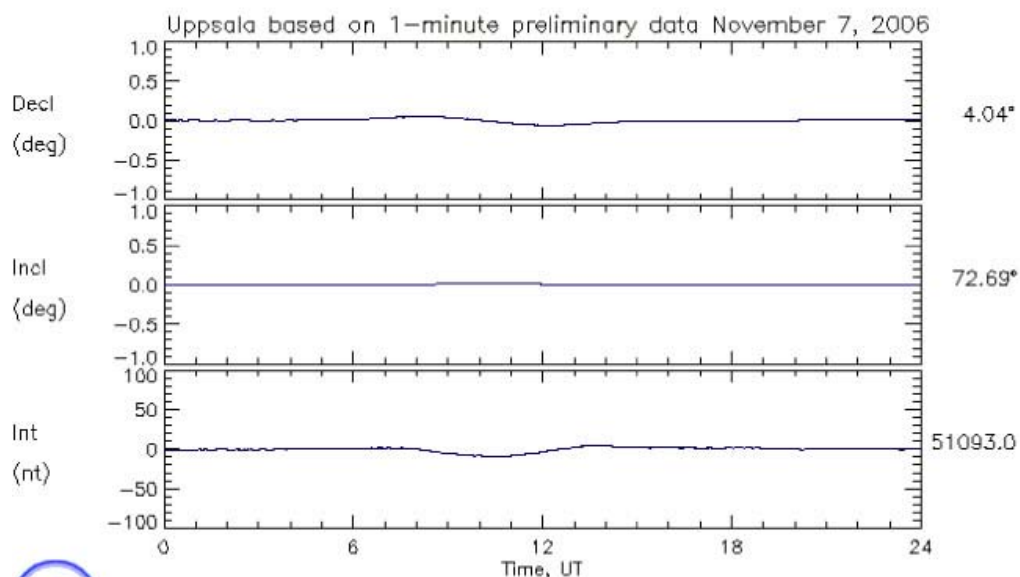
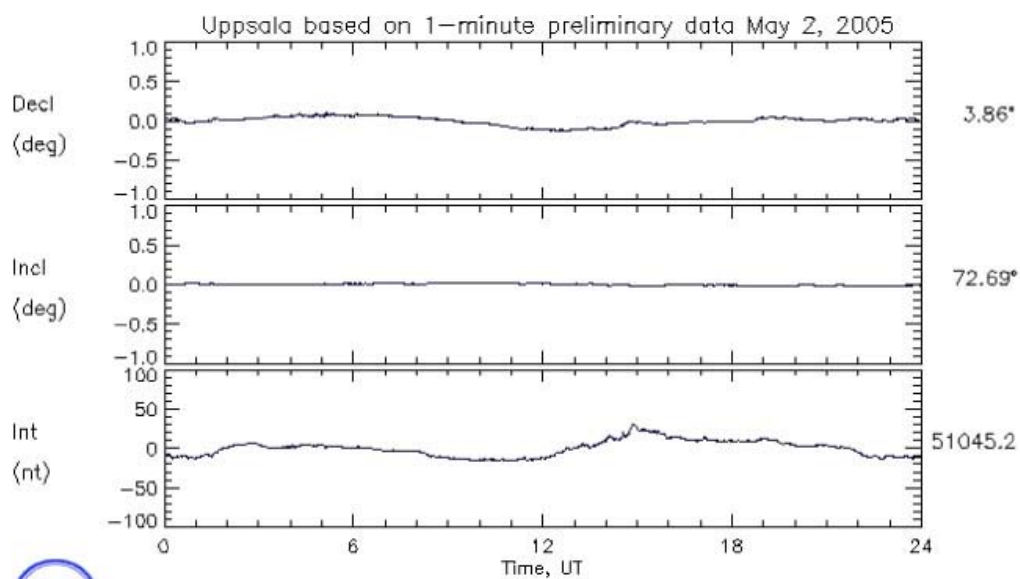


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2005-05-02 and 2006-11-07. The upper curve shows the declination.

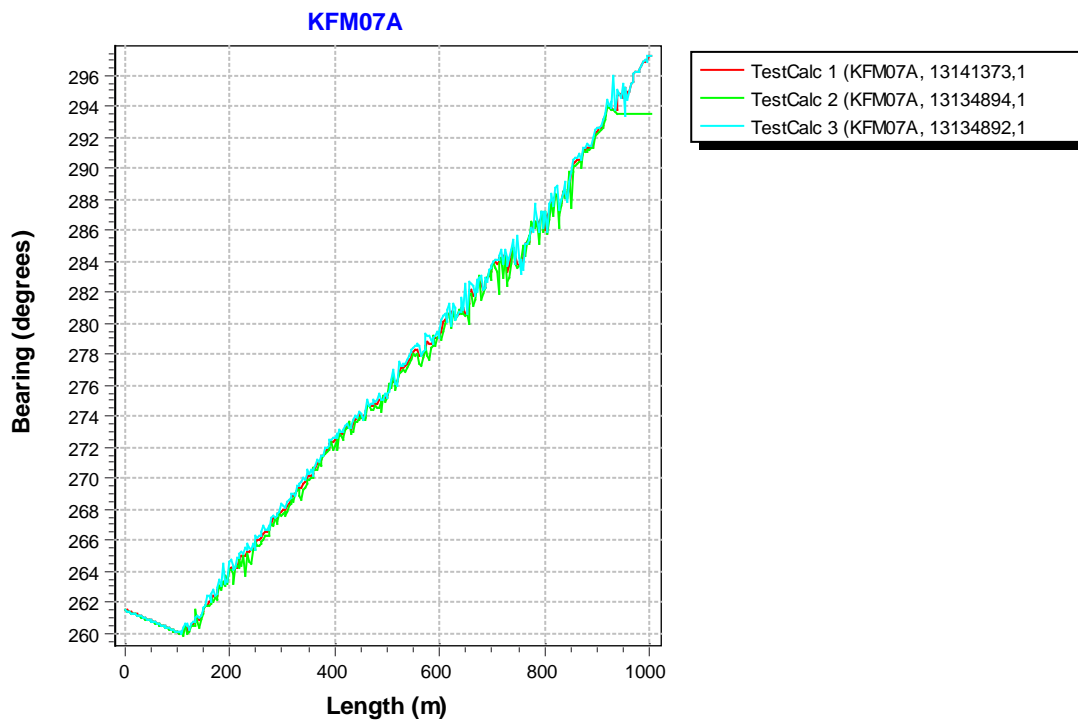
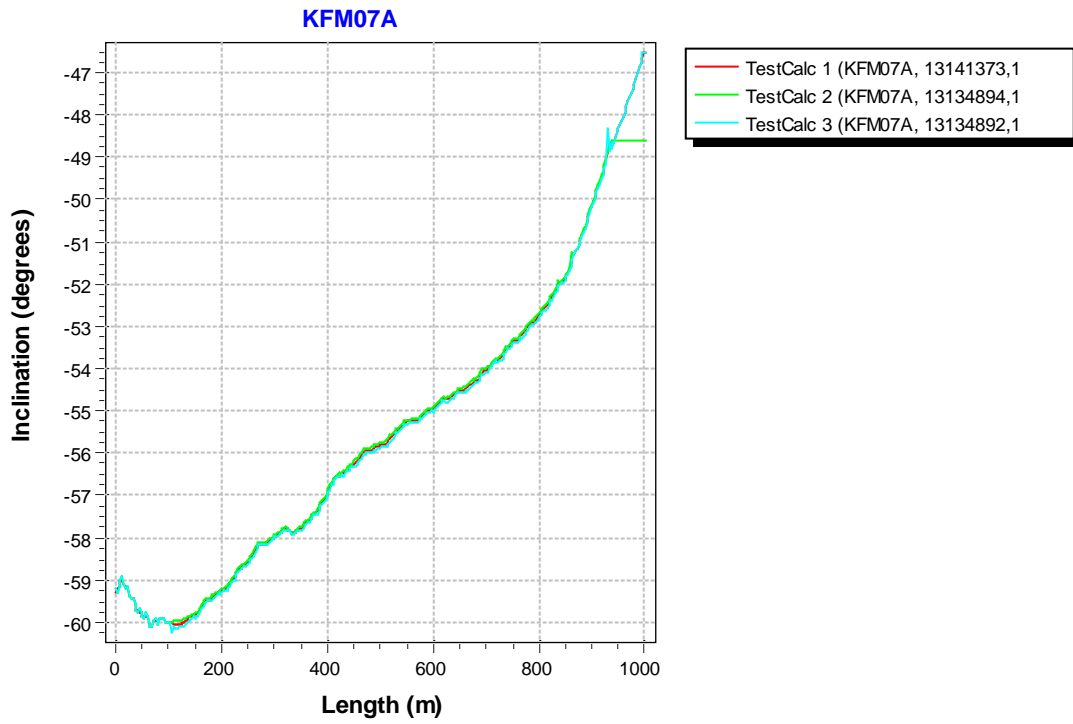


Figure 3. The Borehole deviation multiple measurements data (red line) together with the other, not error marked, deviation activities specified in Table 1. The upper diagram shows the inclination and the lower shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
KFM07A	13059829	EG156	Maxibor measurement	2004-12-09 06:00:00	0.00	996.00	EF	070322 16:04
KFM07A	13134892	EG157	Magnetic - accelerometer measurement	2005-05-02 11:40:00	3.00	996.00	CF	061109 08:50
KFM07A	13134894	EG157	Magnetic - accelerometer measurement	2006-11-07 09:25:00	3.00	936.00	CF	061109 08:51
KFM07A	13141373	EG154	Borehole deviation multiple measurements	2006-12-04 13:00:00			I C	061222 10:30
KFM07A	13140403	EG156	Maxibor measurement	2006-12-05 08:00:00	3.00	993.00	ECF	070322 16:04
KFM07A	13140413	EG156	Maxibor measurement	2006-12-05 12:30:00	3.00	996.00	ECF	070322 16:04

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
KFM07A	13134892	BEARING	105.00	996.00	
KFM07A	13134892	INCLINATION	3.00	996.00	
KFM07A	13134894	BEARING	105.00	936.00	
KFM07A	13134894	INCLINATION	3.00	936.00	

Table 3. Subset (for every approx. 100 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_UNCERT	INCLINATION	BEARING	INCLINATION_UNCERT	BEARING_UNCERT	RADIUS_UNCERT
KFM07A	6700127.08	1631031.57	3.33	0.00	0.00	-59.29	261.47	0.075	0.598	0.00
KFM07A	6700117.28	1630971.87	-100.31	120	0.08	-60.04	260.11	0.075	0.598	0.63
KFM07A	6700109.89	1630912.90	-201.07	237	0.16	-58.70	265.25	0.075	0.598	1.25
KFM07A	6700107.46	1630851.12	-300.39	354	0.24	-57.74	270.13	0.075	0.598	1.90
KFM07A	6700110.69	1630785.47	-400.77	474	0.32	-55.94	274.77	0.075	0.598	2.59
KFM07A	6700119.05	1630718.02	-499.65	594	0.41	-54.98	279.13	0.075	0.598	3.30
KFM07A	6700133.51	1630648.03	-599.74	717	0.51	-53.81	284.05	0.075	0.598	4.04
KFM07A	6700154.43	1630575.15	-700.34	843	0.61	-51.97	288.26	0.075	0.598	4.84
KFM07A	6700186.64	1630498.54	-798.92	972	0.72	-47.58	296.23	0.075	0.598	5.71
KFM07A	6700195.87	1630480.21	-820.94	1002.1	0.74	-46.53	297.29	0.075	0.598	5.92

Borehole description KFM07B

Figure 1 gives a technical description of KFM07B.

Technical data Borehole KFM07B

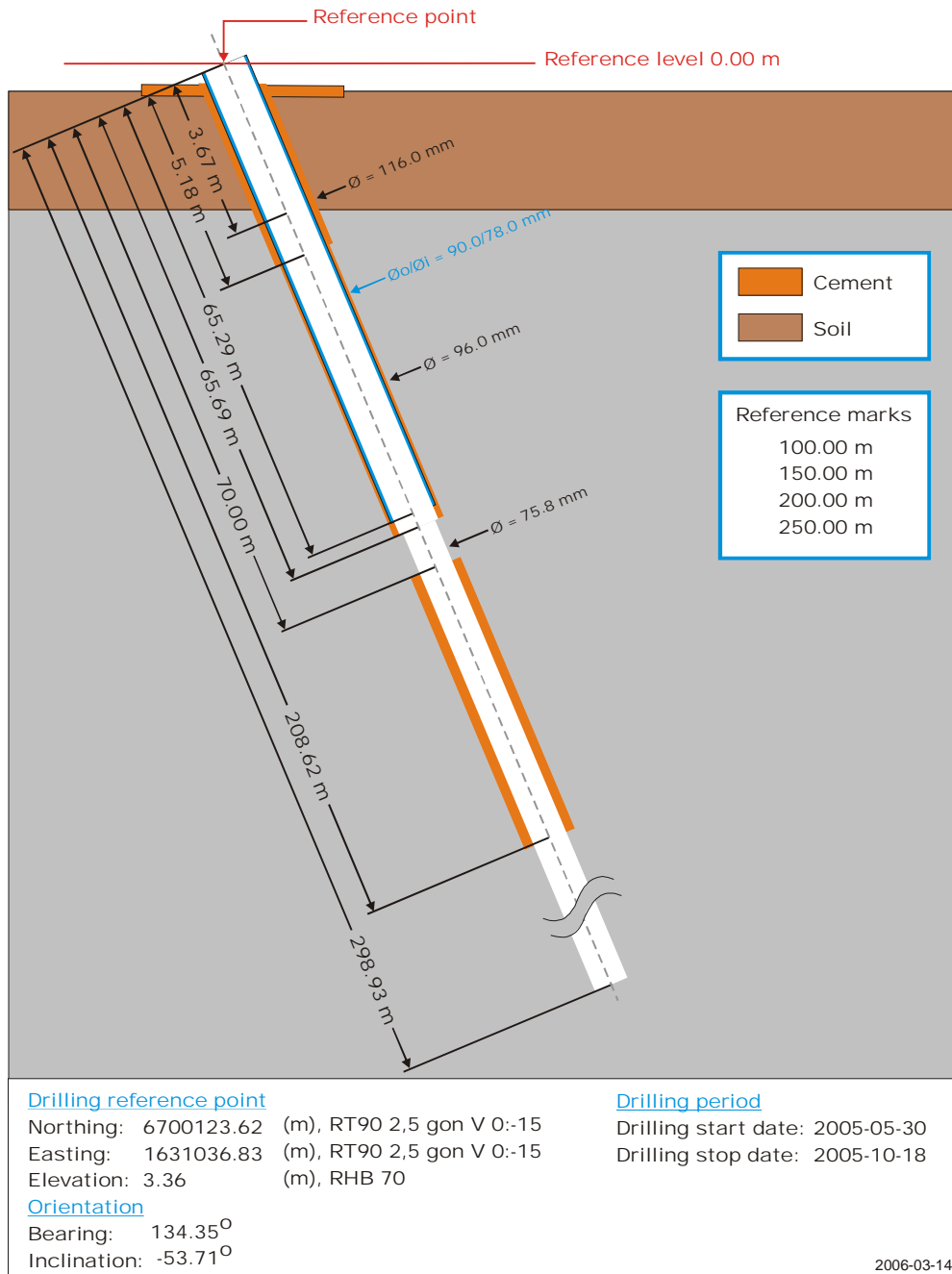


Figure 1. Technical description of KFM07B.

Deviation measurements in KFM07B

In total three deviation measurements were conducted in KFM07B. The deviation logging activities are tabulated in Sicada Activity Log, see Table 1.

There is one full Maxibor measurement executed in borehole KFM07B (ID 13092490) conducted to 297 m length and with the instrument mounted inside a barrel which was joined to the lower end of the drill string.

The starting values (bearing and inclination) for the Maxibor measurement were obtained from the values surveyed at TOC (Borehole direction surveying).

The two Mag/acc measurements (ID 13134861 and 13134871) were executed down and up to 297 m drilling length, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. No geomagnetic disturbances exceeding 0.5 degrees for the declination were observed on the date of measuring, see Figure 2.

Borehole deviation multiple measurements

For the calculation of *Borehole deviation multiple measurements* (ID 13140445) two Mag/acc measurements (ID 13134861 and 13134871) were used, see Table 2. The Maxibor inclination differs significantly from the Flexit inclination curves.

A subset of the resulting deviation file for every approximately 100 m elevation (from Object_location) is shown in Table 3. The inclination and bearing uncertainties are calculated automatically, and based on these values the “Radius uncertainty” is calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

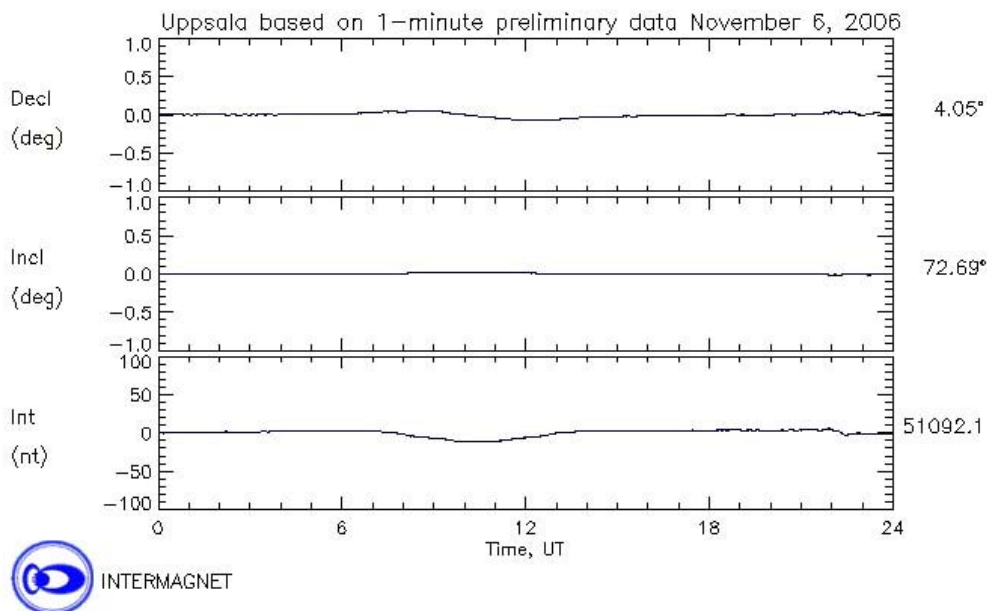


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2006-11-06. The upper curve shows the declination.

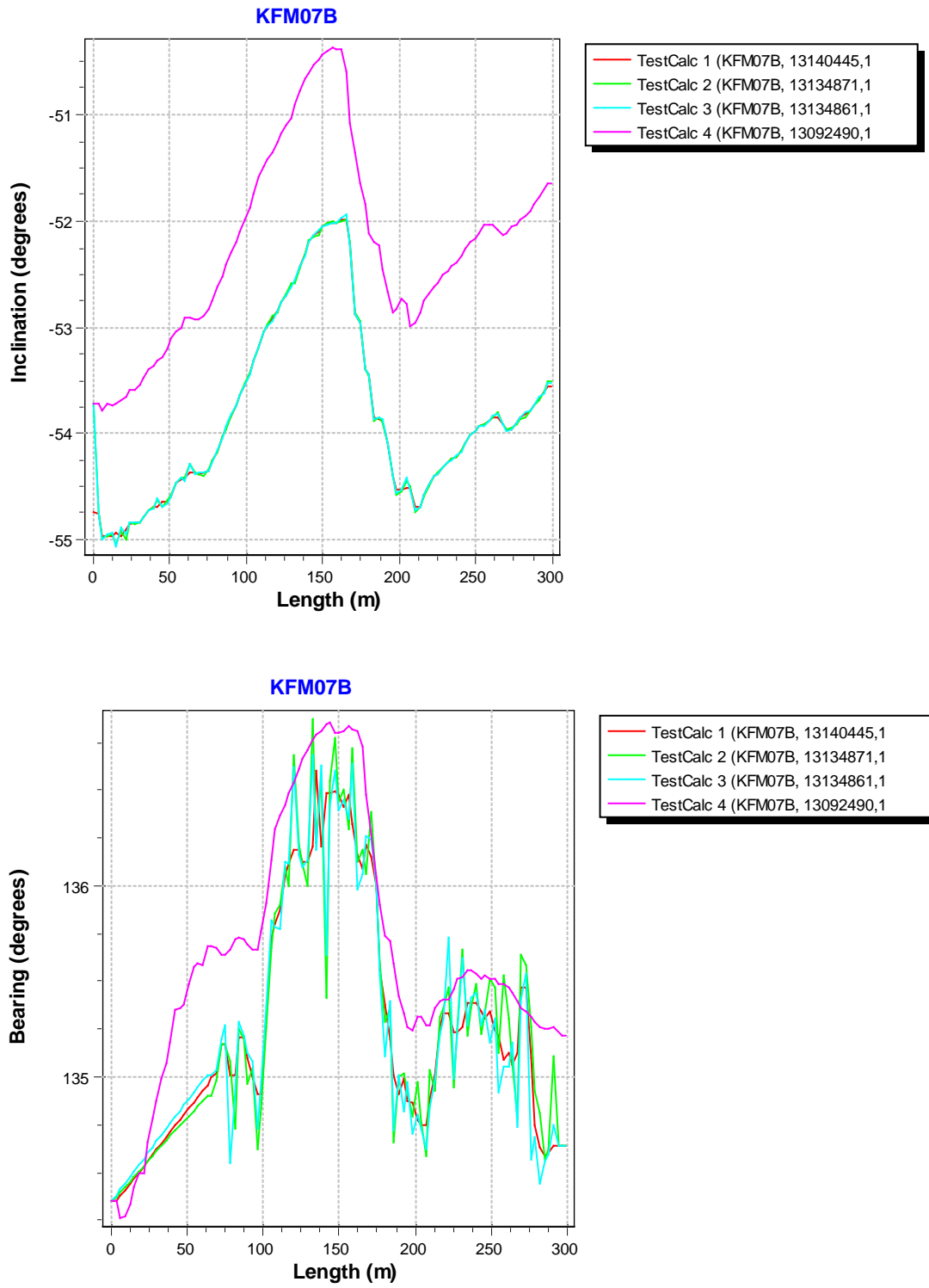


Figure 3. The Borehole deviation multiple measurements data (red line) together with the other, not error marked, deviation activities specified in Table 1. The upper diagram shows the inclination and the lower shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
KFM07B	13092490	EG156	Maxibor measurement	2005-10-19 00:00:00	0.00	297.00		061222 12:22
KFM07B	13134861	EG157	Magnetic - accelerometer measurement	2006-11-06 15:20:00	3.00	297.00	CF	061107 15:20
KFM07B	13134871	EG157	Magnetic - accelerometer measurement	2006-11-06 16:45:00	3.00	297.00	CF	061107 15:20
KFM07B	13140445	EG154	Borehole deviation multiple measurements	2006-12-13 11:00:00			I C	061222 10:31

Table 2. Content of the EG154-file.

DCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
<FM07B	13134861	BEARING	66.00	297.00	
<FM07B	13134861	INCLINATION	3.00	297.00	
<FM07B	13134871	BEARING	66.00	297.00	
<FM07B	13134871	INCLINATION	3.00	297.00	

Table 3. Subset (for every approx. 100 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
KFM07B	6700123.62	1631036.83	3.36	0	0.00	-54.74	134.35	1.725	0.566	0.00
KFM07B	6700071.48	1631088.93	-98.82	126	2.22	-52.70	136.12	1.725	0.566	3.79
KFM07B	6700017.87	1631141.39	-200.03	252	4.48	-53.93	135.24	1.725	0.566	7.59
KFM07B	6699998.30	1631161.00	-237.91	298.93	5.31	-53.56	134.64	1.725	0.566	9.00

Borehole description KFM07C

Figure 1 gives a technical description of KFM07C.

Technical data Borehole KFM07C

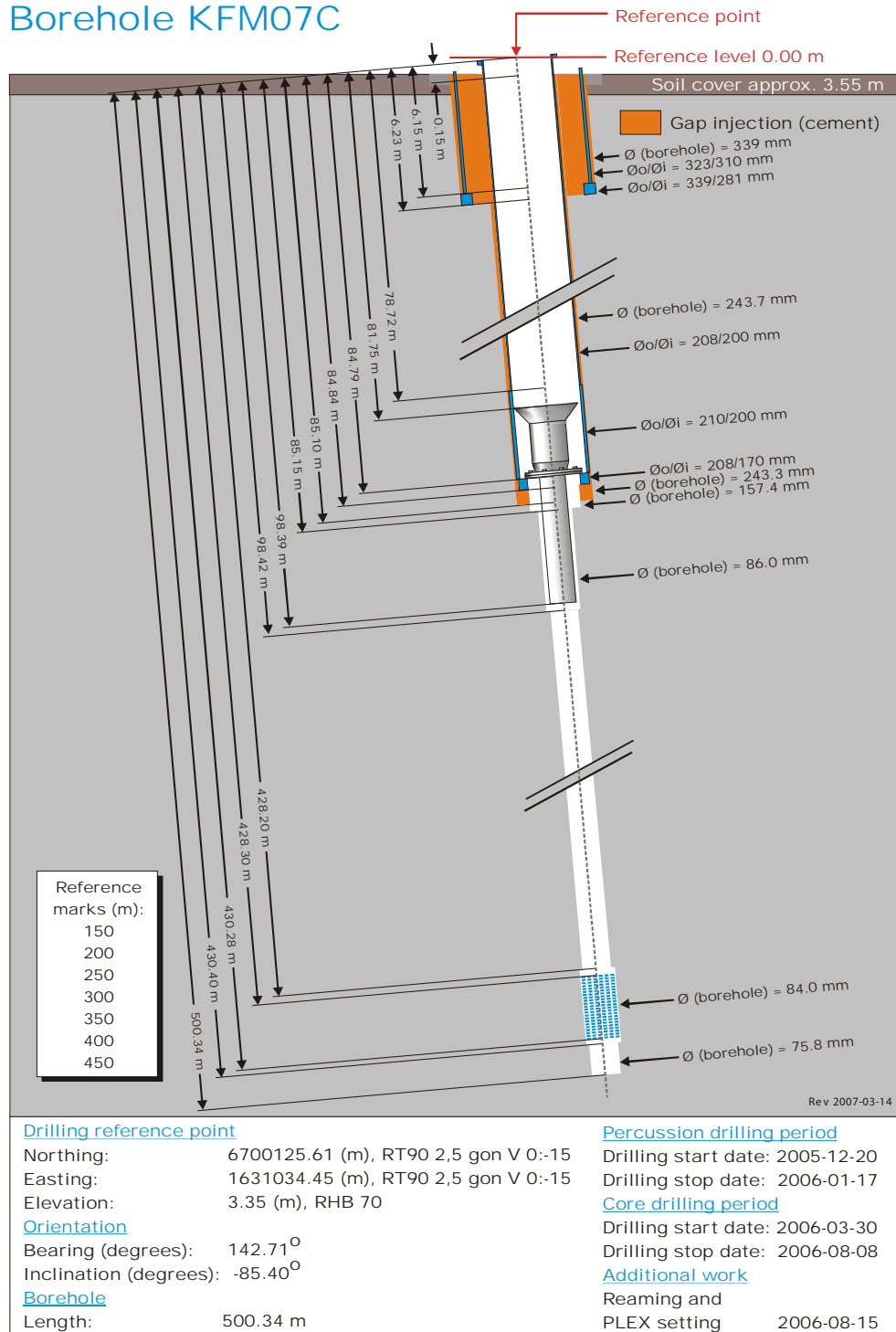


Figure 1. Technical description of KFM07C.

Deviation measurement in KFM07C

In total four deviation measurements were conducted in KFM07C. The deviation logging activities are tabulated in Sicada Activity Log, see Table 1.

There is one full Maxibor measurement executed in borehole KFM07C (ID 13118511) conducted to 498 m length and with the instrument mounted inside a barrel which was joined to the lower end of the drill string.

The starting values (bearing and inclination) for the Maxibor measurement were obtained from the values surveyed at TOC (Borehole direction surveying).

The three Mag/acc measurements (ID 13132004, 13132005 and 13135314) were executed down to 498 m drilling length, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. No geomagnetic disturbances exceeding 0.5 degrees for the declination were observed on the date of measuring, see Figure 2.

Borehole deviation multiple measurements

For the calculation of *Borehole deviation multiple measurements* (ID 13141376) the two Mag/acc measurements (ID 13132004 and 13135314) were used, see Table 2. The Maxibor bearing differs significantly from the corresponding Flexit bearing curves.

A subset of the resulting deviation file for every approximately 100 m elevation (from Object_location) is shown in Table 3. The inclination and bearing uncertainties are calculated automatically, and based on these values the “Radius uncertainty” is calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

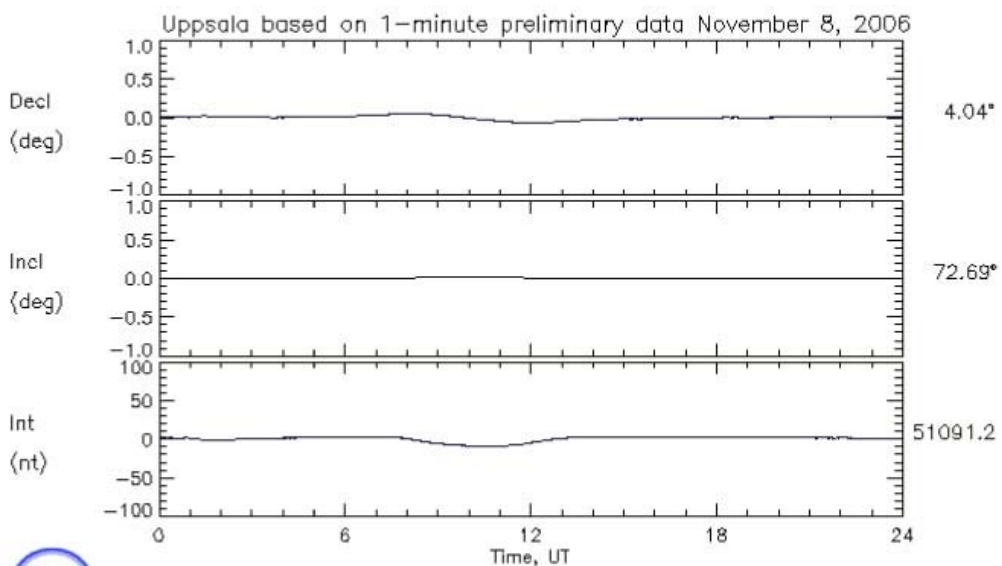
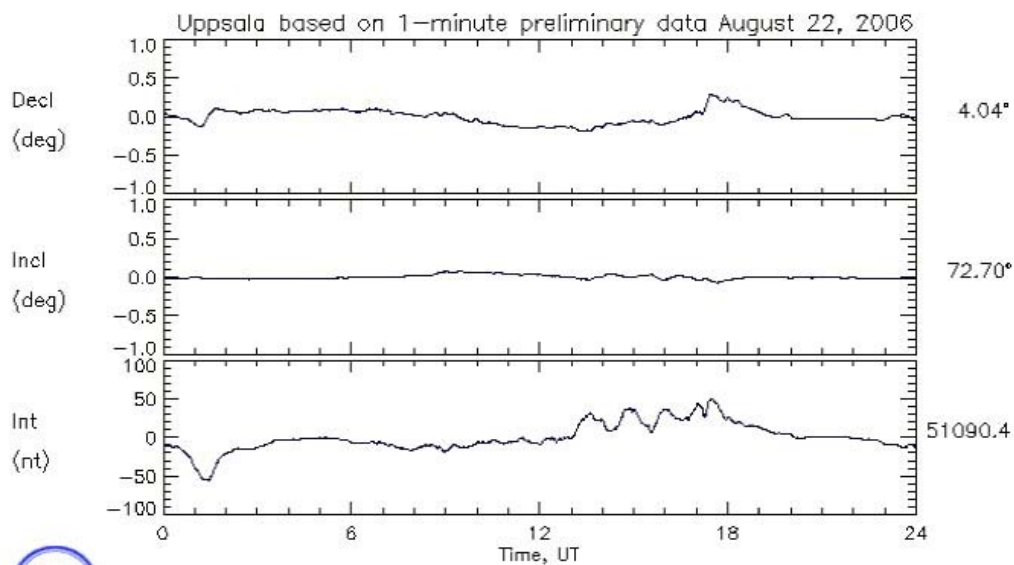


Figure 2. The geomagnetic field was observed at the geomagnetic observatory in Uppsala on 2006-08-22 and 2006-11-08. The upper curve shows the declination.

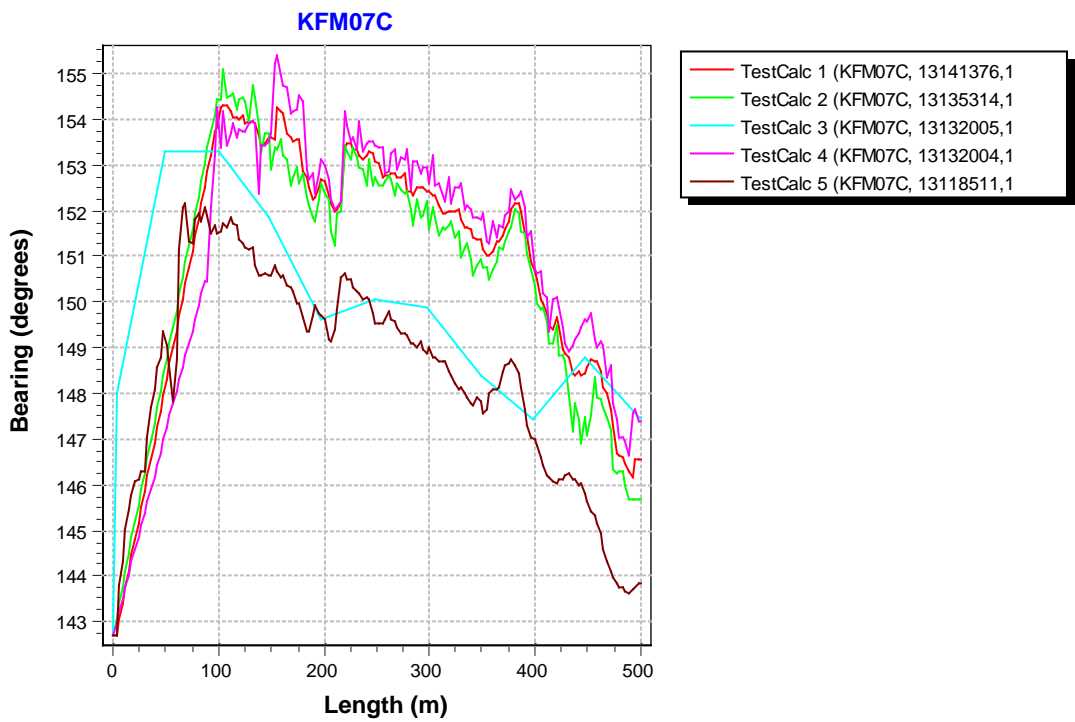
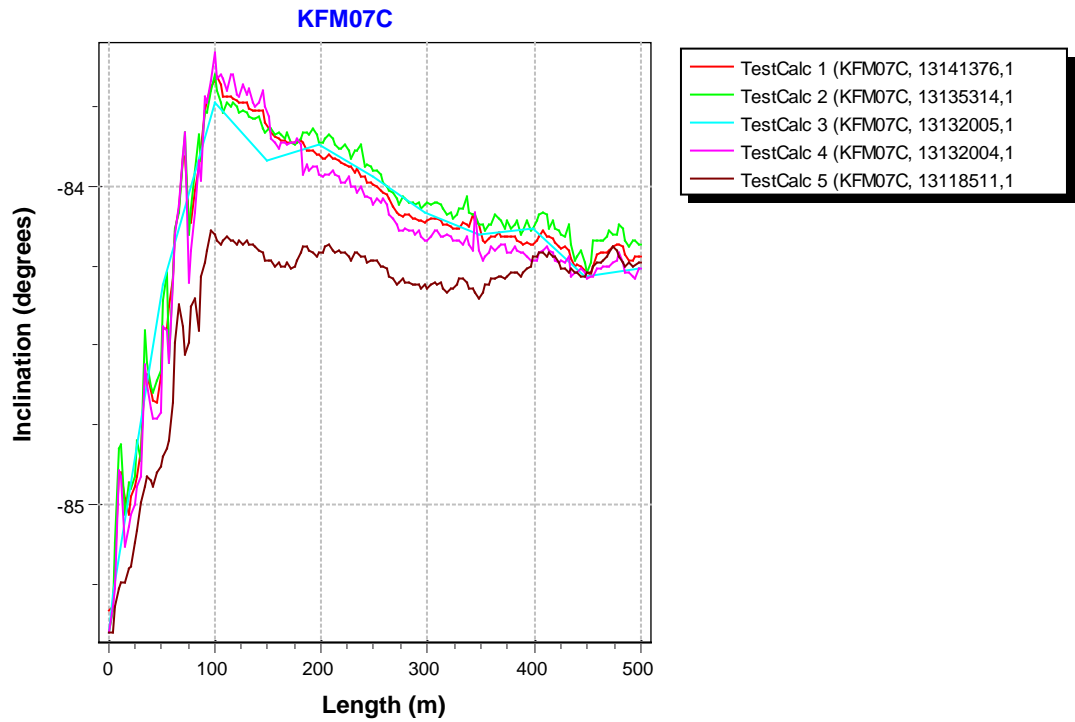


Figure 3. The Borehole deviation multiple measurements data (red line) together with the other, not error marked, deviation activities specified in Table 1. The upper diagram shows the inclination and the lower shows the bearing.

Table 1. The deviation logging activities in SICADA.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
KFM07C	13118511	EG156	Maxibor measurement	2006-08-09 14:00:00	3.00	498.00	F	061222 12:22
KFM07C	13132004	EG157	Magnetic - accelerometer measurement	2006-08-22 15:45:00	3.00	498.00	CF	061012 09:04
KFM07C	13132005	EG157	Magnetic - accelerometer measurement	2006-08-22 17:40:00	3.00	498.00	CF	061012 09:07
KFM07C	13135314	EG157	Magnetic - accelerometer measurement	2006-11-08 07:10:00	3.00	498.00	CF	061113 12:37
KFM07C	13141376	EG154	Borehole deviation multiple measurements	2006-12-05 12:00:00			I C	061222 10:31

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
KFM07C	13132004	BEARING	96.00	498.00	
KFM07C	13132004	INCLINATION	3.00	498.00	
KFM07C	13135314	BEARING	102.00	498.00	
KFM07C	13135314	INCLINATION	3.00	498.00	

Table 3. Subset (for every approx. 100 m elevation) of the resulting "Object_location" in SICADA.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
KFM07C	6700125.61	1631034.45	3.35	0	0.00	-85.33	142.71	0.306	3.36	0.00
KFM07C	6700116.88	1631039.74	-101.15	105	0.05	-83.68	154.30	0.306	3.36	0.61
KFM07C	6700107.33	1631044.50	-199.57	204	0.11	-83.91	152.31	0.306	3.36	1.23
KFM07C	6700097.88	1631049.36	-301.01	306	0.17	-84.10	152.31	0.306	3.36	1.86
KFM07C	6700089.00	1631054.18	-399.50	405	0.22	-84.16	150.08	0.306	3.36	2.45
KFM07C	6700080.83	1631059.25	-494.35	500.34	0.27	-84.22	146.55	0.306	3.36	3.01

Borehole description KFM08A

Figure 1 gives a technical description of KFM08A.

Technical data Borehole KFM08A

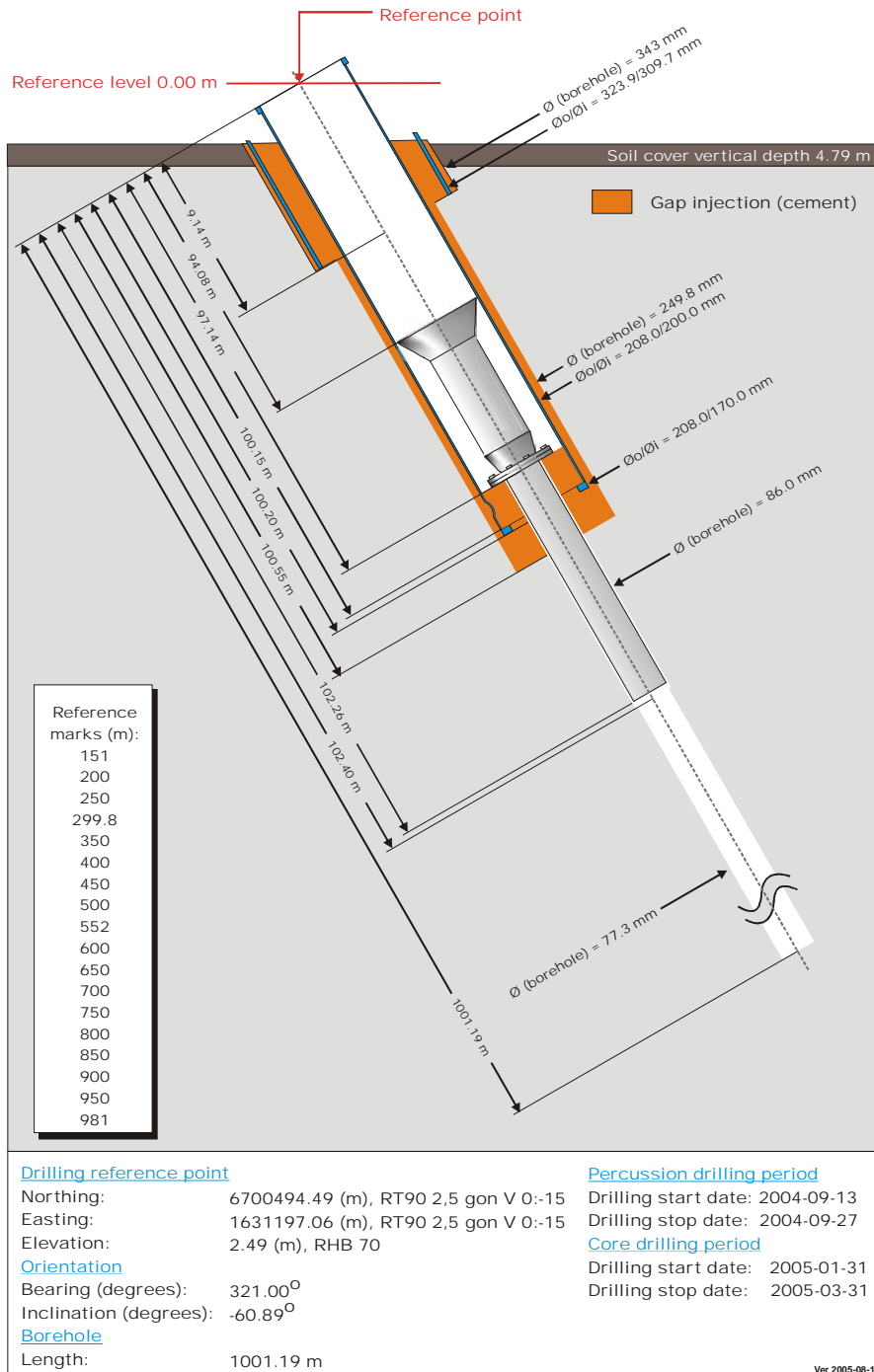


Figure 1. Technical description of KFM08A.

Deviation measurements in KFM08A

In total three deviation measurements were conducted in KFM08A. The deviation logging activities are tabulated in Sicada Activity Log, see Table 1.

There is one full Maxibor measurement executed in borehole KFM08A (ID 13067887) conducted to 999 m length and with the instrument mounted inside a barrel which was joined to the lower end of the drill string.

The starting values (bearing and inclination) for the Maxibor measurement were obtained from the values surveyed at TOC (Borehole direction surveying).

The two Mag/acc measurements (ID 13135315 and 13135318) were executed down to 996 m drilling length, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. No geomagnetic disturbances exceeding 0.5 degrees for the declination were observed on the time of measuring, see Figure 2.

Borehole deviation multiple measurements

For the calculation of *Borehole deviation multiple measurements* (ID 13141377) the two Mag/acc measurements (ID 13135315 and 13135318) were used, see Table 2. The Maxibor inclination has an increasing difference versus length compared to the Flexit inclination curves.

A subset of the resulting deviation file for every approximately 100 m elevation (from Object_location) is shown in Table 3. The inclination and bearing uncertainties are calculated automatically, and based on these values the “Radius uncertainty” is calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

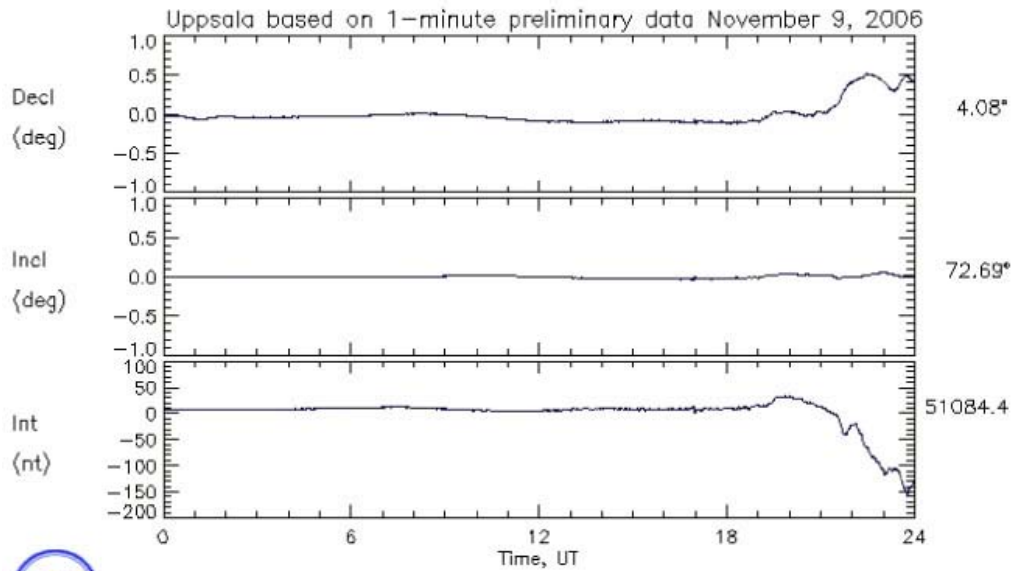
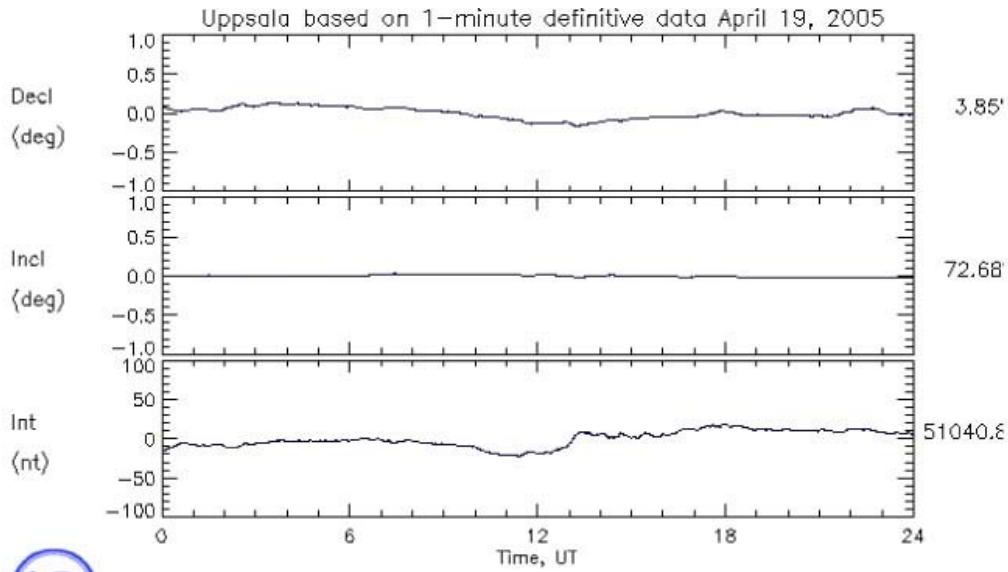


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2005-04-19 and 2006-11-09. The upper curve shows the declination.

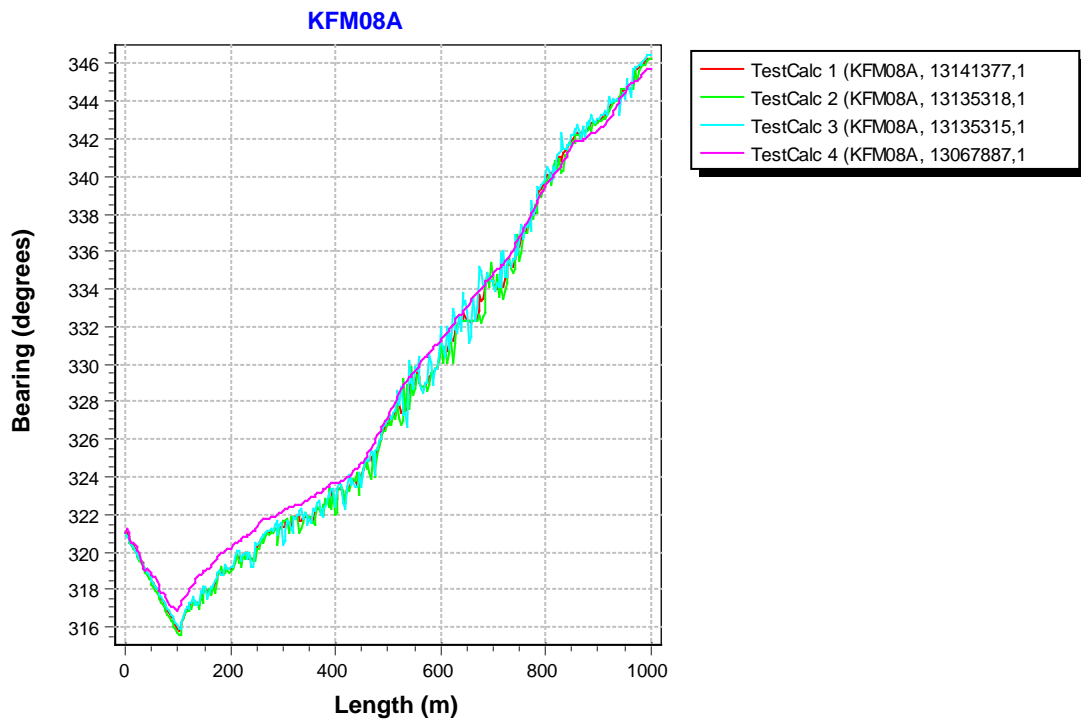
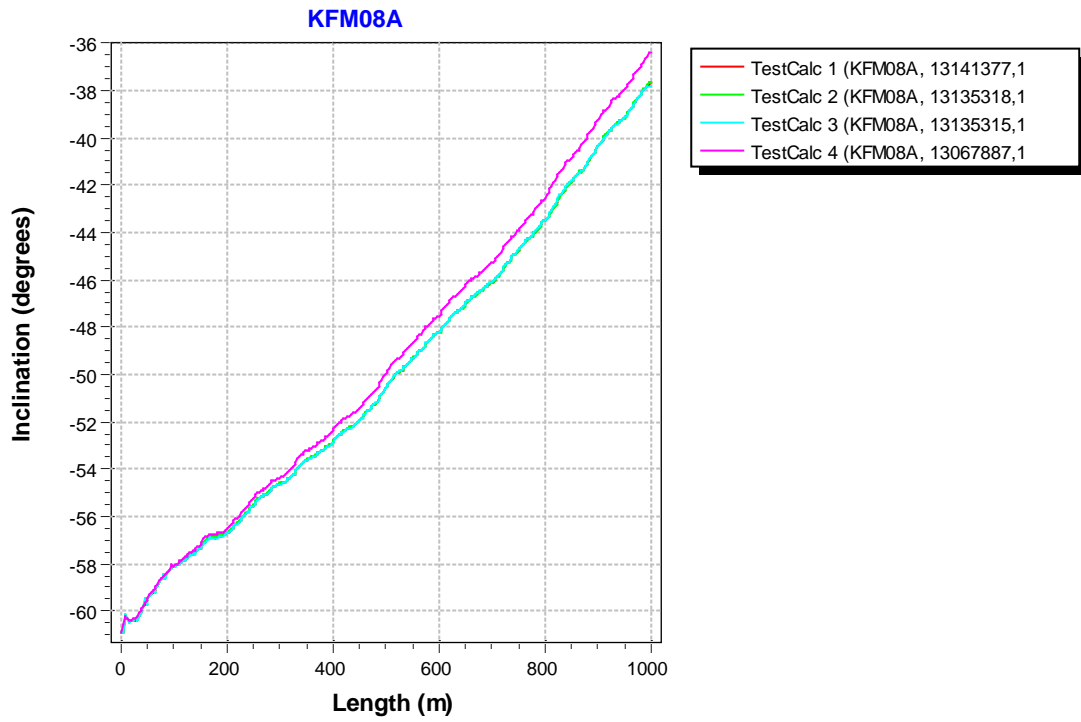


Figure 3. The Borehole deviation multiple measurements data (red line) together with the other, not error marked, deviation activities specified in Table 1. The upper diagram shows the inclination and the lower shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SELOW (m)	FLAGS	_INDAT
KFM08A	13067887	EG156	Maxibor measurement	2005-04-06 10:20:00	0.00	999.00	F	061222 12:23
KFM08A	13135315	EG157	Magnetic - accelerometer measurement	2005-04-19 07:00:00	3.00	996.00	CF	061113 12:37
KFM08A	13135318	EG157	Magnetic - accelerometer measurement	2006-11-09 07:10:00	3.00	996.00	CF	061113 12:38
KFM08A	13141377	EG154	Borehole deviation multiple measurements	2006-12-05 12:00:00			IC	061222 10:31

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SELOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
KFM08A	13135315	BEARING	105.00	993.00	
KFM08A	13135315	INCLINATION	3.00	993.00	
KFM08A	13135318	BEARING	105.00	996.00	
KFM08A	13135318	INCLINATION	3.00	996.00	

Table 3. Subset (for every approx. 100 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS UNCERT
KFM08A	6700494.49	1631197.06	2.49	0	0.00	-60.85	321.00	0.808	0.986	0.00
KFM08A	6700540.19	1631156.09	-100.59	120	0.87	-57.82	317.05	0.808	0.986	1.69
KFM08A	6700589.43	1631112.71	-201.05	240	1.79	-55.76	319.58	0.808	0.986	3.38
KFM08A	6700643.68	1631069.20	-298.84	360	2.77	-53.48	322.05	0.808	0.986	5.08
KFM08A	6700707.13	1631022.49	-400.95	489	3.89	-50.95	326.24	0.808	0.986	6.90
KFM08A	6700780.87	1630977.86	-500.88	621	5.10	-47.61	331.38	0.808	0.986	8.76
KFM08A	6700866.60	1630935.75	-600.43	759	6.45	-44.51	336.97	0.808	0.986	10.70
KFM08A	6700969.02	1630900.15	-699.59	906	7.98	-40.19	343.10	0.808	0.986	12.78
KFM08A	6701040.45	1630880.70	-759.40	1001.19	9.03	-37.66	346.31	0.808	0.986	14.12

Borehole description KFM08B

Figure 1 gives a technical description of KFM08B.

Technical data

Borehole KFM08B

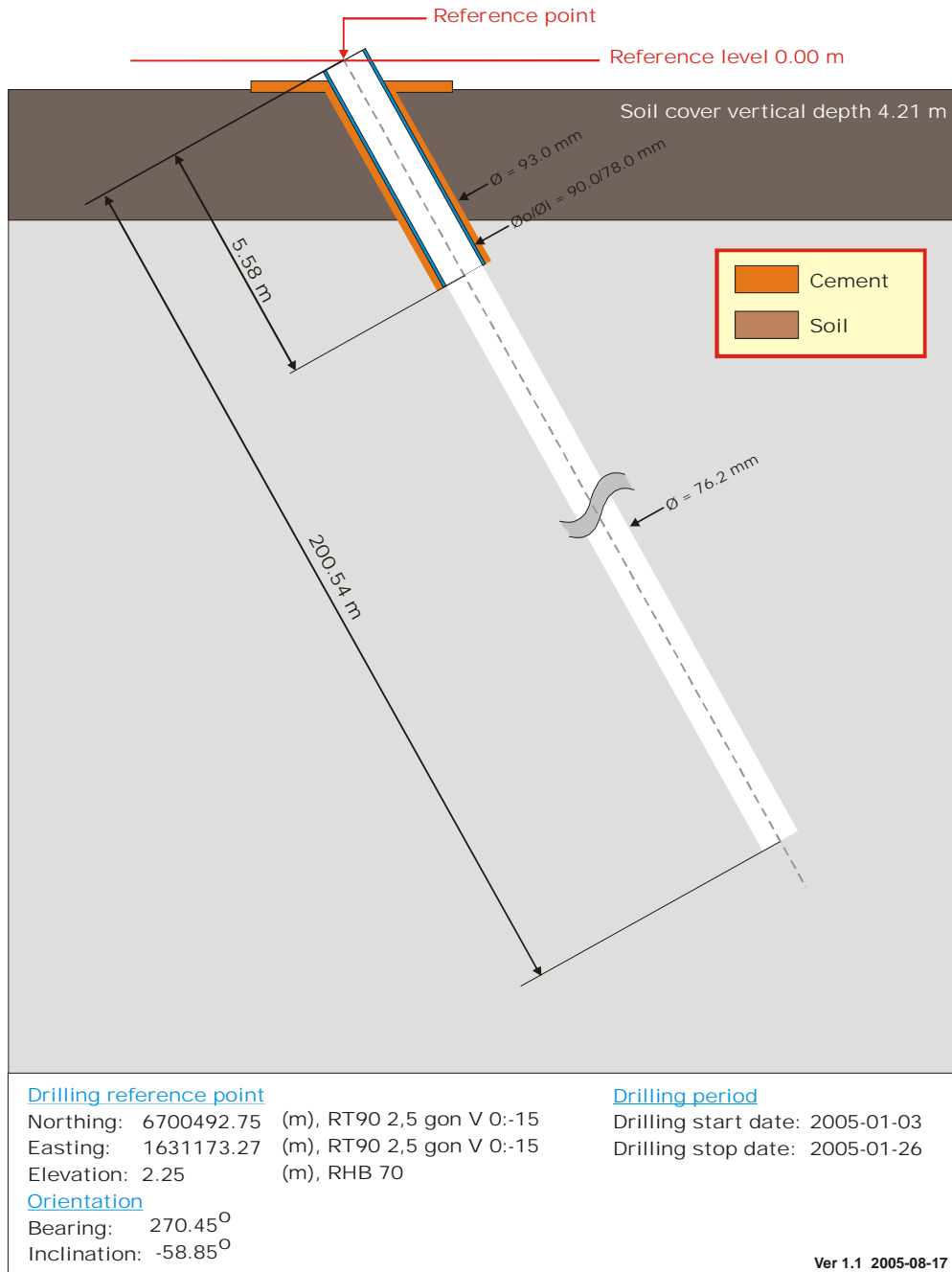


Figure 1. Technical description of KFM08B.

Deviation measurements in KFM08B

In total two deviation measurements were conducted in KFM08B. The deviation logging activities are tabulated in Sicada Activity Log, see Table 1.

There is one full Maxibor measurement executed in borehole KFM08B (ID 13065309) conducted to 195 m length and with the instrument centralized and hoisted by wire, inside the open borehole.

The starting values (bearing and inclination) for the Maxibor measurement were obtained from the values surveyed at TOC (Borehole direction surveying).

One Mag/acc measurement (ID 13136617) was executed down to 198 m drilling length, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. No geomagnetic disturbances exceeding 0.5 degrees for the declination were observed on the date of measuring, see Figure 2.

Borehole deviation multiple measurements

For the calculation of *Borehole deviation multiple measurements* (ID 13140492) the Mag/acc measurement (ID 13136617) was used, see Table 2. The Maxibor bearing differs significantly from the Flexit bearing curve.

A subset of the resulting deviation file for every approximately 100 m elevation (from Object_location) is shown in Table 3. The inclination and bearing uncertainties are calculated automatically, and based on these values the “Radius uncertainty” is calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

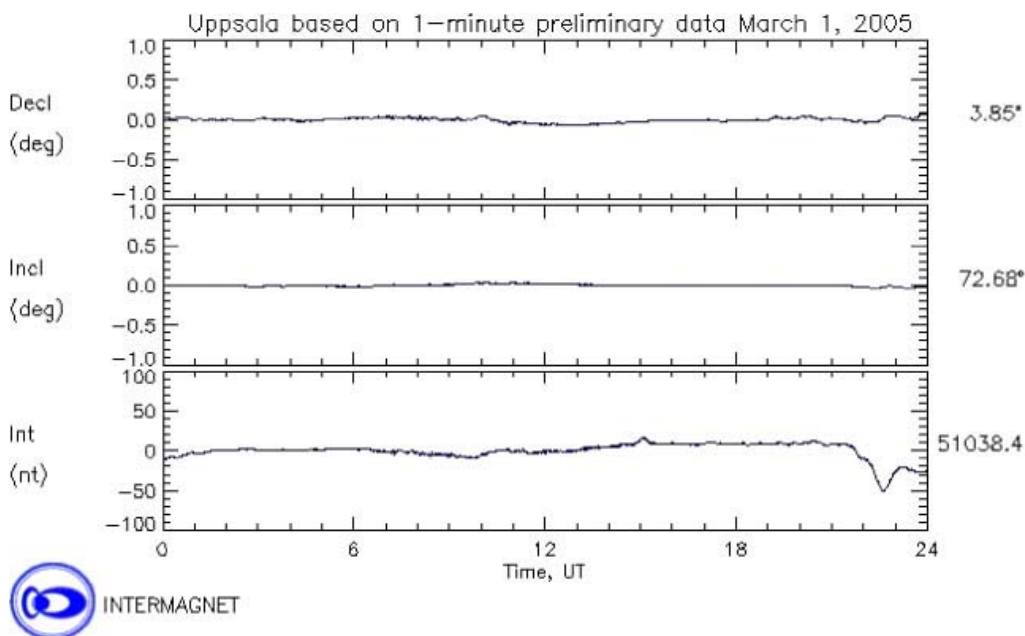


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2005-03-01. The upper curve shows the declination.

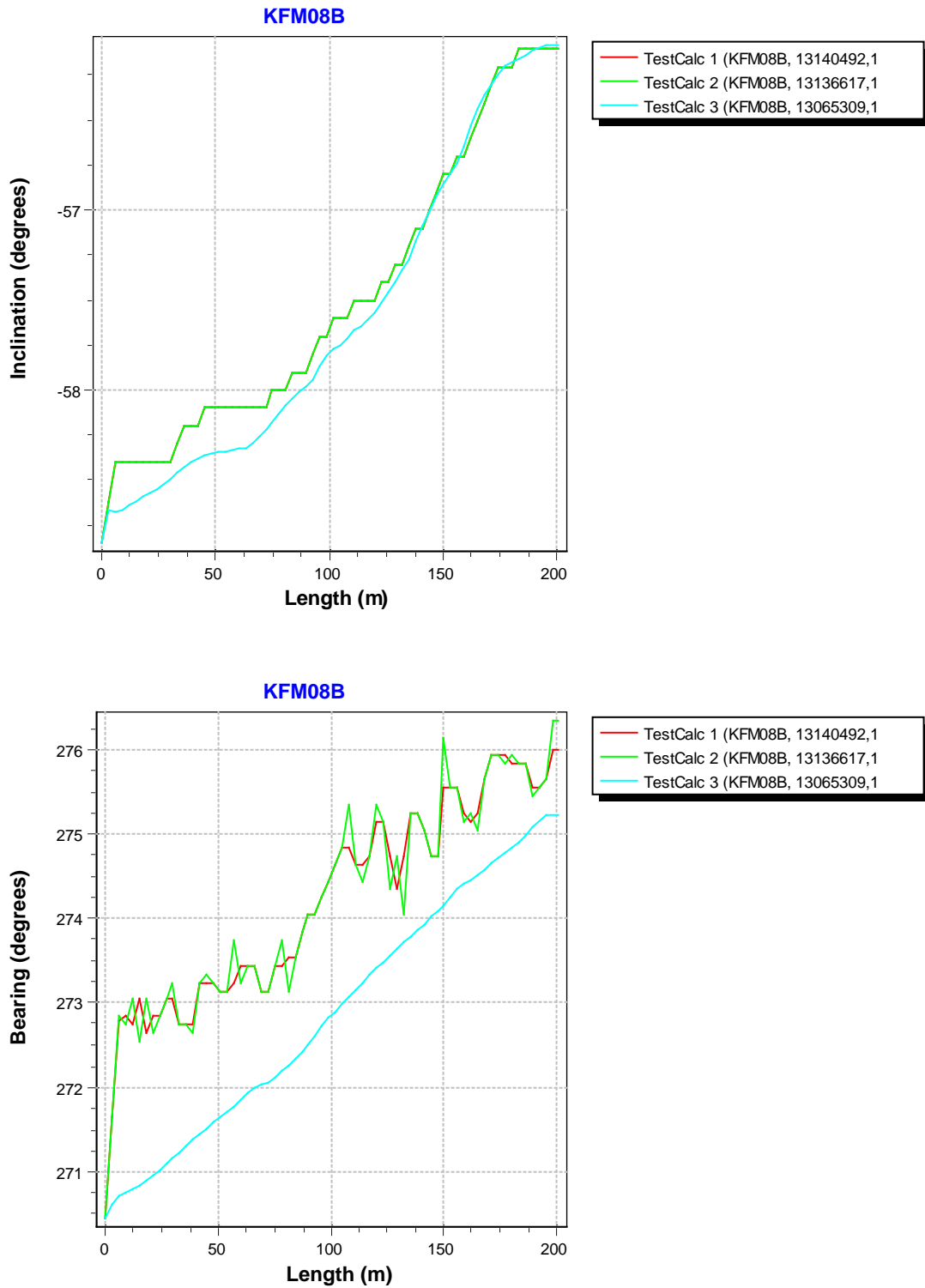


Figure 3. The Borehole deviation multiple measurements data (red line) together with the other, not error marked, deviation activities specified in Table 1. The upper diagram shows the inclination and the lower shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
KFM08B	13136617	EG157	Magnetic - accelerometer measurement	2005-03-01 13:00:00	6.00	198.00	F	070109 09:12
KFM08B	13065309	EG156	Maxibor measurement	2005-03-08 15:28:00	0.00	195.00		061222 12:23
KFM08B	13140492	EG154	Borehole deviation multiple measurements	2006-12-13 10:00:00			I C	061222 10:31

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
KFM08B	13136617	BEARING	6.00	198.00	
KFM08B	13136617	INCLINATION	6.00	198.00	

Table 3. Subset (for every approx. 100 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
KFM08B	6700492.75	1631173.27	2.25	0	0.00	-58.85	270.45	0.2	1.736	0.00
KFM08B	6700496.56	1631109.91	-99.59	120	0.22	-57.50	275.14	0.2	1.736	1.92
KFM08B	6700500.72	1631065.83	-166.86	200.54	0.38	-56.10	275.99	0.2	1.736	3.27

Borehole description KFM08C

Figure 1 gives a technical description of KFM08C.

Technical data Borehole KFM08C

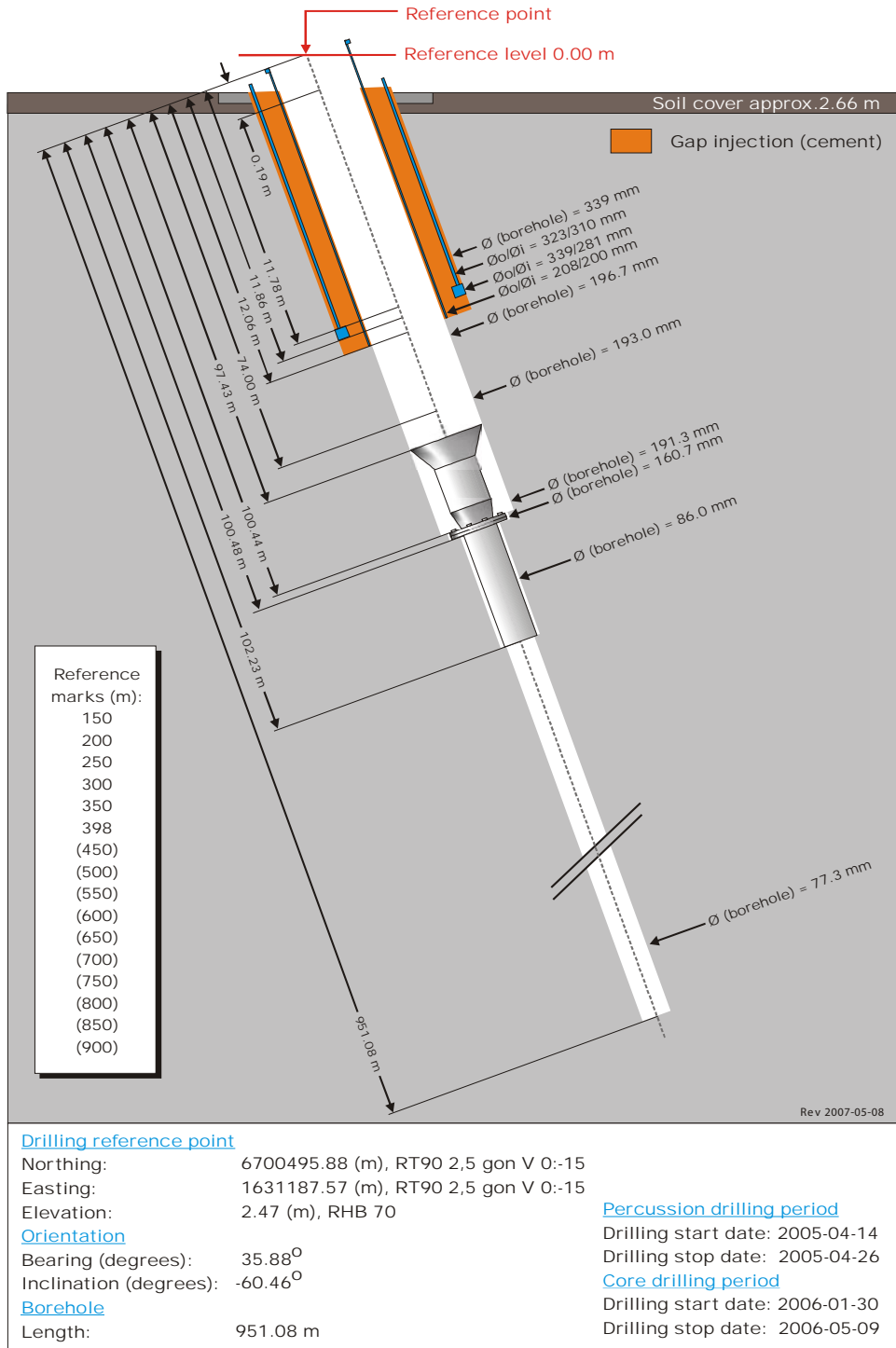


Figure 1. Technical description of KFM08C.

Deviation measurements in KFM08C

In total four deviation measurements were conducted in KFM08C. The deviation logging activities are tabulated in Sicada Activity Log, see Table 1.

There is one full Maxibor measurement executed in borehole KFM08C (ID 13113696) conducted to 945 m length and with the instrument mounted inside a barrel which was joined to the lower end of the drill string.

The starting values (bearing and inclination) for the Maxibor measurement were obtained from the values surveyed at TOC (Borehole direction surveying).

The two Mag/acc measurements (ID 13116460, 13135313) were executed down to 948 m and one measurement (13133032) was executed to 99 m drilling length, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. No geomagnetic disturbances exceeding 0.5 degrees for the declination were observed on the measuring dates, see Figure 2a and 2b.

Borehole deviation multiple measurements

For the calculation of *Borehole deviation multiple measurements* (ID 13141378) the two complete Mag/acc measurements (ID 13116460 and 13135313) were used, see Table 2. The Maxibor measurement is error marked as it deviates significantly from the Flexit curves. As the short Flexit 99 m survey was measured in the telescopic borehole it is only used for the uncertainty calculations.

A subset of the resulting deviation file for every approximately 100 m elevation (from Object_location) is shown in Table 3. The inclination and bearing uncertainties are calculated automatically, and based on these values the “Radius uncertainty” is calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

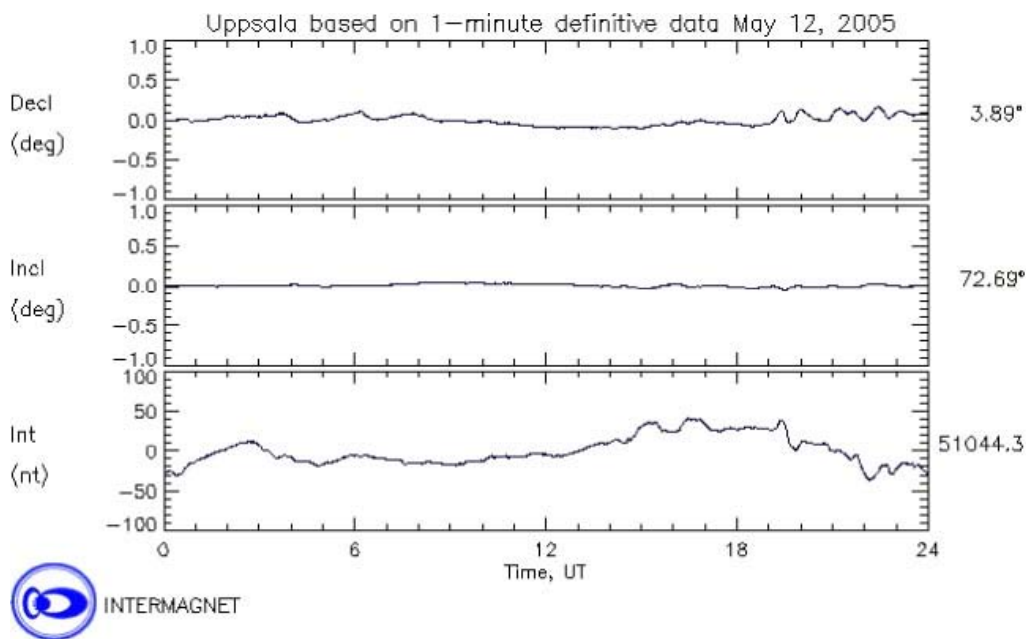
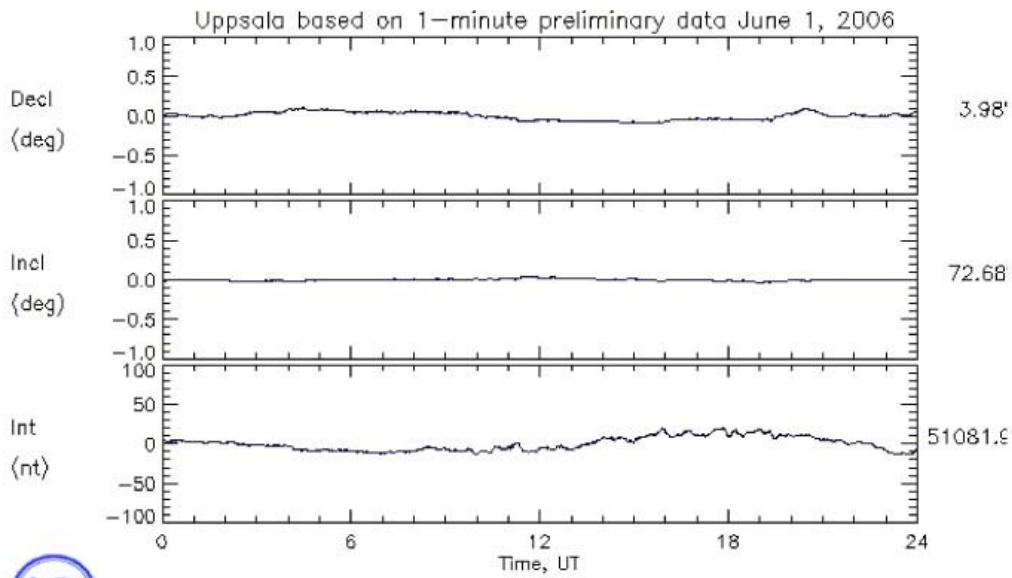
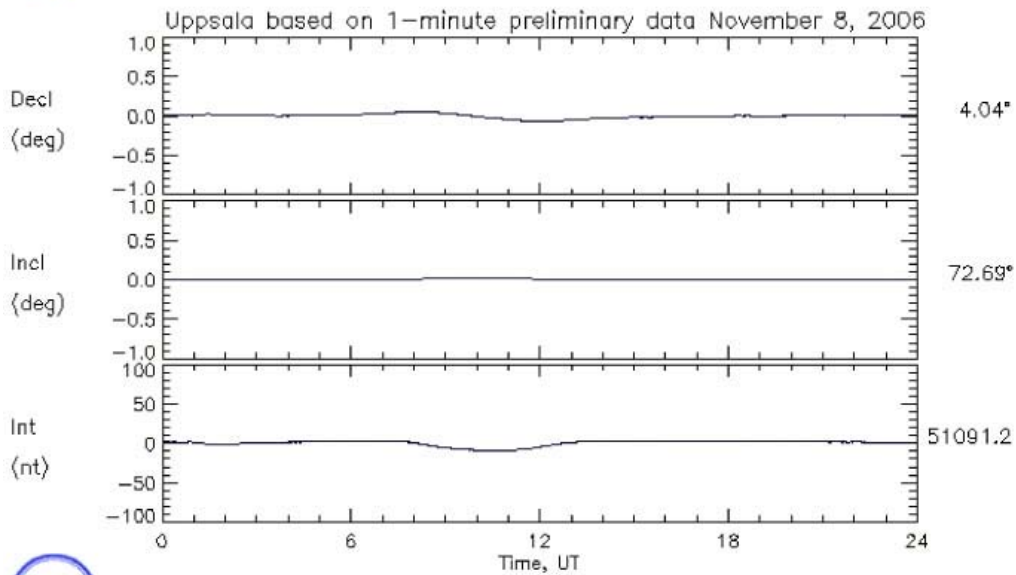


Figure 2a. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2005-05-12. The upper curve shows the declination.



INTERMAGNET



INTERMAGNET

Figure 2b. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2006-06-01 and 2006-11-08. The upper curve shows the declination.

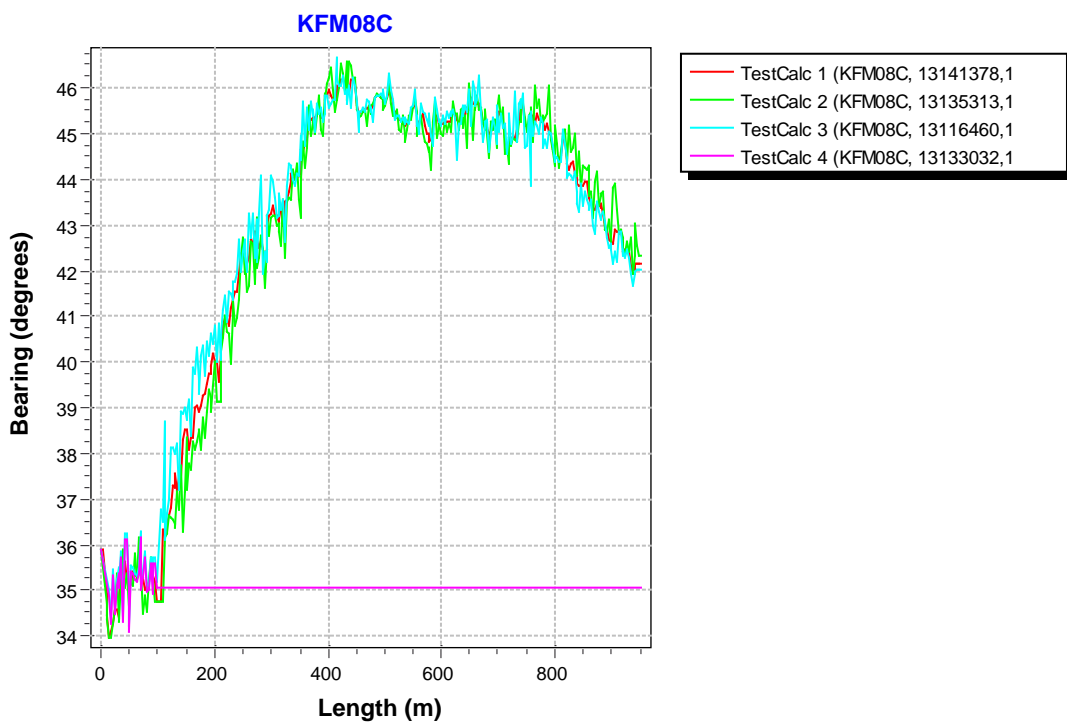
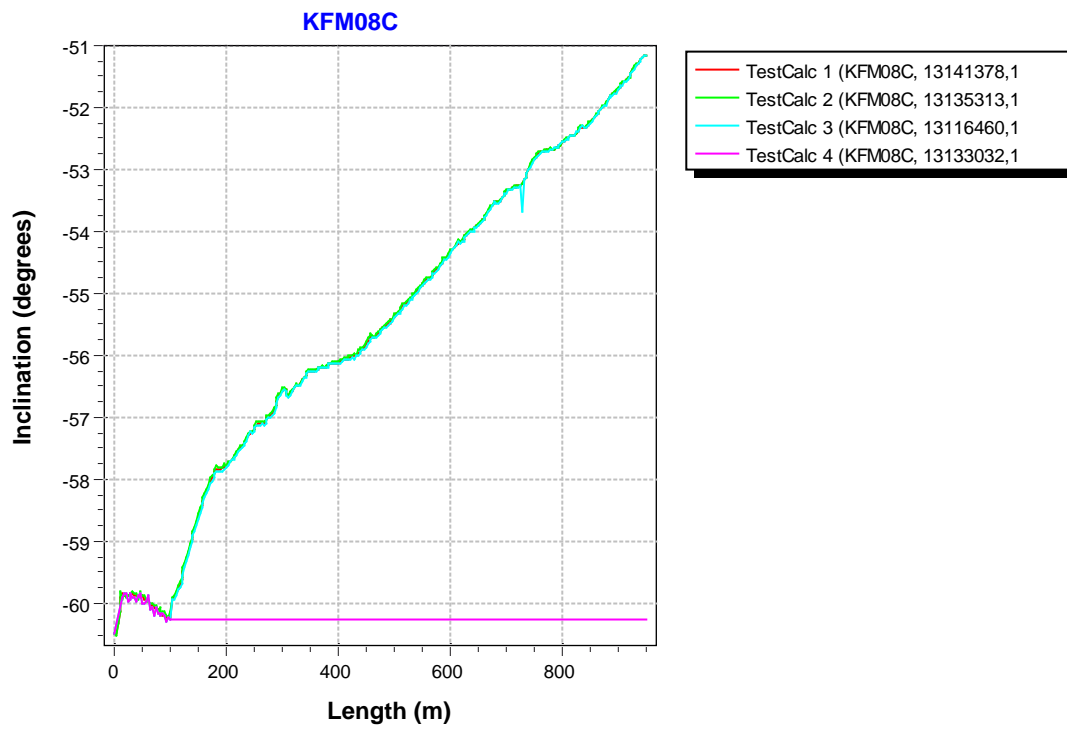


Figure 3. The Borehole deviation multiple measurements data (red line) together with the other, not error marked, deviation activities specified in Table 1. The upper diagram shows the inclination and the lower shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
KFM08C	13133032	EG157	Magnetic - accelerometer measurement	2005-05-12 10:15:00	15.00	99.00	F	061114 14:51
KFM08C	13113696	EG156	Maxibor measurement	2006-05-08 08:00:00	0.00	945.00	EC	061121 15:45
KFM08C	13116460	EG157	Magnetic - accelerometer measurement	2006-06-01 07:30:00	15.00	948.00	C	061222 12:23
KFM08C	13135313	EG157	Magnetic - accelerometer measurement	2006-11-08 10:30:00	3.00	948.00	CF	061113 12:38
KFM08C	13141378	EG154	Borehole deviation multiple measurements	2006-12-05 12:00:00			I C	061222 10:31

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
KFM08C	13116460	BEARING	36.00	948.00	
KFM08C	13116460	INCLINATION	15.00	948.00	
KFM08C	13135313	BEARING	18.00	948.00	
KFM08C	13135313	INCLINATION	3.00	948.00	

Table 3. Subset (for every approx. 100 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
KFM08C	6700495.88	1631187.57	2.47	0	0.00	-60.48	35.88	0.045	0.79	0.00
KFM08C	6700543.71	1631221.28	-98.84	117	0.05	-59.68	36.45	0.045	0.79	0.81
KFM08C	6700592.73	1631261.21	-200.81	237	0.10	-57.34	41.56	0.045	0.79	1.68
KFM08C	6700640.83	1631306.14	-301.14	357	0.15	-56.23	44.59	0.045	0.79	2.59
KFM08C	6700687.76	1631354.15	-400.61	477	0.20	-55.58	45.53	0.045	0.79	3.51
KFM08C	6700736.06	1631403.19	-498.90	597	0.25	-54.38	45.21	0.045	0.79	4.46
KFM08C	6700788.44	1631456.13	-600.53	723	0.31	-53.25	44.92	0.045	0.79	5.49
KFM08C	6700842.62	1631510.02	-700.71	849	0.37	-52.25	43.87	0.045	0.79	6.54
KFM08C	6700888.98	1631553.07	-780.81	951.08	0.42	-51.16	42.18	0.045	0.79	7.42

Borehole description KFM08D

Figure 1 gives a technical description of KFM08D.

Technical data Borehole KFM08D

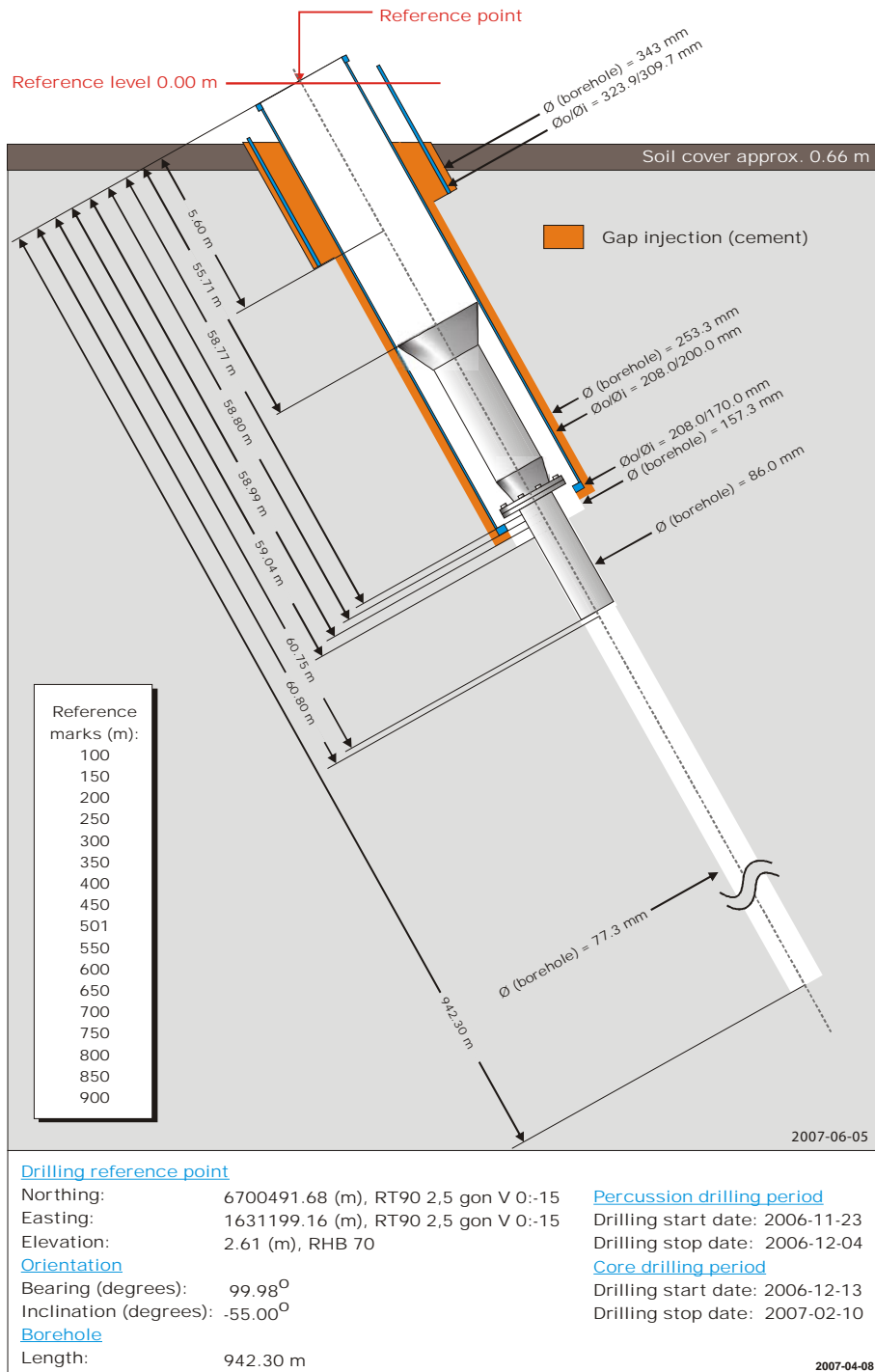


Figure 1. Technical description of KFM08D.

Deviation measurements in KFM08D

In total four deviation measurements were conducted in KFM08D. The deviation logging activities are tabulated in Sicada Activity Log, see Table 1.

There are two full Maxibor measurements executed in borehole KFM08D (ID 13148078 and 13148079) conducted to 924 m length and with the instrument mounted inside a barrel which was joined to the lower end of the drill string.

The starting values (bearing and inclination) for the Maxibor measurements were obtained from the values surveyed at TOC (Borehole direction surveying).

The two Mag/acc measurements (ID 13148134 and 13148138) were executed down and up to 936 m drilling length, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. No geomagnetic disturbances exceeding 0.5 degrees for the declination were observed on the date of measuring, see Figure 2.

Borehole deviation multiple measurements

For the calculation of *Borehole deviation multiple measurements* (ID 13148146) the two Mag/acc measurements (ID 13148134 and 13148138) were used, see Table 2. The two Maxibor measurements are error marked as they are not repeatable and the deviation differs significantly from the Flexit curves.

A subset of the resulting deviation file for every approximately 100 m elevation (from Object_location) is shown in Table 3. The inclination and bearing uncertainties are calculated automatically, and based on these values the “Radius uncertainty” is calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

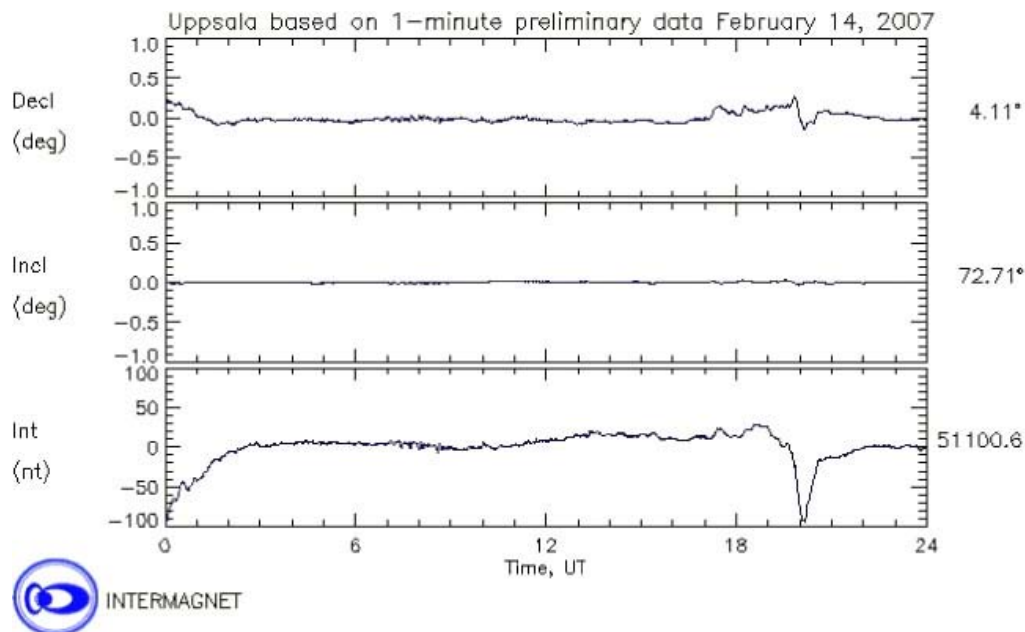


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2007-02-14. The upper curve shows the declination.

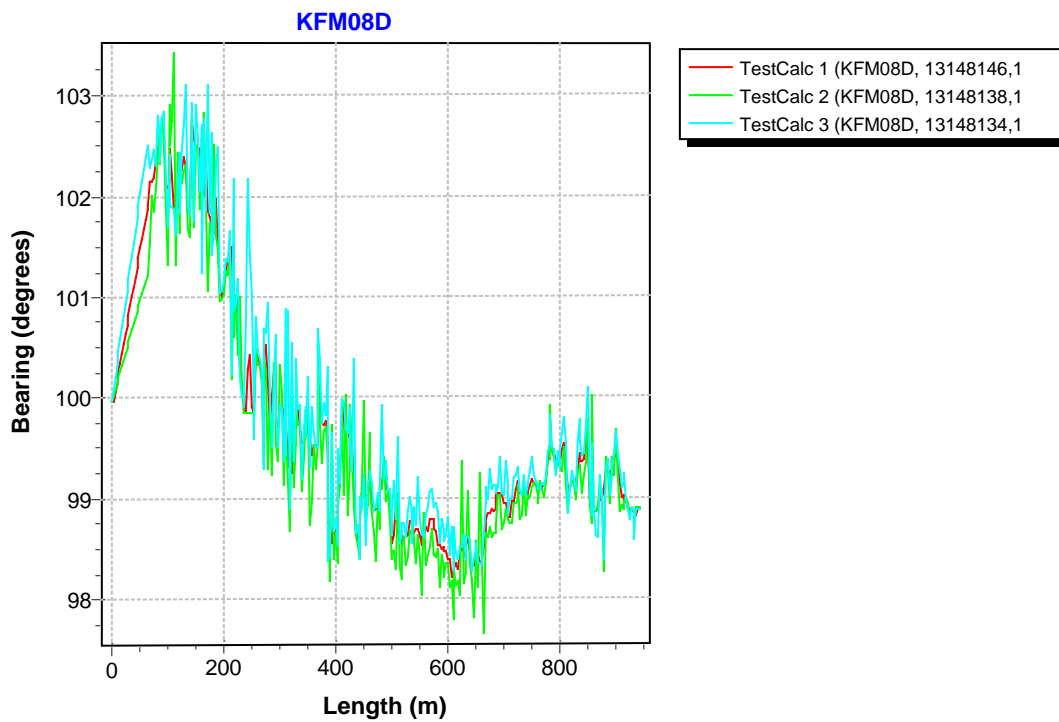
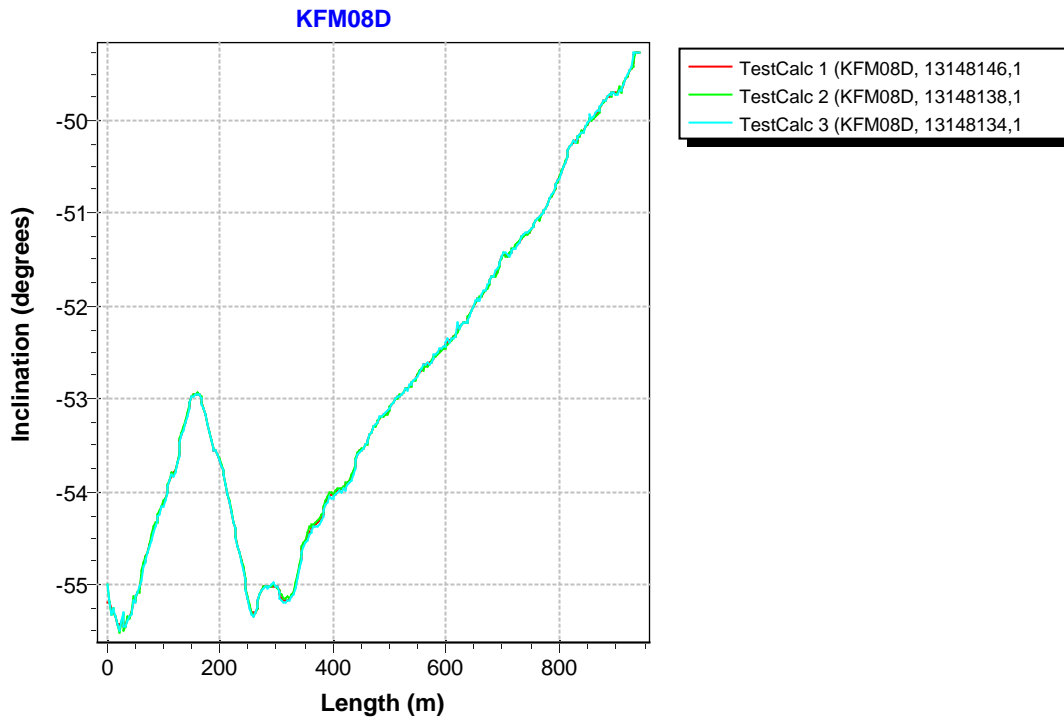


Figure 3. The Borehole deviation multiple measurements data (red line) together with the other, not error marked, deviation activities specified in Table 1. The upper diagram shows the inclination and the lower shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
KFM08D	13148078	EG156	Maxibor measurement	2007-02-08 02:00:00	3.00	924.00	ECF	070322 16:04
KFM08D	13148079	EG156	Maxibor measurement	2007-02-08 08:00:00	3.00	924.00	ECF	070322 16:04
KFM08D	13148134	EG157	Magnetic - accelerometer measurement	2007-02-14 13:40:00	3.00	936.00	CF	070220 11:26
KFM08D	13148138	EG157	Magnetic - accelerometer measurement	2007-02-14 17:19:00	3.00	936.00	CF	070220 11:26
KFM08D	13148146	EG154	Borehole deviation multiple measurements	2007-02-15 15:20:00			I C	070221 10:19

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
KFM08D	13148134	BEARING	66.00	936.00	
KFM08D	13148134	INCLINATION	3.00	936.00	
KFM08D	13148138	BEARING	66.00	936.00	
KFM08D	13148138	INCLINATION	3.00	936.00	

Table 3. Subset (for every approx. 100 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
KFM08D	6700491.67	1631199.16	2.61	0.00	0.00	-55.19	99.98	0.03	0.6	0.00
KFM08D	6700477.09	1631270.44	-100.25	126	0.04	-53.59	102.25	0.03	0.6	0.76
KFM08D	6700462.63	1631341.80	-199.37	249	0.08	-55.14	99.89	0.03	0.6	1.52
KFM08D	6700450.55	1631411.42	-300.05	372	0.11	-54.33	100.05	0.03	0.6	2.26
KFM08D	6700439.01	1631483.27	-399.21	495	0.15	-53.14	98.92	0.03	0.6	3.03
KFM08D	6700427.61	1631558.78	-499.43	621	0.19	-52.27	98.45	0.03	0.6	3.83
KFM08D	6700415.39	1631637.84	-600.63	750	0.23	-51.17	99.18	0.03	0.6	4.66
KFM08D	6700402.25	1631718.92	-700.09	879	0.28	-49.80	99.08	0.03	0.6	5.53
KFM08D	6700395.77	1631759.45	-748.28	942.3	0.30	-49.27	98.89	0.03	0.6	5.96

Deviation measurement in KFM09A

In total three deviation measurements were conducted in KFM09A. The deviation logging activities are tabulated in Sicada Activity Log, see Table 1.

There is one full Maxibor measurement executed in borehole KFM09A (ID 13092480) conducted to 798 m length and with the instrument mounted inside a barrel which was joined to the lower end of the drill string.

The starting values (bearing and inclination) for the Maxibor measurement were obtained from the values surveyed at TOC (Borehole direction surveying).

The two Mag/acc measurements (ID 13131779 and 13131803) were executed down and up to 798 m drilling length, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. No geomagnetic disturbances exceeding 0.5 degrees for the declination were observed on the date of measuring, see Figure 2.

Borehole deviation multiple measurements

For the calculation of *Borehole deviation multiple measurements* (ID 13141379) the two Mag/acc measurements (ID 13131779 and 13131803) were used, see Table 2. The Maxibor bearing shows a significant deviation from the two Flexit bearing curves.

A subset of the resulting deviation file for every approximately 100 m elevation (from Object_location) is shown in Table 3. The inclination and bearing uncertainties are calculated automatically, and based on these values the “Radius uncertainty” is calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

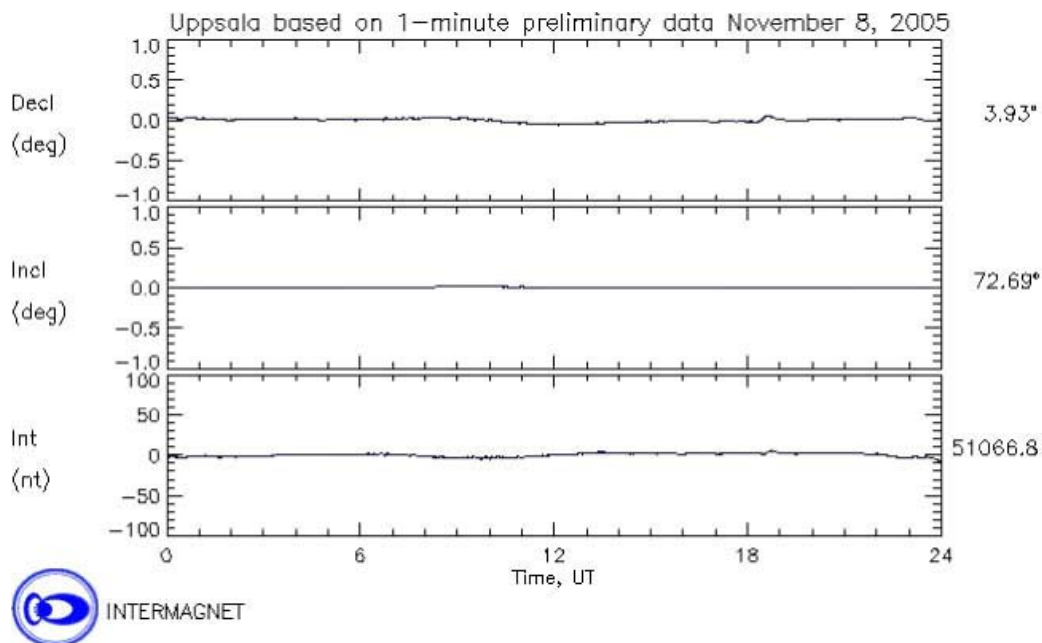


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2005-11-08. The upper curve shows the declination.

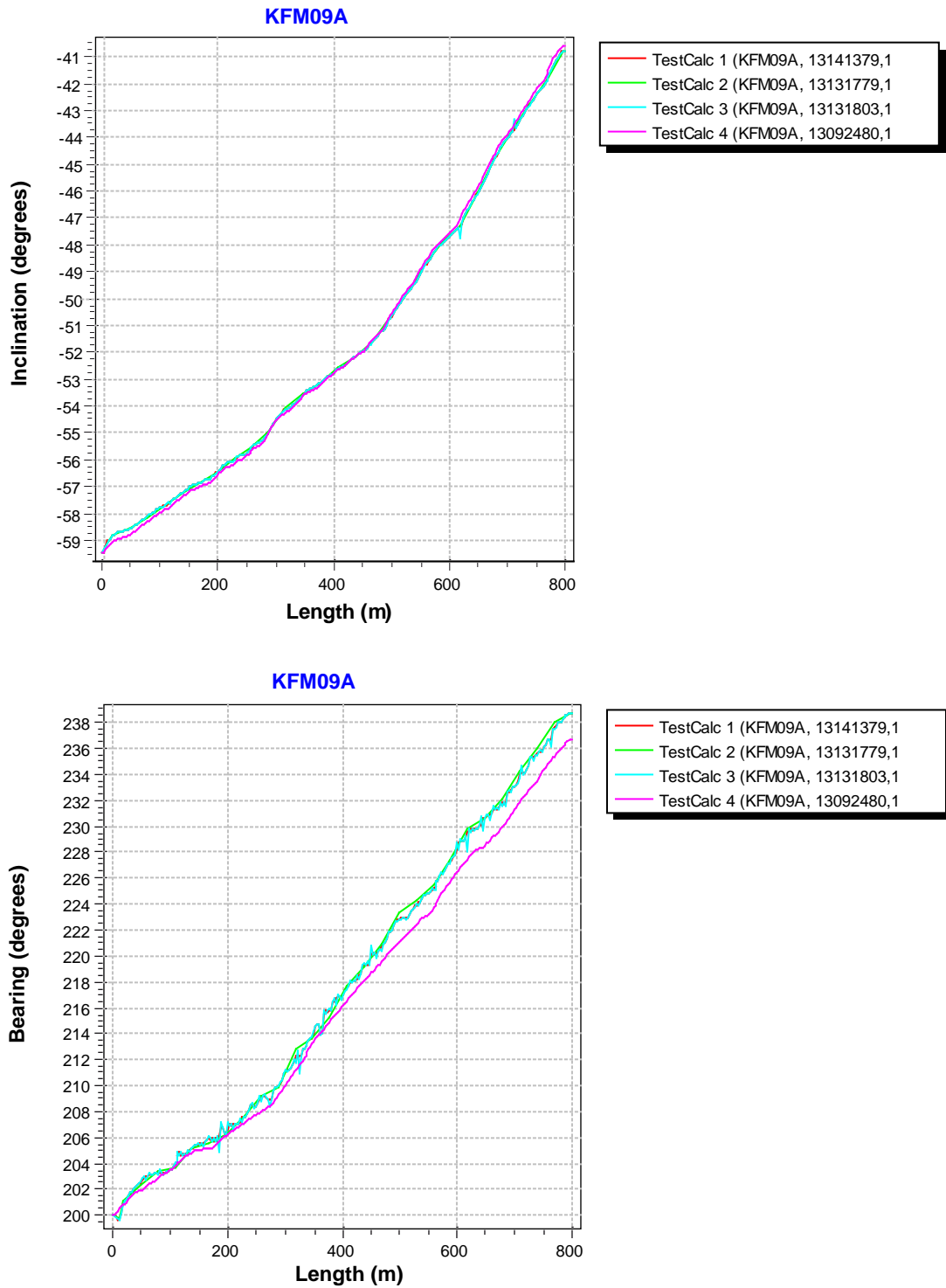


Figure 3. The Borehole deviation multiple measurements data (red line) together with the other, not error marked, deviation activities specified in Table 1. The upper diagram shows the inclination and the lower shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
KFM09A	13092480	EG156	Maxibor measurement	2005-10-31 15:00:00	0.00	798.00		061222 12:23
KFM09A	13131803	EG157	Magnetic - accelerometer measurement	2005-11-08 13:00:00	12.00	798.00	CF	061122 10:14
KFM09A	13131779	EG157	Magnetic - accelerometer measurement	2005-11-08 16:30:00	12.00	798.00	CF	061122 10:15
KFM09A	13141379	EG154	Borehole deviation multiple measurements	2006-12-05 14:00:00			I C	061222 10:31

Table 2. Content of the EG154-file.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
KFM09A	13092480	EG156	Maxibor measurement	2005-10-31 15:00:00	0.00	798.00		061222 12:23
KFM09A	13131803	EG157	Magnetic - accelerometer measurement	2005-11-08 13:00:00	12.00	798.00	CF	061122 10:14
KFM09A	13131779	EG157	Magnetic - accelerometer measurement	2005-11-08 16:30:00	12.00	798.00	CF	061122 10:15
KFM09A	13141379	EG154	Borehole deviation multiple measurements	2006-12-05 14:00:00			I C	061222 10:31

Table 3. Subset (for every approx. 100 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
KFM09A	6700115.04	1630647.50	4.29	0	0.00	-59.46	200.08	0.2	1.767	0.00
KFM09A	6700055.45	1630622.70	-100.40	123	0.23	-57.46	204.75	0.2	1.767	1.99
KFM09A	6699996.28	1630593.44	-200.60	243	0.46	-55.81	208.56	0.2	1.767	4.03
KFM09A	6699935.36	1630556.38	-300.78	366	0.71	-53.30	214.07	0.2	1.767	6.23
KFM09A	6699875.25	1630508.19	-400.43	492	0.97	-50.99	222.63	0.2	1.767	8.61
KFM09A	6699814.70	1630446.09	-499.85	624	1.28	-47.00	229.83	0.2	1.767	11.29
KFM09A	6699752.99	1630363.62	-600.32	768	1.64	-41.86	237.56	0.2	1.767	14.47
KFM09A	6699740.47	1630343.37	-621.21	799.67	1.72	-40.79	238.70	0.2	1.767	15.20

Borehole description KFM09B

Figure 1 gives a technical description of KFM09B.

Technical data Borehole KFM09B

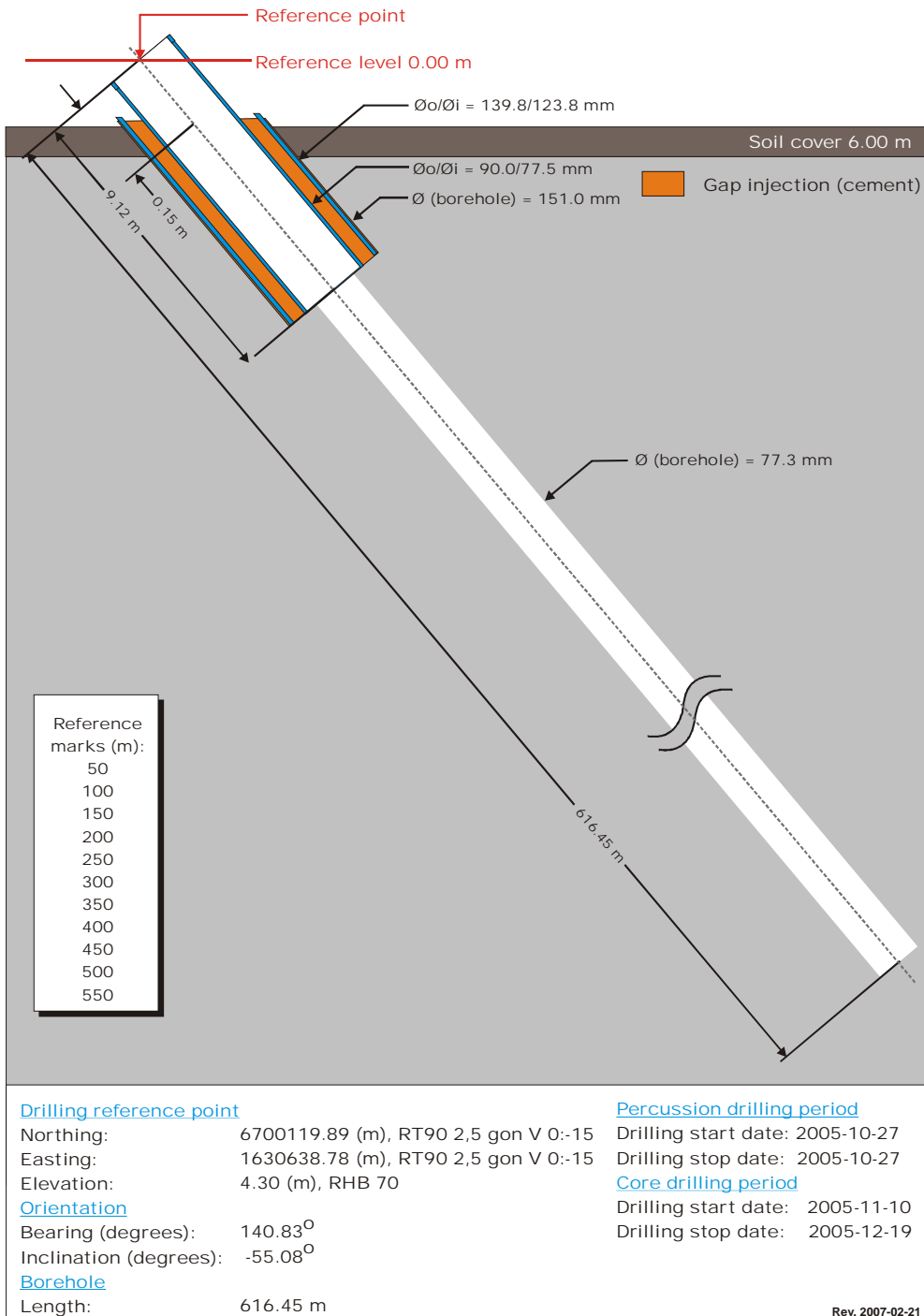


Figure 1. Technical description of KFM09B.

Deviation measurements in KFM09B

In total four deviation measurements were conducted in KFM09B. The deviation logging activities are tabulated in Sicada Activity Log, see Table 1.

There are two full Maxibor measurements executed in borehole KFM09B (ID 13101644 and 13101645) conducted to 612 m length and with the instrument mounted inside a barrel which was joined to the lower end of the drill string.

The starting values (bearing and inclination) for the Maxibor measurements were obtained from the values surveyed at TOC (Borehole direction surveying).

The two Mag/acc measurements (ID 13131958 and 13131959) were executed down and up to 615 m drilling length, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. No geomagnetic disturbances exceeding 0.5 degrees for the declination were observed on the date of measuring, see Figure 2.

Borehole deviation multiple measurements

For the calculation of *Borehole deviation multiple measurements* (ID 13140512) the two Mag/acc measurements (ID 13131958 and 13131959) were used, see Table 2. The inclination for the two Maxibor measurements differs significantly from the Flexit inclination curves.

A subset of the resulting deviation file for every approximately 100 m elevation (from Object_location) is shown in Table 3. The inclination and bearing uncertainties are calculated automatically, and based on these values the “Radius uncertainty” is calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

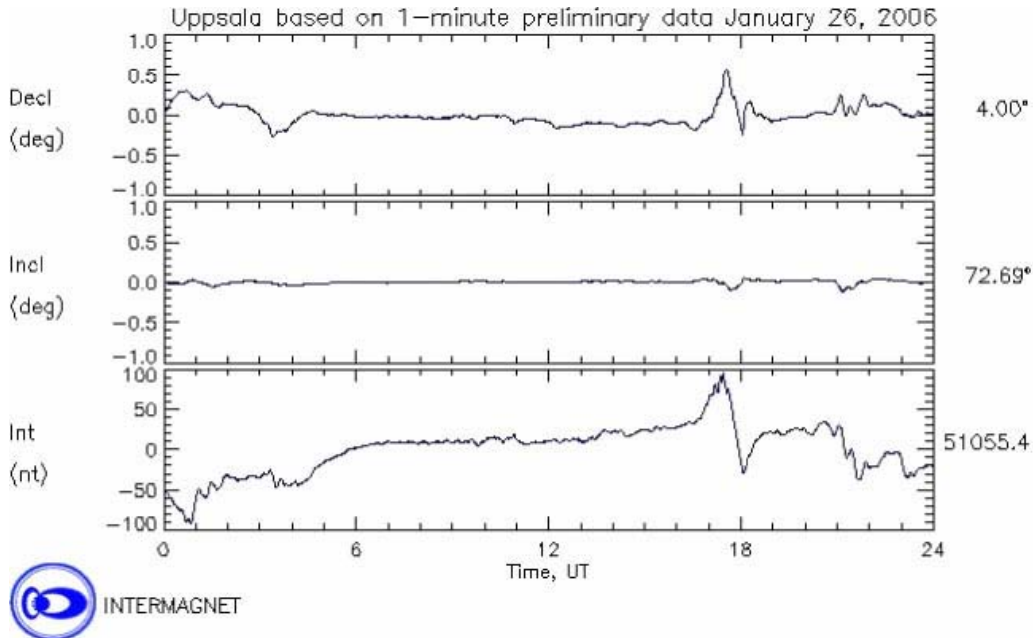


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2006-01-26. The upper curve shows the declination.

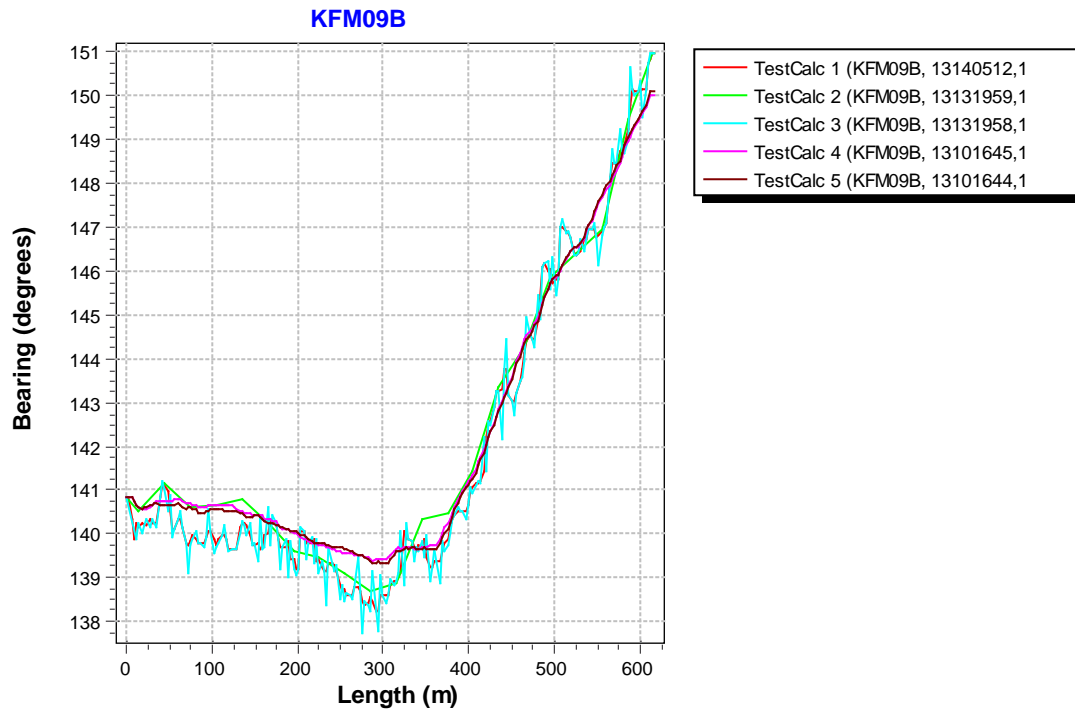
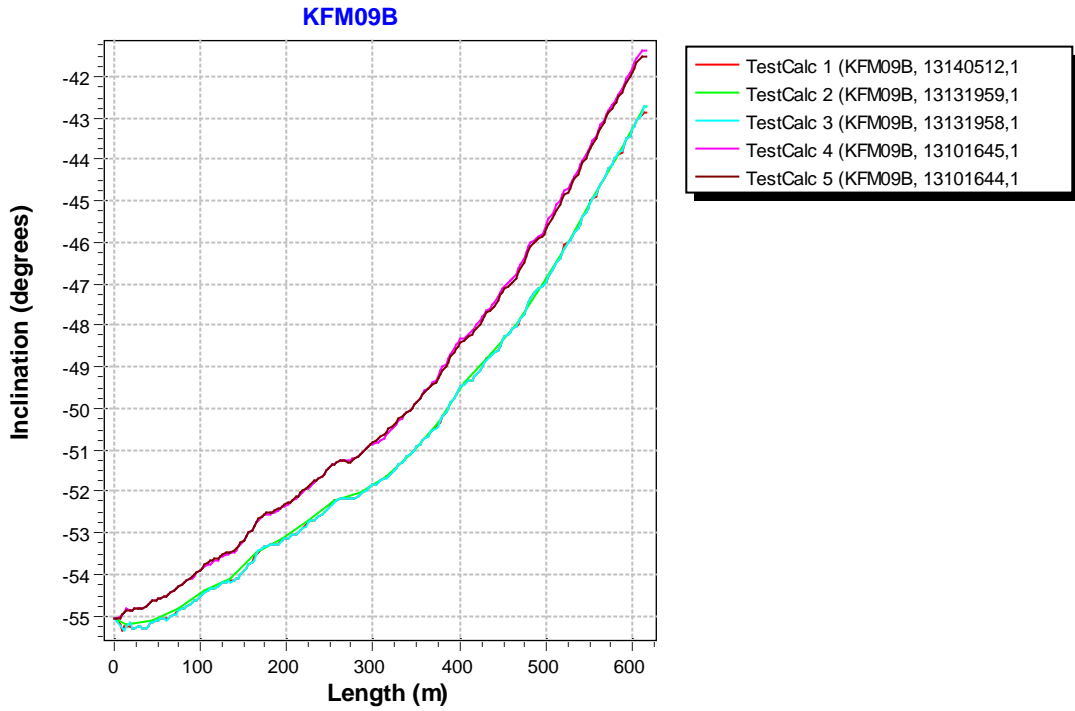


Figure 3. The Borehole deviation multiple measurements data (red line) together with the other, not error marked, deviation activities specified in Table 1. The upper diagram shows the inclination and the lower shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
KFM09B	13101644	EG156	Maxibor measurement	2005-12-21 01:00:00	3.00	612.00		060315 08:26
KFM09B	13101645	EG156	Maxibor measurement	2005-12-21 03:30:00	3.00	612.00		061222 12:24
KFM09B	13131958	EG157	Magnetic - accelerometer measurement	2006-01-26 12:40:00	12.00	615.00	CF	061012 07:45
KFM09B	13131959	EG157	Magnetic - accelerometer measurement	2006-01-26 14:50:00	12.00	615.00	CF	061012 07:47
KFM09B	13140512	EG154	Borehole deviation multiple measurements	2006-12-13 08:00:00			I C	061222 10:31

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
KFM09B	13131958	BEARING	12.00	612.00	
KFM09B	13131958	INCLINATION	12.00	612.00	
KFM09B	13131959	BEARING	12.00	612.00	
KFM09B	13131959	INCLINATION	12.00	612.00	

Table 3. Subset (for every approx. 100 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
KFM09B	6700119.89	1630638.78	4.30	0	0.00	-55.08	140.83	1.31	0.82	0.00
KFM09B	6700062.93	1630686.34	-101.22	129	1.70	-54.17	139.67	1.31	0.82	2.95
KFM09B	6700006.83	1630733.94	-199.77	252	3.38	-52.27	138.68	1.31	0.82	5.76
KFM09B	6699946.09	1630786.50	-300.71	381	5.22	-50.21	140.35	1.31	0.82	8.71
KFM09B	6699875.76	1630838.70	-399.39	513	7.22	-46.49	146.90	1.31	0.82	11.73
KFM09B	6699813.15	1630877.44	-472.00	616.45	8.91	-42.85	150.96	1.31	0.82	14.09

Borehole description KFM10A

Figure 1 gives a technical description of KFM10A.

Technical data Borehole KFM10A

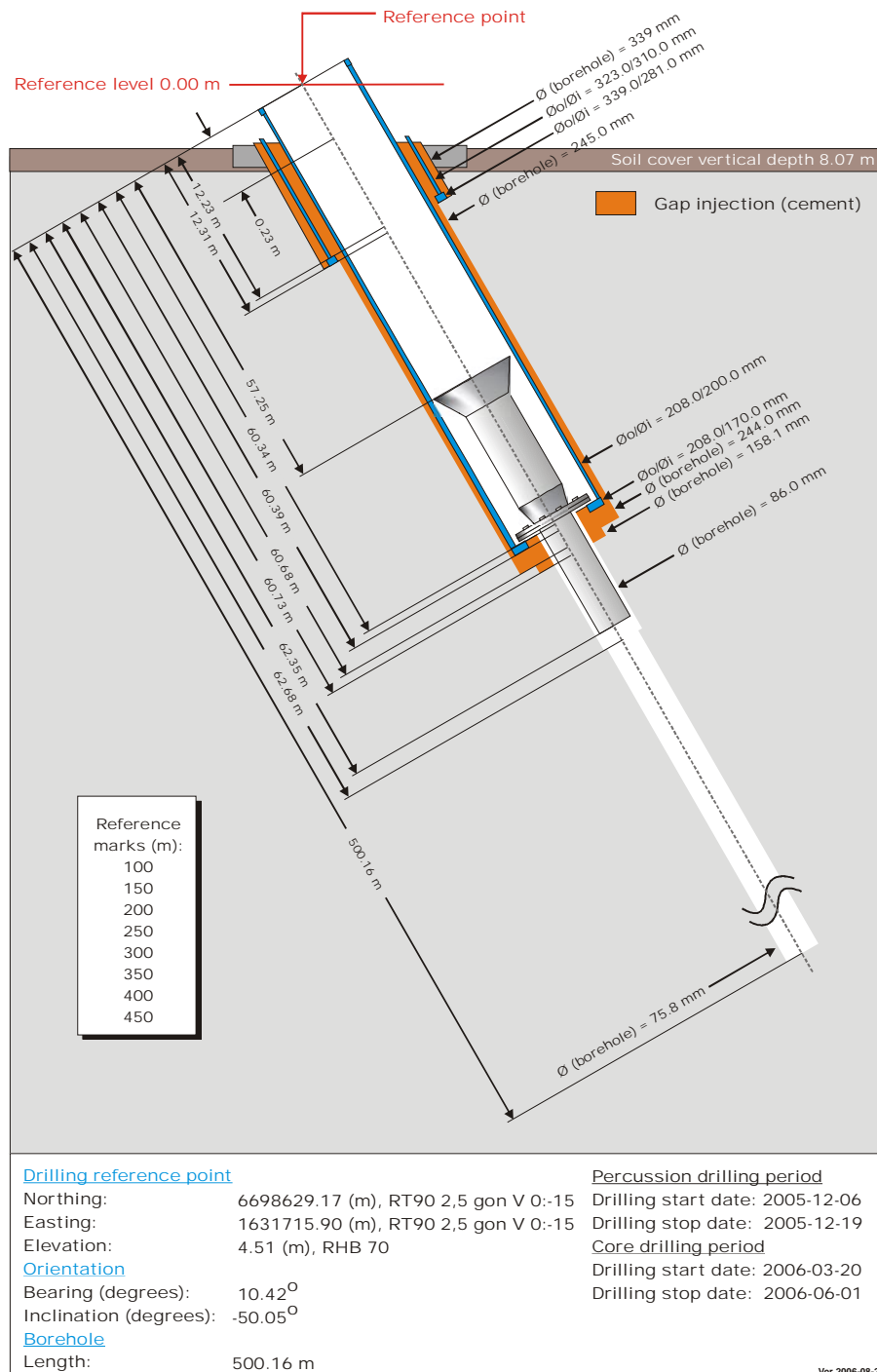


Figure 1. Technical description of KFM10A.

Deviation measurements in KFM10A

In total three deviation measurements were conducted in KFM10A. The deviation logging activities are tabulated in Sicada Activity Log, see Table 1.

There are one full Maxibor measurement executed in borehole KFM10A (ID 13114904) conducted to 498 m length and with the instrument mounted inside a barrel which was joined to the lower end of the drill string.

The starting values (bearing and inclination) for the Maxibor measurement were obtained from the values surveyed at TOC (Borehole direction surveying).

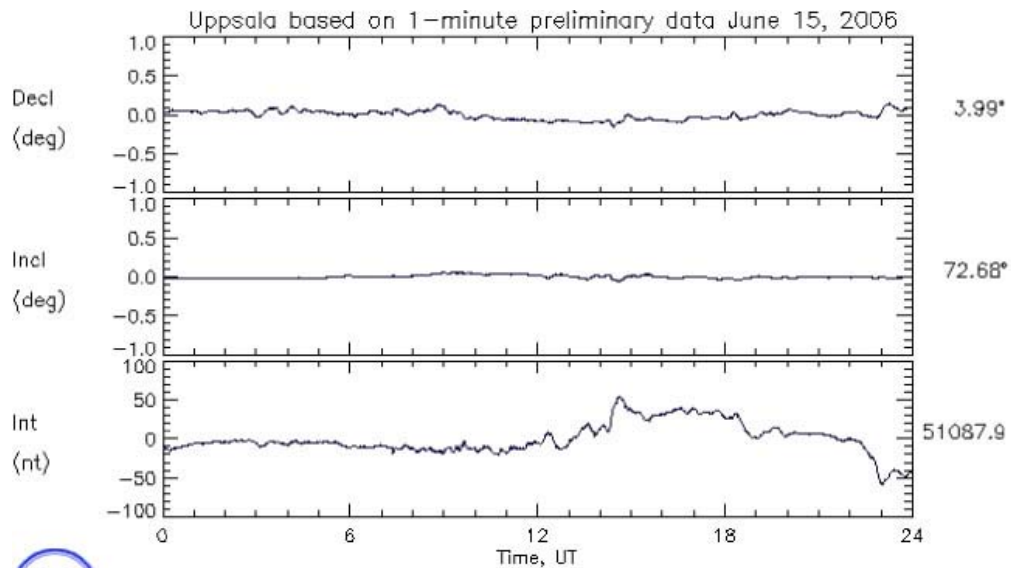
The two Mag/acc measurements (ID 13134859 and 13138898) were executed down to 498 m and 495 m drilling length respectively, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. No geomagnetic disturbances exceeding 0.5 degrees for the declination were observed on the measuring dates, see Figure 2.

Borehole deviation multiple measurements

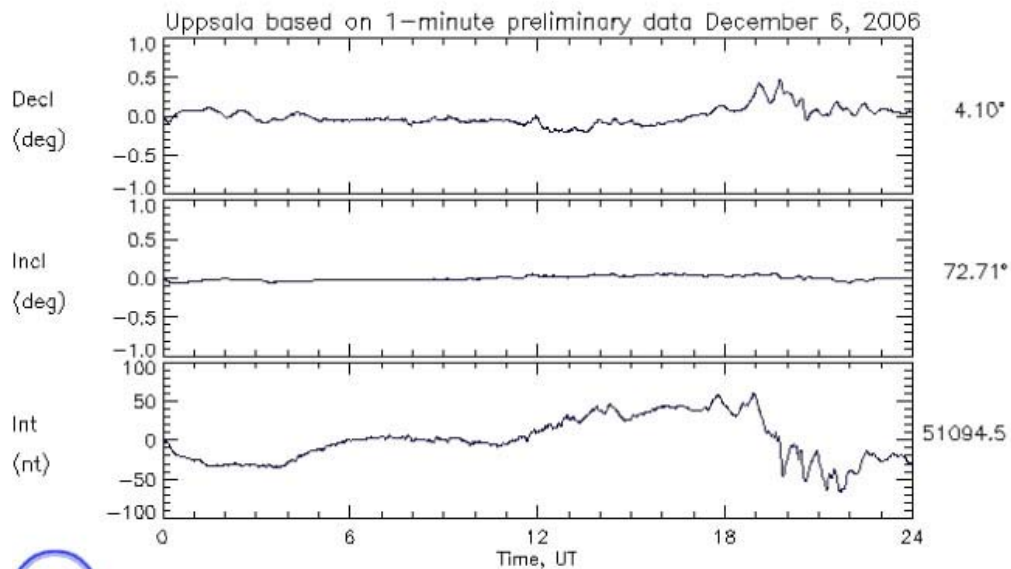
For the calculation of Borehole deviation multiple measurements (ID 13140514) the two Mag/acc measurements (ID 13134859 and 13138898) were used, see Table 2. The Maxibor inclination and bearing differ significantly from the two Flexit curves.

A subset of the resulting deviation file for every approximately 100 m elevation (from Object_location) is shown in Table 3. The inclination and bearing uncertainties are calculated automatically, and based on these values the “Radius uncertainty” is calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.



INTERMAGNET



INTERMAGNET

Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2006-06-15 and 2006-12-06. The upper curve shows the declination.

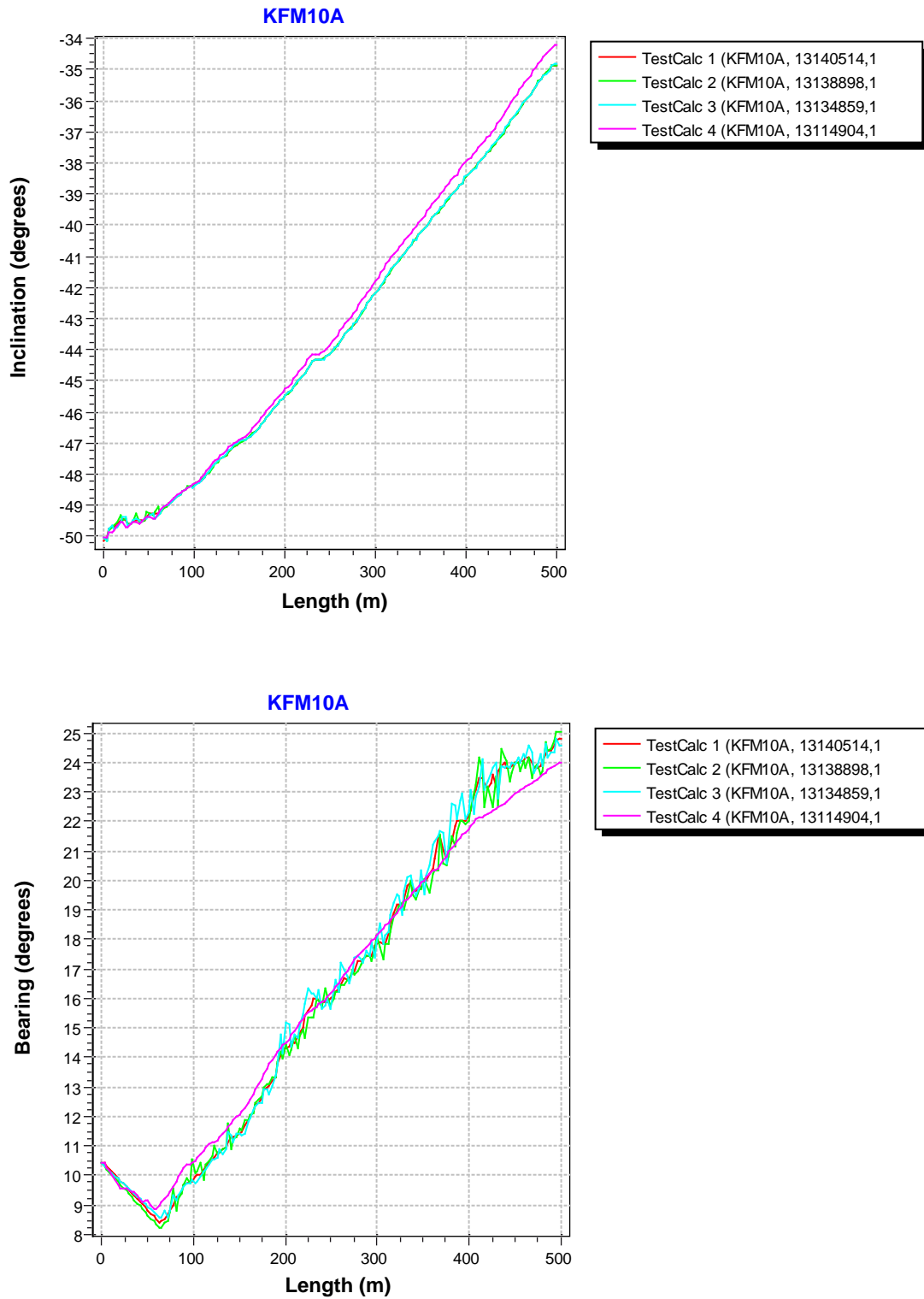


Figure 3. The Borehole deviation multiple measurements data (red line) together with the other, not error marked, deviation activities specified in Table 1. The upper diagram shows the inclination and the lower shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
KFM10A	13114904	EG156	Maxibor measurement	2006-06-06 08:00:00	0.00	498.00		061222 12:24
KFM10A	13134859	EG157	Magnetic - accelerometer measurement	2006-06-15 15:20:00	3.00	498.00	CF	061107 13:48
KFM10A	13138898	EG157	Magnetic - accelerometer measurement	2006-12-06 07:25:00	3.00	495.00	F	061206 13:41
KFM10A	13140514	EG154	Borehole deviation multiple measurements	2006-12-13 09:00:00			I C	061222 10:32

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
KFM10A	13134859	BEARING	66.00	498.00	
KFM10A	13134859	INCLINATION	3.00	498.00	
KFM10A	13138898	BEARING	66.00	498.00	
KFM10A	13138898	INCLINATION	3.00	498.00	

Table 3. Subset (for every approx. 100 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_UNCERT	INCLINATION	BEARING	INCLINATION_UNCERT	BEARING_UNCERT	RADIUS_UNCERT
KFM10A	6698629.17	1631715.90	4.51	0	0.00	-50.13	10.42	0.425	0.676	0.00
KFM10A	6698718.71	1631731.15	-99.37	138	0.67	-47.26	11.15	0.425	0.676	1.07
KFM10A	6698814.78	1631755.76	-199.50	279	1.41	-43.09	17.25	0.425	0.676	2.25
KFM10A	6698926.52	1631797.54	-299.83	435	2.30	-37.28	23.84	0.425	0.676	3.66
KFM10A	6698974.66	1631819.10	-338.08	500.16	2.69	-34.87	24.77	0.425	0.676	4.28

Borehole description KFM11A

Figure 1 gives a technical description of KFM11A.

Technical data Borehole KFM11A

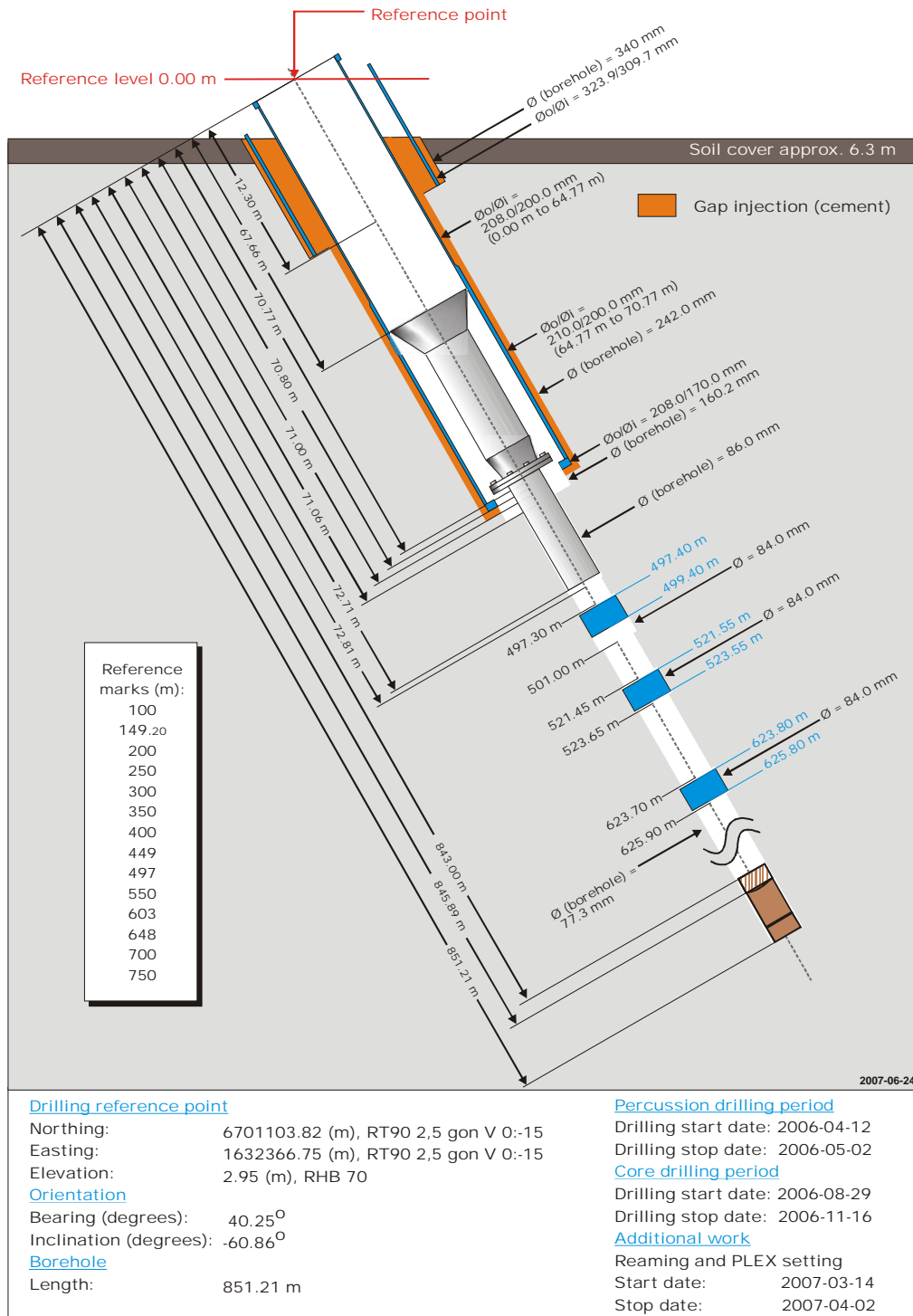


Figure 1. Technical description of KFM11A.

Deviation measurements in KFM11A

In total four deviation measurements were conducted in KFM11A. The deviation logging activities are tabulated in Sicada Activity Log, see Table 1.

There are two full Maxibor measurements executed in borehole KFM11A (ID 13135951 and 13135952) conducted to 843 m length and with the instrument mounted inside a barrel which was joined to the lower end of the drill string.

The starting values (bearing and inclination) for the Maxibor measurements were obtained from the values surveyed at TOC (Borehole direction surveying).

The two Mag/acc measurements (ID 13138423 and 13138432) were executed (down and up) to 840 m drilling length, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. No geomagnetic disturbances exceeding 0.5 degrees for the declination were observed on the date of measuring, see Figure 2.

Borehole deviation multiple measurements

For the calculation of *Borehole deviation multiple measurements* (ID 13140521) the two Mag/acc measurements (ID 13138423 and 13138432) were used, see Table 2. The Maxibor inclination differs significantly from the Flexit inclination curves.

A subset of the resulting deviation file for every approximately 100 m elevation (from Object_location) is shown in Table 3. The inclination and bearing uncertainties are calculated automatically, and based on these values the “Radius uncertainty” is calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

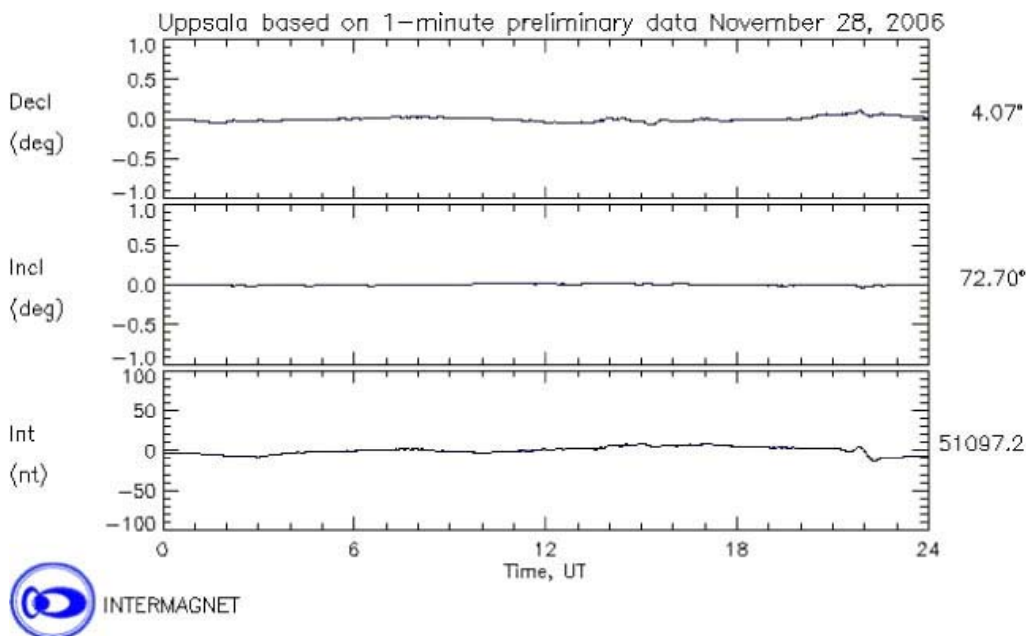


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2006-11-28. The upper curve shows the declination.

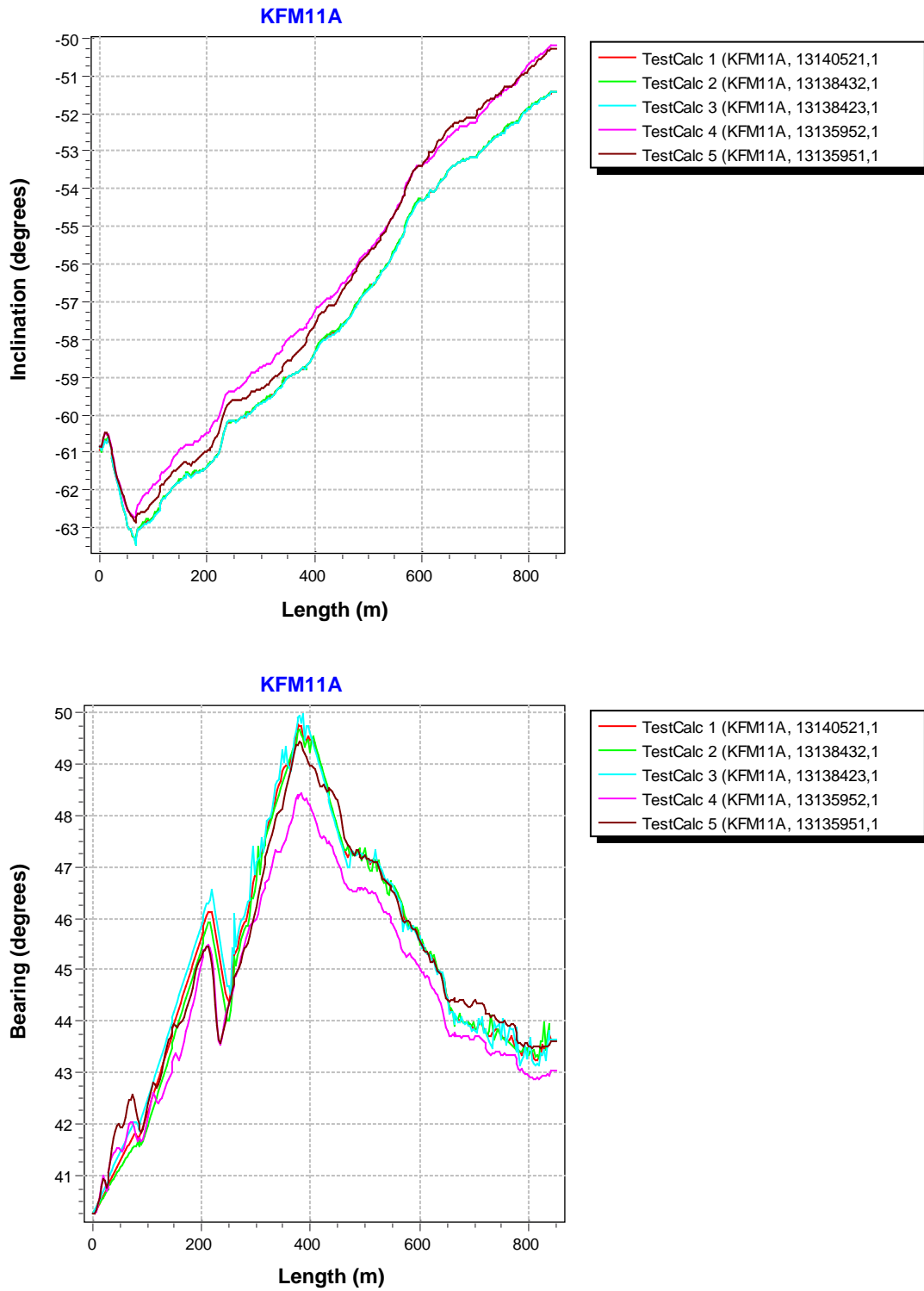


Figure 3. The resulting deviation results (EG154 in red) together with the involved deviation activities specified in the EG154-file. Upper diagram shows inclination, lower diagram bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
KFM11A	13135951	EG156	Maxibor measurement	2006-11-06 11:00:00	3.00	843.00	CF	061115 12:56
KFM11A	13135952	EG156	Maxibor measurement	2006-11-06 15:00:00	3.00	843.00	CF	061115 12:56
KFM11A	13138423	EG157	Magnetic - accelerometer measurement	2006-11-28 12:55:00	3.00	840.00	CF	061130 11:09
KFM11A	13138432	EG157	Magnetic - accelerometer measurement	2006-11-28 16:25:00	3.00	840.00	CF	061222 12:24
KFM11A	13140521	EG154	Borehole deviation multiple measurements	2006-12-13 18:00:00			I C	061222 10:32

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
KFM11A	13138423	BEARING	78.00	840.00	
KFM11A	13138423	INCLINATION	3.00	840.00	
KFM11A	13138432	BEARING	78.00	840.00	
KFM11A	13138432	INCLINATION	3.00	840.00	

Table 3. Subset (for every approx. 100 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
KFM11A	6701103.82	1632366.75	2.95	0	0.00	-60.94	40.25	1.045	0.695	0.00
KFM11A	6701144.67	1632402.74	-100.59	117	0.99	-62.26	42.77	1.045	0.695	2.13
KFM11A	6701183.26	1632440.92	-200.82	231	1.98	-60.47	45.34	1.045	0.695	4.21
KFM11A	6701222.78	1632482.45	-299.35	345	3.03	-59.09	48.66	1.045	0.695	6.29
KFM11A	6701263.21	1632528.73	-398.90	462	4.15	-57.47	47.32	1.045	0.695	8.43
KFM11A	6701310.08	1632578.69	-501.05	585	5.40	-54.55	45.83	1.045	0.695	10.67
KFM11A	6701361.86	1632629.90	-600.16	708	6.73	-53.05	43.94	1.045	0.695	12.92
KFM11A	6701417.74	1632683.09	-699.78	834	8.14	-51.53	43.65	1.045	0.695	15.21
KFM11A	6701425.50	1632690.49	-713.24	851.21	8.33	-51.43	43.64	1.045	0.695	15.53

Borehole description KFM12A

Figure 1 gives a technical description of KFM12A.

Technical data Borehole KFM12A

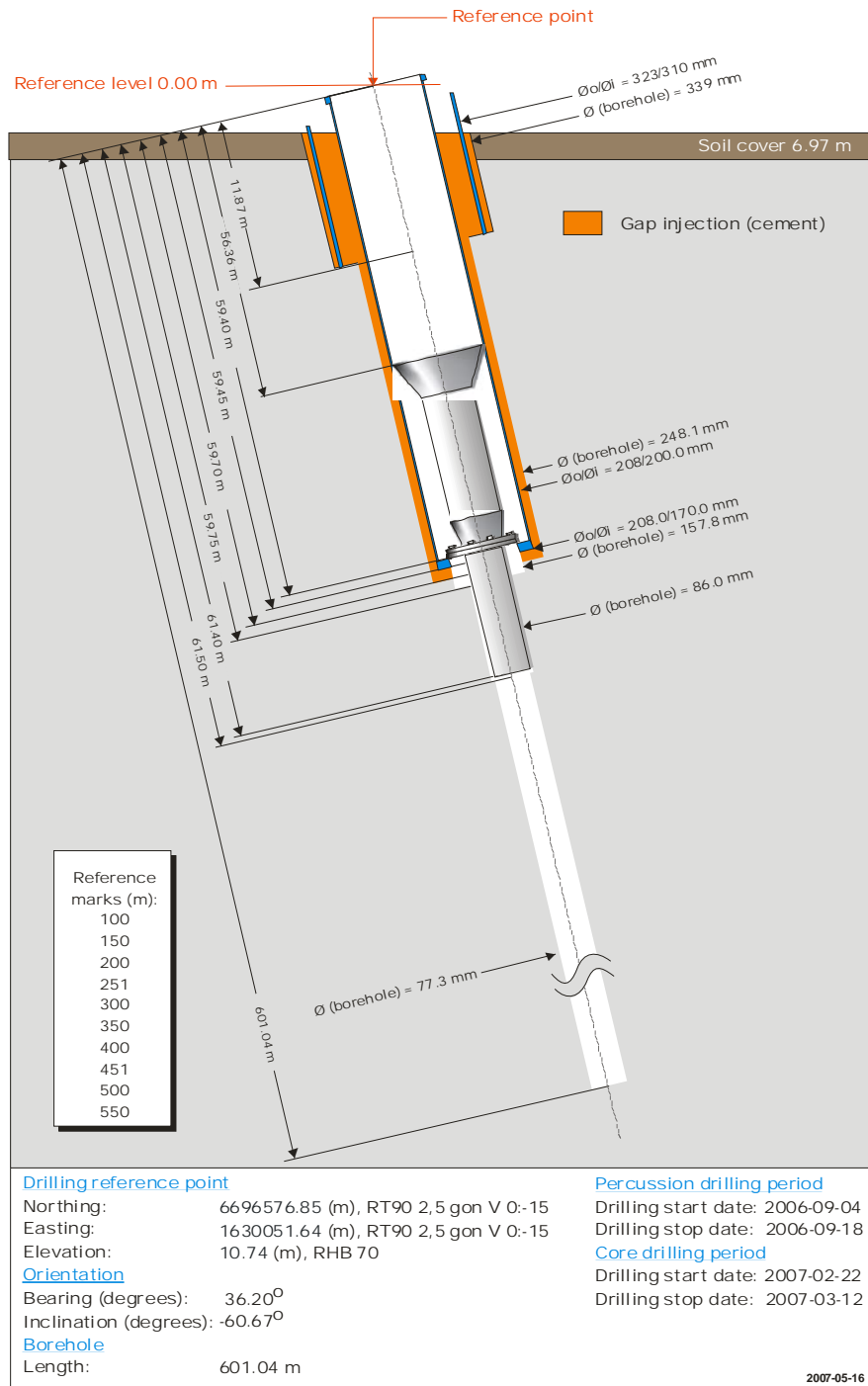


Figure 1. Technical description of KFM12A.

Deviation measurements in KFM12A

In total six deviation measurements were conducted in KFM12A. The deviation logging activities are tabulated in Sicada Activity Log, see Table 1.

There are two full Maxibor measurements executed in borehole KFM12A (ID 13155165 and 13155166) conducted to 591 m length and with the instrument mounted inside a barrel which was joined to the lower end of the drill string.

The starting values (bearing and inclination) for the Maxibor measurements were obtained from the values surveyed at TOC (Borehole direction surveying).

Three Mag/acc measurements (ID13155161, 13155153 and 13155159) were executed down and up to 597 m drilling length and one measurement (ID13155160), to 57 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. No geomagnetic disturbances exceeding 0.5 degrees for the declination were observed on the measuring dates, see Figure 2a and 2b.

Borehole deviation multiple measurements

For the calculation of *Borehole deviation multiple measurements* (ID 13155218) the three Mag/acc measurements (ID 13155161, 13155153 and 13155159) were used, see Table 2. The Maxibor inclination measurements deviated significantly from the Flexit measurements.

A subset of the resulting deviation file for every approximately 100 m elevation (from Object_location) is shown in Table 3. The inclination and bearing uncertainties are calculated automatically, and based on these values the “Radius uncertainty” is calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

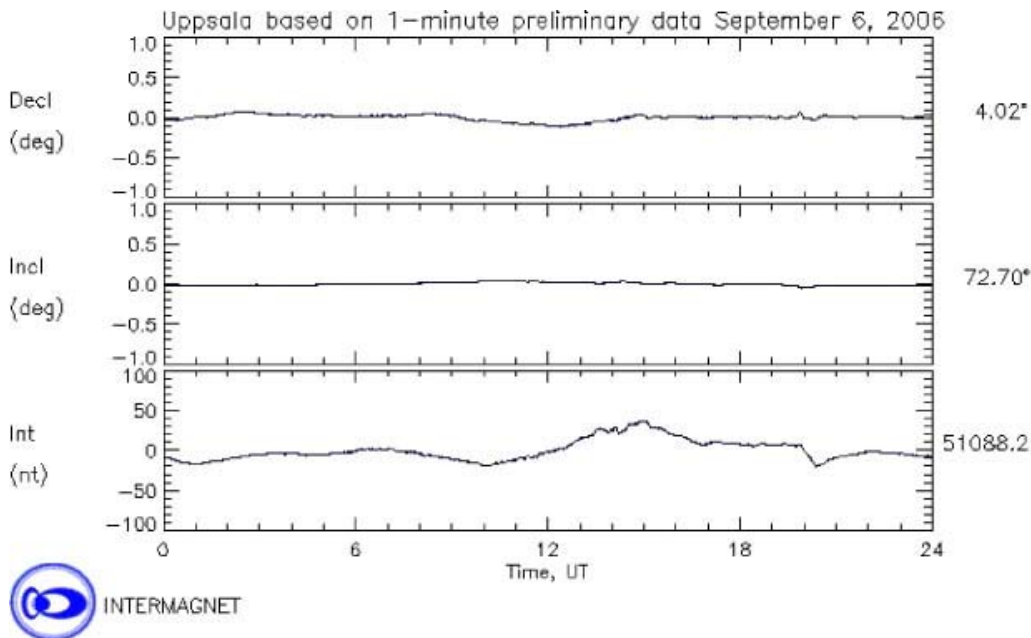


Figure 2a. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2006-09-06. The upper curve shows the declination.

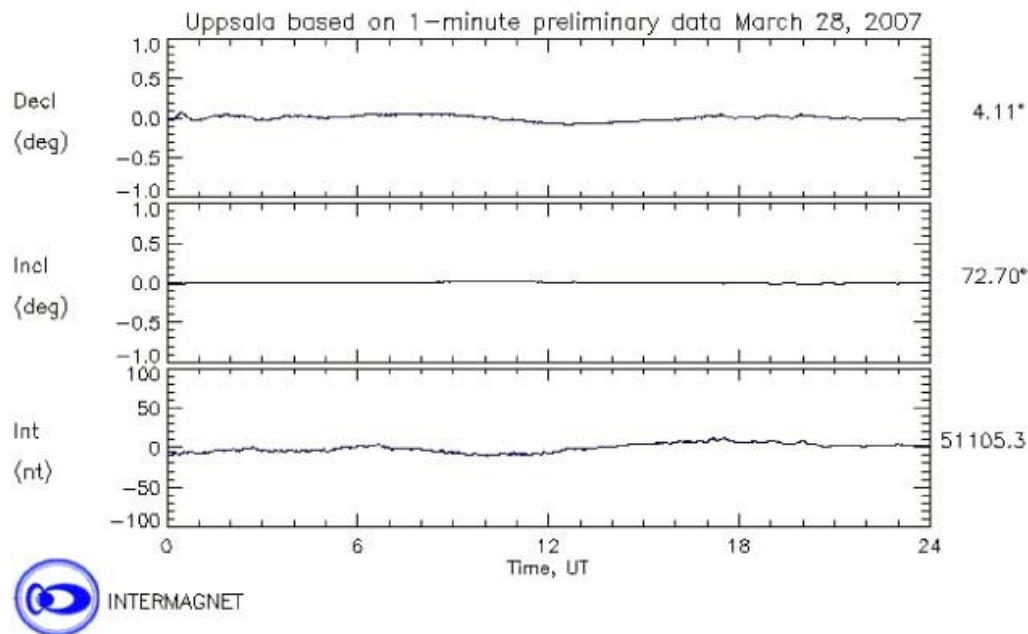
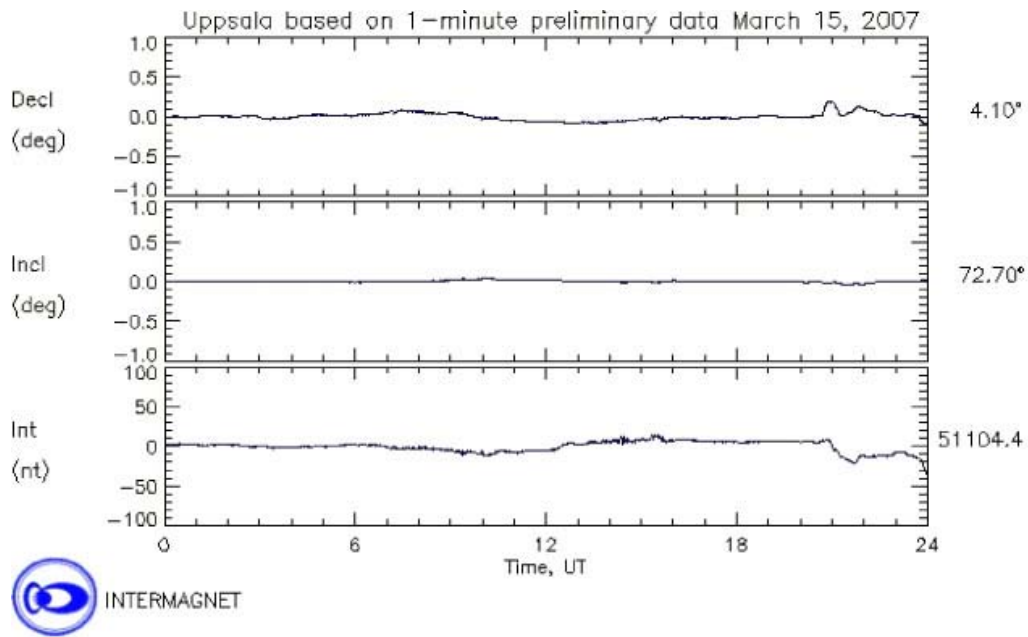


Figure 2b. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2007-03-15 and 2007-03-28. The upper curve shows the declination.

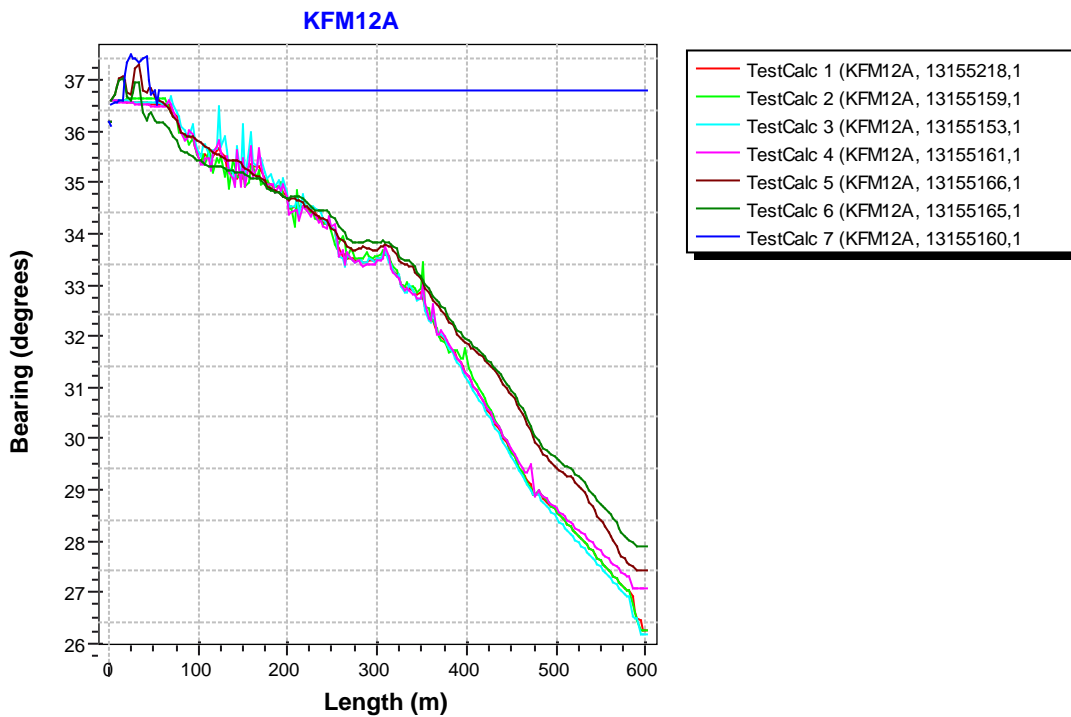
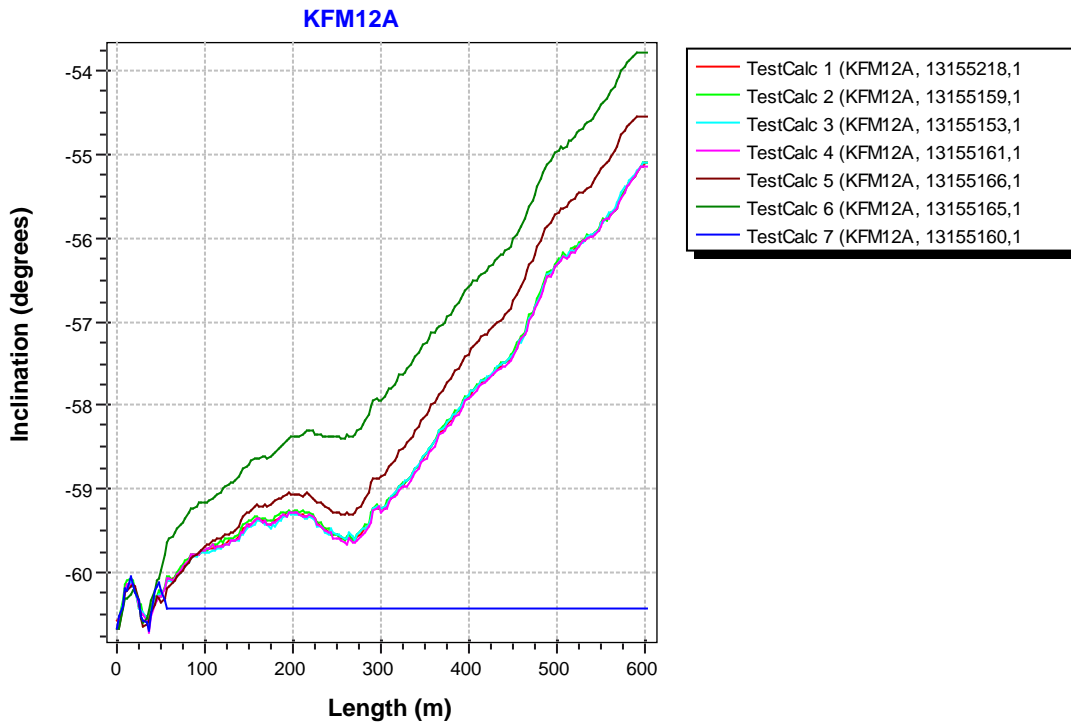


Figure 3. The Borehole deviation multiple measurements data (red line) together with the other, not error marked, deviation activities specified in Table 1. The upper diagram shows the inclination and the lower shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
KFM12A	13155160	EG157	Magnetic - accelerometer measurement	2006-09-06 14:20	3.00	57.00	CF	070330 13:38
KFM12A	13155165	EG156	Maxibor measurement	2007-03-11 12:00	3.00	591.00	CF	070330 13:38
KFM12A	13155166	EG156	Maxibor measurement	2007-03-11 15:00	3.00	591.00	CF	070330 13:38
KFM12A	13155161	EG157	Magnetic - accelerometer measurement	2007-03-15 09:20	3.00	597.00	CF	070330 13:28
KFM12A	13155153	EG157	Magnetic - accelerometer measurement	2007-03-28 13:10	3.00	597.00	CF	070330 13:28
KFM12A	13155159	EG157	Magnetic - accelerometer measurement	2007-03-28 15:40	3.00	597.00	CF	070330 13:28
KFM12A	13155218	EG154	Borehole deviation multiple measurements	2007-03-30 12:00			I C	071012 07:54

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
KFM12A	13155153	BEARING	69.00	597.00	
KFM12A	13155153	INCLINATION	3.00	597.00	
KFM12A	13155159	BEARING	69.00	597.00	
KFM12A	13155159	INCLINATION	3.00	597.00	
KFM12A	13155161	BEARING	69.00	597.00	
KFM12A	13155161	INCLINATION	3.00	597.00	

Table 3. Subset (for every approx. 100 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
KFM12A	6696576.85	1630051.64	10.74	0.00	0.00	-60.56	36.2	1.26	0.865	0.00
KFM12A	6696629.11	1630089.30	-101.03	129	1.42	-59.62	35.11	1.26	0.865	2.84
KFM12A	6696676.97	1630122.13	-199.15	243	2.69	-59.52	33.78	1.26	0.865	5.34
KFM12A	6696727.30	1630154.72	-299.61	360	4.01	-58.43	31.95	1.26	0.865	7.92
KFM12A	6696782.77	1630187.01	-400.99	480	5.42	-56.67	28.51	1.26	0.865	10.55
KFM12A	6696842.54	1630217.91	-500.34	600	6.91	-55.11	25.82	1.26	0.865	13.19
KFM12A	6696843.27	1630218.25	-501.49	601.4	6.92	-55.11	25.82	1.26	0.865	13.22

Details of the percussion-drilled boreholes

Borehole description HFM01

Figure 1 gives a technical description of HFM01.

Technical data

Borehole HFM01

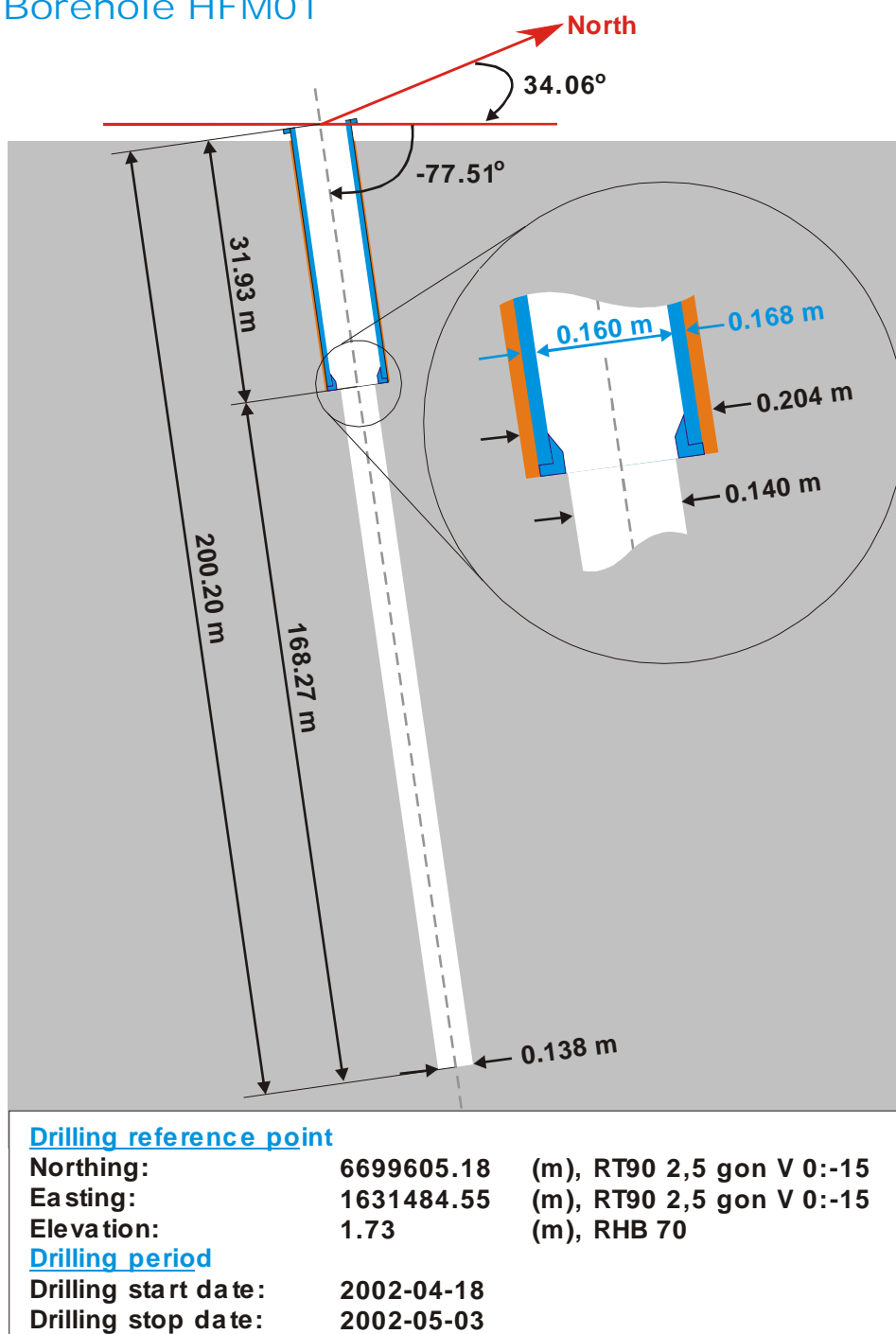


Figure 1. Technical description of HFM01.

Deviation measurement in HFM01

The only deviation measurement in HFM01 was performed with the Maxibor. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

One measurement (ID 12943818) was executed every three metres downwards between the length 0–198 m, with the Maxibor instrument centralized and hoisted by wire into the borehole. The starting values surveyed at TOC (Borehole direction surveying) were obtained from Sicada.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142399) the Maxibor measurement (ID 12943818) was used. Table 2 shows the content of the EG154-file used for the calculation of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively (see Section 4.4.2), and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 2 shows the resulting deviation data together with the deviation data listed in Table 1.

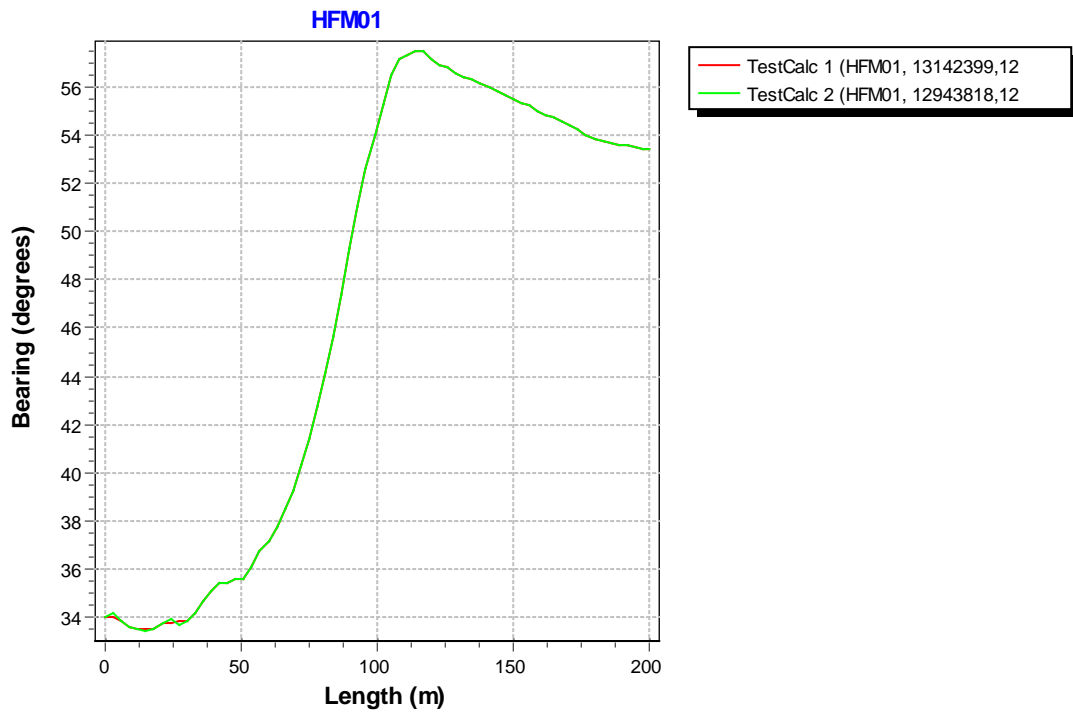
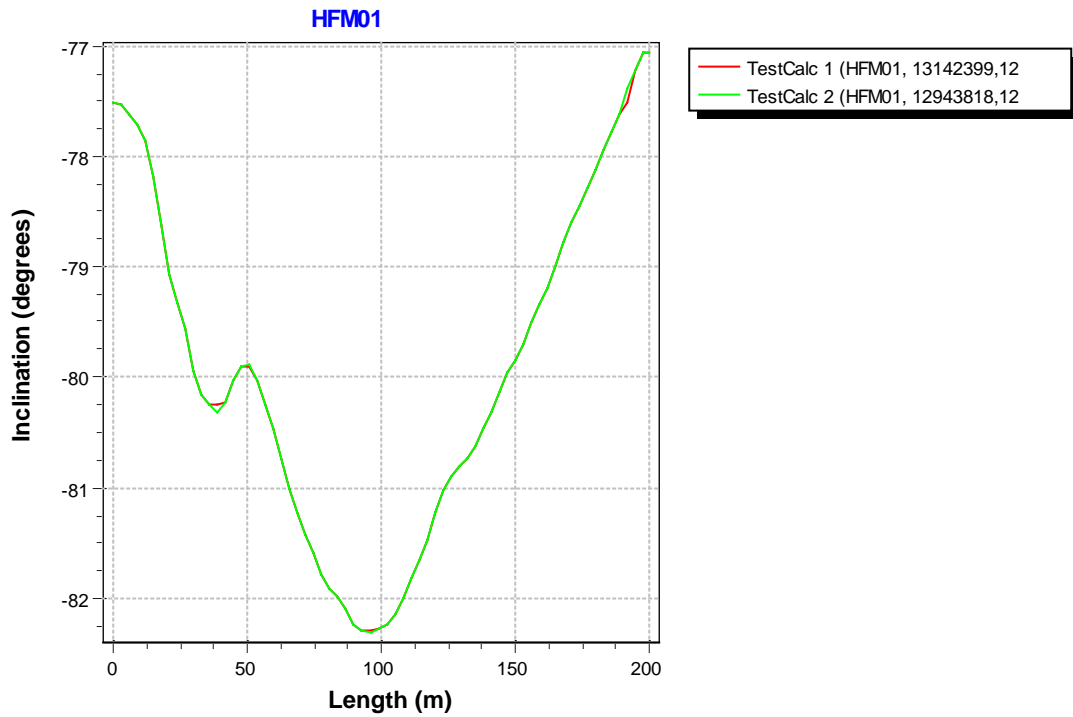


Figure 2. The resulting deviation results (EG154 in red) together with the deviation activity specified in the EG154-file. Upper diagram shows inclination, lower diagram bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM01	12943818	EG156	Maxibor measurement	2002-08-13 14:00	0.00	198.00		070813 13:09
HFM01	13142399	EG154	Borehole deviation multiple measurements	2006-12-21 07:40			I C	070111 08:11

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM01	12943818	BEARING	0.00	198.00	4.900
HFM01	12943818	INCLINATION	0.00	198.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_UNCERT	INCLINATION	BEARING	INCLINATION_UNCERT	BEARING_UNCERT	RADIUS_UNCERT
HFM01	6699605.18	1631484.55	1.73	0	0.00	-77.51	34.06	1.8	4.9	0.00
HFM01	6699608.82	1631486.98	-18.81	21	0.14	-79.07	33.80	1.8	4.9	0.66
HFM01	6699611.87	1631489.06	-39.48	42	0.25	-80.22	35.41	1.8	4.9	1.32
HFM01	6699614.77	1631491.18	-60.17	63	0.36	-80.73	37.79	1.8	4.9	1.98
HFM01	6699617.12	1631493.22	-80.94	84	0.46	-81.99	45.64	1.8	4.9	2.64
HFM01	6699618.66	1631495.11	-98.77	102	0.54	-82.23	55.27	1.8	4.9	3.20
HFM01	6699620.31	1631497.65	-119.55	123	0.63	-81.02	56.87	1.8	4.9	3.86
HFM01	6699622.20	1631500.50	-140.27	144	0.74	-80.13	55.82	1.8	4.9	4.52
HFM01	6699624.36	1631503.61	-160.93	165	0.86	-78.99	54.70	1.8	4.9	5.18
HFM01	6699626.47	1631506.54	-178.56	183	0.98	-77.94	53.76	1.8	4.9	5.75
HFM01	6699628.69	1631509.54	-195.35	200.2	1.09	-77.06	53.45	1.8	4.9	6.29

Borehole description HFM02

Figure 1 gives a technical description of HFM02.

Technical data

Borehole HFM02

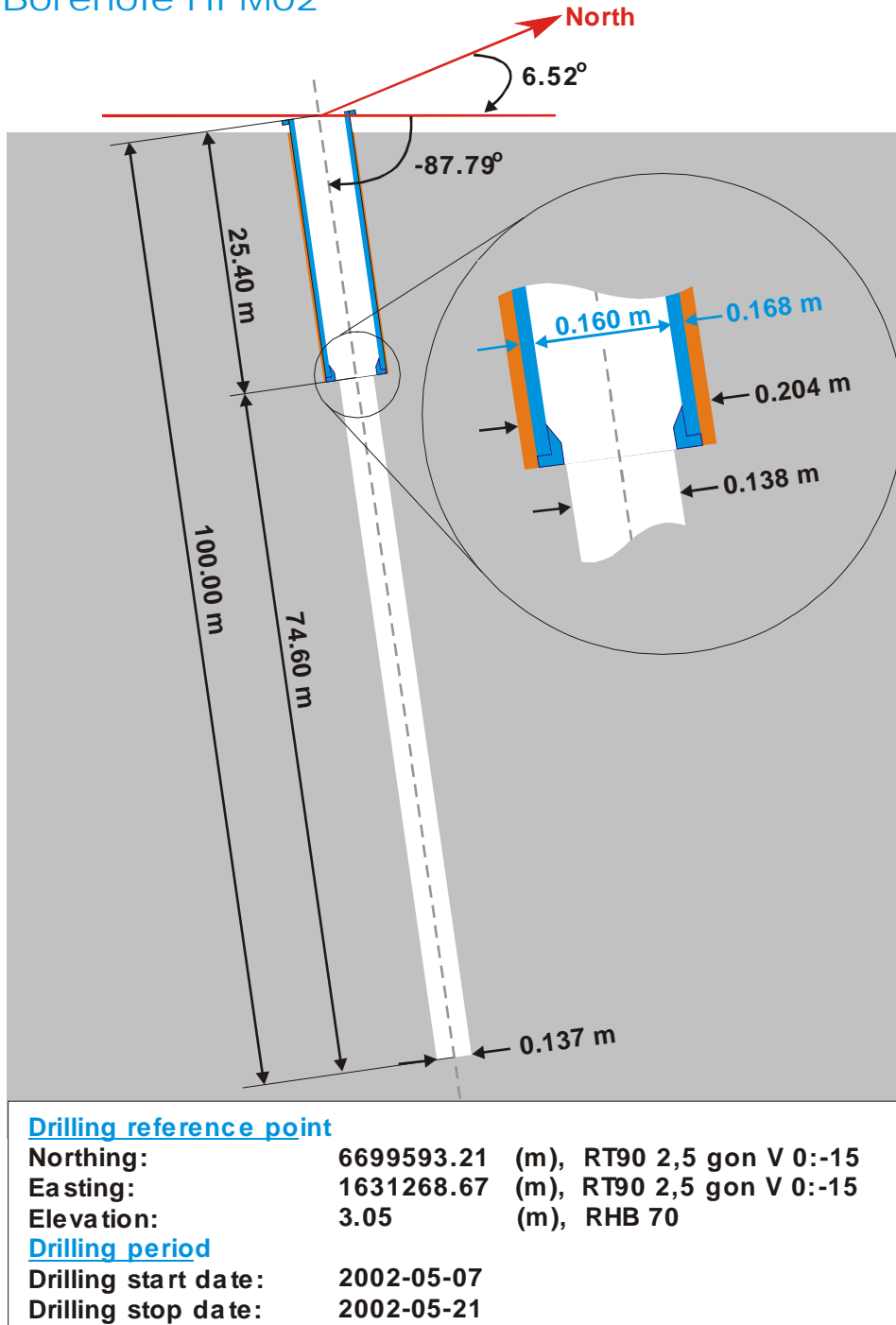


Figure 1. Technical description of HFM02.

Deviation measurement in HFM02

The only deviation measurement in HFM02 was performed with the Maxibor. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

The measurement (ID 12943819) was executed every three metres downwards between the length 0–96 m, with the Maxibor instrument centralized and hoisted by wire into the borehole. The starting values surveyed at TOC (Borehole direction surveying) were obtained from Sicada.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142400) the Maxibor measurement (ID 12943819) was used. Table 2 shows the content of the EG154-file used for the calculation of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively, and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 2 shows the resulting deviation data together with the deviation data listed in Table 1.

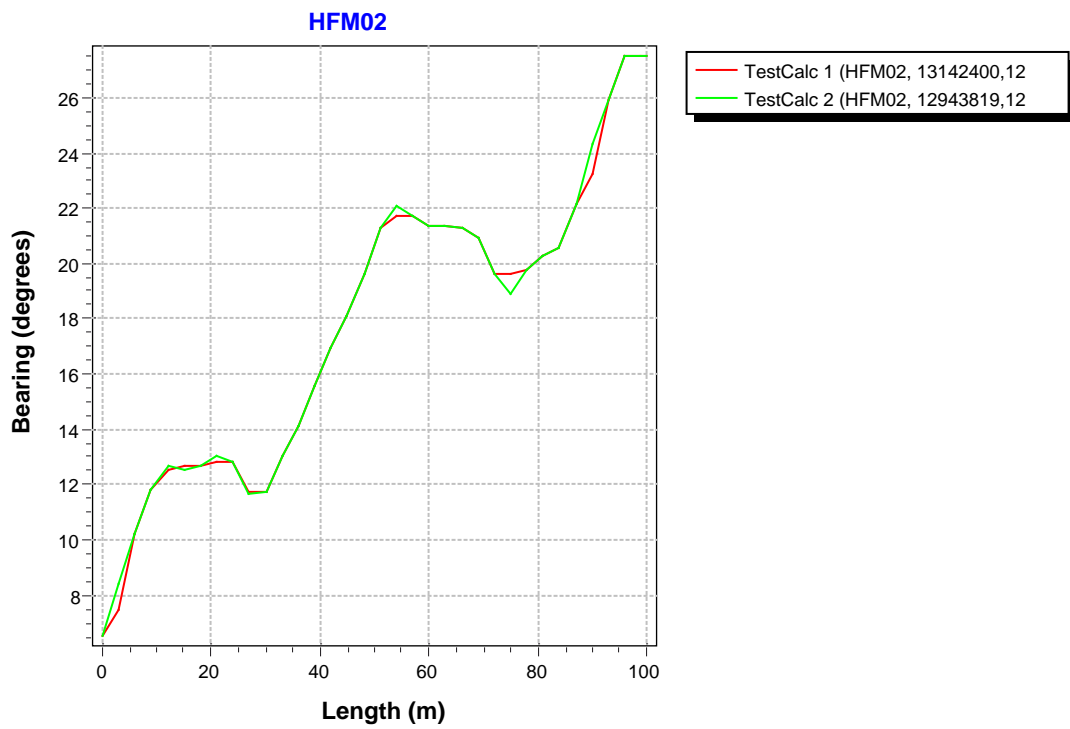
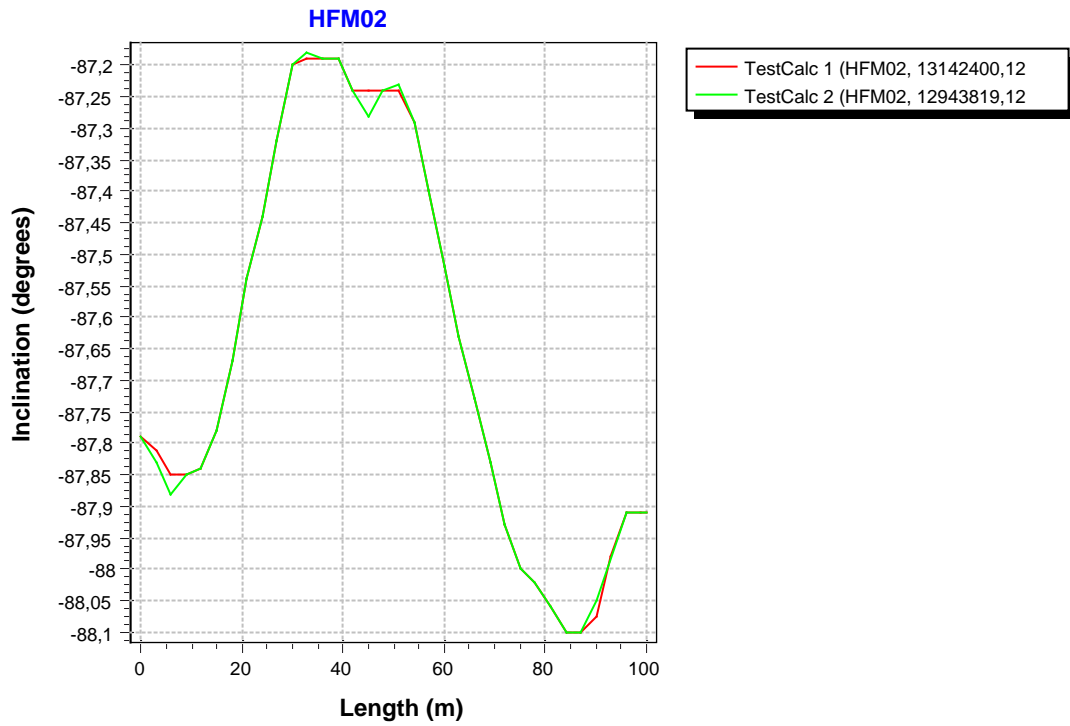


Figure 2. The resulting deviation results (EG154 in red) together with the involved deviation activity specified in the EG154-file. Upper diagram shows inclination, lower diagram bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM02	12943819	EG156	Maxibor measurement	2002-08-14 08:30	0.00	96.00		070813 13:10
HFM02	13142400	EG154	Borehole deviation multiple measurements	2006-12-21 07:45			I C	070111 08:11

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM02	12943819	BEARING	0.00	96.00	4.900
HFM02	12943819	INCLINATION	0.00	96.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_UNCERT	INCLINATION	BEARING	INCLINATION_UNCERT	BEARING_UNCERT	RADIUS_UNCERT
HFM02	6699593.21	1631268.67	3.05	0	0.00	-87.79	6.52	1.8	4.9	0.00
HFM02	6699594.14	1631268.86	-20.93	24	0.03	-87.44	12.85	1.8	4.9	0.75
HFM02	6699594.98	1631269.06	-38.91	42	0.06	-87.24	16.94	1.8	4.9	1.32
HFM02	6699595.89	1631269.40	-59.88	63	0.09	-87.63	21.36	1.8	4.9	1.98
HFM02	6699596.61	1631269.67	-80.87	84	0.11	-88.10	20.57	1.8	4.9	2.64
HFM02	6699597.11	1631269.90	-96.86	100	0.13	-87.91	27.52	1.8	4.9	3.14

Borehole description HFM03

Figure 1 gives a technical description of HFM03.

Technical data

Borehole HFM03

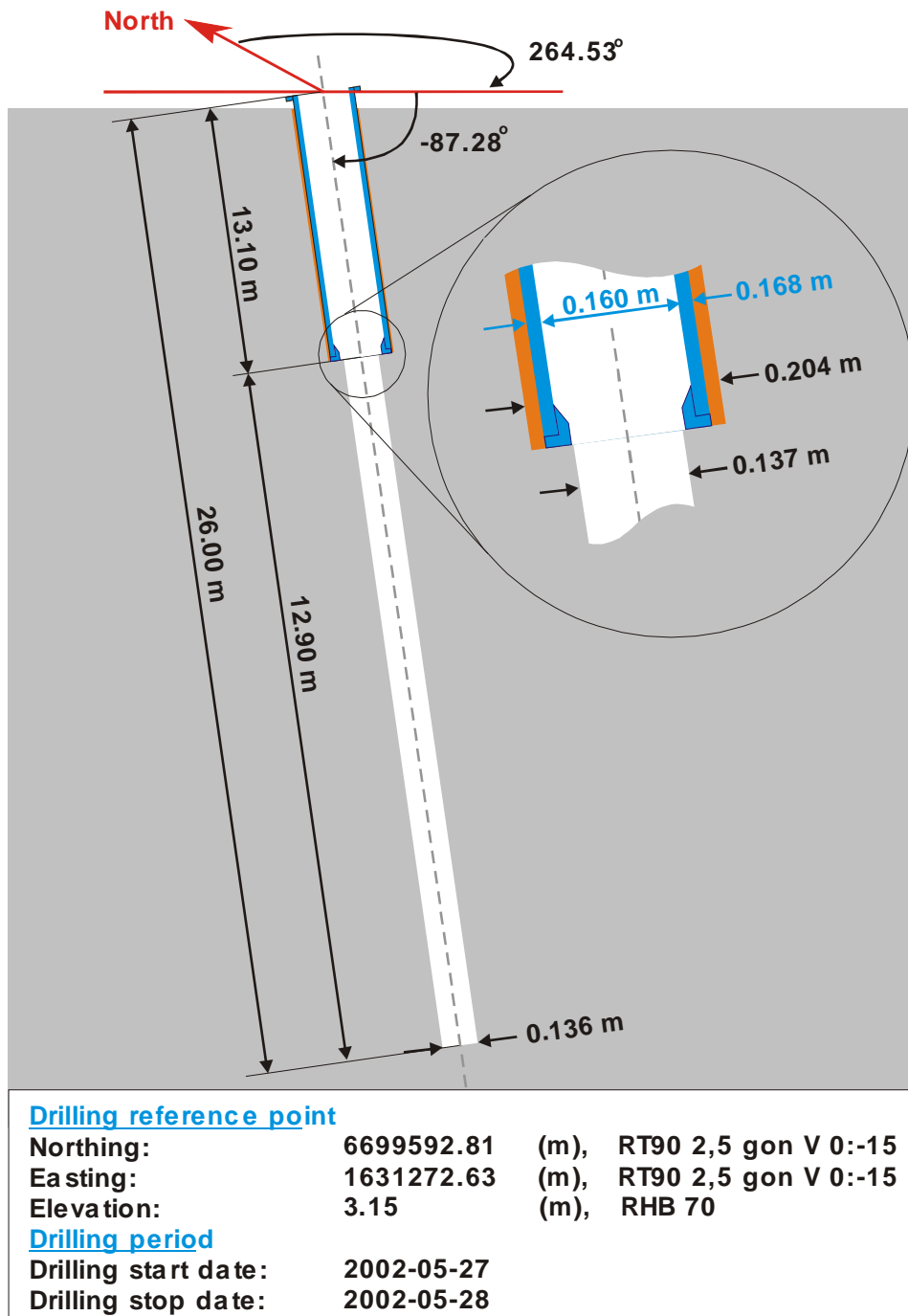


Figure 1. Technical description of HFM03.

Deviation measurement in HFM03

The only deviation measurement in HFM03 was performed with the Maxibor. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

One measurement (ID 12943820) was executed every three metres downwards between the length 0–21 m, with the Maxibor instrument centralized and hoisted by wire into the borehole. The starting values surveyed at TOC (Borehole direction surveying) were obtained from Sicada.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142413) the Maxibor measurement (ID 12943820) was used. Table 2 shows the content of the EG154-file used for calculation of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively, and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 2 shows the resulting deviation data together with the deviation data listed in Table 1.

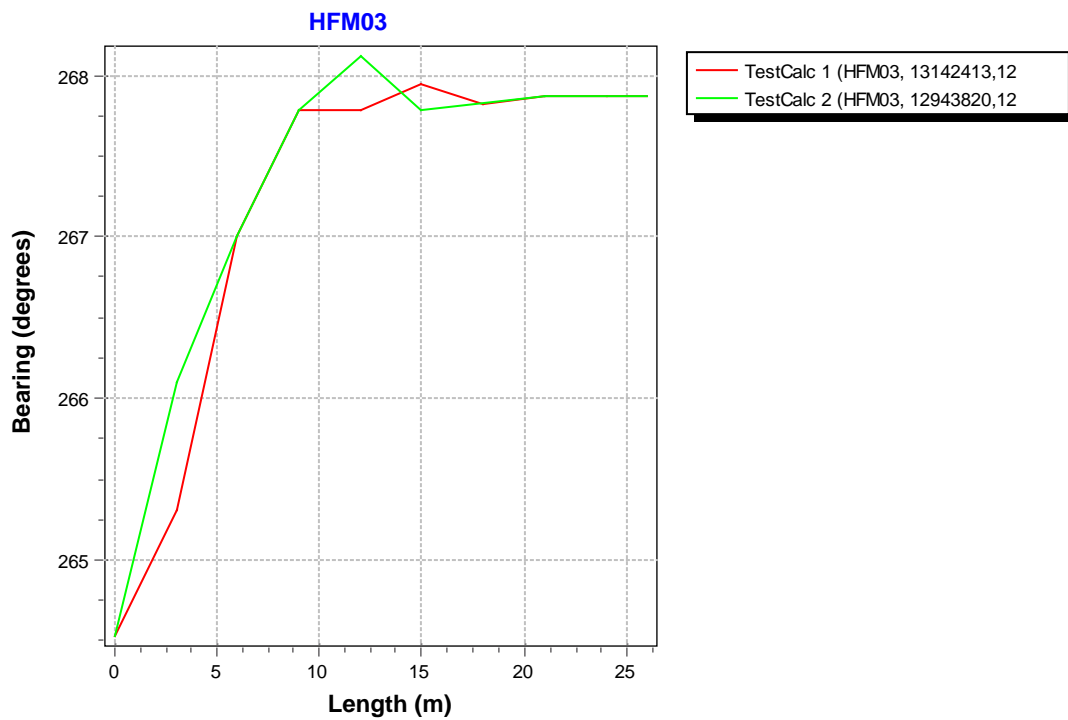
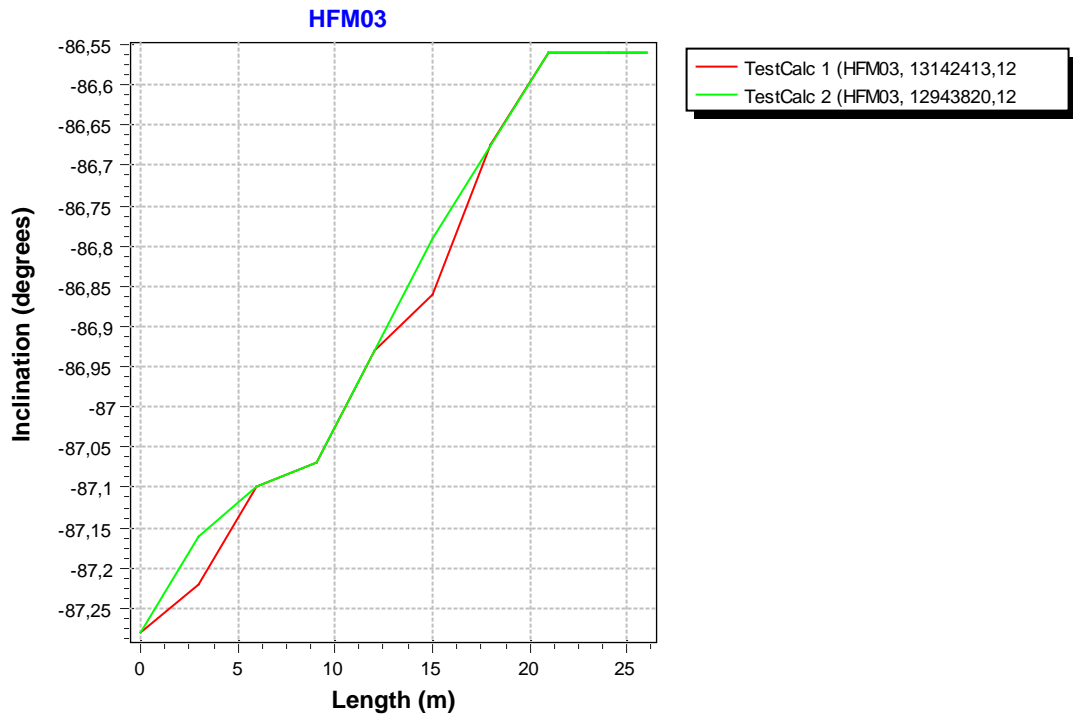


Figure 2. The resulting deviation results (EG154 in red) together with the involved deviation activity specified in the EG154-file. Upper diagram shows inclination, lower diagram bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM03	12943820	EG156	Maxibor measurement	2002-08-14 08:30	0.00	21.00		070813 13:10
HFM03	13142413	EG154	Borehole deviation multiple measurements	2006-12-21 07:50			I C	070111 08:11

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM03	12943820	BEARING	0.00	21.00	4.900
HFM03	12943820	INCLINATION	0.00	21.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_UNCERT	INCLINATION	BEARING	INCLINATION_UNCERT	BEARING_UNCERT	RADIUS_UNCERT
HFM03	6699592.81	1631272.63	3.15	0	0.00	-87.28	264.53	1.8	4.9	0.00
HFM03	6699592.75	1631271.34	-20.82	24	0.04	-86.56	267.87	1.8	4.9	0.75
HFM03	6699592.75	1631271.22	-22.81	26	0.04	-86.56	267.87	1.8	4.9	0.82

Borehole description HFM04

Figure 1 gives a technical description of HFM04.

Technical data

Borehole HFM04

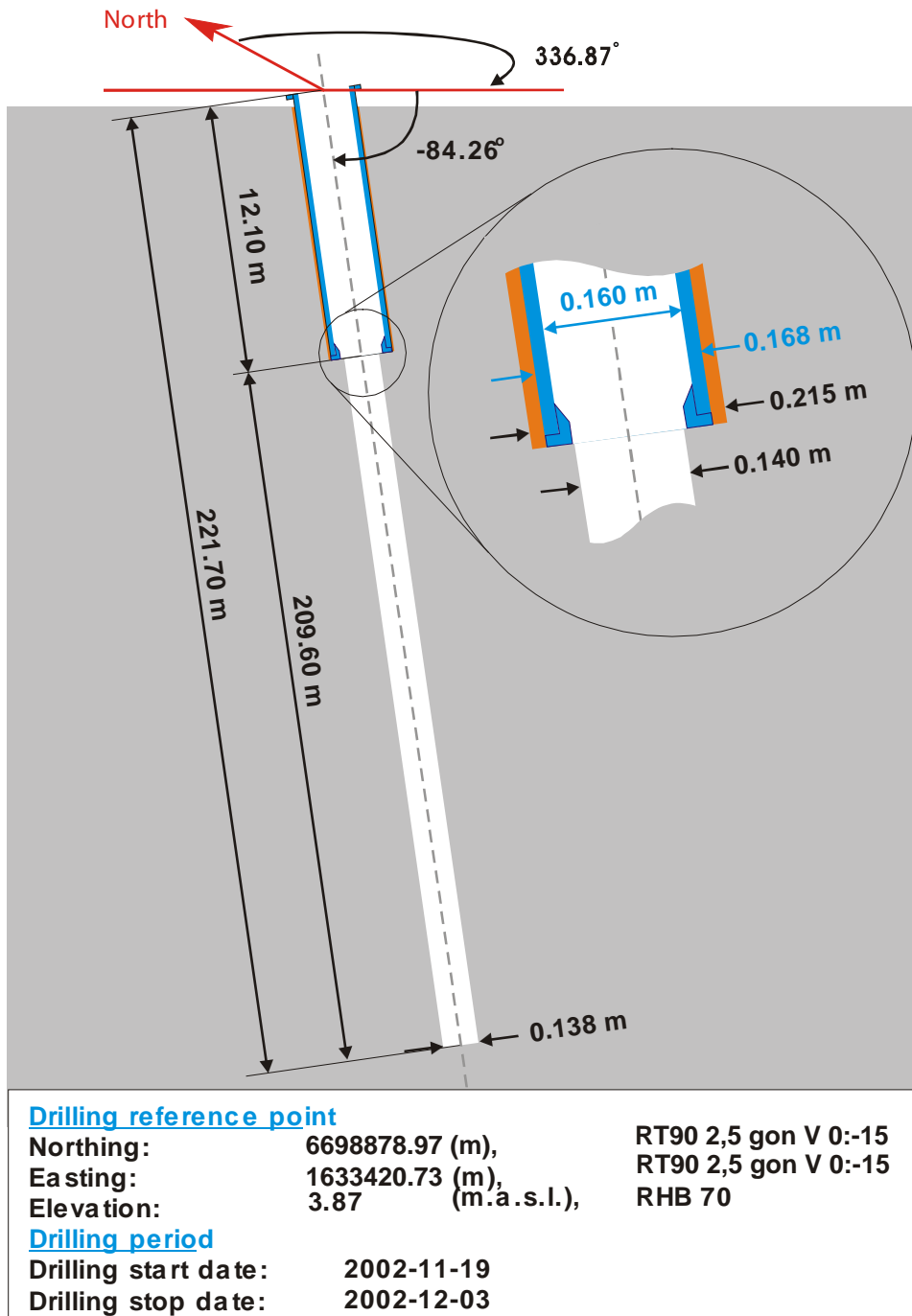


Figure 1. Technical description of HFM04.

Deviation measurements in HFM04

Two deviation measurements were performed in HFM04 with the Mac/acc, Flexit instrument. The deviation logging activities are tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurement (ID 13141484) was executed every three metres downwards between the length 3–222 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activities ID 12949464 and 12990236 were adjusted with wrong magnetic declination and were therefore error marked. No geomagnetic disturbance exceeding 0.5 degrees for the declination were observed on the date and time of the Mag/acc measurements, see Figure 2.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142340) the Mag/acc measurement (ID 13141484) was used. Table 2 shows the content of the EG154-file used for the calculation of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively, and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the deviation data listed in Table 1.

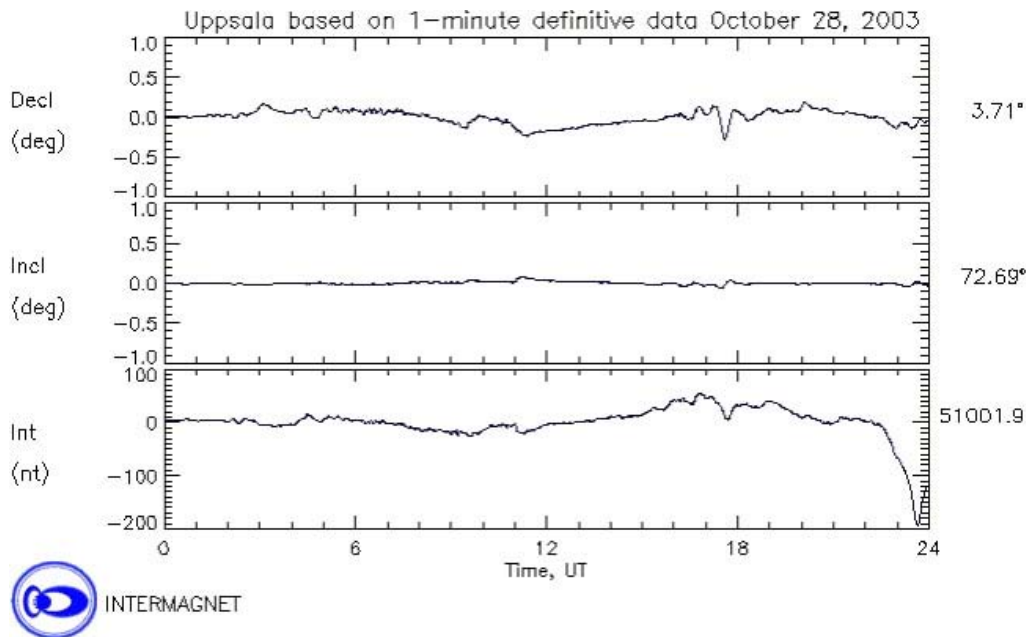


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2003-10-28. The upper curve shows the declination.

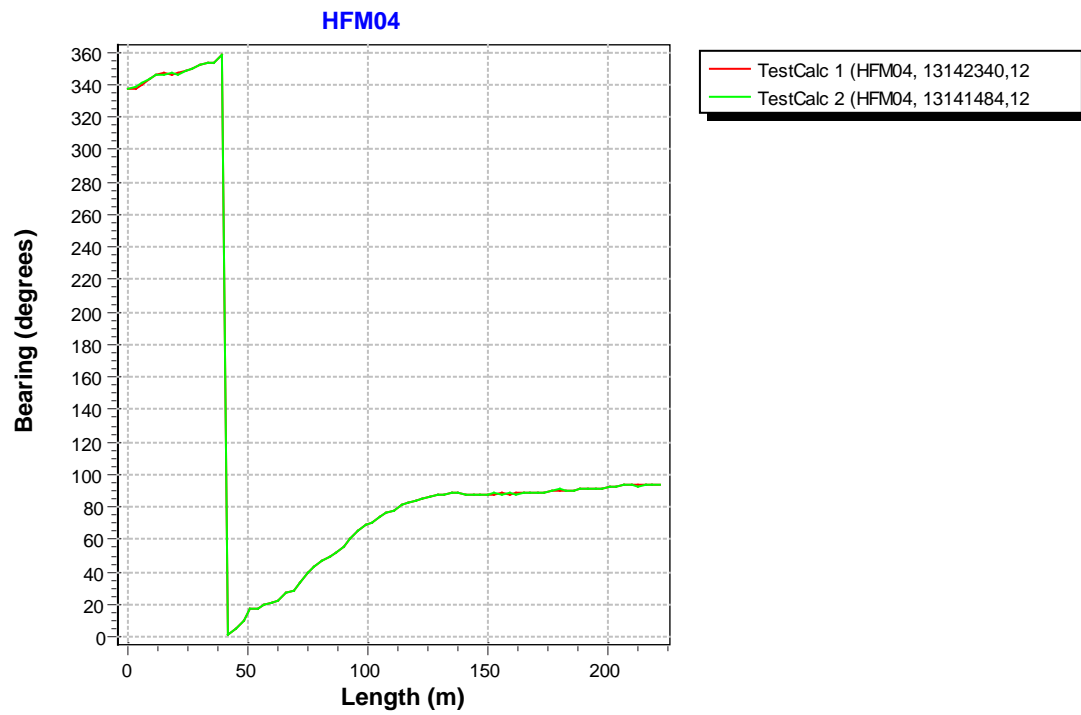
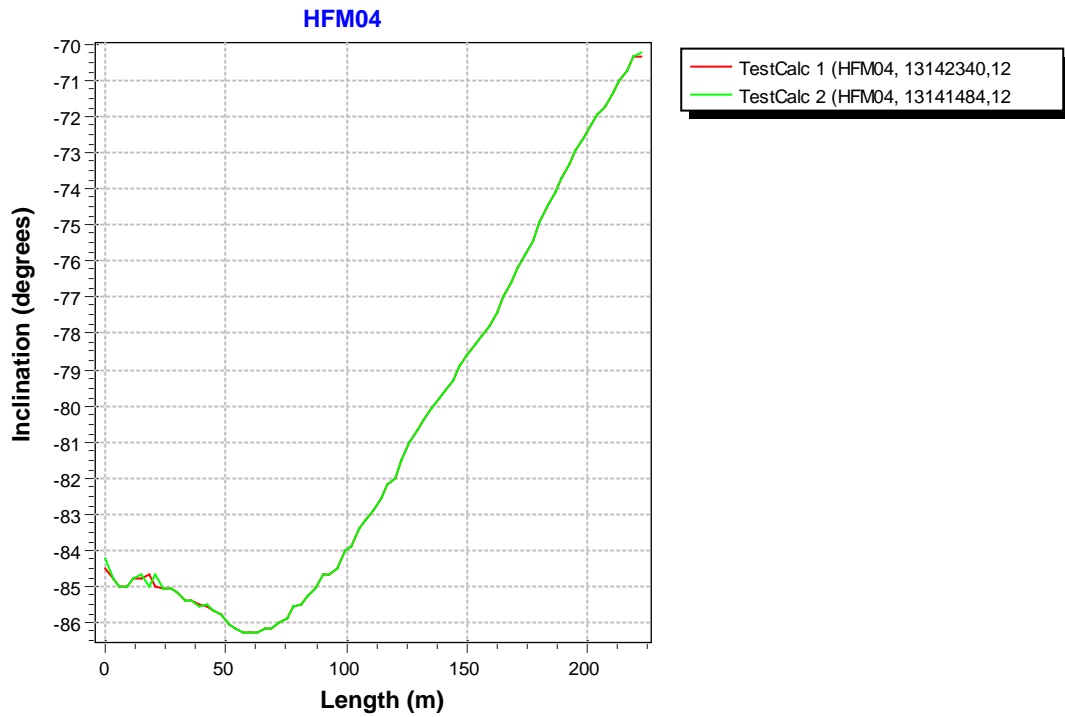


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activity specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM04	12949464	EG157	Magnetic - accelerometer measurement	2002-11-29 09:00:00	0.00	219.00	ECF	060427 12:35
HFM04	12990236	EG157	Magnetic - accelerometer measurement	2003-10-28 16:00:00	15.00	219.00	E	061220 08:03
HFM04	13141484	EG157	Magnetic - accelerometer measurement	2003-10-28 16:00:00	3.00	222.00	F	061220 08:04
HFM04	13142340	EG154	Borehole deviation multiple measurements	2006-12-20 07:50:00			I C	070111 08:11

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM04	13141484	BEARING	15.00	222.00	4.900
HFM04	13141484	INCLINATION	3.00	222.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
HFM04	6698878.97	1633420.73	3.87	0	0.00	-84.53	336.87	1.8	4.9	0.00
HFM04	6698881.02	1633420.13	-20.03	24	0.07	-85.10	348.30	1.8	4.9	0.75
HFM04	6698882.71	1633419.98	-40.96	45	0.12	-85.70	5.60	1.8	4.9	1.41
HFM04	6698883.87	1633420.33	-58.92	63	0.16	-86.30	22.60	1.8	4.9	1.98
HFM04	6698885.06	1633421.23	-79.87	84	0.21	-85.30	49.60	1.8	4.9	2.64
HFM04	6698885.98	1633423.01	-100.77	105	0.27	-83.40	74.20	1.8	4.9	3.30
HFM04	6698886.36	1633425.31	-118.62	123	0.35	-81.50	85.10	1.8	4.9	3.86
HFM04	6698886.51	1633428.85	-139.31	144	0.46	-79.30	87.80	1.8	4.9	4.52
HFM04	6698886.66	1633433.15	-159.87	165	0.60	-77.00	88.90	1.8	4.9	5.18
HFM04	6698886.68	1633438.38	-180.20	186	0.76	-74.10	90.70	1.8	4.9	5.84
HFM04	6698886.48	1633444.59	-200.26	207	0.96	-71.70	93.30	1.8	4.9	6.50
HFM04	6698886.19	1633449.40	-214.15	221.7	1.11	-70.30	93.70	1.8	4.9	6.96

Borehole description HFM05

Figure 1 gives a technical description of HFM05.

Technical data

Borehole HFM05

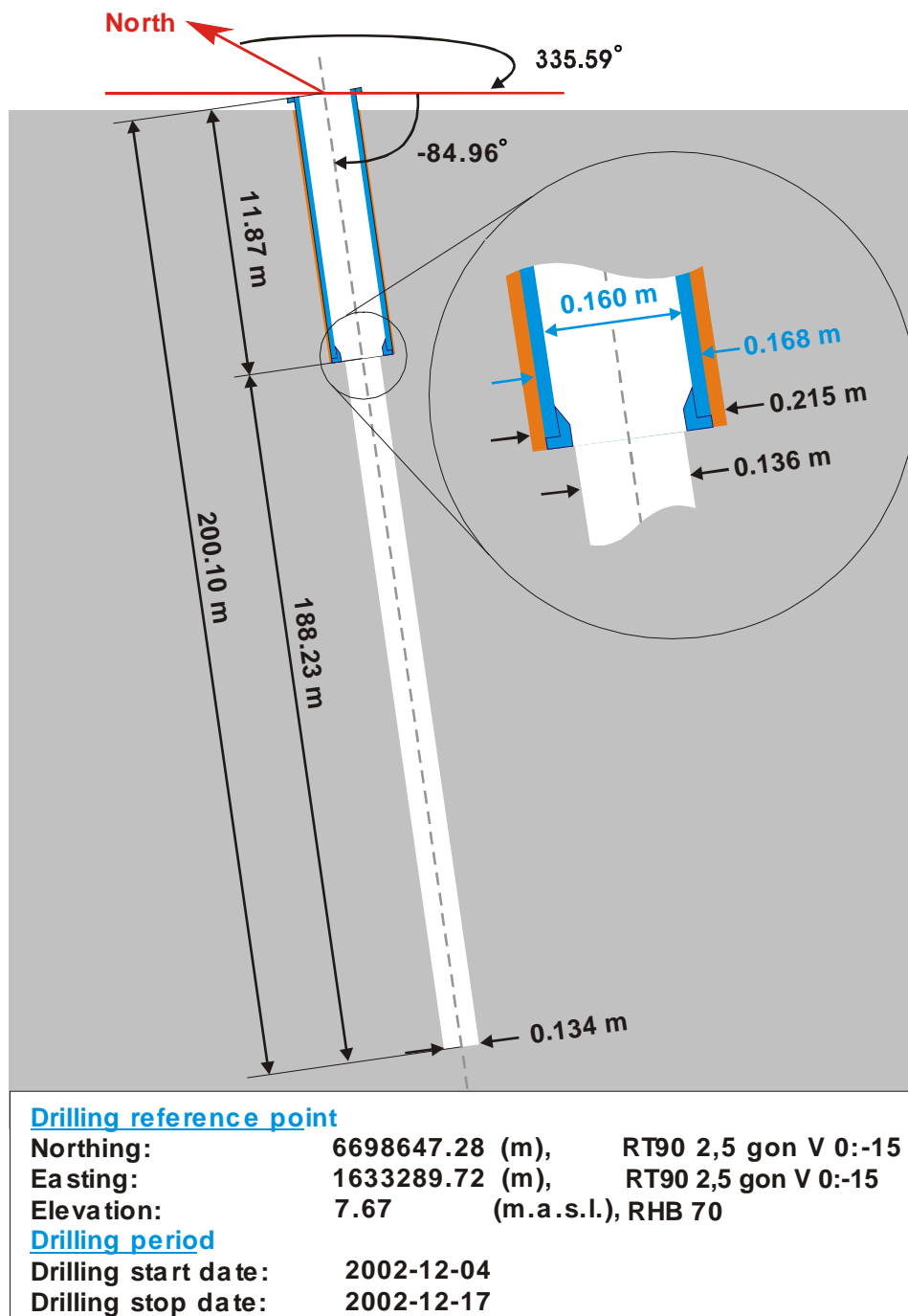


Figure 1. Technical description of HFM05.

Deviation measurements in HFM05

Two deviation measurements were performed in HFM05 with the Mag/acc (Flexit) instrument. The deviation logging activities are tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurement (ID 13141495) was executed every three metres downwards between the length 3–201 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activities ID 12960600 and 12990237 were adjusted with wrong magnetic declination and were therefore error marked. Some geomagnetic disturbances were observed on the date and time of the Mag/acc measurement, see Figure 2. These disturbances might have introduced errors up to approximately $\pm 2^\circ$ in the bearing readings.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142341) the Mag/acc measurement (ID 13141495) was used. Table 2 shows the content of the EG154-file used for calculation of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively, and based on these values the “Radius uncertainty” was calculated for every measuring level. The bearing uncertainty (4.9°) is assumed to include the errors introduced by the magnetic disturbances.

Figure 3 shows the resulting deviation data together with the deviation data listed in Table 1.

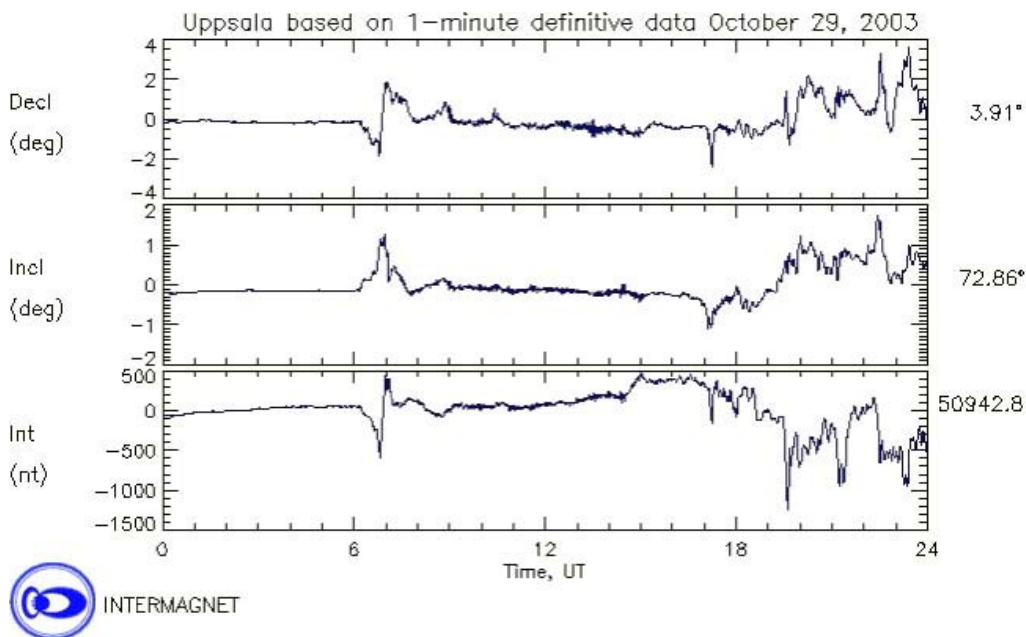


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2003-10-29. The upper curve shows the declination.

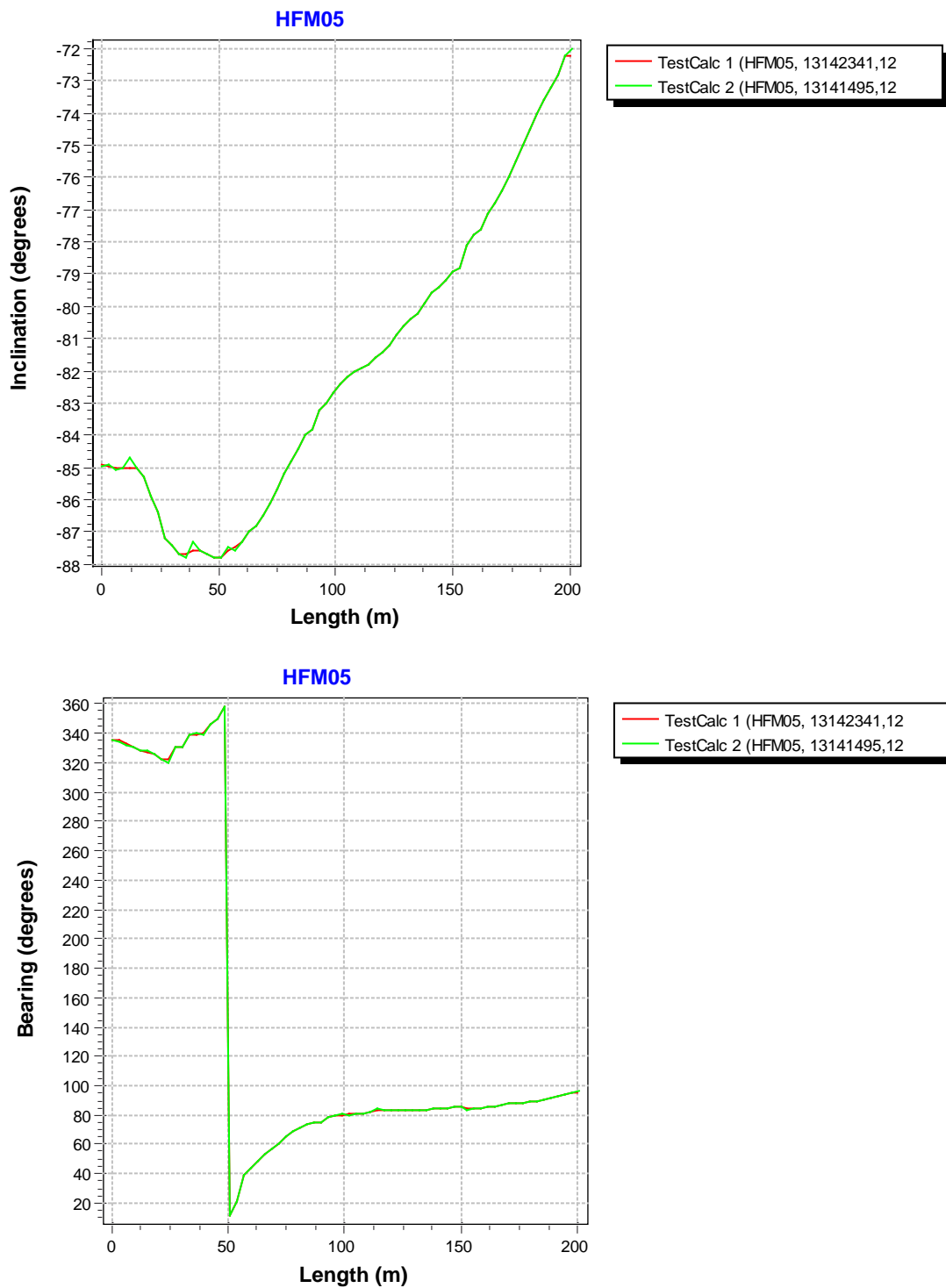


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activities specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM05	12960600	EG157	Magnetic - accelerometer measurement	2003-01-07 09:00:00	0.00	198.00	EC	060427 12:35
HFM05	12990237	EG157	Magnetic - accelerometer measurement	2003-10-29 08:00:00	15.00	198.00	E	061220 08:05
HFM05	13141495	EG157	Magnetic - accelerometer measurement	2003-10-29 08:00:00	3.00	201.00	F	061220 08:05
HFM05	13142341	EG154	Borehole deviation multiple measurements	2006-12-20 08:00:00			I C	070111 08:11

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM05	13141495	BEARING	15.00	201.00	4.900
HFM05	13141495	INCLINATION	3.00	201.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
HFM05	6698647.28	1633289.72	7.67	0	0.00	-84.93	335.59	1.8	4.9	0.00
HFM05	6698649.12	1633288.61	-19.24	27	0.07	-87.20	330.40	1.8	4.9	0.85
HFM05	6698649.95	1633288.32	-40.22	48	0.09	-87.80	358.10	1.8	4.9	1.51
HFM05	6698650.70	1633288.90	-61.20	69	0.13	-86.50	57.50	1.8	4.9	2.17
HFM05	6698651.24	1633290.28	-79.13	87	0.17	-84.00	74.60	1.8	4.9	2.73
HFM05	6698651.73	1633292.83	-99.97	108	0.26	-82.00	80.90	1.8	4.9	3.39
HFM05	6698652.10	1633295.93	-120.74	129	0.36	-80.60	83.60	1.8	4.9	4.05
HFM05	6698652.46	1633299.64	-141.40	150	0.48	-78.90	85.50	1.8	4.9	4.71
HFM05	6698652.75	1633303.41	-159.00	168	0.60	-76.80	86.80	1.8	4.9	5.28
HFM05	6698652.83	1633308.76	-179.30	189	0.77	-73.60	91.10	1.8	4.9	5.94
HFM05	6698652.63	1633312.03	-189.91	200.1	0.87	-72.20	94.90	1.8	4.9	6.29

Borehole description HFM06

Figure 1 gives a technical description of HFM06.

Technical data

Borehole HFM06

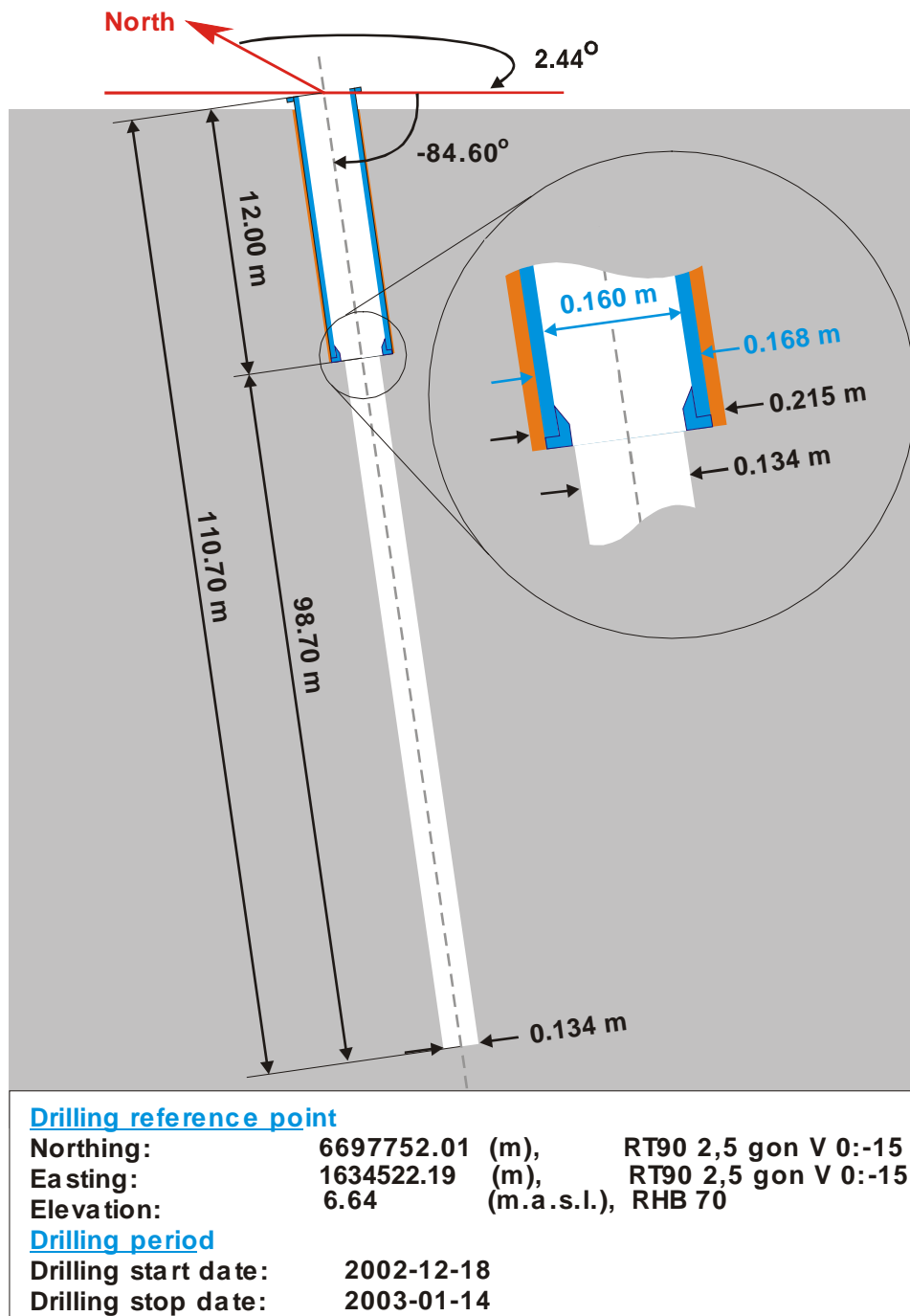


Figure 1. Technical description of HFM06.

Deviation measurement in HFM06

Two deviation measurements were performed in HFM06 with the Mac/acc (Flexit) instrument. The deviation logging activities are tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurement (ID 13141521) was executed every three metres downwards between the length 3–110 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activities ID 12960622 and 12990240 were adjusted with wrong magnetic declination and are therefore error marked. No geomagnetic disturbance exceeding 0.5 degrees in declination were observed on the date of the Mag/acc measurement, see Figure 2.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142349) the Mag/acc measurement (ID 13141521) was used. Table 2 shows the content of the EG154-file used for the calculation of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively, and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the deviation data listed in Table 1.

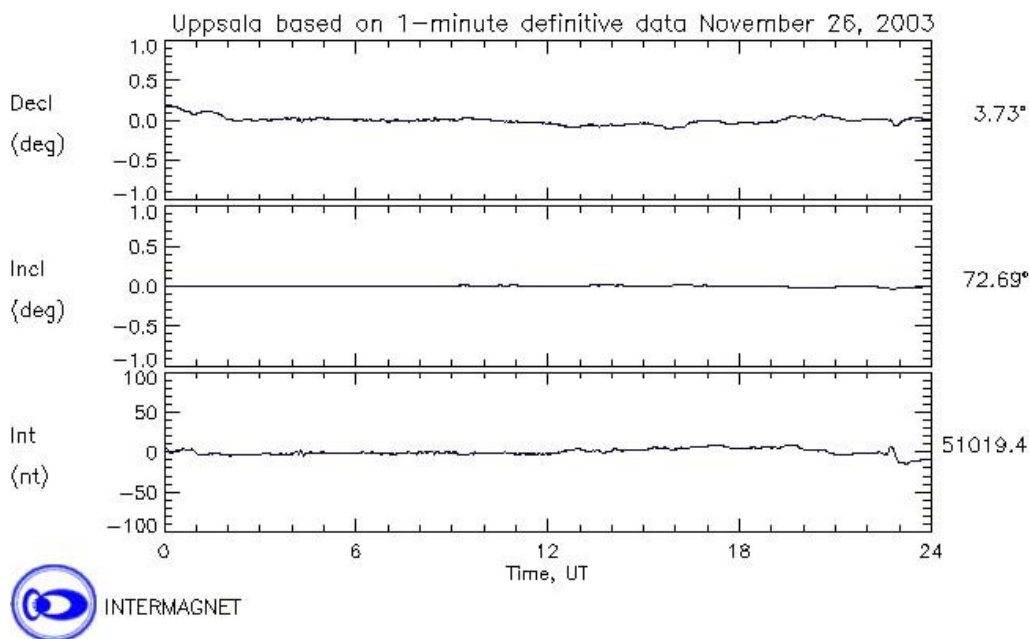


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2003-11-26. The upper curve shows the declination.

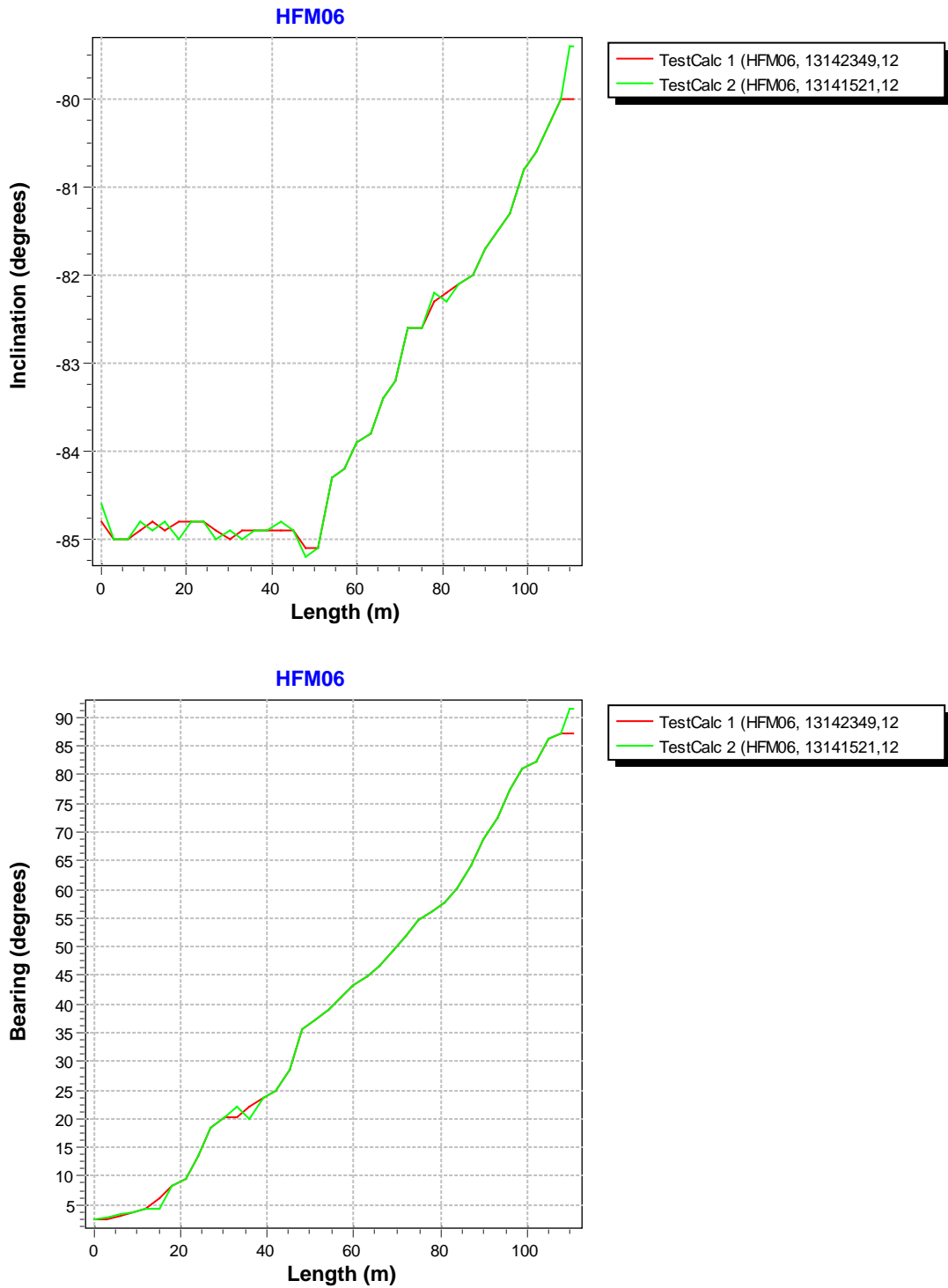


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activity specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM06	12960622	EG157	Magnetic - accelerometer measurement	2003-01-14 10:54:00	0.00	110.00	EC	060427 12:33
HFM06	13141521	EG157	Magnetic - accelerometer measurement	2003-11-26 14:00:00	3.00	110.00	F	061220 08:06
HFM06	12990240	EG157	Magnetic - accelerometer measurement	2003-11-26 14:00:00	15.00	110.00	E	061220 08:05
HFM06	13142349	EG154	Borehole deviation multiple measurements	2006-12-20 08:15:00			I C	070111 08:11

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM06	13141521	BEARING	15.00	110.00	4.900
HFM06	13141521	INCLINATION	3.00	110.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
HFM06	6697752.01	1634522.19	6.64	0	0.00	-84.80	2.44	1.8	4.9	0.00
HFM06	6697754.40	1634522.47	-20.25	27	0.08	-84.90	18.40	1.8	4.9	0.85
HFM06	6697756.10	1634523.22	-41.17	48	0.13	-85.10	35.60	1.8	4.9	1.51
HFM06	6697757.45	1634524.41	-59.08	66	0.19	-83.40	46.70	1.8	4.9	2.07
HFM06	6697759.00	1634526.65	-79.90	87	0.28	-82.00	64.30	1.8	4.9	2.73
HFM06	6697759.66	1634529.83	-100.64	108	0.38	-80.00	87.30	1.8	4.9	3.39
HFM06	6697759.68	1634530.30	-103.30	110.7	0.40	-80.00	87.30	1.8	4.9	3.48

Borehole description HFM07

Figure 1 gives a technical description of HFM07.

Technical data

Borehole HFM07

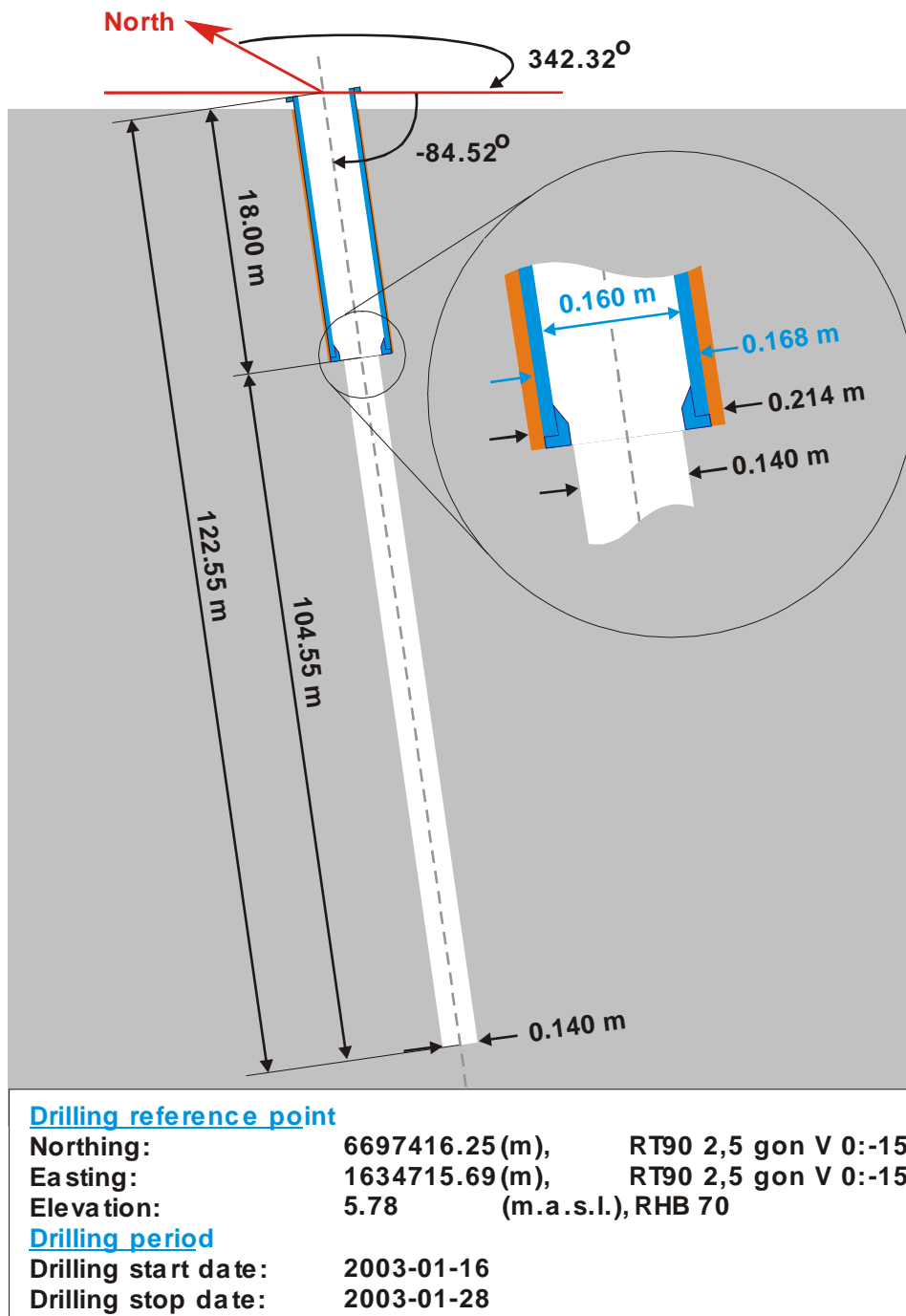


Figure 1. Technical description of HFM07.

Deviation measurements in HFM07

Two deviation measurements were performed in HFM07 with the Mac/acc (Flexit) instrument. The deviation logging activities are tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurement (ID 13141597) was executed every three metres downwards between the length 3–120 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activities ID 12960624 and 12990238 were adjusted with wrong magnetic declination and are therefore error marked. Some geomagnetic disturbances were observed on the date and time of the Mag/acc measurement, see Figure 2. These disturbances might have introduced errors up to approximately $\pm 2^\circ$ in the bearing readings.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13144127) the Mag/acc measurement (ID 13141597) was used. Table 2 shows the deviation data for the calculation.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively, and based on these values the “Radius uncertainty” was calculated for every measuring level. The bearing uncertainty (4.9°) is assumed to include the errors introduced by the magnetic disturbances.

Figure 3 shows the resulting deviation data together with the deviation data listed in Table 1.

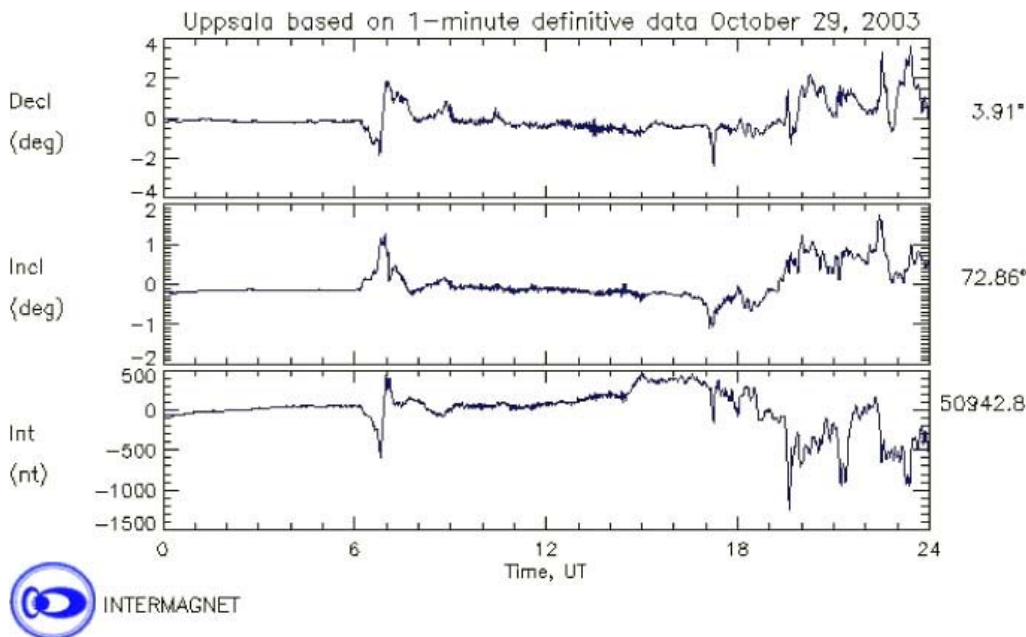


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2003-10-29. The upper curve shows the declination.

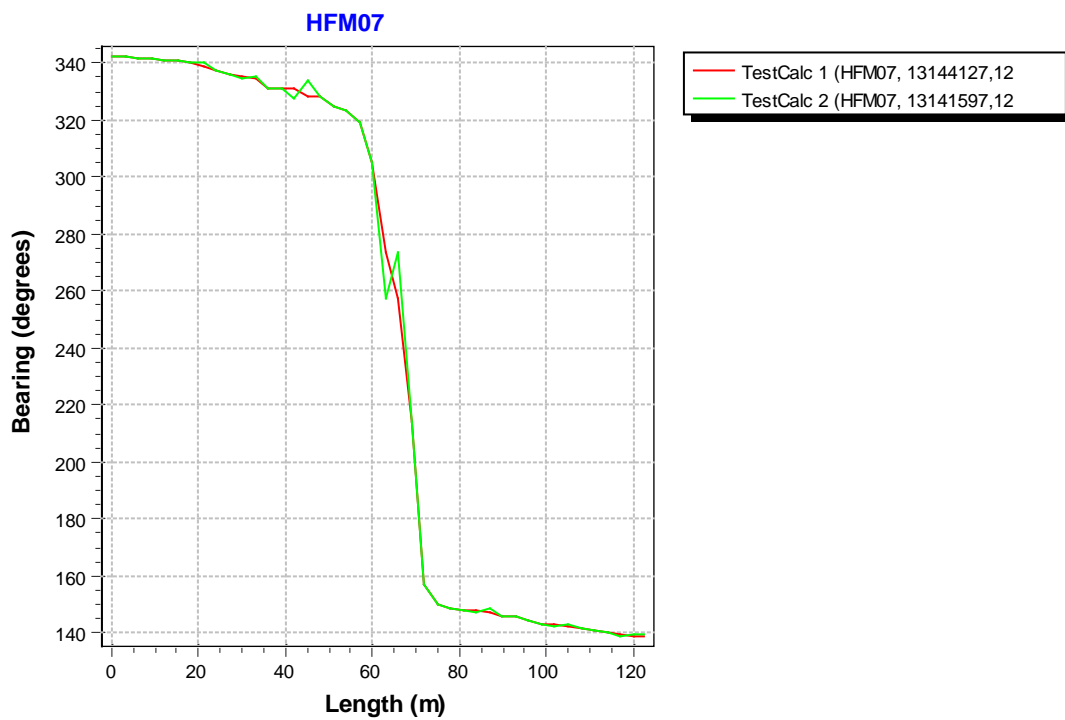
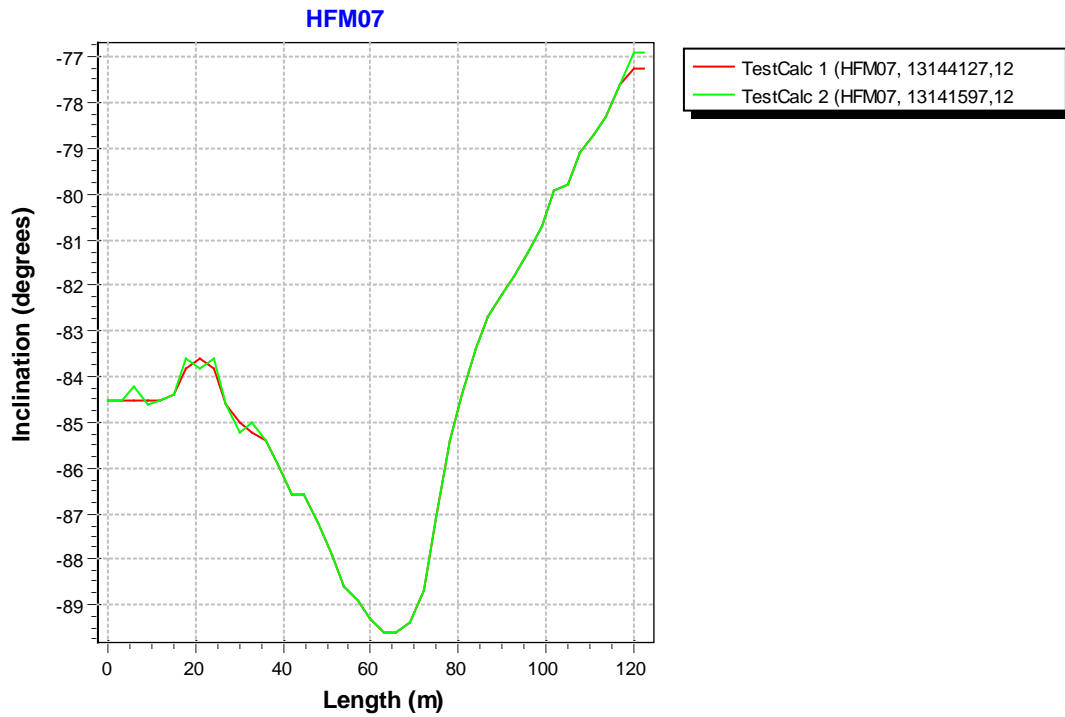


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activities specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM07	12960624	EG157	Magnetic - accelerometer measurement	2003-02-25 08:00:00	0.00	120.00	EC	060427 12:33
HFM07	12990238	EG157	Magnetic - accelerometer measurement	2003-10-29 09:00:00	21.00	120.00	E	061220 08:06
HFM07	13141597	EG157	Magnetic - accelerometer measurement	2003-10-29 09:00:00	3.00	120.00	F	070110 13:03
HFM07	13144127	EG154	Borehole deviation multiple measurements	2006-12-20 08:30:00			I C	070111 08:11

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM07	13141597	BEARING	21.00	120.00	4.900
HFM07	13141597	INCLINATION	3.00	120.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_UNCERT	INCLINATION	BEARING	INCLINATION_UNCERT	BEARING_UNCERT	RADIUS_UNCERT
HFM07	6697416.25	1634715.69	5.78	0	0.00	-84.51	342.32	1.8	4.9	0.00
HFM07	6697418.80	1634714.78	-21.08	27	0.09	-84.60	336.00	1.8	4.9	0.85
HFM07	6697420.02	1634714.15	-39.03	45	0.13	-86.60	328.10	1.8	4.9	1.41
HFM07	6697420.43	1634713.82	-60.02	66	0.14	-89.60	257.40	1.8	4.9	2.07
HFM07	6697419.30	1634714.45	-80.96	87	0.19	-82.70	147.10	1.8	4.9	2.73
HFM07	6697417.06	1634716.05	-98.74	105	0.28	-79.80	142.60	1.8	4.9	3.30
HFM07	6697414.32	1634718.32	-115.88	122.5	0.39	-77.25	139.00	1.8	4.9	3.85

Borehole description HFM08

Figure 1 gives a technical description of HFM08.

Technical data

Borehole HFM08

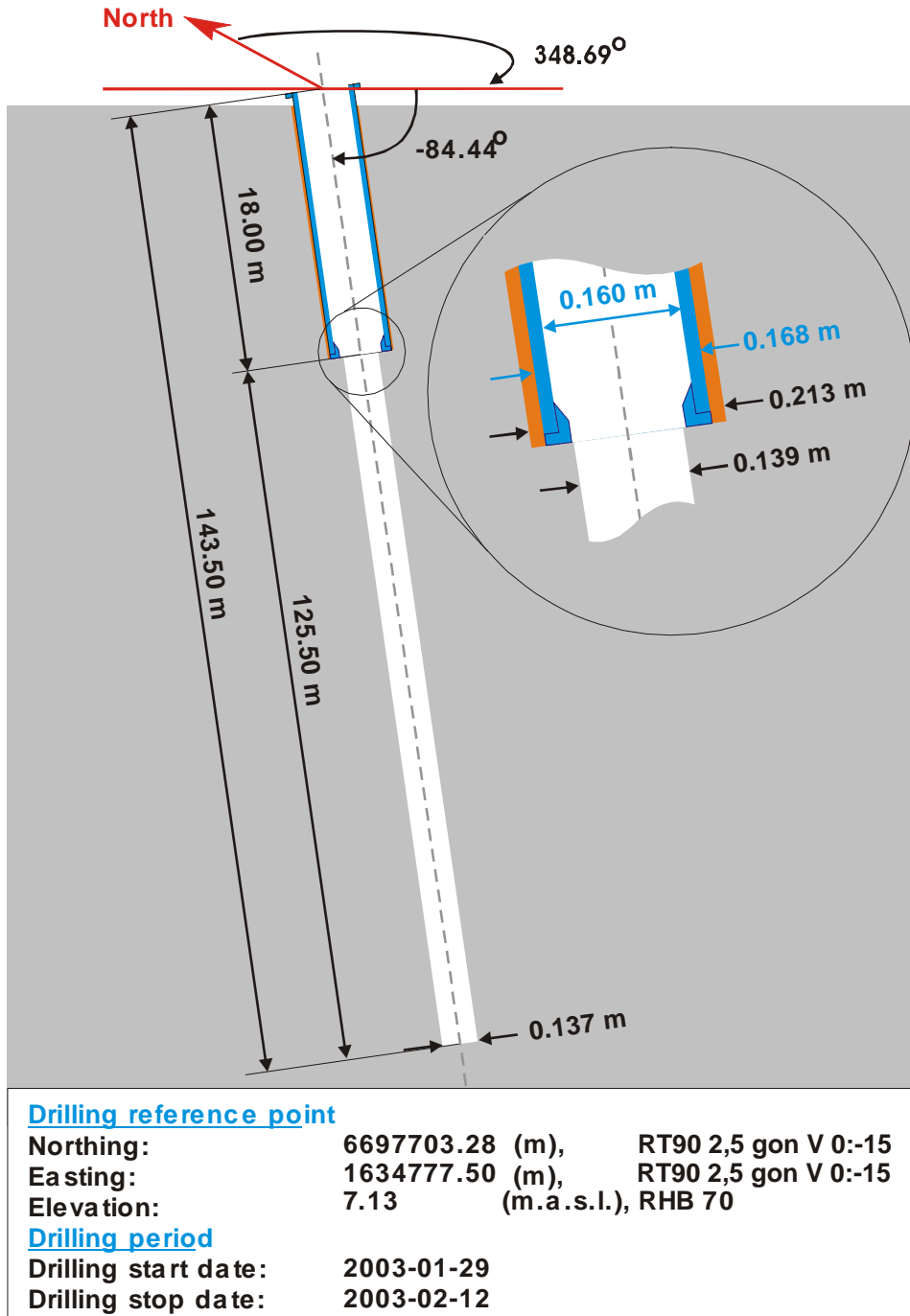


Figure 1. Technical description of HFM08.

Deviation measurements in HFM08

In total three deviation measurements were performed in HFM08 with the Mac/acc (Flexit) instrument. The deviation logging activities are tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurement (ID 13141691) was executed every three metres downwards between the length 3–141 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activities ID 12960625 and 12990239 were adjusted with wrong magnetic declination and were therefore error marked. Some geomagnetic disturbances were observed on the date and time of the Mag/acc measurement, see Figure 2. These disturbances might have introduced errors up to approximately $\pm 2^\circ$ in the bearing readings.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142356) the Mag/acc measurement (ID 13141691) was used. Table 2 shows the content of the EG154-file used for the calculation of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° (see Section 4.4.2) respectively, and based on these values the “Radius uncertainty” was calculated for every measuring level. The bearing uncertainty (4.9°) is assumed to include the errors introduced by the magnetic disturbances.

Figure 3 shows the resulting deviation data together with the deviation data listed in Table 1.

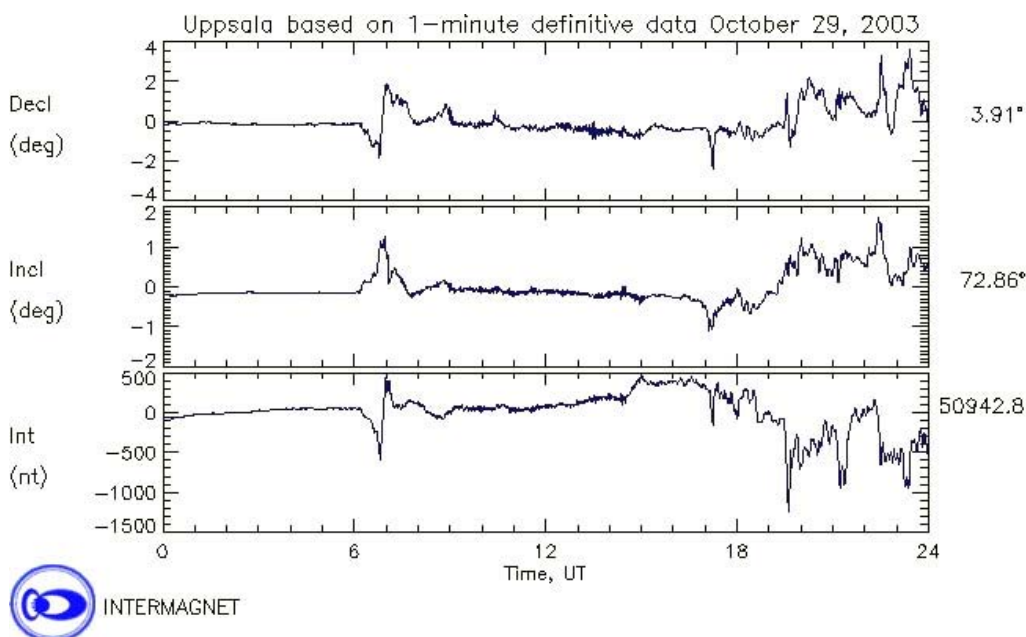


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2003-10-29. The upper curve shows the declination.

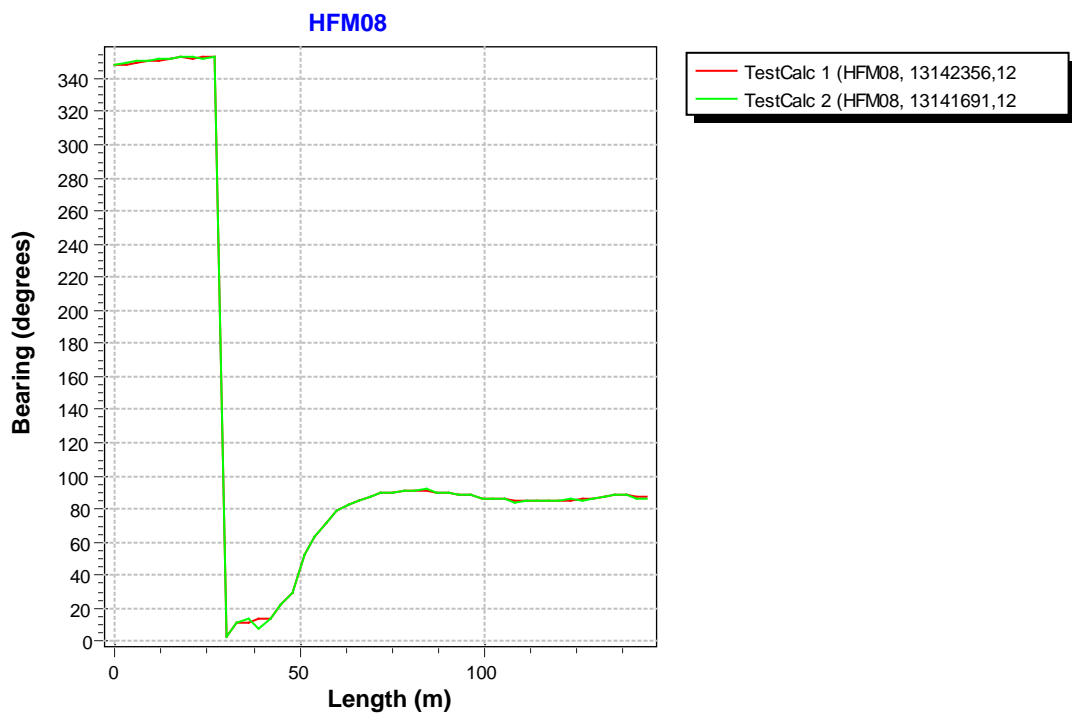
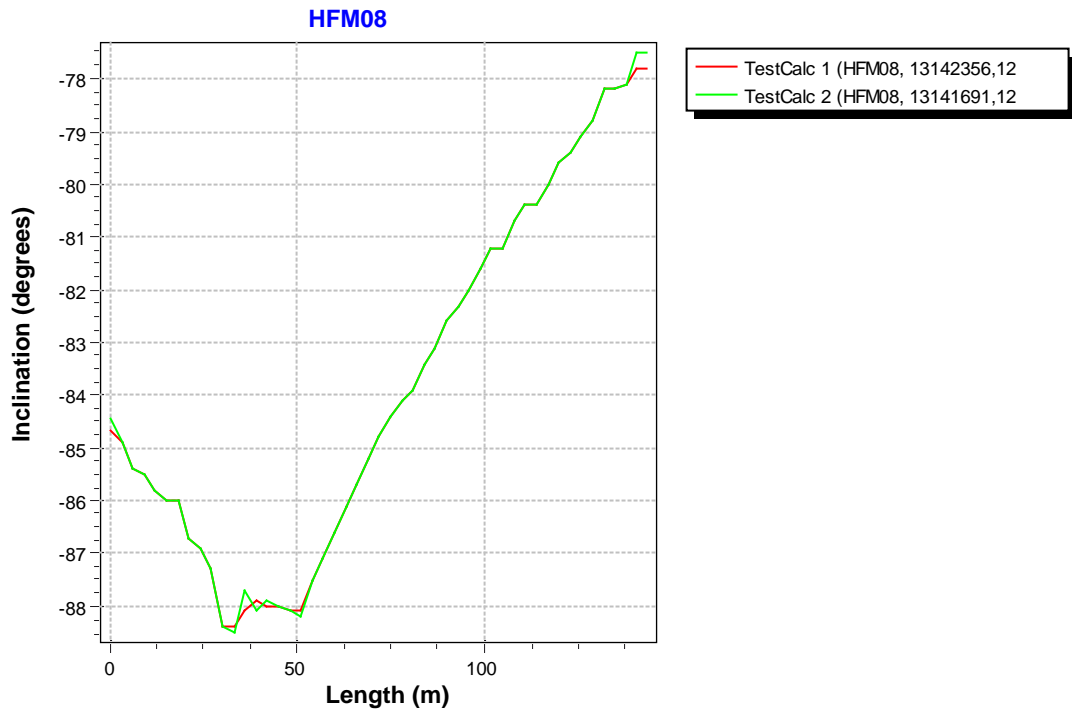


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activities specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM08	12960625	EG157	Magnetic - accelerometer measurement	2003-02-24 14:30:00	0.00	142.00	EC	060427 12:35
HFM08	12990239	EG157	Magnetic - accelerometer measurement	2003-10-29 10:00:00	21.00	141.00	E	061220 08:07
HFM08	13141691	EG157	Magnetic - accelerometer measurement	2003-10-29 10:00:00	3.00	141.00	F	061220 08:07
HFM08	13142356	EG154	Borehole deviation multiple measurements	2006-12-20 08:45:00			I C	070111 08:11

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM08	13141691	BEARING	21.00	141.00	4.900
HFM08	13141691	INCLINATION	3.00	141.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_UNCERT	INCLINATION	BEARING	INCLINATION_UNCERT	BEARING_UNCERT	RADIUS_UNCERT
HFM08	6697703.28	1634777.50	7.13	0	0.00	-84.67	348.69	1.8	4.9	0.00
HFM08	6697705.18	1634777.20	-19.80	27	0.06	-87.30	353.10	1.8	4.9	0.85
HFM08	6697705.86	1634777.35	-40.79	48	0.08	-88.10	28.80	1.8	4.9	1.51
HFM08	6697706.15	1634778.20	-58.76	66	0.11	-85.70	84.40	1.8	4.9	2.07
HFM08	6697706.15	1634780.28	-79.65	87	0.18	-83.10	90.00	1.8	4.9	2.73
HFM08	6697706.29	1634783.26	-100.44	108	0.27	-80.70	85.00	1.8	4.9	3.39
HFM08	6697706.60	1634786.96	-121.11	129	0.39	-78.80	86.50	1.8	4.9	4.05
HFM08	6697706.72	1634789.94	-135.30	143.5	0.49	-77.80	87.35	1.8	4.9	4.51

Borehole description HFM09

Figure 1 gives a technical description of HFM09.

Technical data

Borehole HFM09

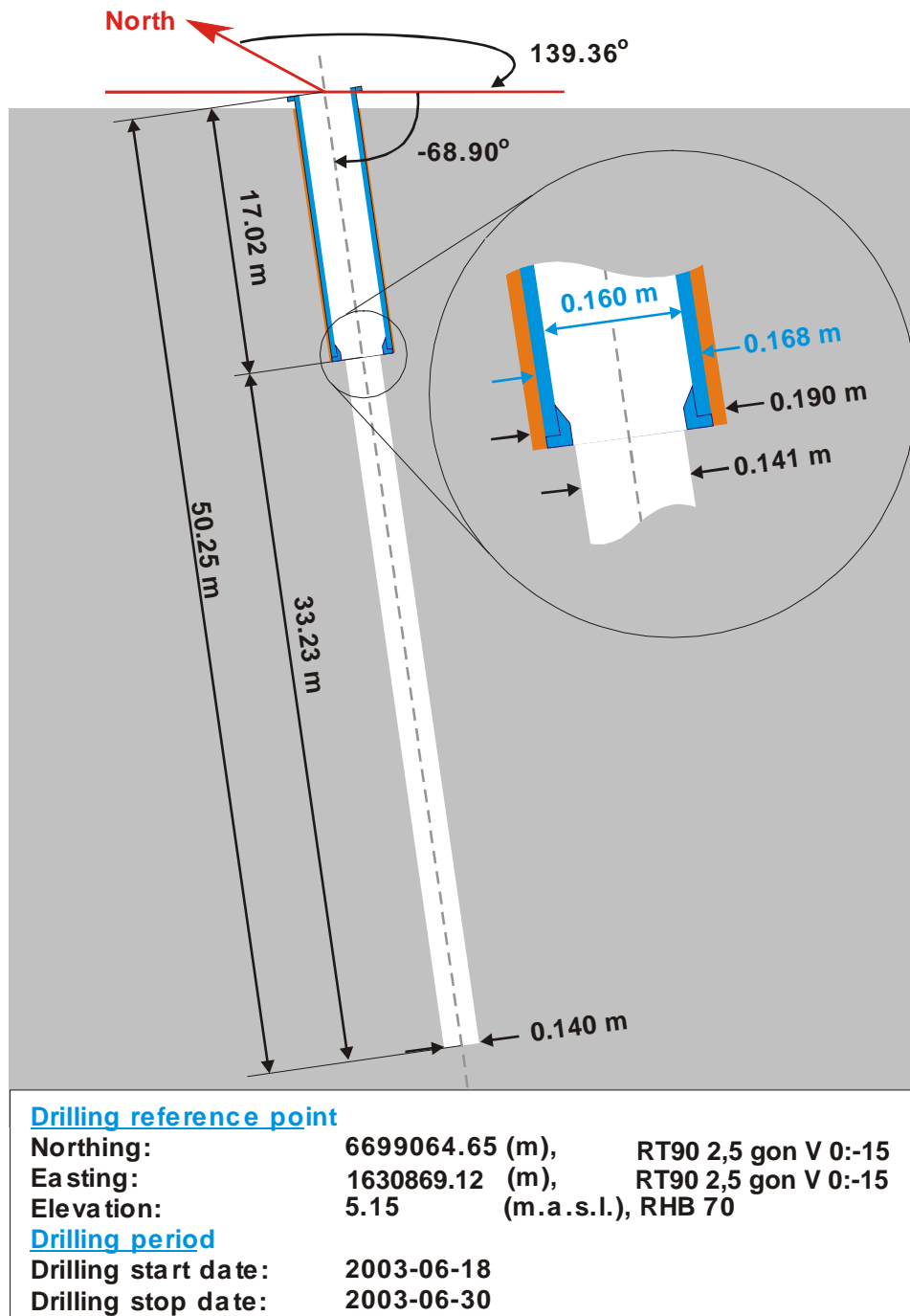


Figure 1. Technical description of HFM09.

Deviation measurement in HFM09

The only deviation measurement in HFM09 was performed with the Mac/acc (Flexit) instrument. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurement (ID 13141692) was executed every three metres downwards between the length 3–51 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurement. The activity ID 12989855 was based on the same measurement, but was adjusted with wrong magnetic declination and was therefore error marked. Some geomagnetic disturbance exceeding 0.5 degrees was observed on the date and time of the Mag/acc measurement, see Figure 2.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142358) the Mag/acc measurement (ID 13141692) was used. Table 2 shows the content of the EG154-file used for the calculation of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively (see Section 4.4.2), and based on these values the “Radius uncertainty” was calculated for every measuring level. The bearing uncertainty (4.9°) is assumed to include the errors introduced by the magnetic disturbances.

Figure 3 show the resulting deviation data together with the other, not error marked, deviation activity listed in Table 1.

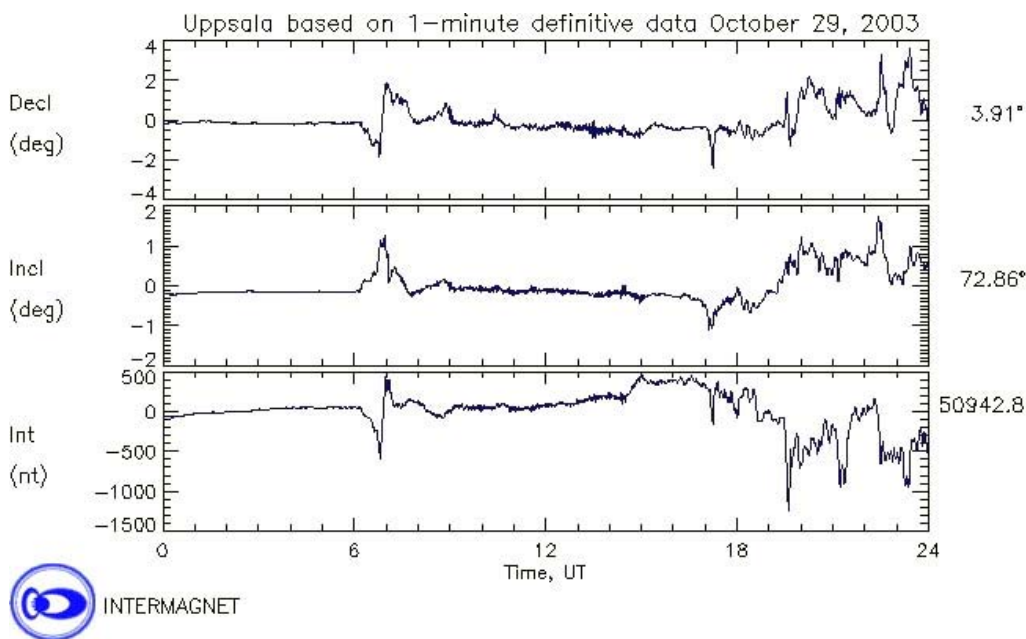


Figure 2. The geomagnetic field was observed at the Observatory in Uppsala on 2003-10-29. The upper curve shows the declination.

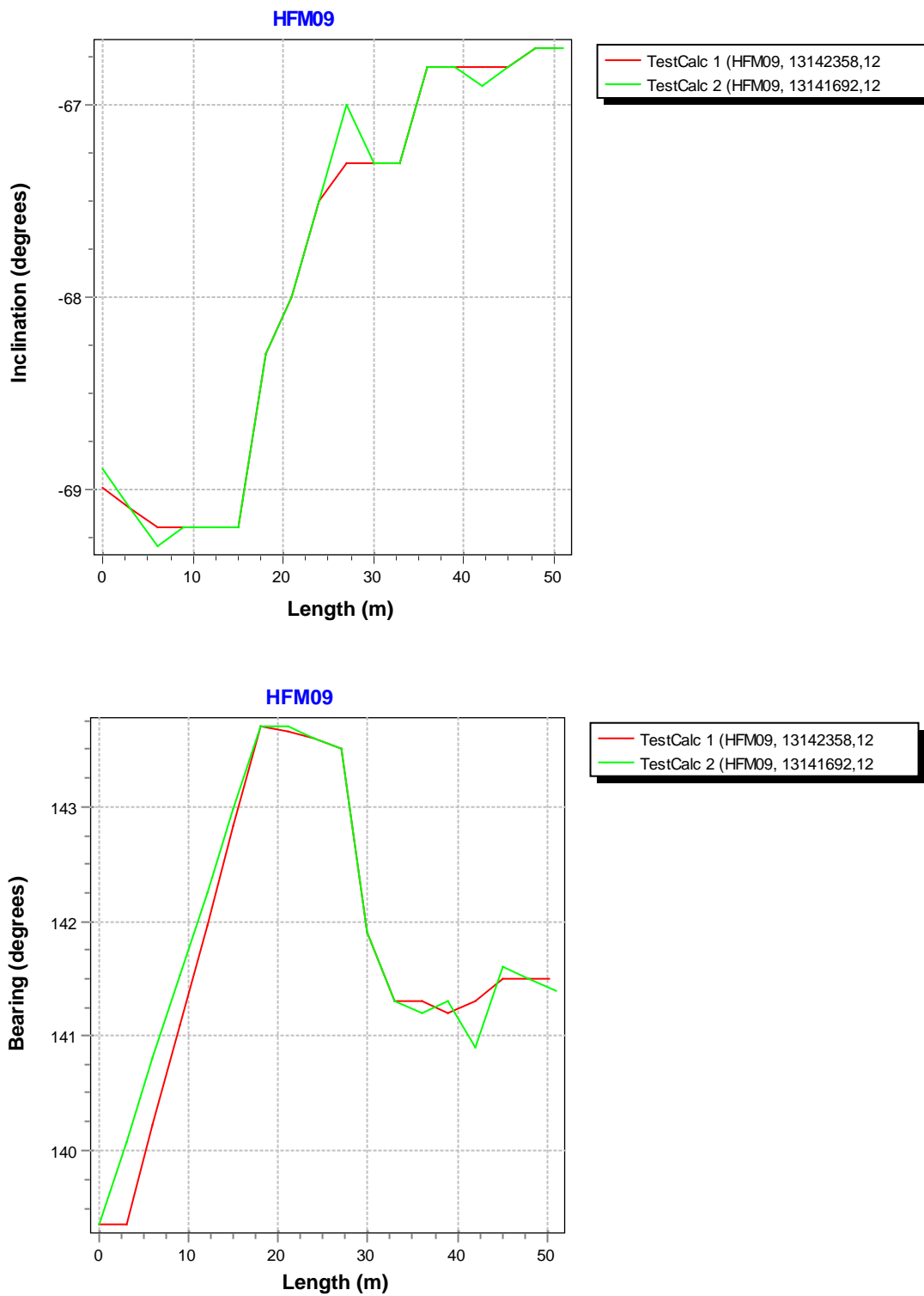


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activity specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM09	12989855	EG157	Magnetic - accelerometer measurement	2003-10-29 11:00:00	21.00	48.00	E	061220 08:08
HFM09	13141692	EG157	Magnetic - accelerometer measurement	2003-10-29 11:00:00	3.00	51.00	F	061220 08:08
HFM09	13142358	EG154	Borehole deviation multiple measurements	2006-12-20 09:15:00			I C	070111 08:11

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM09	13141692	BEARING	21.00	51.00	4.900
HFM09	13141692	INCLINATION	3.00	51.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_UNCERT	INCLINATION	BEARING	INCLINATION_UNCERT	BEARING_UNCERT	RADIUS_UNCERT
HFM09	6699064.65	1630869.12	5.15	0	0.00	-69.00	139.36	1.8	4.9	0.00
HFM09	6699056.90	1630875.17	-20.00	27	0.31	-67.30	143.50	1.8	4.9	0.86
HFM09	6699050.47	1630880.27	-39.32	48	0.57	-66.70	141.50	1.8	4.9	1.56
HFM09	6699049.77	1630880.83	-41.39	50.25	0.60	-66.70	141.50	1.8	4.9	1.64

Borehole description HFM10

Figure 1 gives a technical description of HFM10.

Technical data

Borehole HFM10

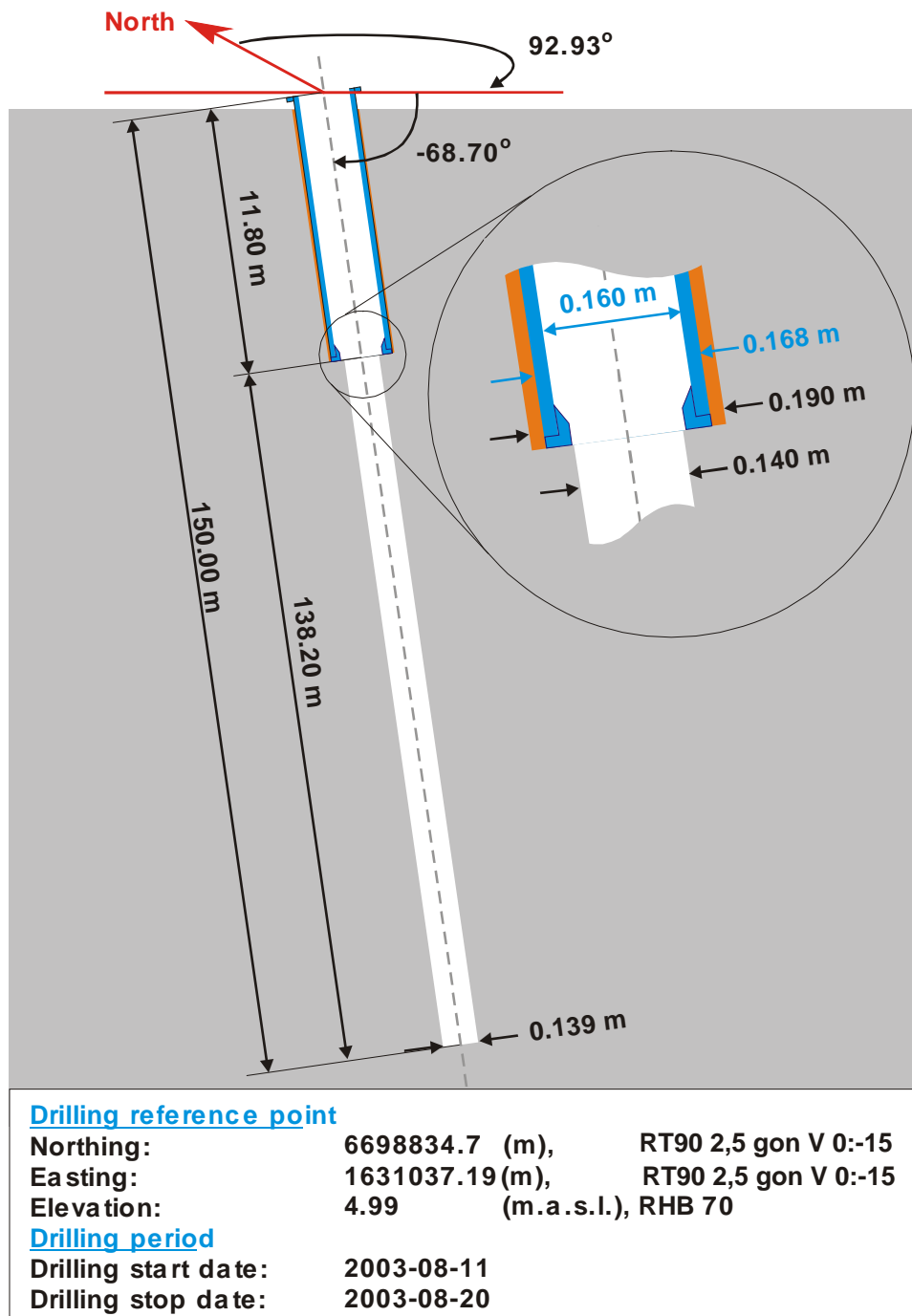


Figure 1. Technical description of HFM10.

Deviation measurement in HFM10

The only deviation measurement in HFM10 was performed with the Mac/acc (Flexit) instrument. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurement (ID 13141716) was executed every three metres downwards between the length 3–150 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activities ID 12989854 and 13125506 were based on the same measurement, but were adjusted with wrong magnetic declination and were therefore error marked. No geomagnetic disturbance exceeding 0.5 degrees was observed on the date and time of the Mag/acc measurement, see Figure 2.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142361) the Mag/acc measurement (ID 13141716) was used. Table 2 shows the content of the EG154-file used for the calculations of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively (see Section 4.4.2), and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activity listed in Table 1.

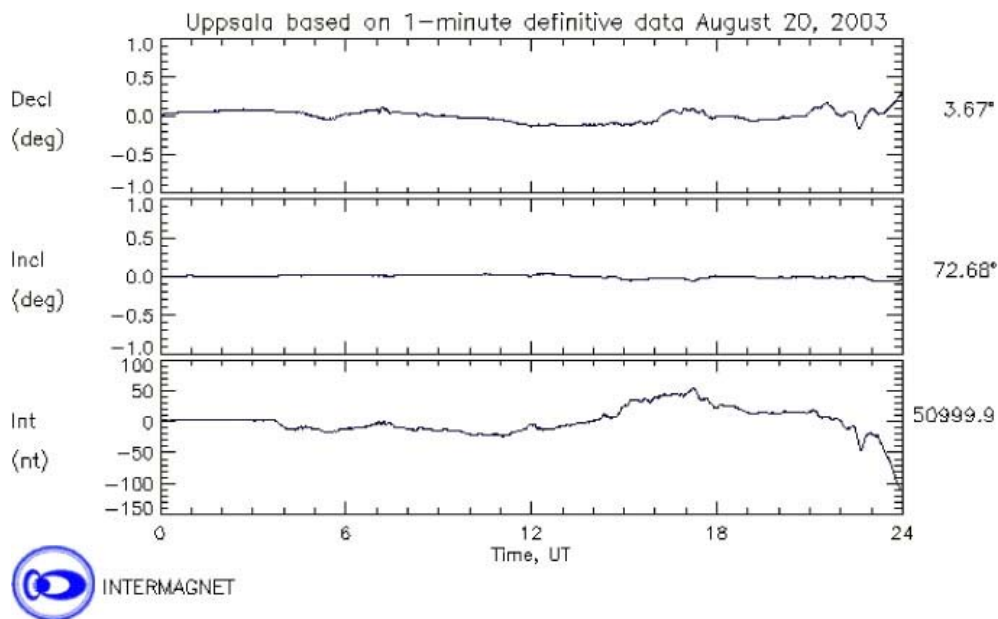


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2003-08-20. The upper curve shows the declination.

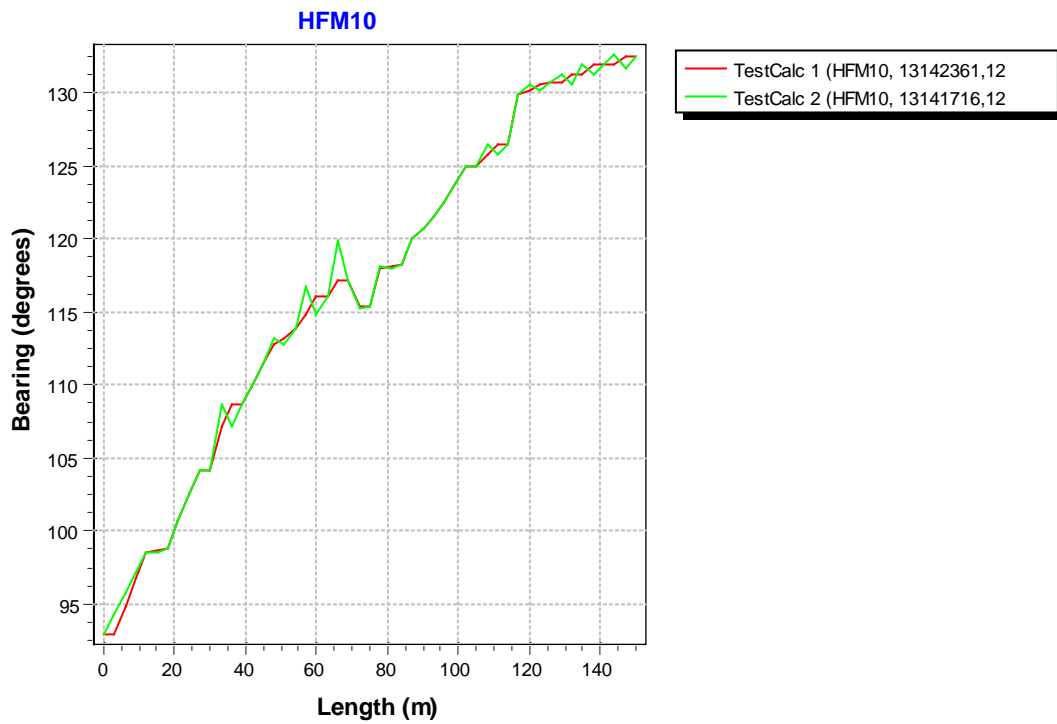
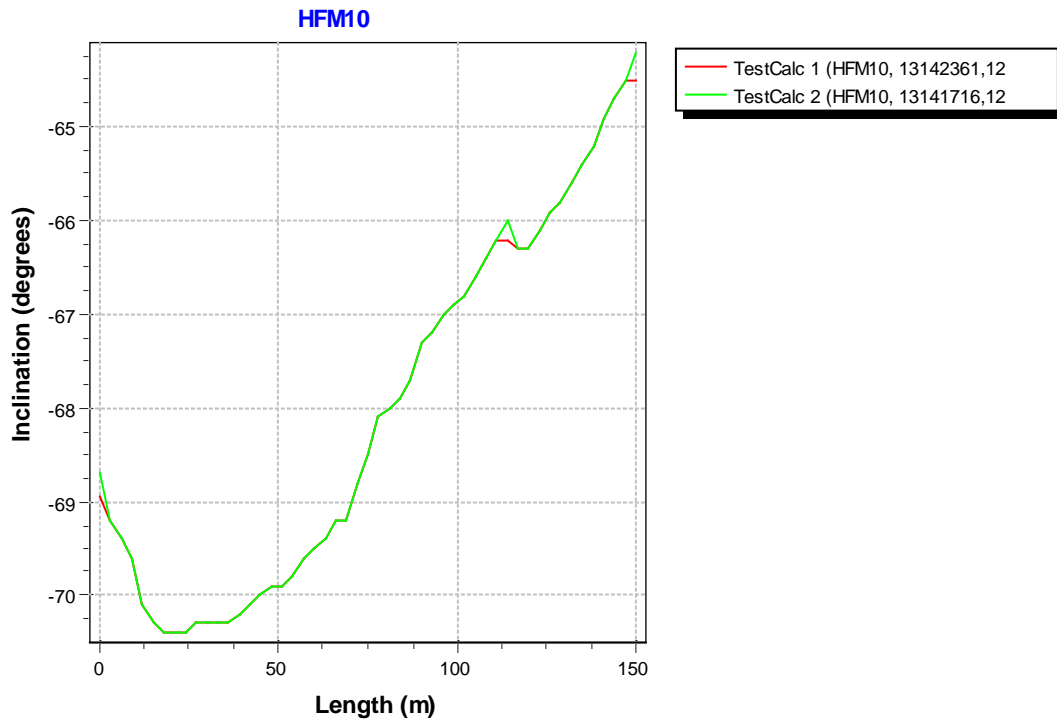


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activities specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM10	12989854	EG157	Magnetic - accelerometer measurement	2003-08-20 14:00:00	15.00	150.00	E	061220 08:09
HFM10	13125506	EG157	Magnetic - accelerometer measurement	2003-08-20 14:00:00	15.00	150.00	E	061220 08:09
HFM10	13141716	EG157	Magnetic - accelerometer measurement	2003-08-20 14:00:00	3.00	150.00	F	061220 08:09
HFM10	13142361	EG154	Borehole deviation multiple measurements	2006-12-20 09:30:00			I C	070111 08:11

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM10	13141716	BEARING	15.00	150.00	4.900
HFM10	13141716	INCLINATION	3.00	150.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_UNCERT	INCLINATION	BEARING	INCLINATION_UNCERT	BEARING_UNCERT	RADIUS_UNCERT
HFM10	6698834.79	1631037.19	4.99	0	0.00	-68.95	92.93	1.8	4.9	0.00
HFM10	6698833.50	1631046.35	-20.37	27	0.29	-70.30	104.20	1.8	4.9	0.85
HFM10	6698831.25	1631053.09	-40.13	48	0.51	-69.90	112.70	1.8	4.9	1.51
HFM10	6698828.14	1631059.73	-59.81	69	0.74	-69.20	117.20	1.8	4.9	2.17
HFM10	6698824.51	1631066.63	-79.30	90	0.99	-67.30	120.70	1.8	4.9	2.84
HFM10	6698819.18	1631074.47	-101.35	114	1.29	-66.20	126.50	1.8	4.9	3.65
HFM10	6698813.65	1631080.99	-120.53	135	1.56	-65.40	131.20	1.8	4.9	4.38
HFM10	6698809.39	1631085.73	-134.11	150	1.76	-64.50	132.40	1.8	4.9	4.93

Borehole description HFM11

Figure 1 gives a technical description of HFM11.

Technical data

Borehole HFM11

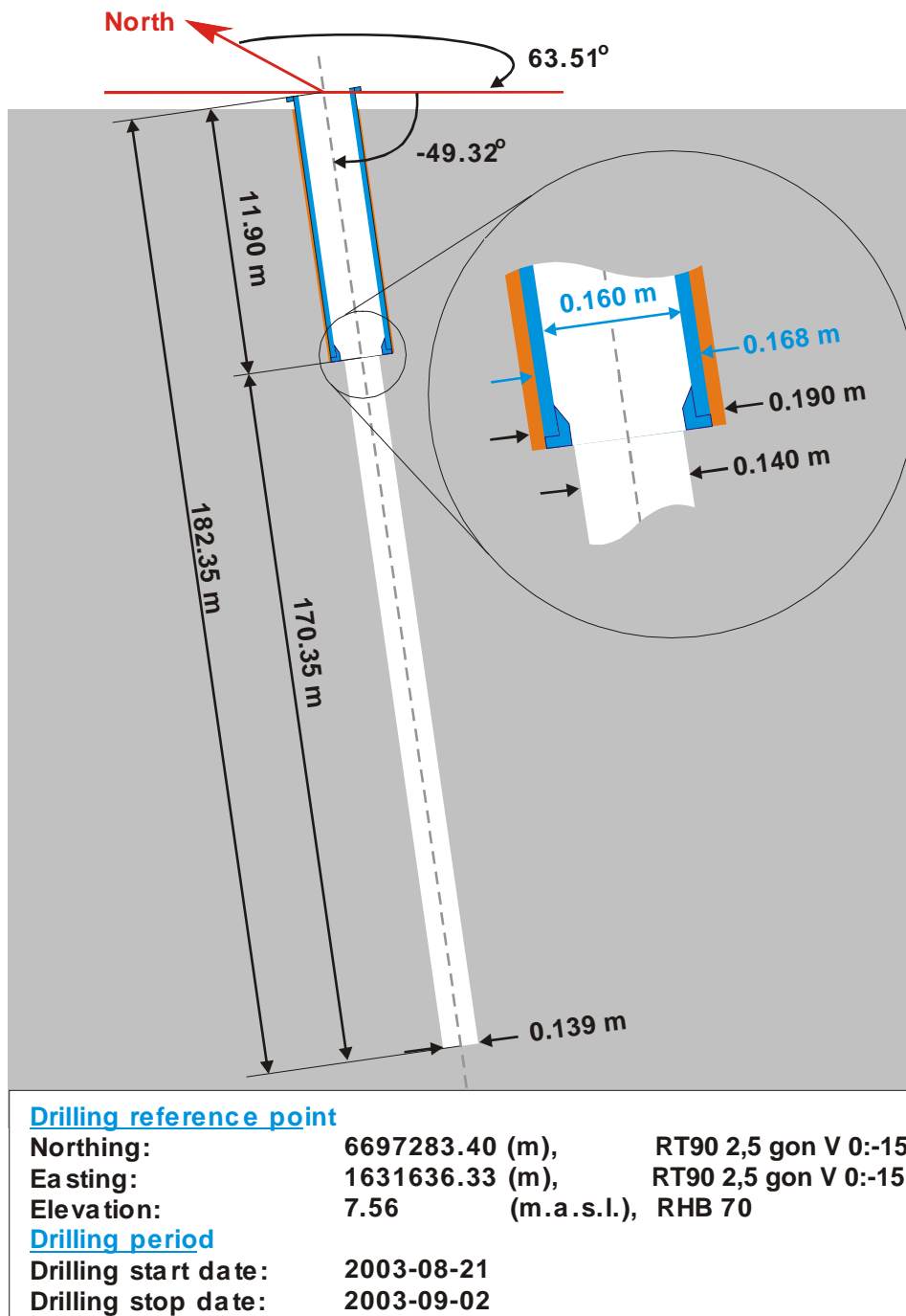


Figure 1. Technical description of HFM11.

Deviation measurements in HFM11

The only deviation measurement in HFM11 was performed with the Mag/acc (Flexit) instrument. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurement (ID 13141747) was executed every three metres downwards between the length 3–182 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activity ID 12990241 was based on the same measurement, but was adjusted with wrong magnetic declination and was therefore error marked. No geomagnetic disturbances exceeding 0.5 degrees in declination were observed on the date of the Mag/acc measurement, see Figure 2.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142362) the Mag/acc measurement (ID 13141747) was used. Table 2 shows the contents of the EG154-file used for the calculation of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively (see Section 4.4.2), and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activity listed in Table 1.

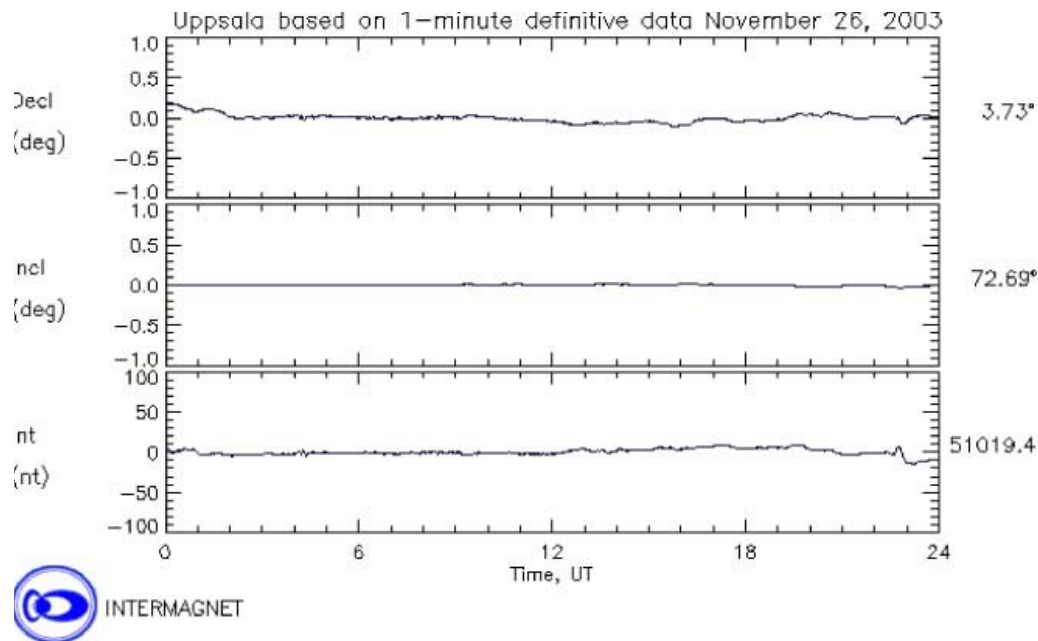


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2003-11-26. The upper curve shows the declination.

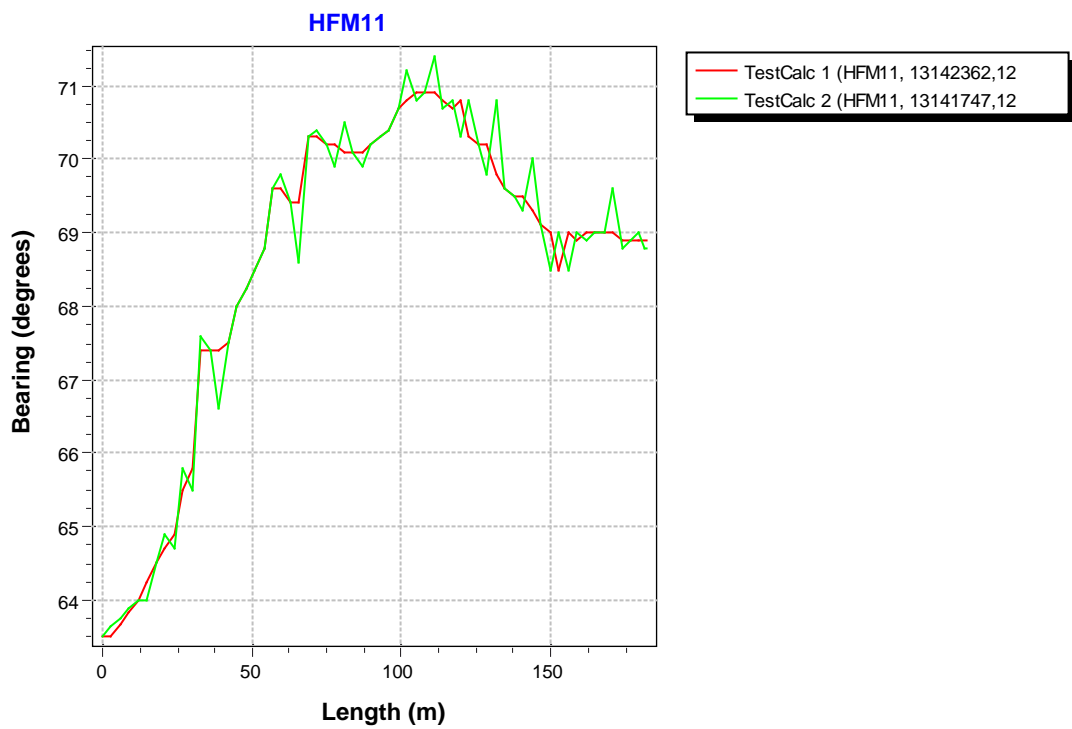
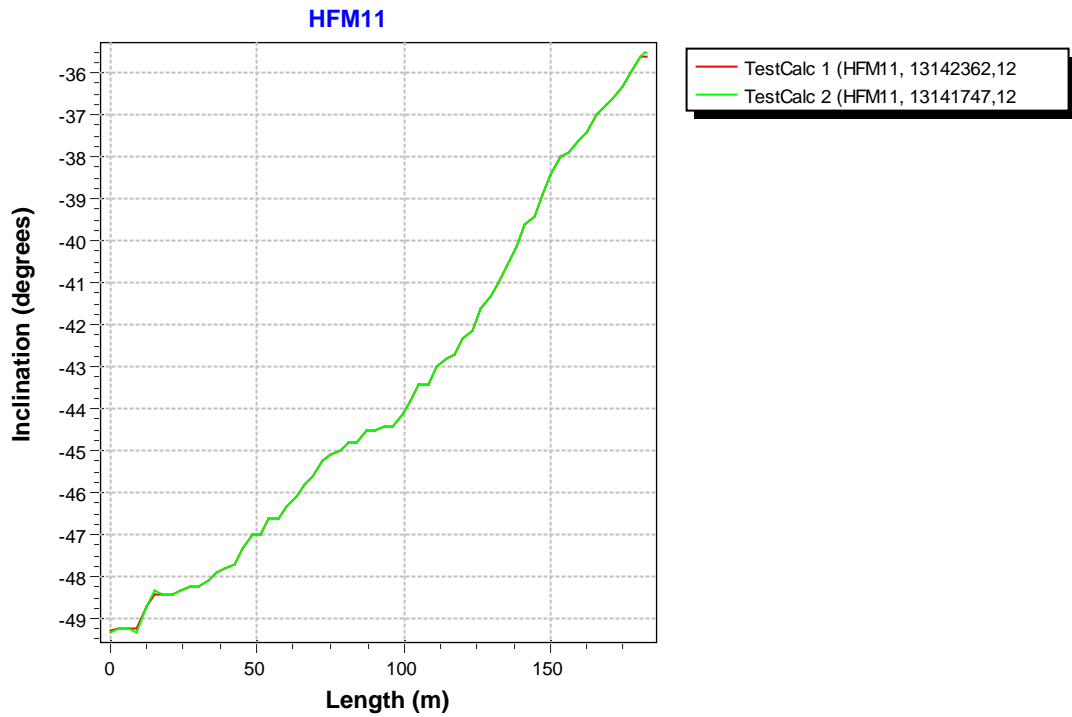


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked, deviation activity specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM11	13141747	EG157	Magnetic - accelerometer measurement	2003-11-26 10:30:00	3.00	182.00	F	061220 08:11
HFM11	12990241	EG157	Magnetic - accelerometer measurement	2003-11-26 10:30:00	15.00	182.00	E	061220 08:11
HFM11	13142362	EG154	Borehole deviation multiple measurements	2006-12-20 09:40:00			I C	070111 08:11

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM11	13141747	BEARING	15.00	182.00	4.900
HFM11	13141747	INCLINATION	3.00	182.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
HFM11	6697283.40	1631636.33	7.56	0	0.00	-49.26	63.51	1.8	4.9	0.00
HFM11	6697293.54	1631657.88	-19.43	36	0.75	-47.90	67.40	1.8	4.9	2.04
HFM11	6697300.30	1631675.00	-39.19	63	1.33	-46.10	69.40	1.8	4.9	3.61
HFM11	6697307.52	1631694.92	-60.42	93	1.99	-44.40	70.30	1.8	4.9	5.42
HFM11	6697314.73	1631715.52	-81.00	123	2.68	-42.10	70.30	1.8	4.9	7.29
HFM11	6697322.74	1631737.02	-100.32	153	3.40	-38.00	68.50	1.8	4.9	9.26
HFM11	6697331.19	1631758.94	-117.91	182.35	4.14	-35.60	68.90	1.8	4.9	11.27

Borehole description HFM12

Figure 1 gives a technical description of HFM12.

Technical data

Borehole HFM12

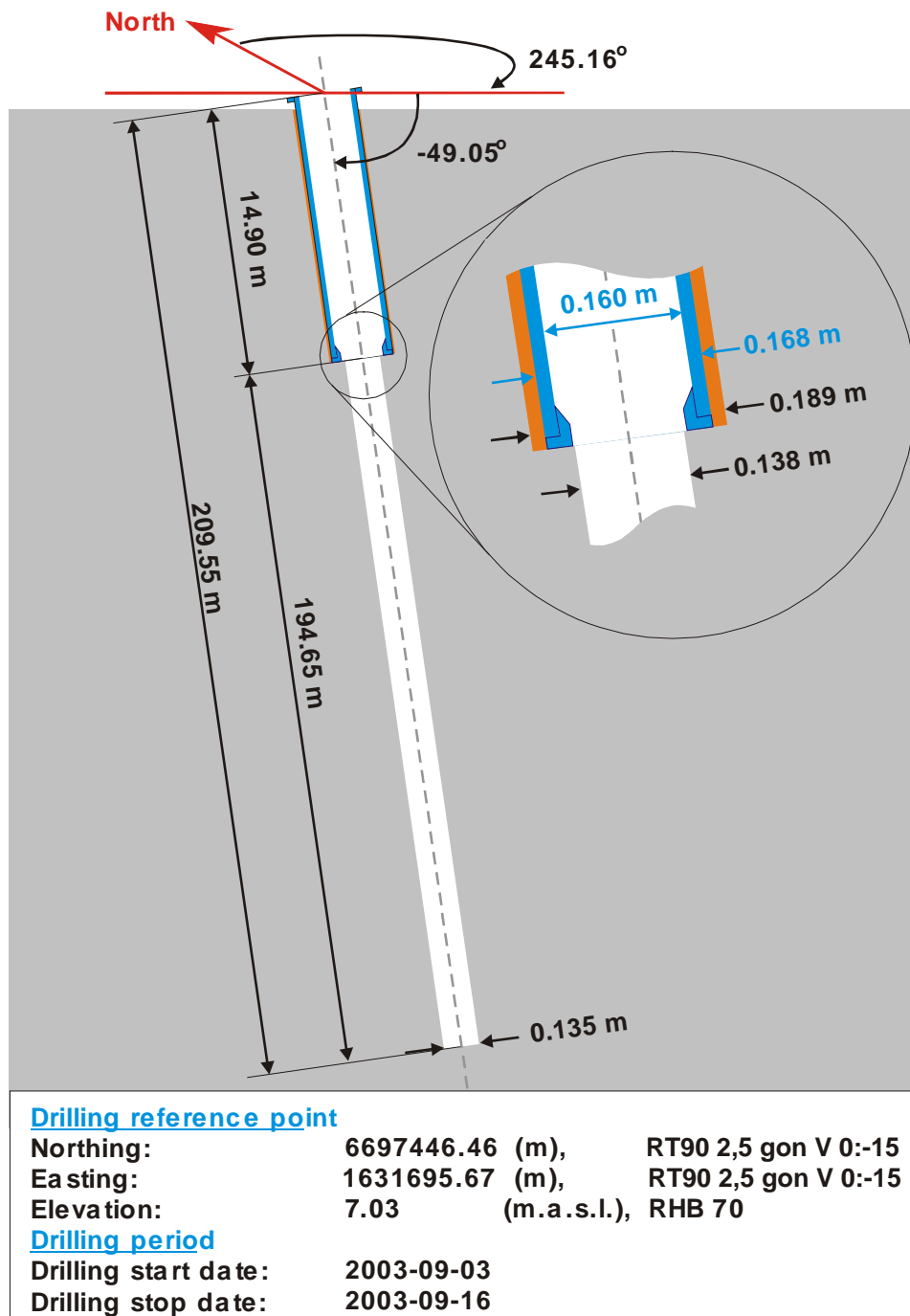


Figure 1. Technical description of HFM12.

Deviation measurement in HFM12

The only deviation measurement in HFM12 was performed with the Mag/acc (Flexit) instrument. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurement (ID 13141764) was executed every three metres downwards between the length 3–210 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activity ID 12989856 was based on the same measurement, but was adjusted with wrong magnetic declination and was therefore error marked. No geomagnetic disturbances exceeding 0.5 degrees in declination were observed on the date of the Mag/acc measurement, see Figure 2.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142368) the Mag/acc measurement (ID 13141764) was used. Table 2 shows the contents of the EG154-file used for the calculation of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively (see Section 4.4.2), and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activity listed in Table 1.

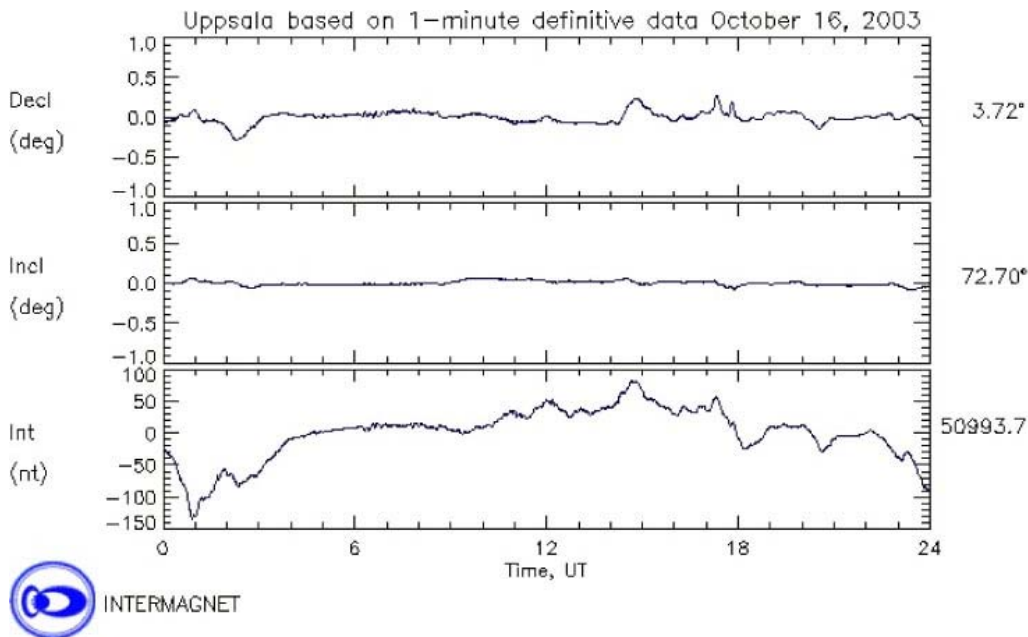


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2003-10-16. The upper curve shows the declination.

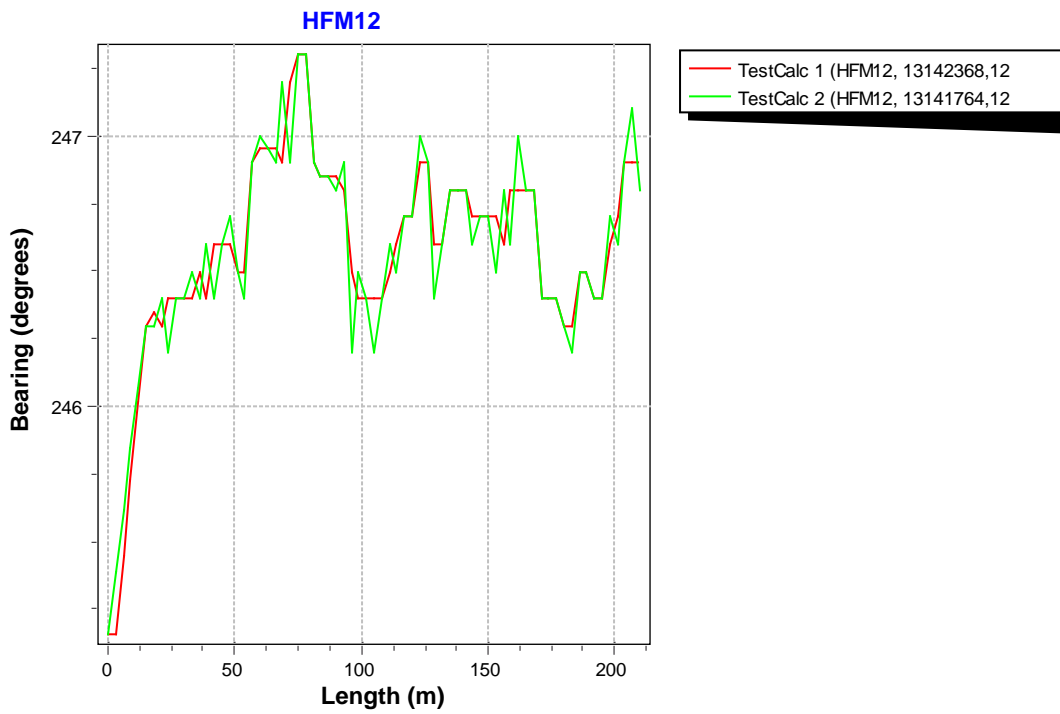
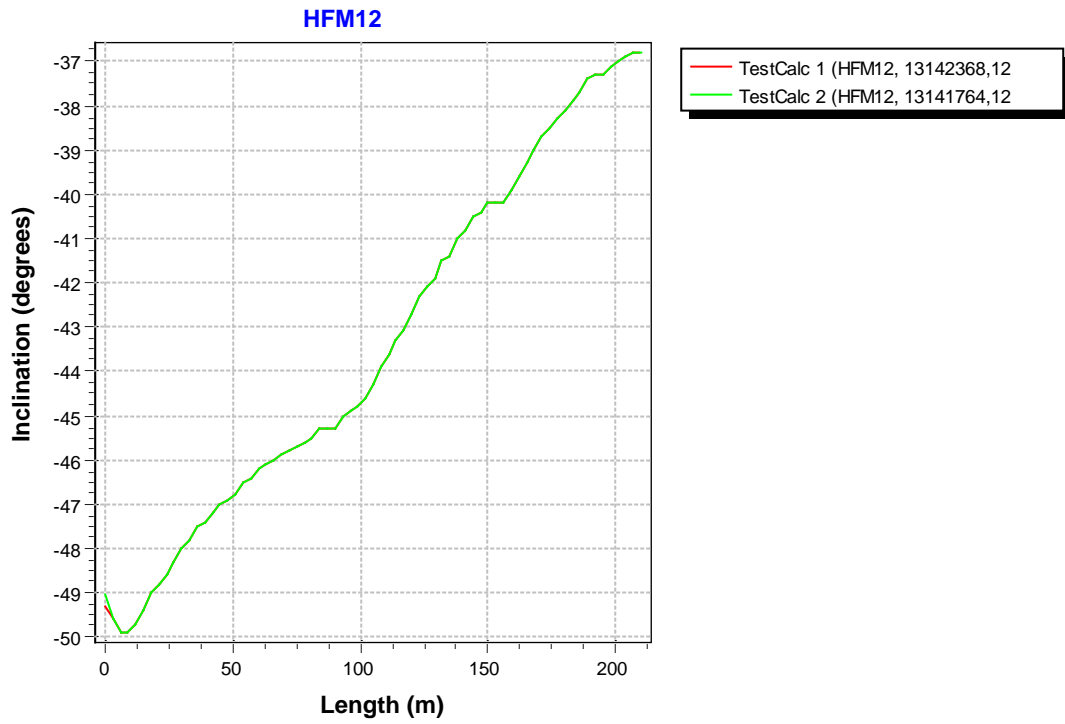


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activity specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM12	13141764	EG157	Magnetic - accelerometer measurement	2003-10-16 15:00:00	3.00	210.00	F	061220 08:11
HFM12	12989856	EG157	Magnetic - accelerometer measurement	2003-10-16 15:00:00	18.00	207.00	E	061220 08:11
HFM12	13142368	EG154	Borehole deviation multiple measurements	2006-12-20 09:50:00			I C	070111 08:11

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM12	13141764	BEARING	18.00	210.00	4.900
HFM12	13141764	INCLINATION	3.00	210.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_UNCERT	INCLINATION	BEARING	INCLINATION_UNCERT	BEARING_UNCERT	RADIUS_UNCERT
HFM12	6697446.46	1631695.67	7.03	0	0.00	-49.33	245.16	1.8	4.9	0.00
HFM12	6697436.87	1631674.06	-20.12	36	0.74	-47.50	246.50	1.8	4.9	2.02
HFM12	6697429.54	1631657.10	-39.80	63	1.33	-46.10	246.95	1.8	4.9	3.60
HFM12	6697422.17	1631639.72	-59.11	90	1.92	-45.30	246.85	1.8	4.9	5.22
HFM12	6697413.61	1631619.97	-80.00	120	2.60	-42.70	246.70	1.8	4.9	7.06
HFM12	6697404.71	1631599.28	-99.82	150	3.30	-40.20	246.70	1.8	4.9	8.99
HFM12	6697394.55	1631575.80	-120.66	183	4.11	-37.90	246.30	1.8	4.9	11.18
HFM12	6697386.15	1631556.40	-136.71	209.55	4.77	-36.80	246.90	1.8	4.9	12.98

Borehole description HFM13

Figure 1 gives a technical description of HFM13.

Technical data

Borehole HFM13

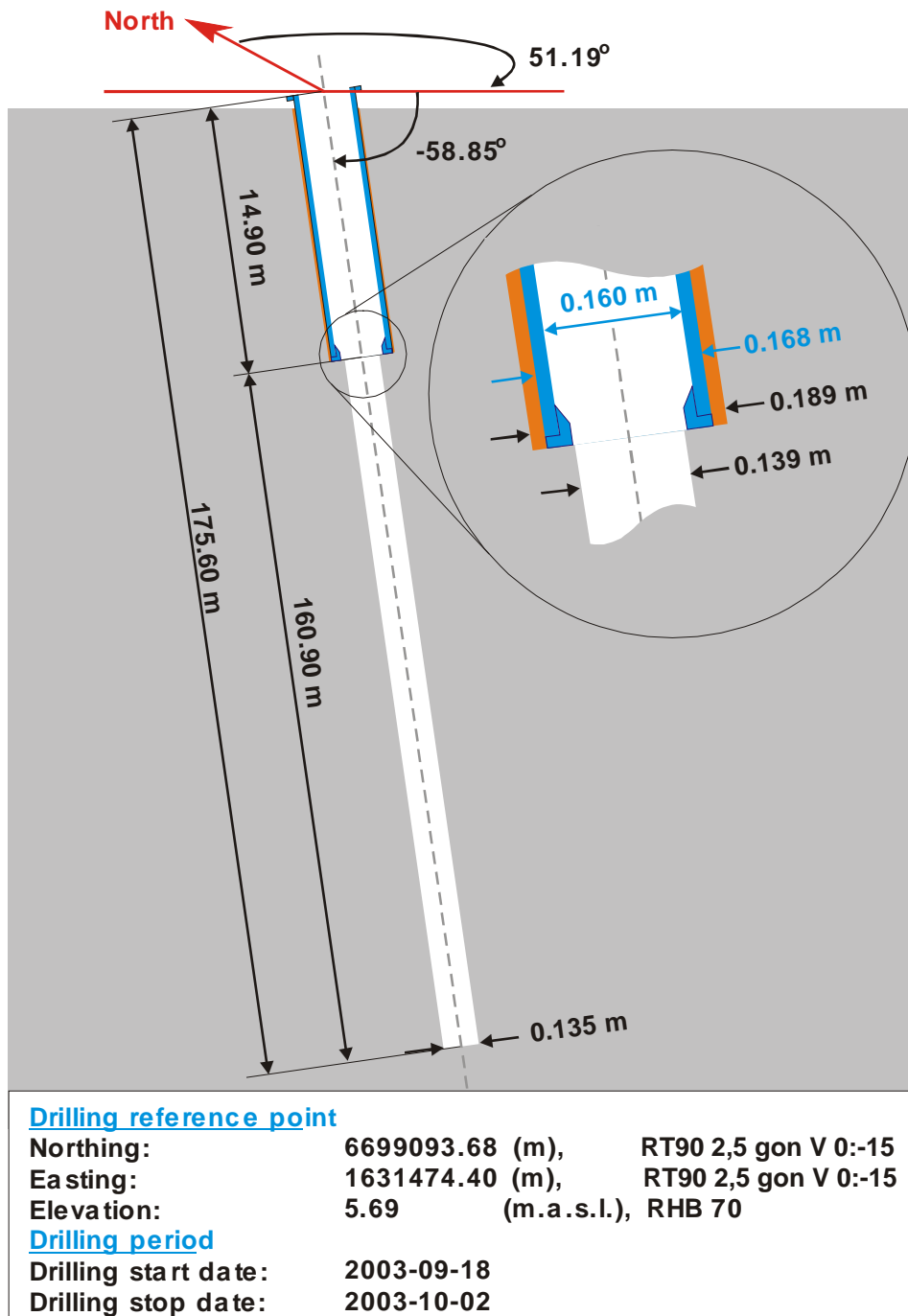


Figure 1. Technical description of HFM13.

Deviation measurement in HFM13

The only deviation measurement in HFM13 was performed with the Mag/acc (Flexit) instrument. The deviation logging activities are tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurement (ID 13141793) was executed every three metres downwards between the length 3–174 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activity ID 12990242 was based on the same measurement, but was adjusted with wrong magnetic declination and was therefore error marked. No geomagnetic disturbance exceeding 0.5 degrees in declination was observed on the date and time of the Mag/acc measurement, see Figure 2.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142369) the Mag/acc measurement (ID 13141793) was used. Table 2 shows the contents of the EG154-file for calculation of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively (see Section 4.4.2), and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activity listed in Table 1.

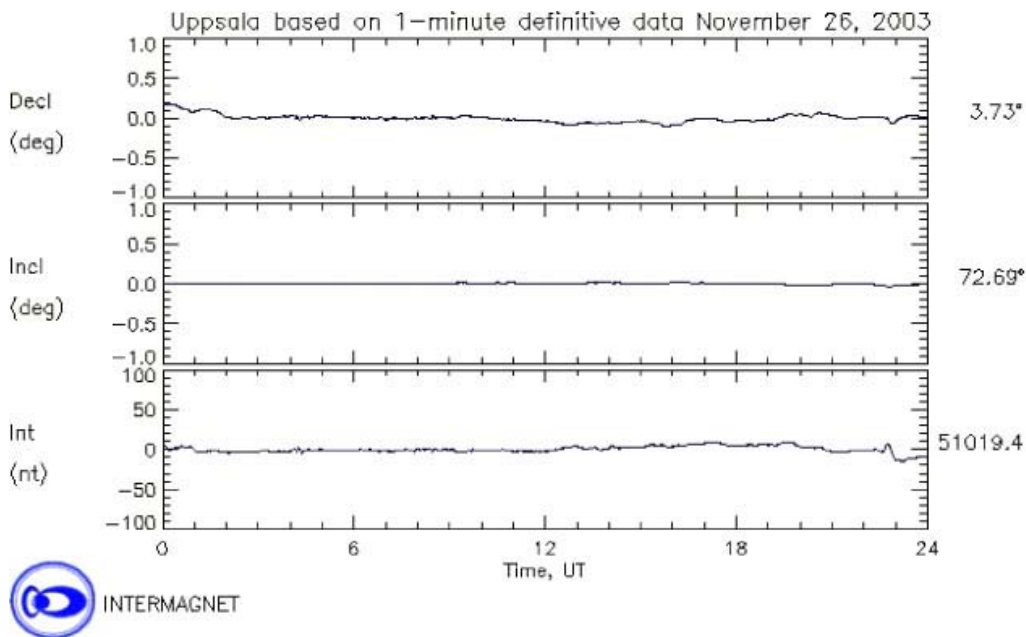


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2003-11-26. The upper curve shows the declination.

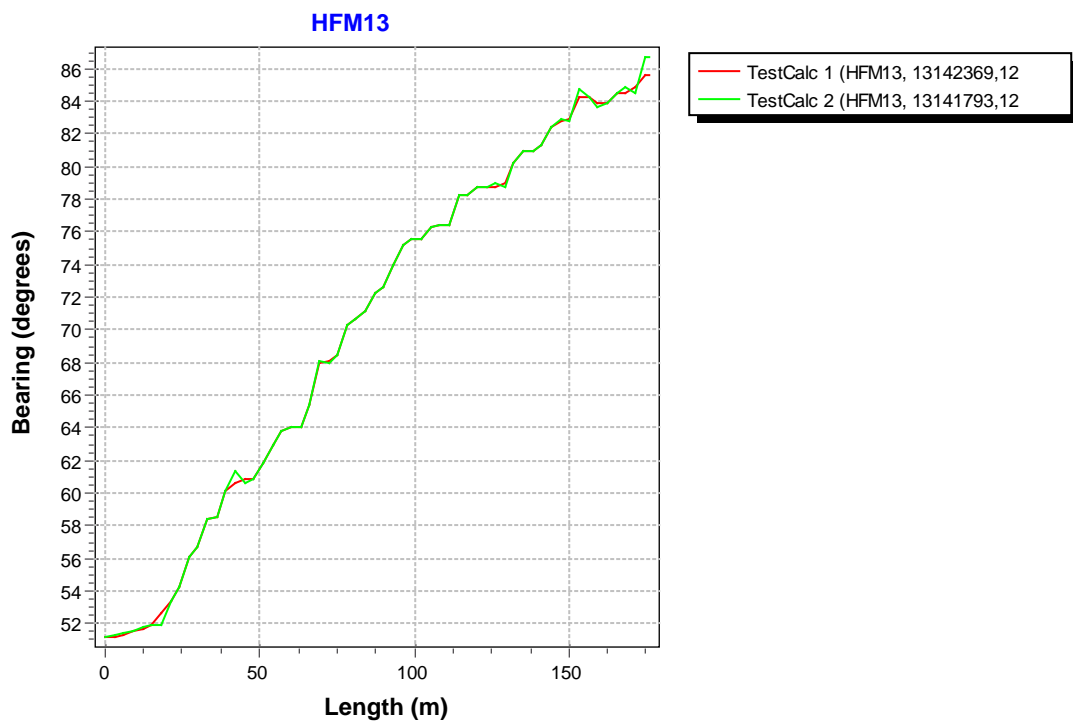
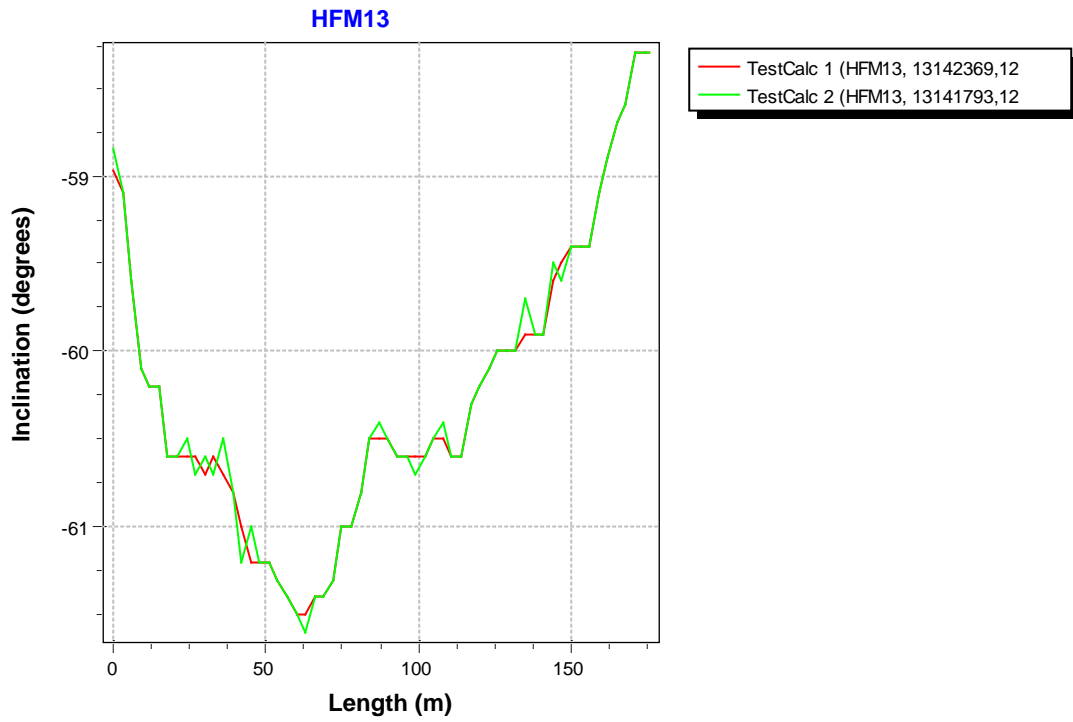


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activity specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM13	13141793	EG157	Magnetic - accelerometer measurement	2003-11-26 11:30:00	3.00	174.00	F	061220 10:24
HFM13	12990242	EG157	Magnetic - accelerometer measurement	2003-11-26 11:30:00	18.00	174.00	E	061220 10:24
HFM13	13142369	EG154	Borehole deviation multiple measurements	2006-12-20 10:30:00			I C	070111 08:11

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM13	13141793	BEARING	18.00	174.00	4.900
HFM13	13141793	INCLINATION	3.00	174.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_UNCERT	INCLINATION	BEARING	INCLINATION_UNCERT	BEARING_UNCERT	RADIUS_UNCERT
HFM13	6699093.68	1631474.40	5.69	0	0.00	-58.97	51.19	1.8	4.9	0.00
HFM13	6699102.70	1631486.29	-20.33	30	0.47	-60.70	56.70	1.8	4.9	1.27
HFM13	6699108.51	1631496.39	-41.31	54	0.83	-61.30	63.00	1.8	4.9	2.27
HFM13	6699112.66	1631505.55	-59.75	75	1.15	-61.00	68.40	1.8	4.9	3.13
HFM13	6699116.24	1631516.74	-80.67	99	1.52	-60.60	75.50	1.8	4.9	4.13
HFM13	6699118.58	1631526.81	-98.95	120	1.84	-60.20	78.70	1.8	4.9	5.02
HFM13	6699120.65	1631538.64	-119.72	144	2.22	-59.60	82.40	1.8	4.9	6.04
HFM13	6699122.00	1631550.86	-140.34	168	2.61	-58.60	84.50	1.8	4.9	7.09
HFM13	6699122.34	1631554.83	-146.81	175.6	2.73	-58.30	85.60	1.8	4.9	7.44

Borehole description HFM14

Figure 1 gives a technical description of HFM14.

Technical data

Borehole HFM14

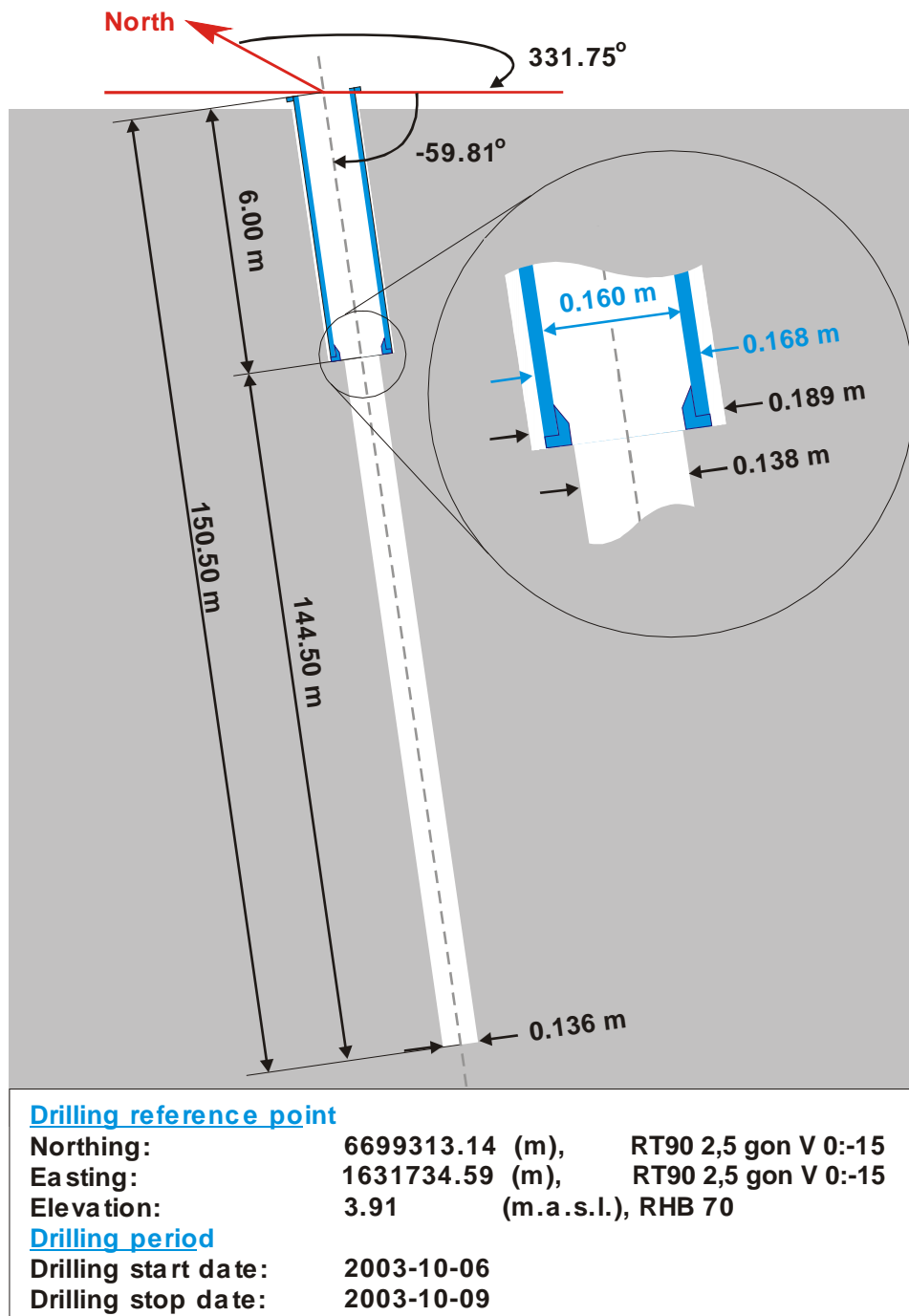


Figure 1. Technical description of HFM14.

Deviation measurements in HFM14

The only deviation measurement in HFM14 was performed with the Mag/acc (Flexit) instrument. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurement (ID 13141802) was executed every three metres downwards between the length 3–150 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activities ID 12989771 and 13125546 were based on the same measurement, but were adjusted with wrong magnetic declination and are therefore error marked. No geomagnetic disturbance exceeding 0.5 degrees was observed on the date and time of the Mag/acc measurement, see Figure 2.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142370) the Mag/acc measurement (ID 13141802) was used. Table 2 shows the contents of the EG154-file used for the calculation of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively (see Section 4.4.2), and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

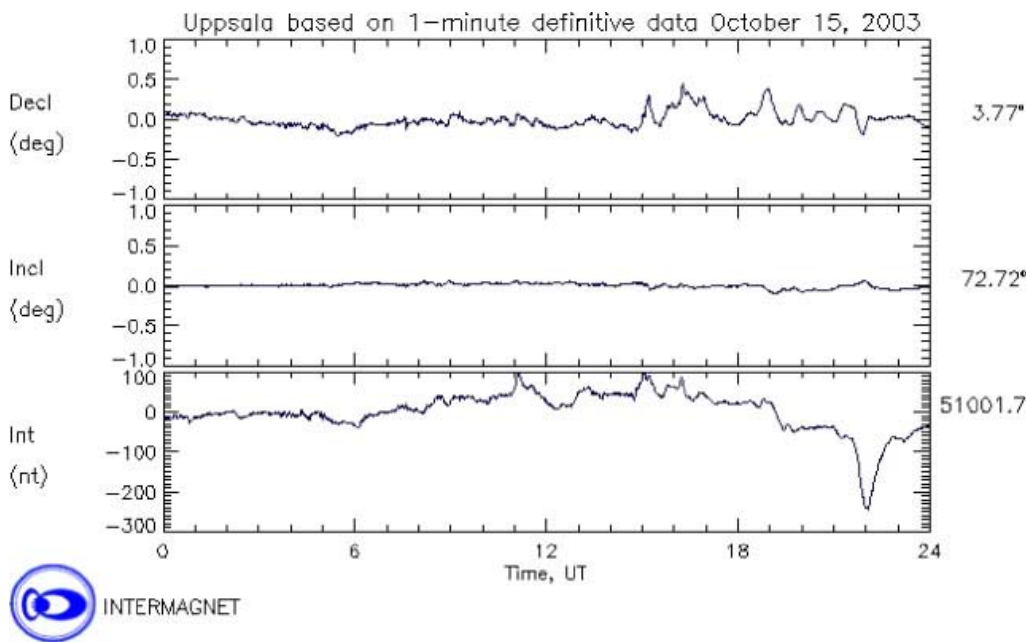


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2003-10-15. The upper curve shows the declination.

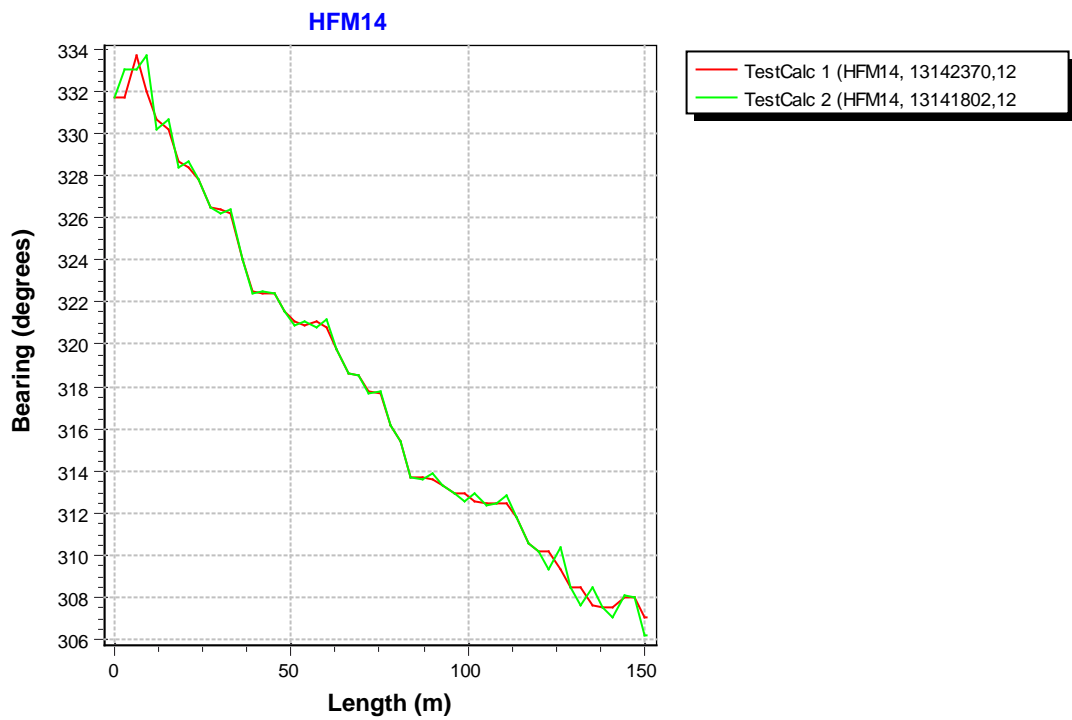
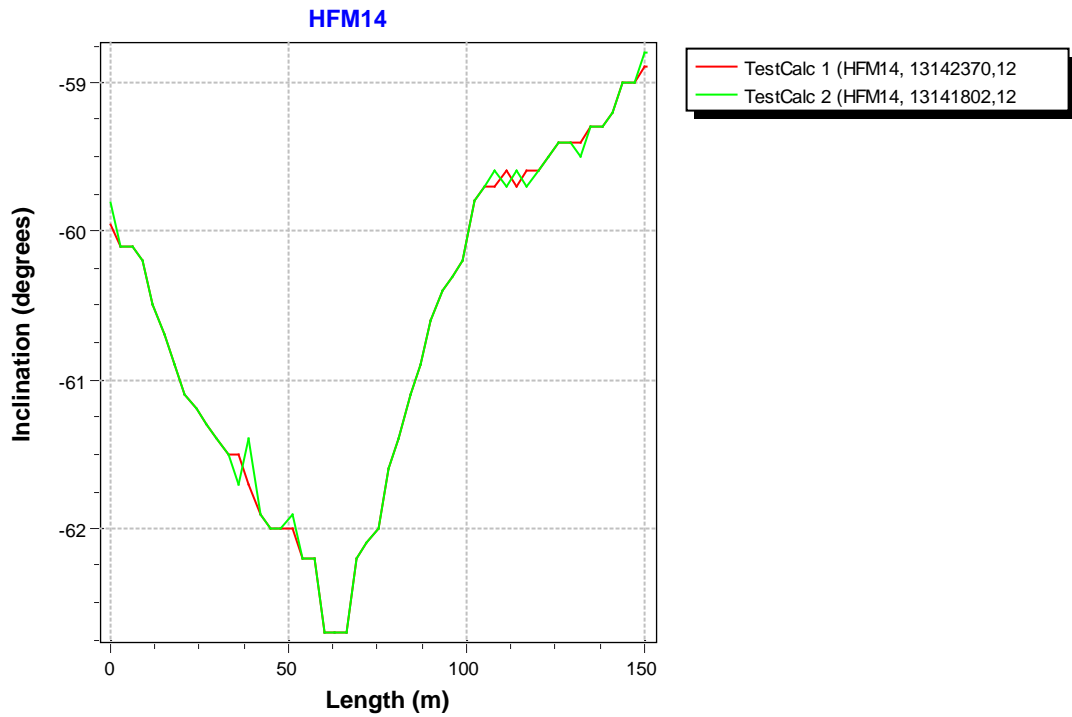


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activities specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM14	12989771	EG157	Magnetic - accelerometer measurement	2003-10-15 11:00:00	6.00	150.00	E	061220 10:25
HFM14	13125546	EG157	Magnetic - accelerometer measurement	2003-10-15 11:00:00	6.00	150.00	E	061220 10:25
HFM14	13141802	EG157	Magnetic - accelerometer measurement	2003-10-15 11:00:00	3.00	150.00	F	061220 10:25
HFM14	13142370	EG154	Borehole deviation multiple measurements	2006-12-20 10:40:00			I C	070111 08:11

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM14	13141802	BEARING	9.00	150.00	4.900
HFM14	13141802	INCLINATION	3.00	150.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_UNCERT	INCLINATION	BEARING	INCLINATION_UNCERT	BEARING_UNCERT	RADIUS_UNCERT
HFM14	6699313.14	1631734.59	3.91	0	0.00	-59.95	331.75	1.8	4.9	0.00
HFM14	6699324.64	1631728.02	-19.61	27	0.42	-61.30	326.50	1.8	4.9	1.13
HFM14	6699333.80	1631721.29	-40.74	51	0.77	-62.00	321.10	1.8	4.9	2.10
HFM14	6699341.24	1631715.02	-59.35	72	1.08	-62.10	317.80	1.8	4.9	2.93
HFM14	6699349.41	1631706.81	-80.37	96	1.44	-60.30	312.95	1.8	4.9	3.92
HFM14	6699357.51	1631697.85	-101.11	120	1.82	-59.60	310.20	1.8	4.9	4.96
HFM14	6699364.18	1631689.50	-119.18	141	2.16	-59.20	307.50	1.8	4.9	5.87
HFM14	6699367.17	1631685.63	-127.33	150.5	2.31	-58.90	307.10	1.8	4.9	6.29

Borehole description HFM15

Figure 1 gives a technical description of HFM15.

Technical data

Borehole HFM15

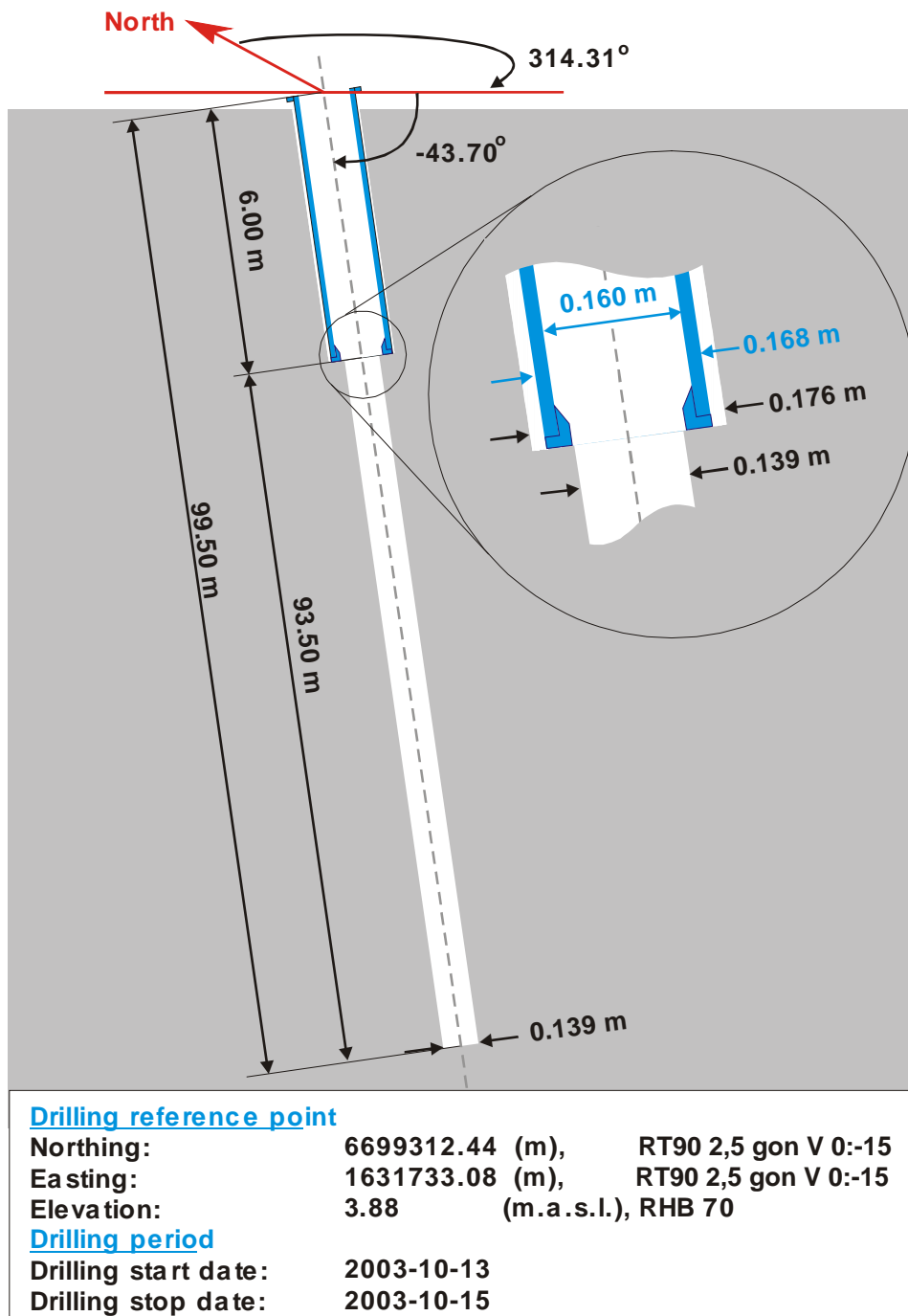


Figure 1. Technical description of HFM15.

Deviation measurement in HFM15

The only deviation measurement in HFM15 was performed with the Mag/acc (Flexit) instrument. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurement (ID 13141807) was executed every three metres downwards between the length 3–99 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activity ID 12989770 was based on the same measurement, but was adjusted with wrong magnetic declination and was therefore error marked. No geomagnetic disturbance exceeding 0.5 degrees in declination was observed on the date and time of the Mag/acc measurement, see Figure 2.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142371) the Mag/acc measurement (ID 13141807) was used. Table 2 shows the contents of the EG154-file used for the calculation of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively (see Section 4.4.2), and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

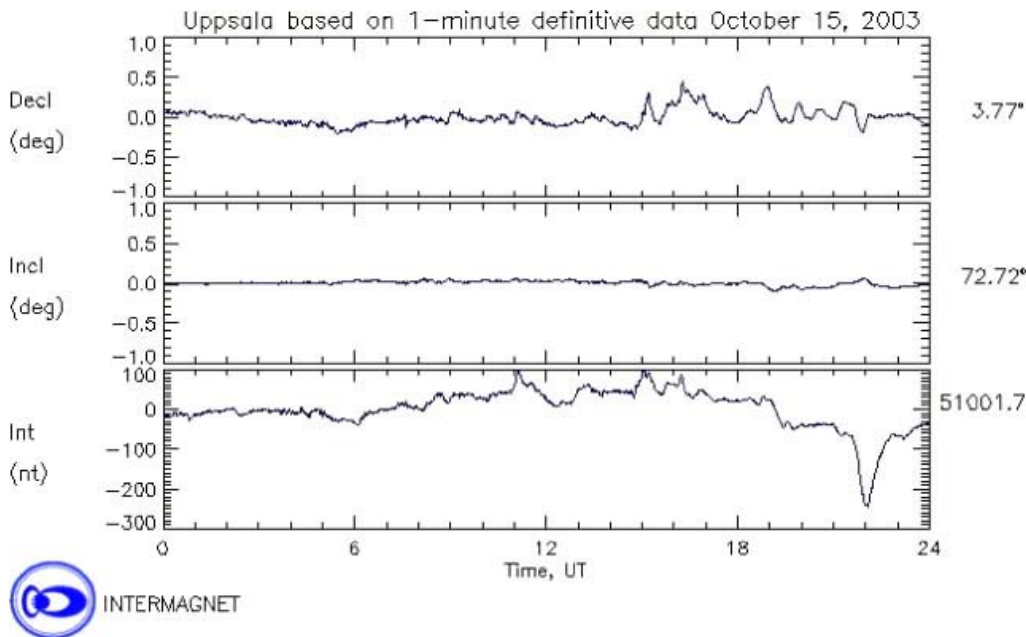


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2003-10-15. The upper curve shows the declination.

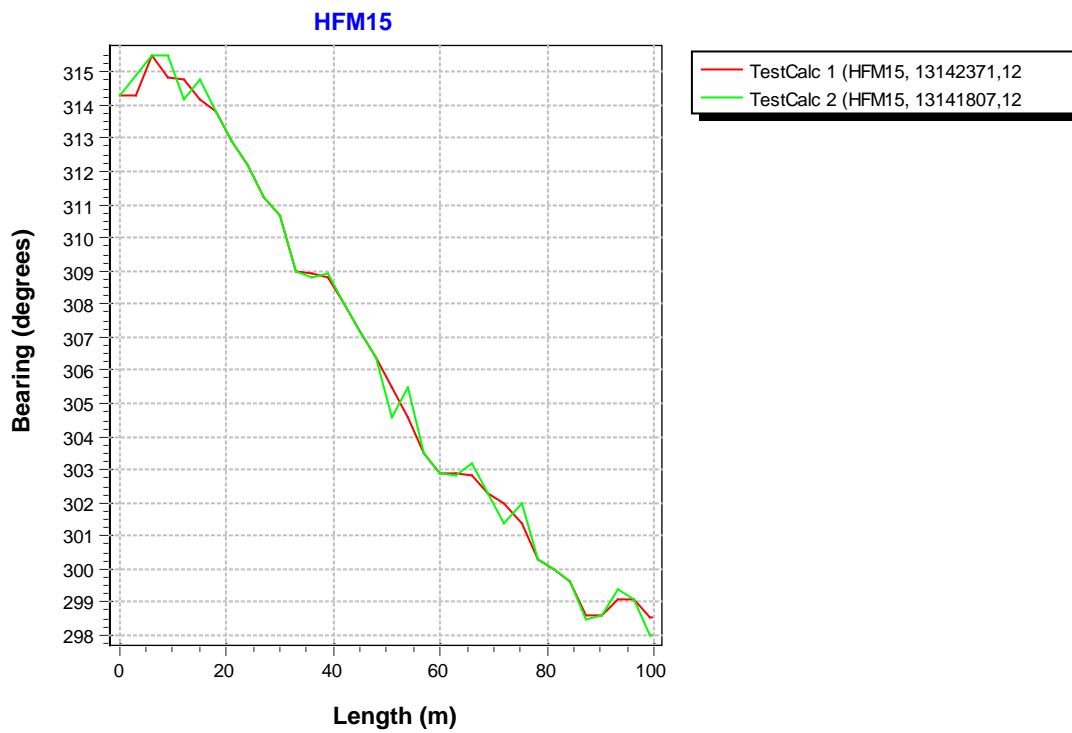
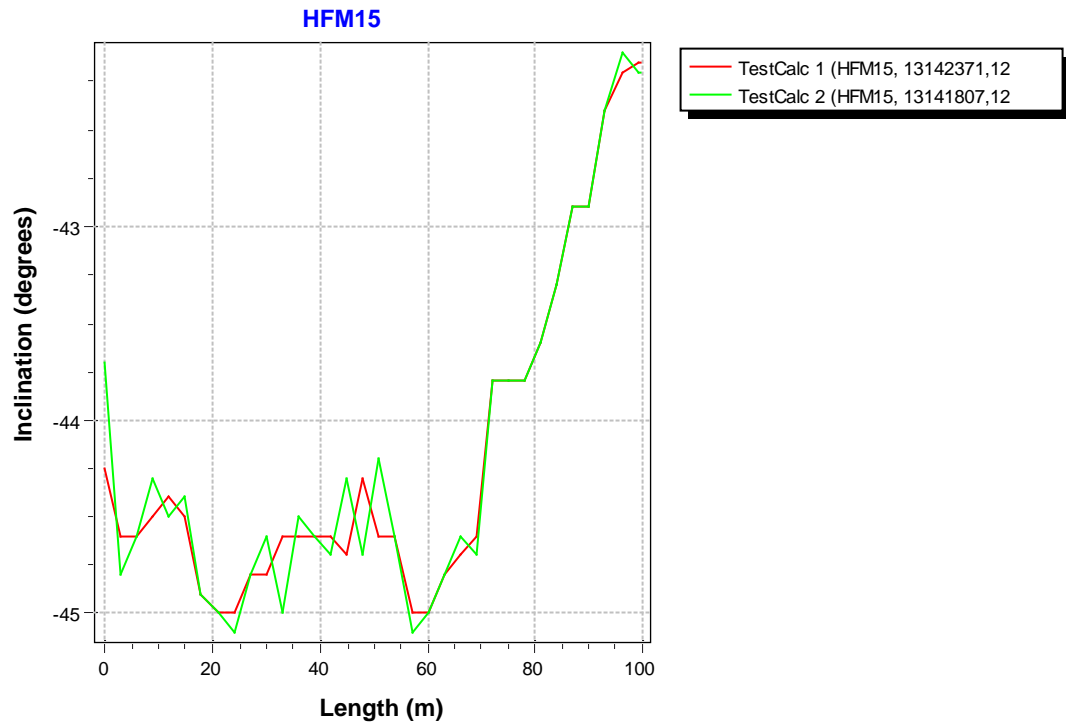


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activities specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM15	12989770	EG157	Magnetic - accelerometer measurement	2003-10-15 13:00:00	9.00	99.00	E	061220 10:26
HFM15	13141807	EG157	Magnetic - accelerometer measurement	2003-10-15 13:00:00	3.00	99.00	F	061220 10:27
HFM15	13142371	EG154	Borehole deviation multiple measurements	2006-12-20 11:00:00			I C	070111 08:11

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM15	13141807	BEARING	9.00	99.00	4.900
HFM15	13141807	INCLINATION	3.00	99.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
HFM15	6699312.44	1631733.08	3.88	0	0.00	-44.25	314.31	1.8	4.9	0.00
HFM15	6699328.52	1631716.01	-19.33	33	0.74	-44.60	309.00	1.8	4.9	2.00
HFM15	6699341.11	1631698.80	-40.42	63	1.41	-44.80	302.90	1.8	4.9	3.83
HFM15	6699351.09	1631682.08	-59.11	90	2.02	-42.90	298.60	1.8	4.9	5.49
HFM15	6699354.49	1631675.94	-65.51	99.5	2.24	-42.15	298.55	1.8	4.9	6.09

Borehole description HFM16

Figure 1 gives a technical description of HFM16.

Technical data

Borehole HFM16

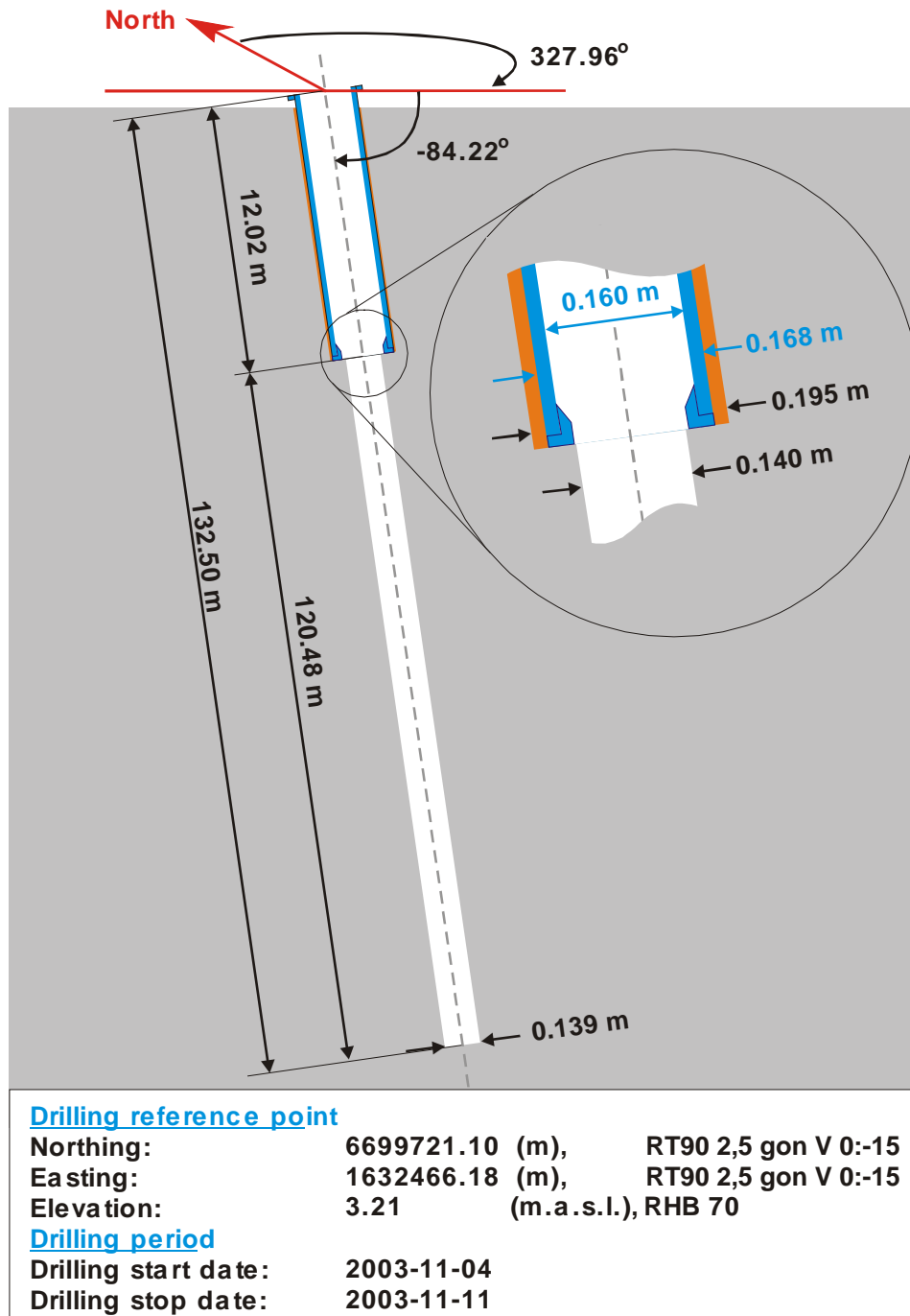


Figure 1. Technical description of HFM16.

Deviation measurement in HFM16

The only deviation measurement in HFM16 was performed with the Mag/acc (Flexit) instrument. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurement (ID 13141809) was executed every three metres downwards between the length 3–132 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activity ID 12996324 was based on the same measurement, but was adjusted with wrong magnetic declination and was therefore error marked. No geomagnetic disturbance exceeding 0.5 degrees in declination was observed on the date and time of the Mag/acc measurement, see Figure 2.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142374) the Mag/acc measurement (ID 13141809) was used. Table 2 shows the contents of the EG154-file used for the calculation of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively (see Section 4.4.2), and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

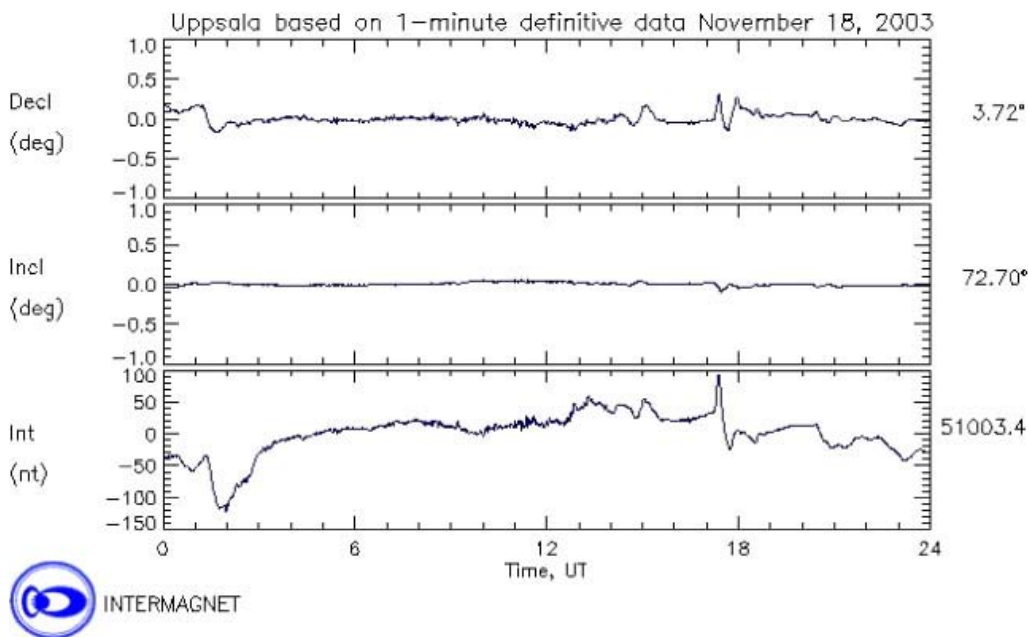


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2003-11-18. The upper curve shows the declination.

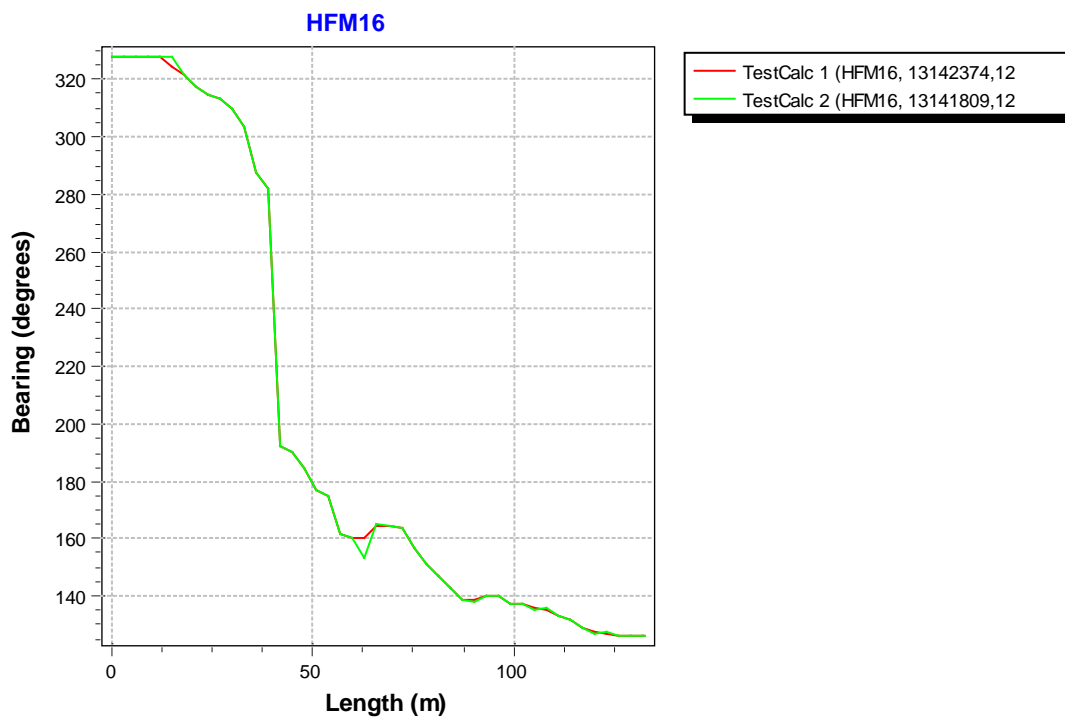
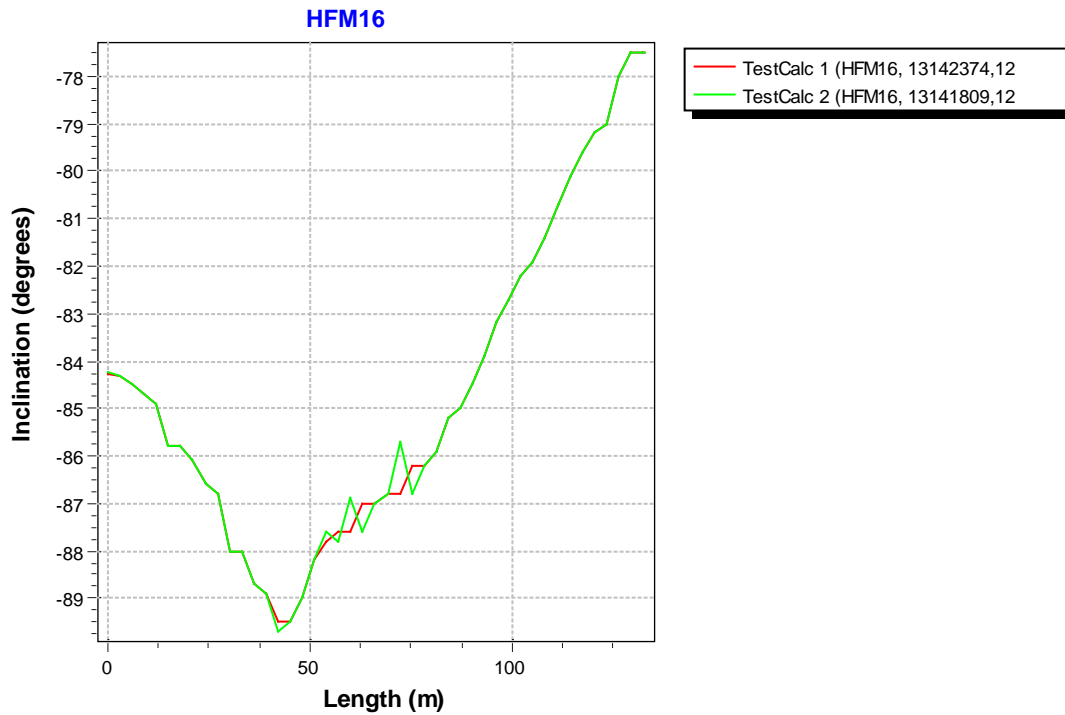


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activities specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM16	12996324	EG157	Magnetic - accelerometer measurement	2003-11-18 14:22:00	15.00	132.00	E	061220 10:28
HFM16	13141809	EG157	Magnetic - accelerometer measurement	2003-11-18 14:22:00	3.00	132.00	F	061220 10:28
HFM16	13142374	EG154	Borehole deviation multiple measurements	2006-12-20 12:50:00			I C	070111 08:11

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM16	13141809	BEARING	15.00	132.00	4.900
HFM16	13141809	INCLINATION	3.00	132.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
HFM16	6699721.10	1632466.18	3.21	0	0.00	-84.26	327.96	1.8	4.9	0.00
HFM16	6699722.75	1632465.04	-20.70	24	0.06	-86.60	314.60	1.8	4.9	0.75
HFM16	6699723.05	1632464.55	-38.69	42	0.08	-89.50	192.20	1.8	4.9	1.32
HFM16	6699722.44	1632464.66	-59.68	63	0.10	-87.00	160.00	1.8	4.9	1.98
HFM16	6699721.25	1632465.19	-80.64	84	0.14	-85.20	143.20	1.8	4.9	2.64
HFM16	6699719.79	1632466.46	-98.53	102	0.21	-82.20	137.20	1.8	4.9	3.20
HFM16	6699717.49	1632469.04	-119.24	123	0.32	-79.00	126.70	1.8	4.9	3.86
HFM16	6699716.31	1632470.64	-128.53	132.5	0.38	-77.50	126.20	1.8	4.9	4.16

Borehole description HFM17

Figure 1 gives a technical description of HFM17.

Technical data

Borehole HFM17

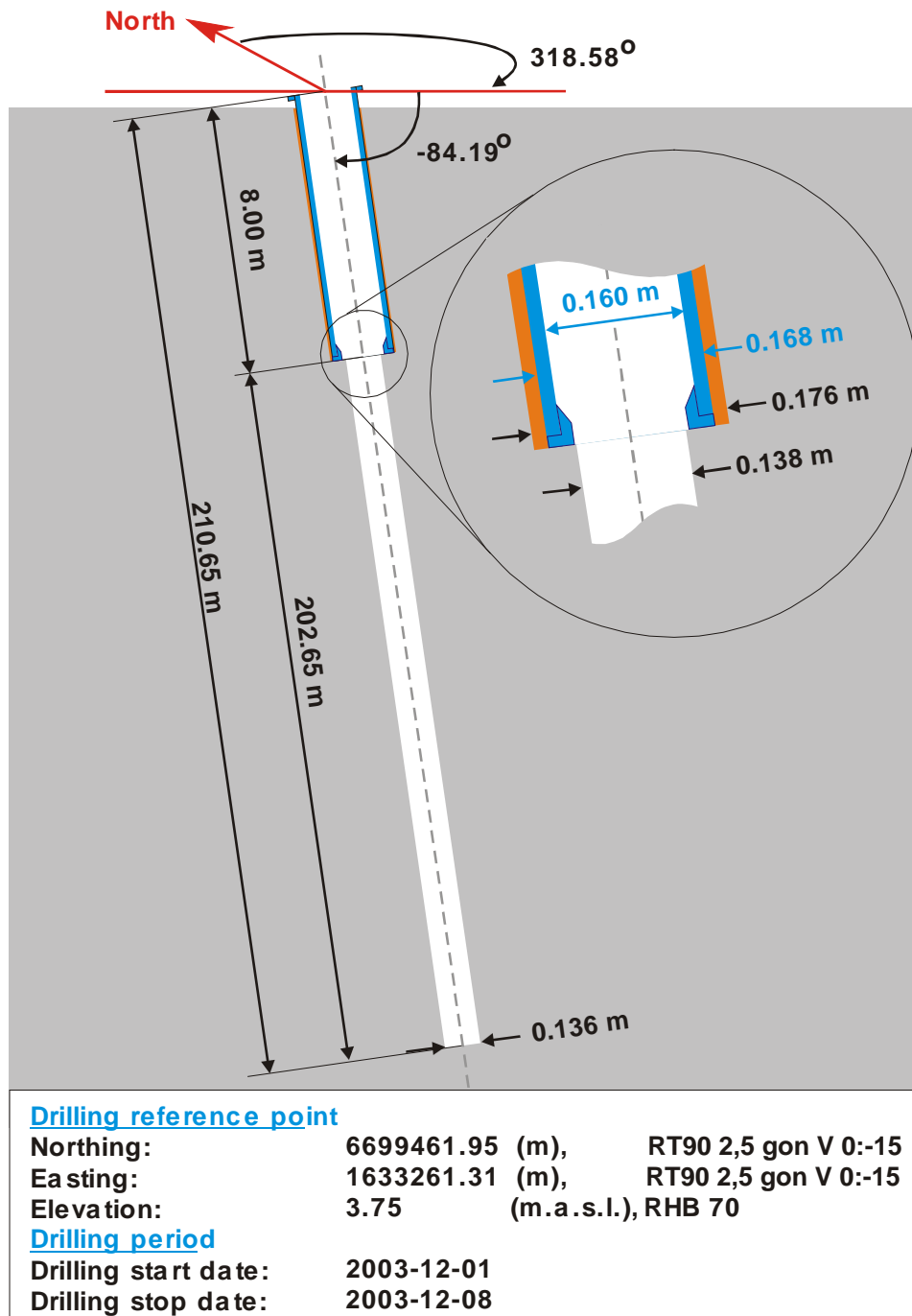


Figure 1. Technical description of HFM17.

Deviation measurement in HFM17

The only deviation measurement in HFM17 was performed with the Mag/acc (Flexit) instrument. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurement (ID 13141831) was executed every three metres downwards between the length 3–207 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activity ID 12996458 was based on the same measurement, but was adjusted with wrong magnetic declination and was therefore error marked. No geomagnetic disturbance exceeding 0.5 degrees in declination was observed on the date and time of the Mag/acc measurements, see Figure 2.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142391) the Mag/acc measurement (ID 13141831) was used. Table 2 shows the contents of the EG154-file used for the calculation of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively (see Section 4.4.2), and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

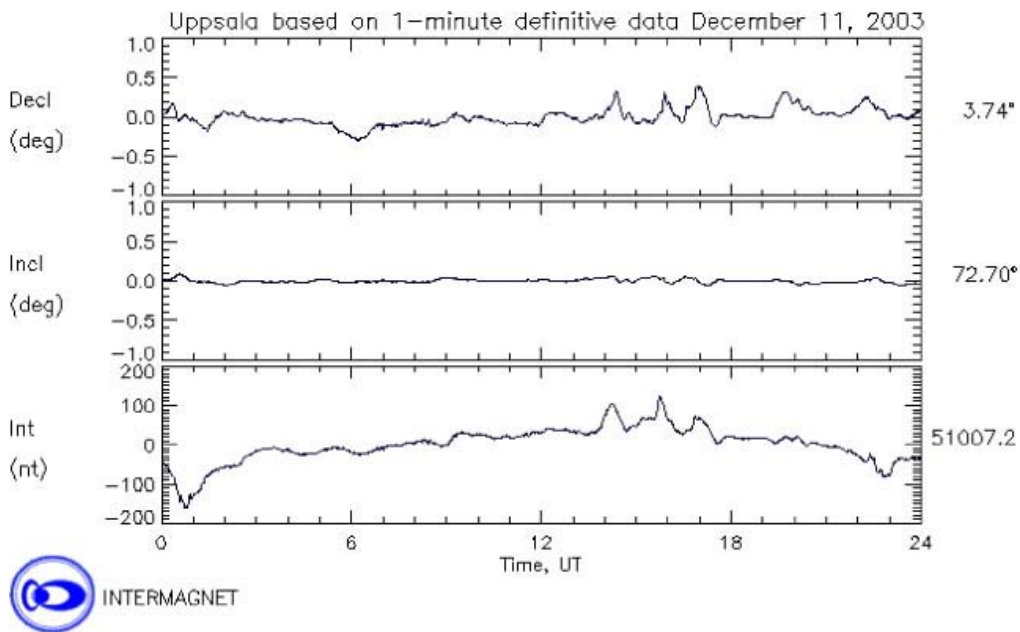


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2003-12-11. The upper curve shows the declination.

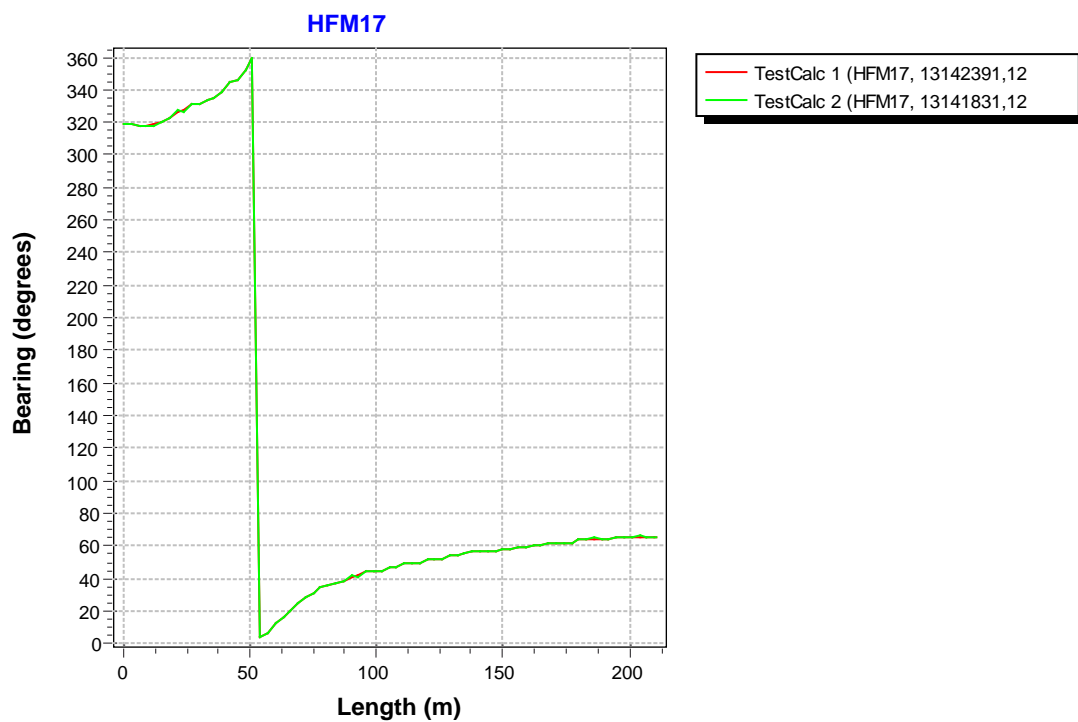
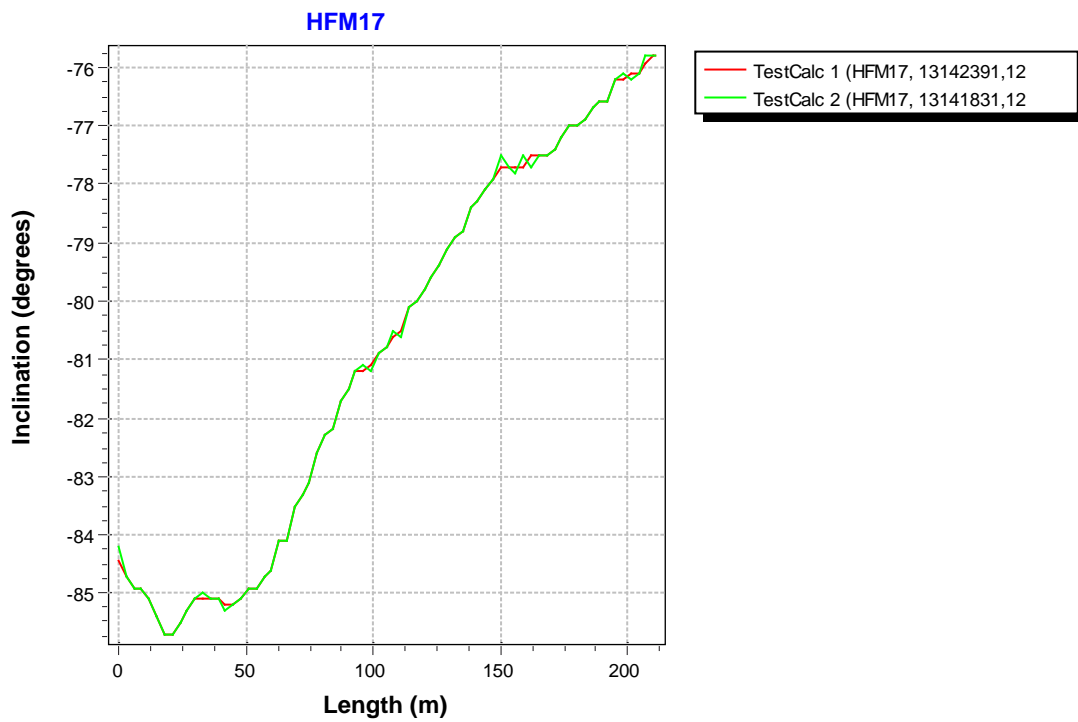


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activities specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM17	12996458	EG157	Magnetic - accelerometer measurement	2003-12-11 00:00:00	12.00	210.00	E	061220 10:29
HFM17	13141831	EG157	Magnetic - accelerometer measurement	2003-12-11 08:00:00	3.00	207.00	F	061220 10:29
HFM17	13142391	EG154	Borehole deviation multiple measurements	2006-12-20 16:00:00			I C	070111 08:11

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM17	13141831	BEARING	12.00	207.00	4.900
HFM17	13141831	INCLINATION	3.00	207.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_UNCERT	INCLINATION	BEARING	INCLINATION_UNCERT	BEARING_UNCERT	RADIUS_UNCERT
HFM17	6699461.95	1633261.31	3.75	0	0.00	-84.44	318.58	1.8	4.9	0.00
HFM17	6699463.51	1633260.03	-20.16	24	0.06	-85.50	327.60	1.8	4.9	0.75
HFM17	6699465.12	1633259.31	-41.09	45	0.12	-85.20	346.50	1.8	4.9	1.41
HFM17	6699466.72	1633259.40	-59.02	63	0.17	-84.10	16.30	1.8	4.9	1.98
HFM17	6699468.90	1633260.62	-79.86	84	0.25	-82.20	36.60	1.8	4.9	2.64
HFM17	6699471.23	1633262.77	-100.62	105	0.35	-80.80	46.50	1.8	4.9	3.30
HFM17	6699473.56	1633265.53	-121.31	126	0.47	-79.40	52.30	1.8	4.9	3.96
HFM17	6699475.55	1633268.43	-138.96	144	0.58	-78.10	57.20	1.8	4.9	4.52
HFM17	6699477.87	1633272.25	-159.48	165	0.72	-77.50	60.90	1.8	4.9	5.18
HFM17	6699480.04	1633276.38	-179.95	186	0.87	-76.70	64.50	1.8	4.9	5.84
HFM17	6699482.13	1633280.90	-200.36	207	1.02	-75.95	65.85	1.8	4.9	6.50
HFM17	6699482.49	1633281.71	-203.90	210.65	1.05	-75.80	65.50	1.8	4.9	6.62

Borehole description HFM18

Figure 1 gives a technical description of HFM18.

Technical data

Borehole HFM18

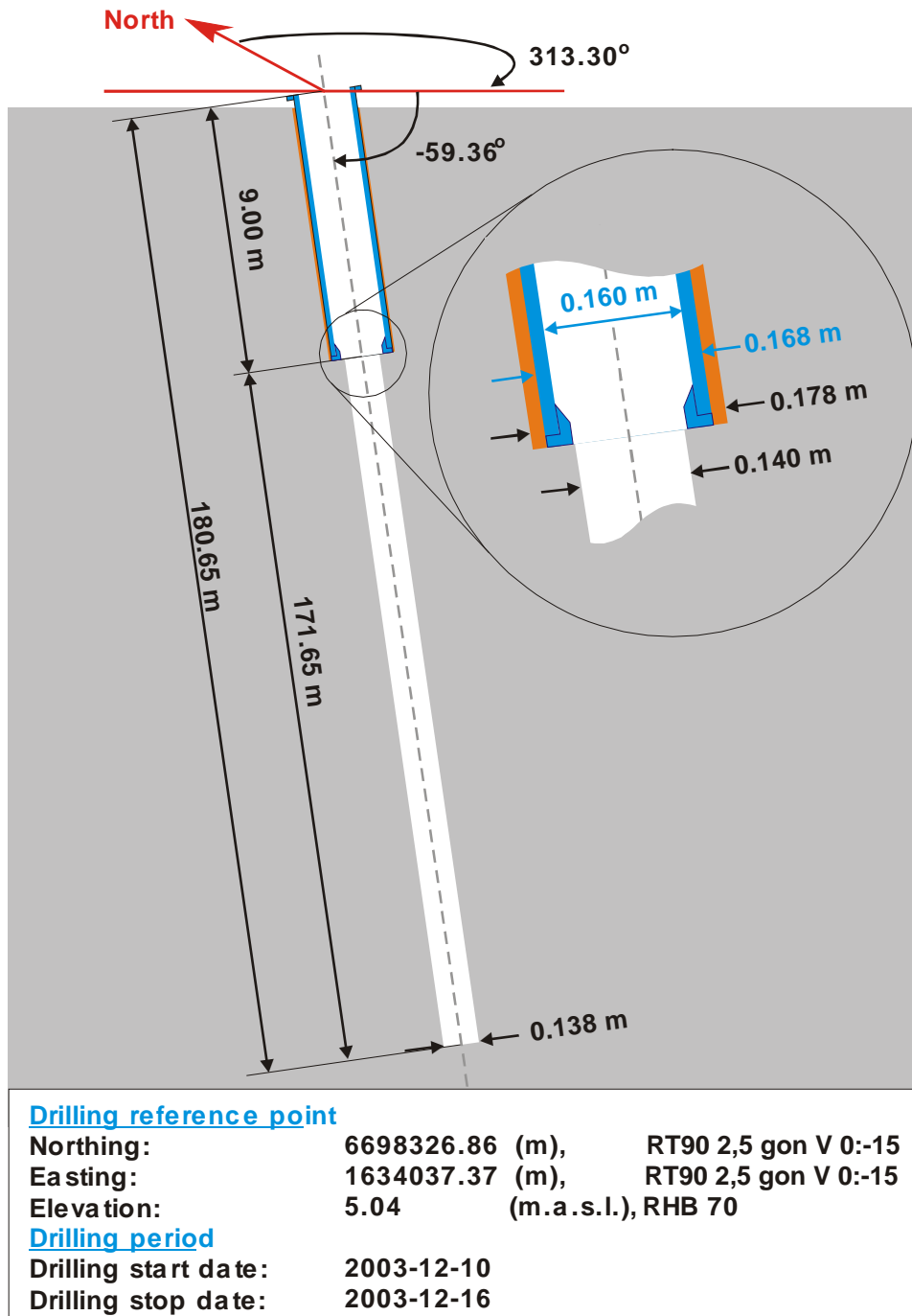


Figure 1. Technical description of HFM18.

Deviation measurement in HFM18

One deviation measurement was performed in HFM18 with the Mag/acc (Flexit) instrument. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

The Mag/acc measurement (ID 13141858) was executed every three metres downwards between the length 3–177 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activities ID 12996459 and 13125548 were based on the same measurement, but were adjusted with wrong magnetic declination and were therefore error marked. No geomagnetic disturbances exceeding 0.5 degrees in declination were observed on the date of the Mag/acc measurement, see Figure 2.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142392) the Mag/acc measurement (ID 13141858) was used. Table 2 shows the contents of the EG154-file used for the calculation of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively (see Section 4.4.2), and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

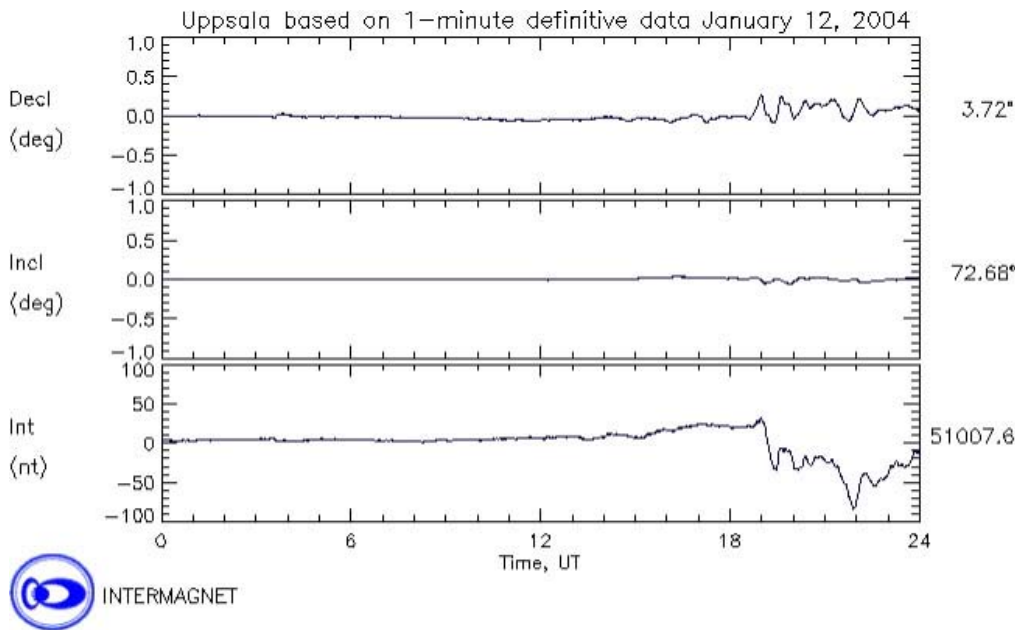


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2004-01-12. The upper curve shows the declination.

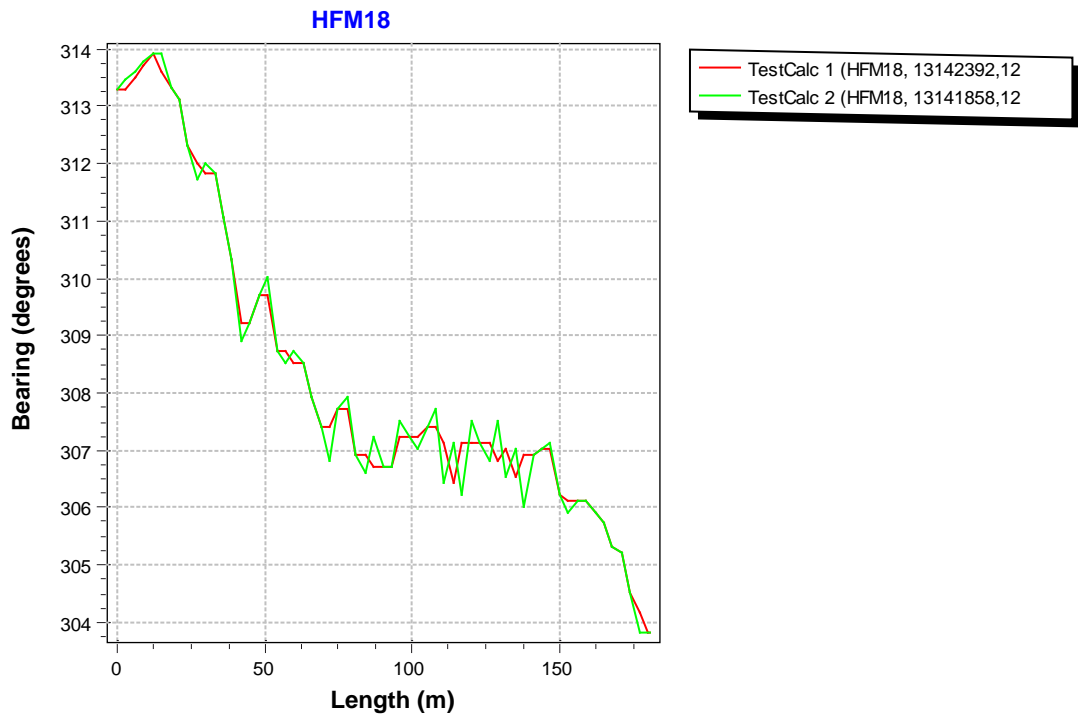
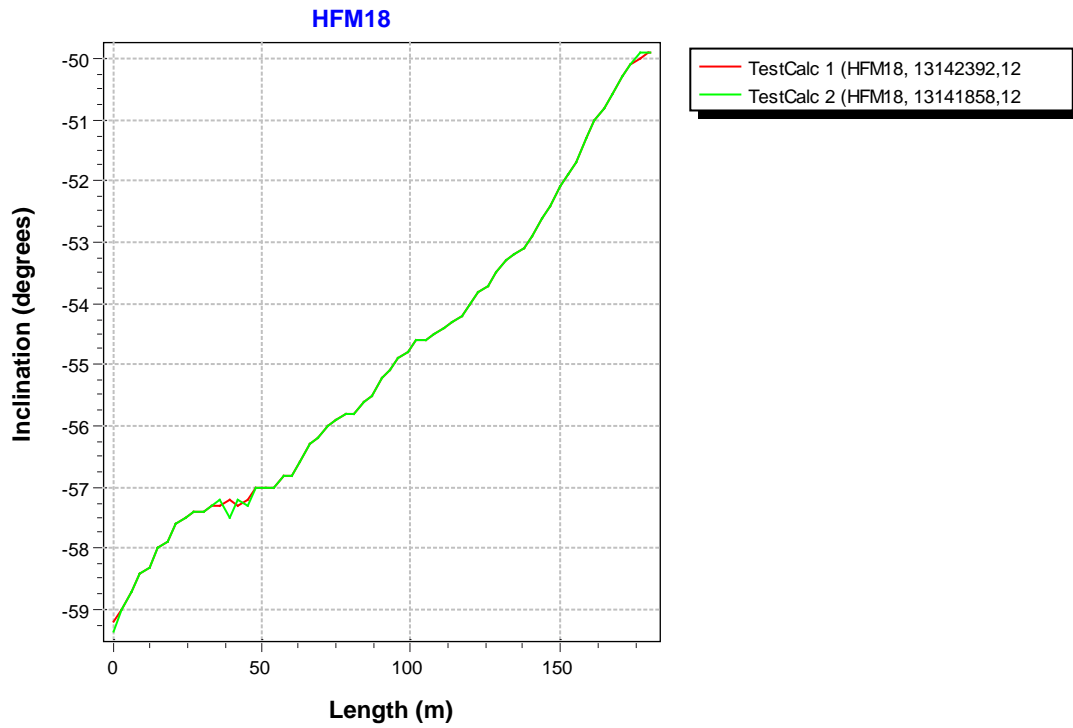


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activities specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM18	13125548	EG157	Magnetic - accelerometer measurement	2004-01-12 00:00:00	12.00	180.00	E	061220 10:45
HFM18	12996459	EG157	Magnetic - accelerometer measurement	2004-01-12 00:00:00	12.00	180.00	E	061220 10:46
HFM18	13141858	EG157	Magnetic - accelerometer measurement	2004-01-12 08:00:00	3.00	177.00	F	061220 10:46
HFM18	13142392	EG154	Borehole deviation multiple measurements	2006-12-20 16:20:00			I C	070111 08:11

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM18	13141858	BEARING	15.00	177.00	4.900
HFM18	13141858	INCLINATION	3.00	177.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_UNCERT	INCLINATION	BEARING	INCLINATION_UNCERT	BEARING_UNCERT	RADIUS_UNCERT
HFM18	6698326.86	1634037.37	5.04	0	0.00	-59.18	313.30	1.8	4.9	0.00
HFM18	6698337.69	1634025.81	-20.43	30	0.50	-57.40	311.82	1.8	4.9	1.36
HFM18	6698346.08	1634015.87	-40.60	54	0.91	-57.00	308.72	1.8	4.9	2.47
HFM18	6698354.27	1634005.41	-60.59	78	1.33	-55.80	307.72	1.8	4.9	3.61
HFM18	6698362.50	1633994.48	-80.31	102	1.76	-54.60	307.22	1.8	4.9	4.78
HFM18	6698370.96	1633983.30	-99.78	126	2.20	-53.70	307.12	1.8	4.9	5.98
HFM18	6698379.63	1633971.74	-118.95	150	2.65	-52.10	306.22	1.8	4.9	7.21
HFM18	6698389.52	1633957.92	-139.92	177	3.19	-50.00	304.17	1.8	4.9	8.67
HFM18	6698390.83	1633955.97	-142.71	180.65	3.26	-49.90	303.82	1.8	4.9	8.87

Borehole description HFM19

Figure 1 gives a technical description of HFM19.

Technical data

Borehole HFM19

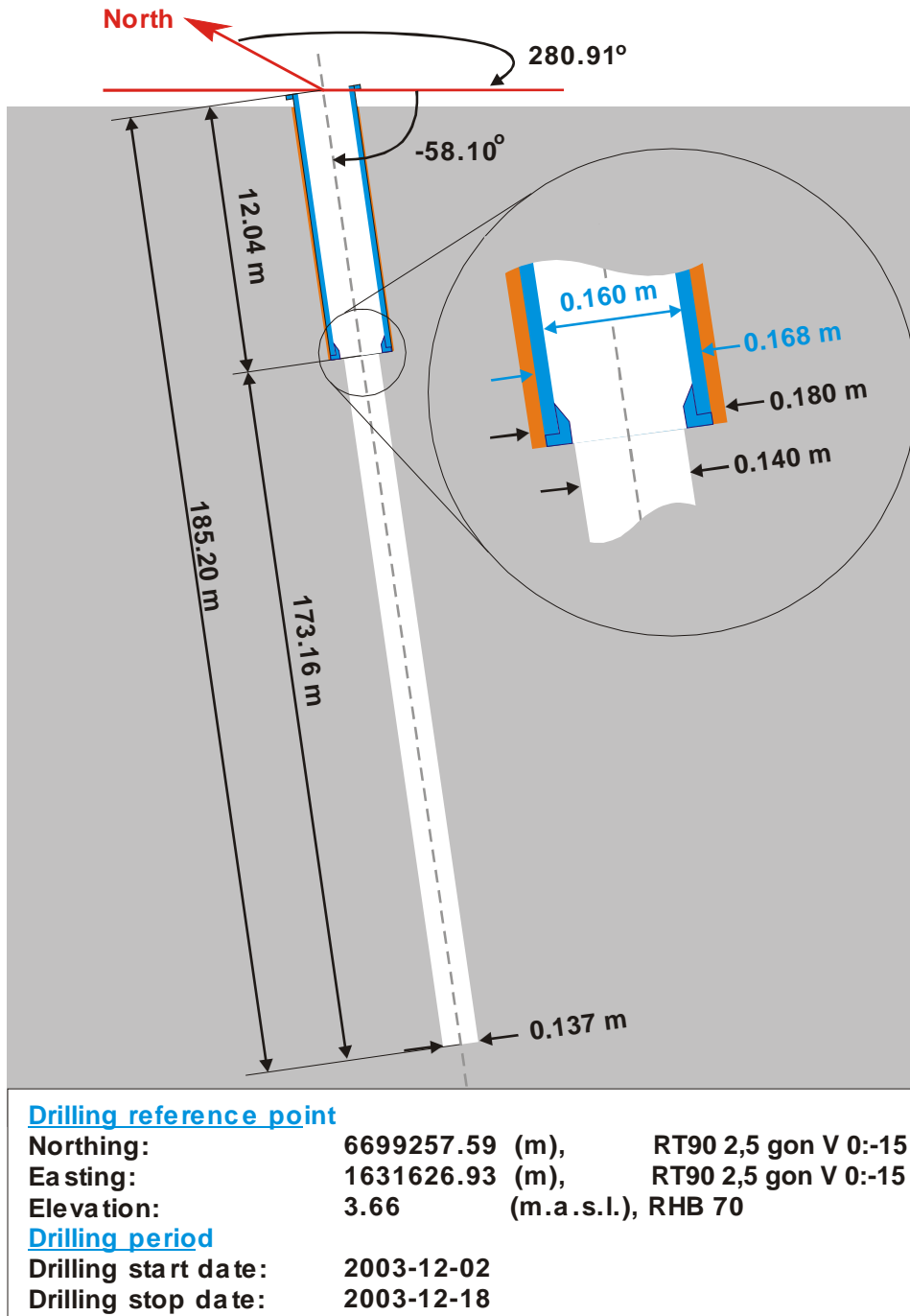


Figure 1. Technical description of HFM19.

Deviation measurement in HFM19

One deviation measurement in HFM19 was performed with the Mag/acc (Flexit) instrument. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurement (ID 13141859) was executed every three metres downwards between the length 3–185 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activities ID 12996460 and 13125551 were based on the same measurement, but were adjusted with wrong magnetic declination and were therefore error marked. No geomagnetic disturbances exceeding 0.5 degrees were observed on the date and time of the Mag/acc measurement, see Figure 2.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142393) the Mag/acc measurement (ID 13141859) was used. Table 2 shows the contents of the EG154-file used for the calculation of the deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively (see Section 4.4.2), and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

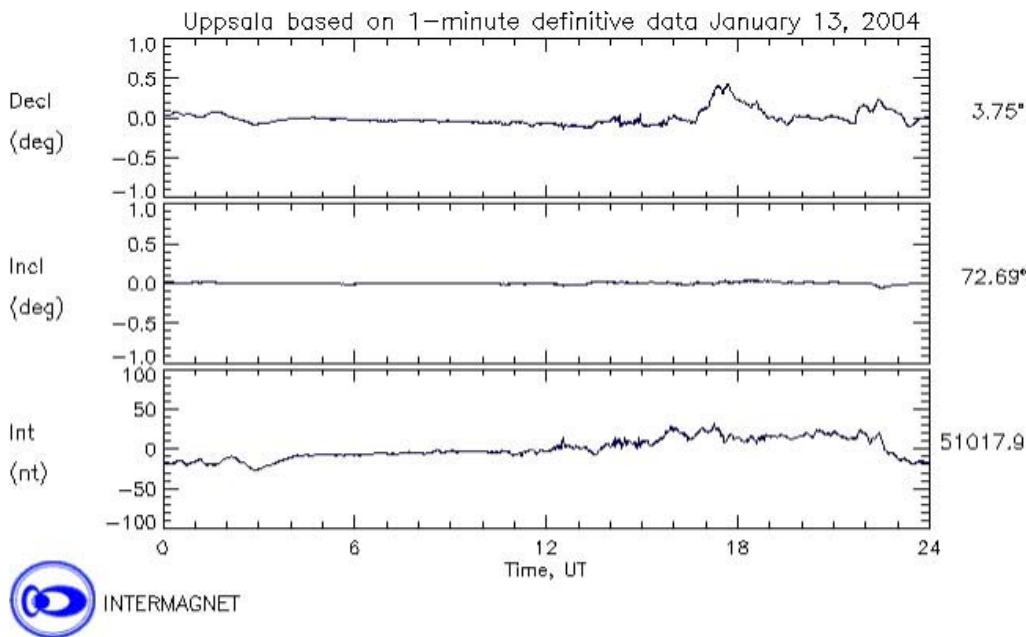


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2004-01-13. The upper curve shows the declination.

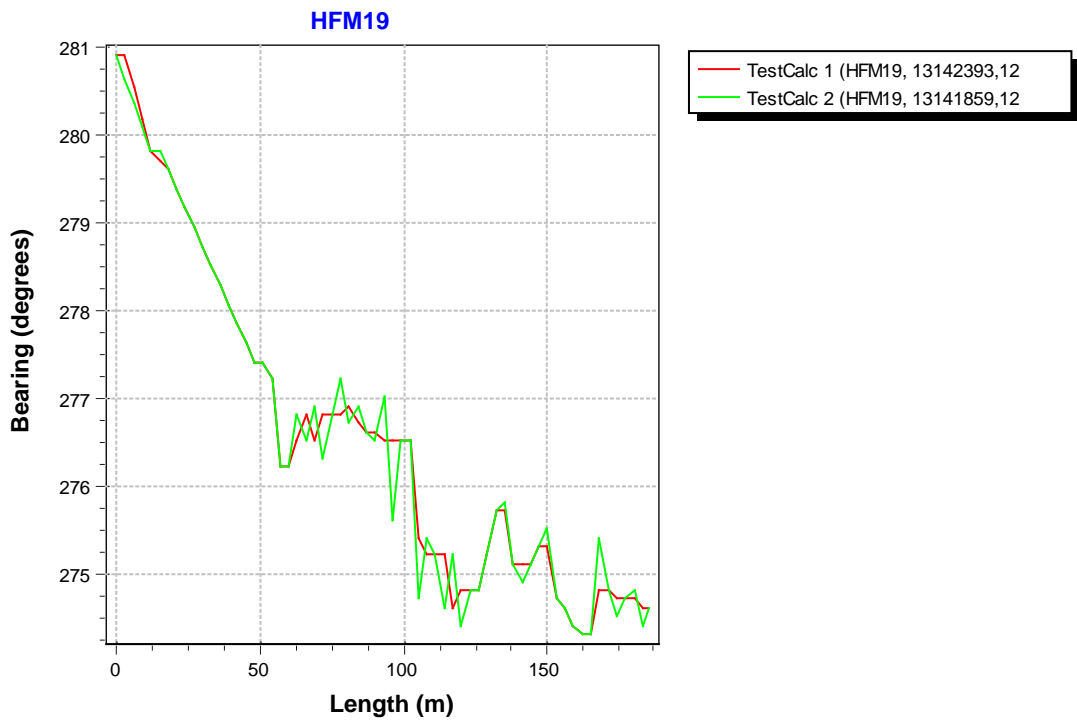
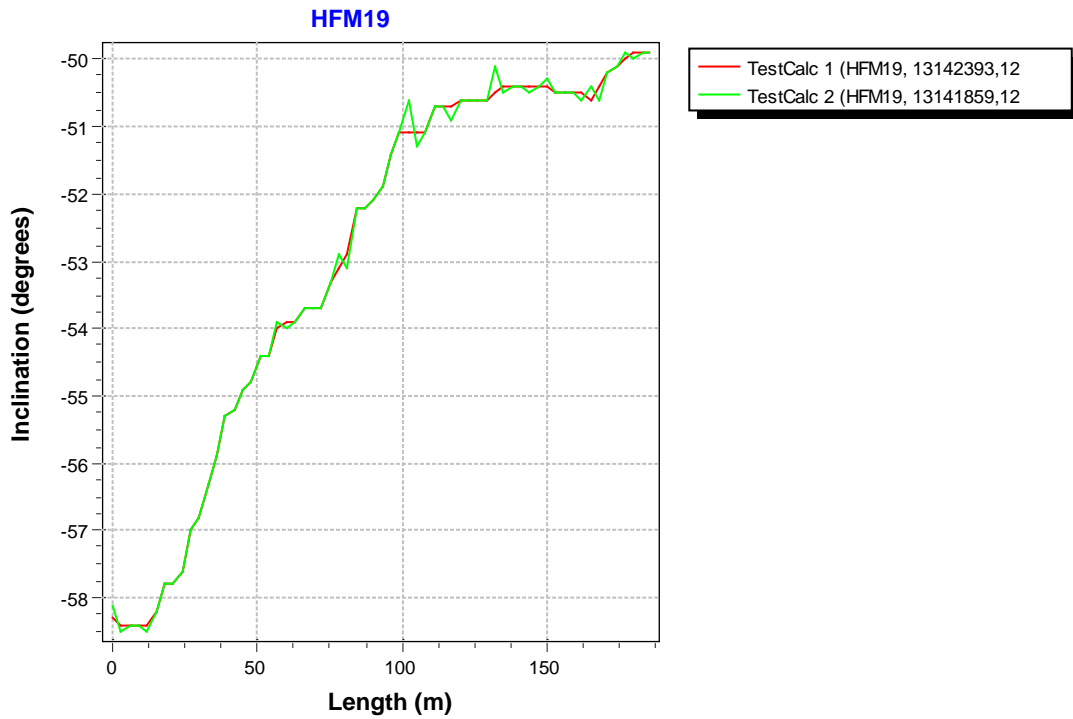


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activities specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM19	12996460	EG157	Magnetic - accelerometer measurement	2004-01-13 00:00:00	15.00	185.00	E	061220 11:00
HFM19	13125551	EG157	Magnetic - accelerometer measurement	2004-01-13 00:00:00	15.00	185.00	E	061220 11:00
HFM19	13141859	EG157	Magnetic - accelerometer measurement	2004-01-13 08:00:00	3.00	185.00	F	061220 11:00
HFM19	13142393	EG154	Borehole deviation multiple measurements	2006-12-20 16:30:00			I C	070111 08:11

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM19	13141859	BEARING	15.00	185.00	4.900
HFM19	13141859	INCLINATION	3.00	185.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_UNCERT	INCLINATION	BEARING	INCLINATION_UNCERT	BEARING_UNCERT	RADIUS_UNCERT
HFM19	6699257.59	1631626.93	3.66	0	0.00	-58.30	280.91	1.8	4.9	0.00
HFM19	6699260.04	1631612.86	-19.26	27	0.45	-57.00	278.96	1.8	4.9	1.22
HFM19	6699261.95	1631599.44	-39.06	51	0.88	-54.40	277.42	1.8	4.9	2.38
HFM19	6699263.81	1631583.61	-60.85	78	1.38	-53.10	276.82	1.8	4.9	3.75
HFM19	6699265.52	1631568.93	-79.76	102	1.84	-51.10	276.52	1.8	4.9	5.01
HFM19	6699267.04	1631551.92	-100.68	129	2.38	-50.60	275.22	1.8	4.9	6.47
HFM19	6699268.45	1631536.70	-119.18	153	2.86	-50.50	274.72	1.8	4.9	7.78
HFM19	6699269.84	1631519.52	-139.96	180	3.40	-49.90	274.72	1.8	4.9	9.25
HFM19	6699270.11	1631516.19	-143.94	185.2	3.51	-49.90	274.62	1.8	4.9	9.54

Borehole description HFM20

Figure 1 gives a technical description of HFM20.

Technical data

Borehole HFM20

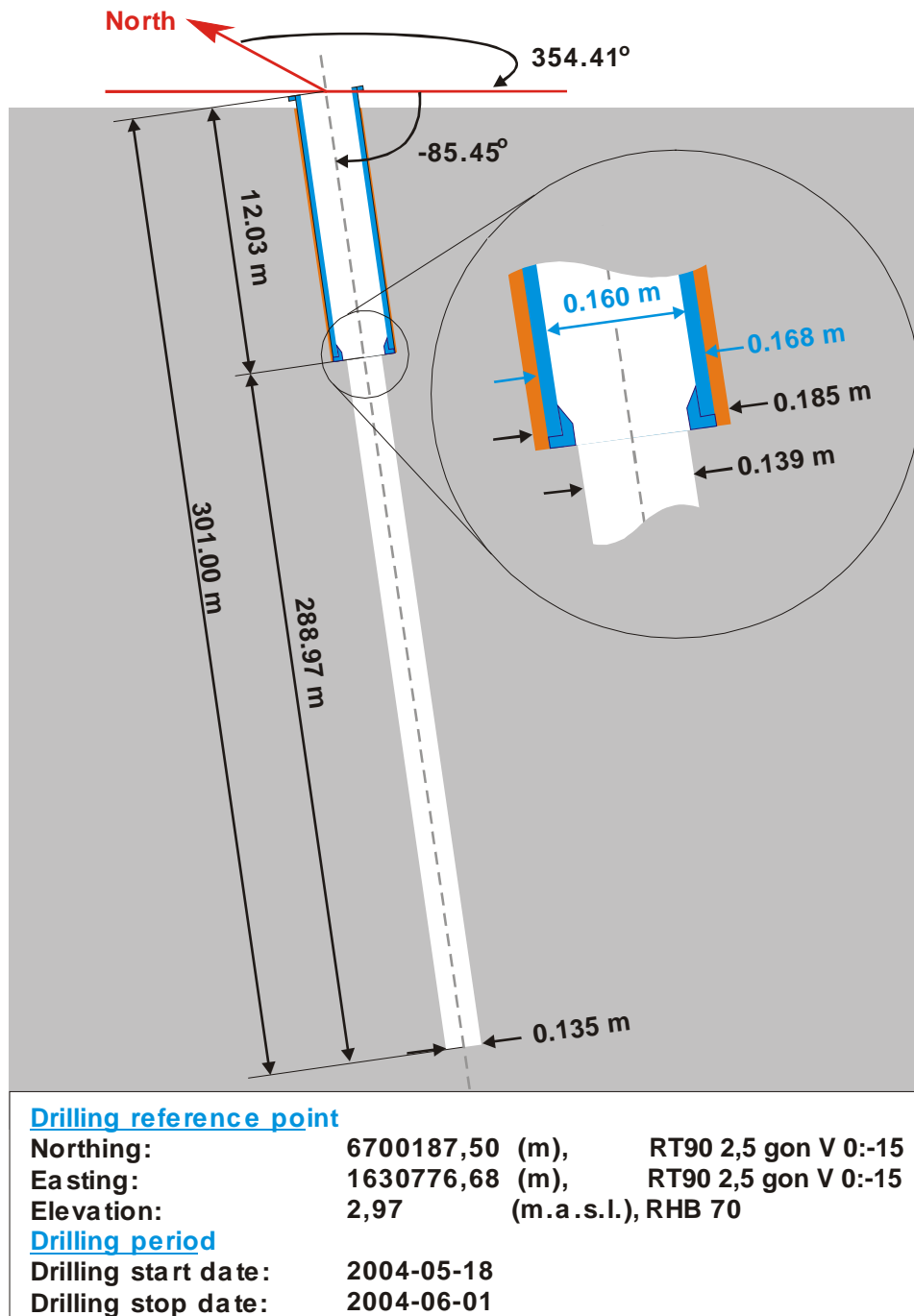


Figure 1. Technical description of HFM20.

Deviation measurement in HFM20

The only deviation measurement in HFM20 was performed with the Mag/acc (Flexit) instrument. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurement (ID 13141860) was executed every three metres downwards between the length 15–301 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activity ID 13036511 was based on the same measurement, but was adjusted with wrong magnetic declination and was therefore error marked. No geomagnetic disturbance exceeding 0.5 degrees in declination was observed on the date and time of the Mag/acc measurement, see Figure 2.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142394) the Mag/acc measurement (ID 13141860) was used. Table 2 shows the contents of the EG154-file used for the calculation of the deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively (see Section 4.4.2), and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

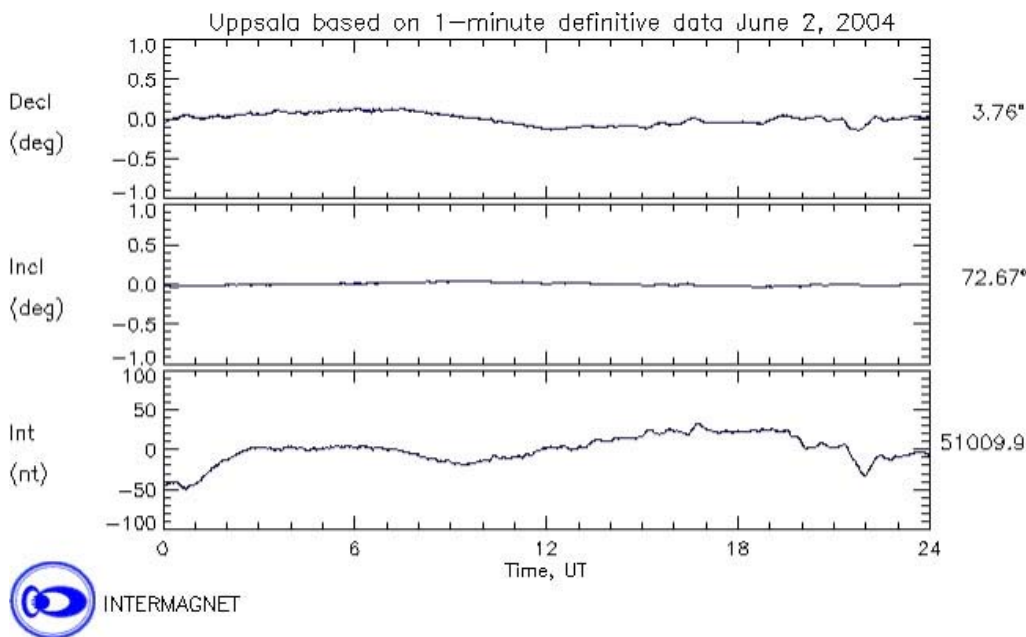


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2004-06-02. The upper curve shows the declination.

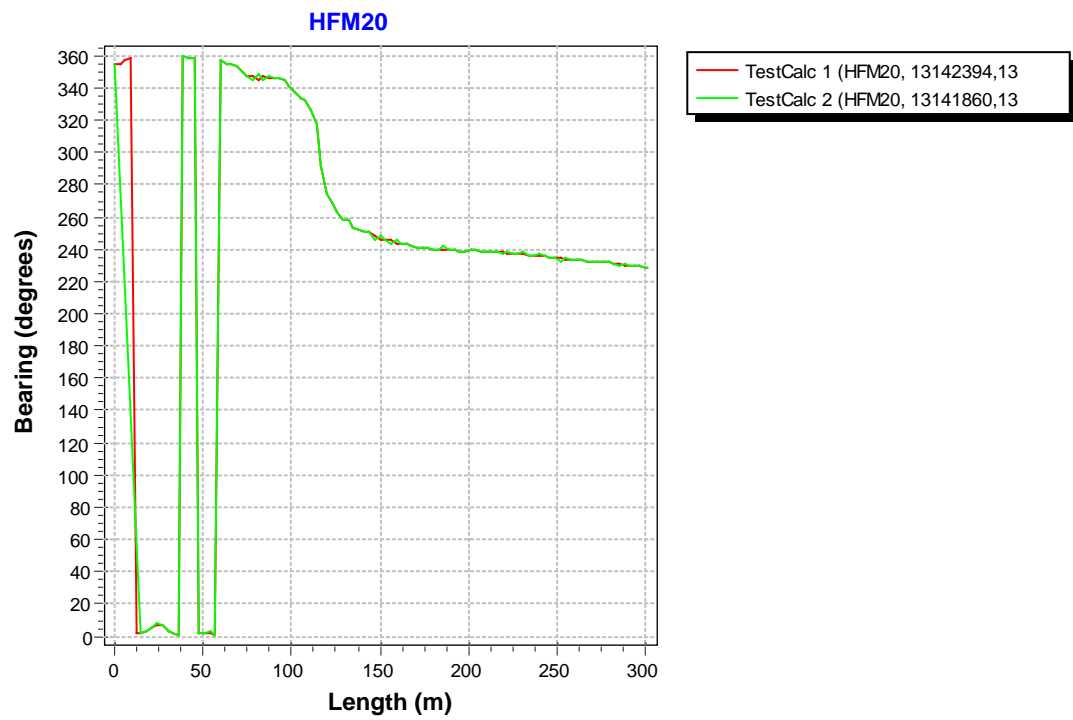
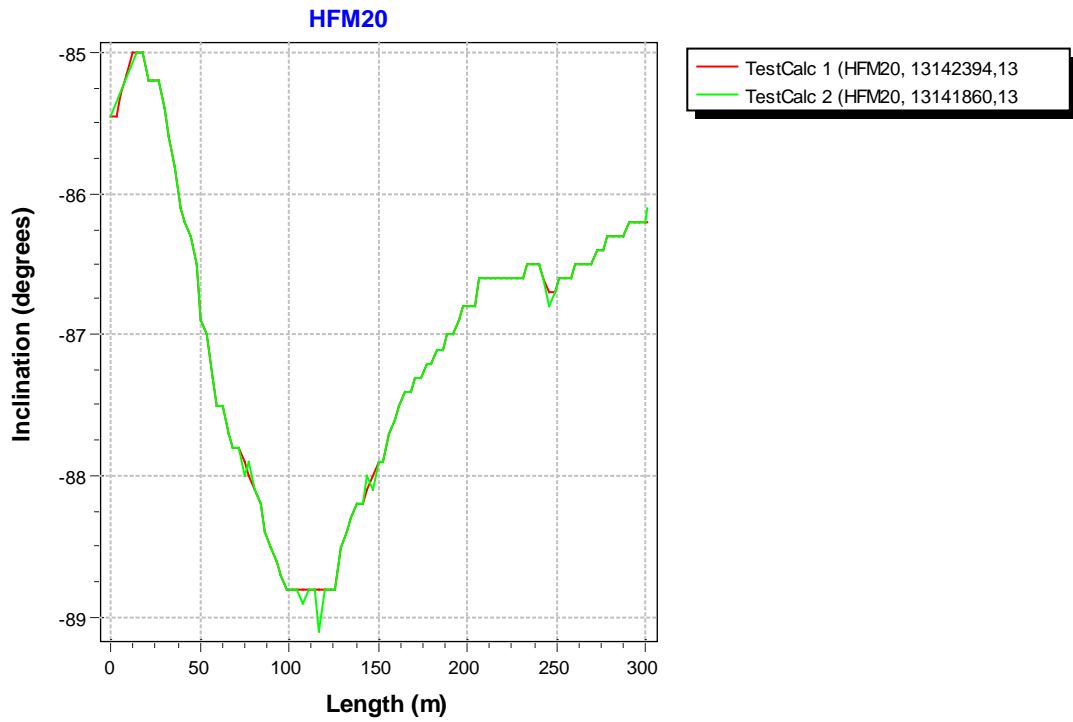


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activities specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM20	13141860	EG157	Magnetic - accelerometer measurement	2004-06-02 09:00:00	15.00	301.00	F	061220 11:16
HFM20	13036511	EG157	Magnetic - accelerometer measurement	2004-06-02 09:00:00	15.00	301.00	E	061220 11:16
HFM20	13142394	EG154	Borehole deviation multiple measurements	2006-12-20 16:40:00			I C	070111 08:11

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM20	13141860	BEARING	15.00	301.00	4.900
HFM20	13141860	INCLINATION	15.00	301.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_UNCERT	INCLINATION	BEARING	INCLINATION_UNCERT	BEARING_UNCERT	RADIUS_UNCERT
HFM20	6700187.50	1630776.68	2.97	0	0.00	-85.45	354.41	1.8	4.9	0.00
HFM20	6700189.51	1630776.70	-20.95	24	0.06	-85.20	6.92	1.8	4.9	0.75
HFM20	6700190.88	1630776.77	-38.90	42	0.11	-86.20	358.92	1.8	4.9	1.32
HFM20	6700192.01	1630776.77	-59.87	63	0.14	-87.50	355.32	1.8	4.9	1.98
HFM20	6700192.77	1630776.64	-80.85	84	0.16	-88.20	347.02	1.8	4.9	2.64
HFM20	6700193.20	1630776.52	-98.85	102	0.18	-88.80	337.72	1.8	4.9	3.20
HFM20	6700193.47	1630776.22	-119.84	123	0.19	-88.80	268.12	1.8	4.9	3.86
HFM20	6700193.32	1630775.65	-140.83	144	0.21	-88.10	250.62	1.8	4.9	4.52
HFM20	6700193.04	1630775.03	-158.82	162	0.23	-87.50	243.22	1.8	4.9	5.09
HFM20	6700192.57	1630774.16	-179.80	183	0.26	-87.10	239.72	1.8	4.9	5.75
HFM20	6700192.00	1630773.19	-200.77	204	0.30	-86.80	239.22	1.8	4.9	6.41
HFM20	6700191.44	1630772.29	-218.73	222	0.33	-86.60	237.72	1.8	4.9	6.97
HFM20	6700190.75	1630771.23	-239.70	243	0.37	-86.60	235.52	1.8	4.9	7.63
HFM20	6700190.02	1630770.23	-260.66	264	0.41	-86.50	233.42	1.8	4.9	8.29
HFM20	6700189.33	1630769.34	-278.62	282	0.45	-86.30	231.52	1.8	4.9	8.86
HFM20	6700188.53	1630768.39	-297.58	301	0.49	-86.20	229.02	1.8	4.9	9.45

Borehole description HFM21

Figure 1 gives a technical description of HFM21.

Technical data

Borehole HFM21

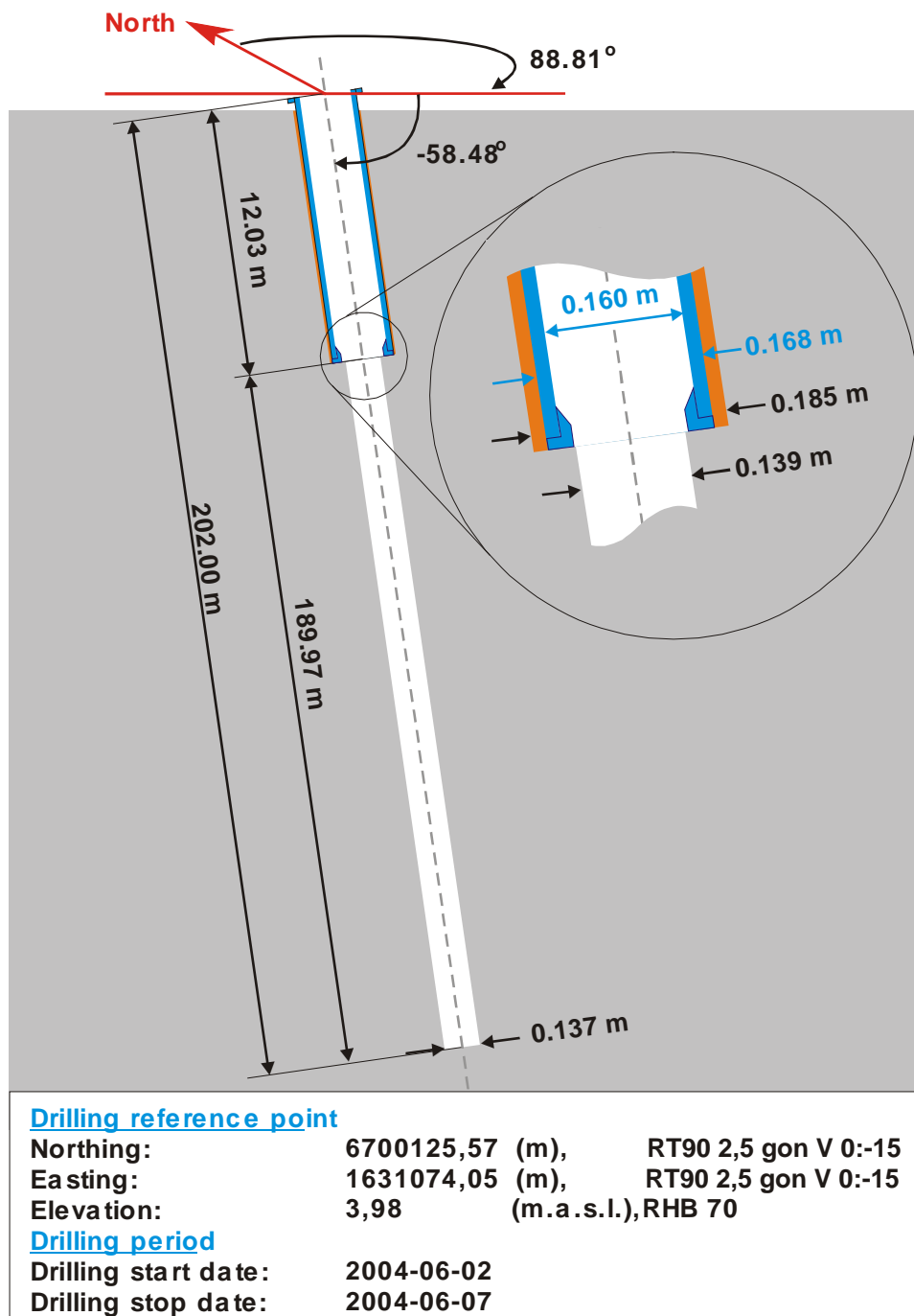


Figure 1. Technical description of HFM21.

Deviation measurement in HFM21

The only deviation measurement in HFM21 was performed with the Mag/acc (Flexit) instrument. The deviation logging activities are tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurement (ID 13141866) was executed every three metres downwards between the length 15–202 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activity ID 13036512 was based on the same measurement, but was adjusted with wrong magnetic declination and was therefore error marked. No geomagnetic disturbance exceeding 0.5 degrees in declination was observed on the date of the Mag/acc measurement, see Figure 2.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142395) the Mag/acc measurement (ID 13141866) was used. Table 2 shows the contents of the EG154-file used for the calculation of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively (see Section 4.4.2), and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activity listed in Table 1.

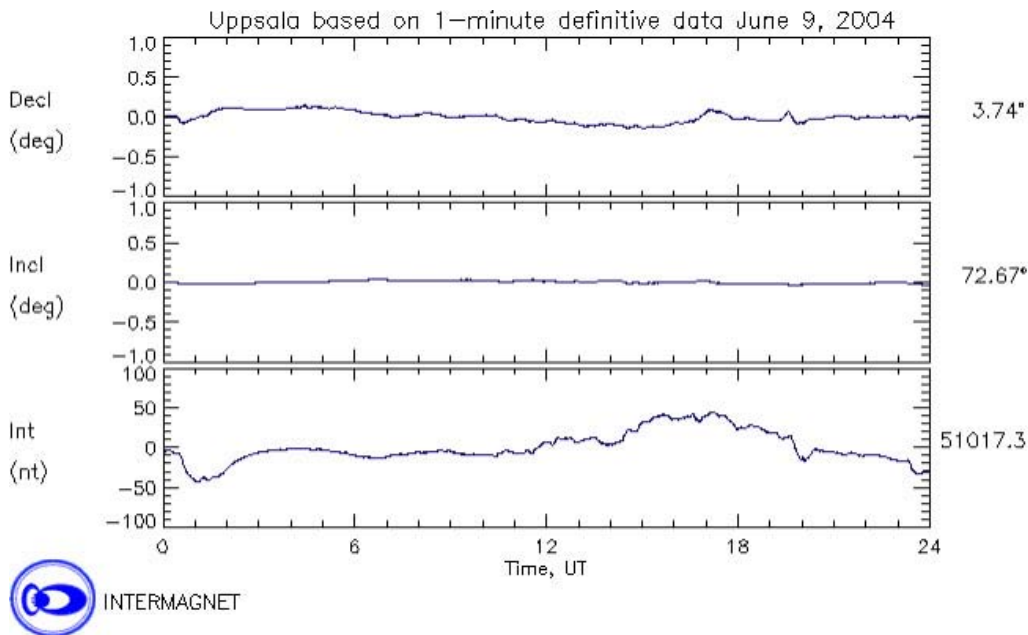


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2004-06-09. The upper curve shows the declination.

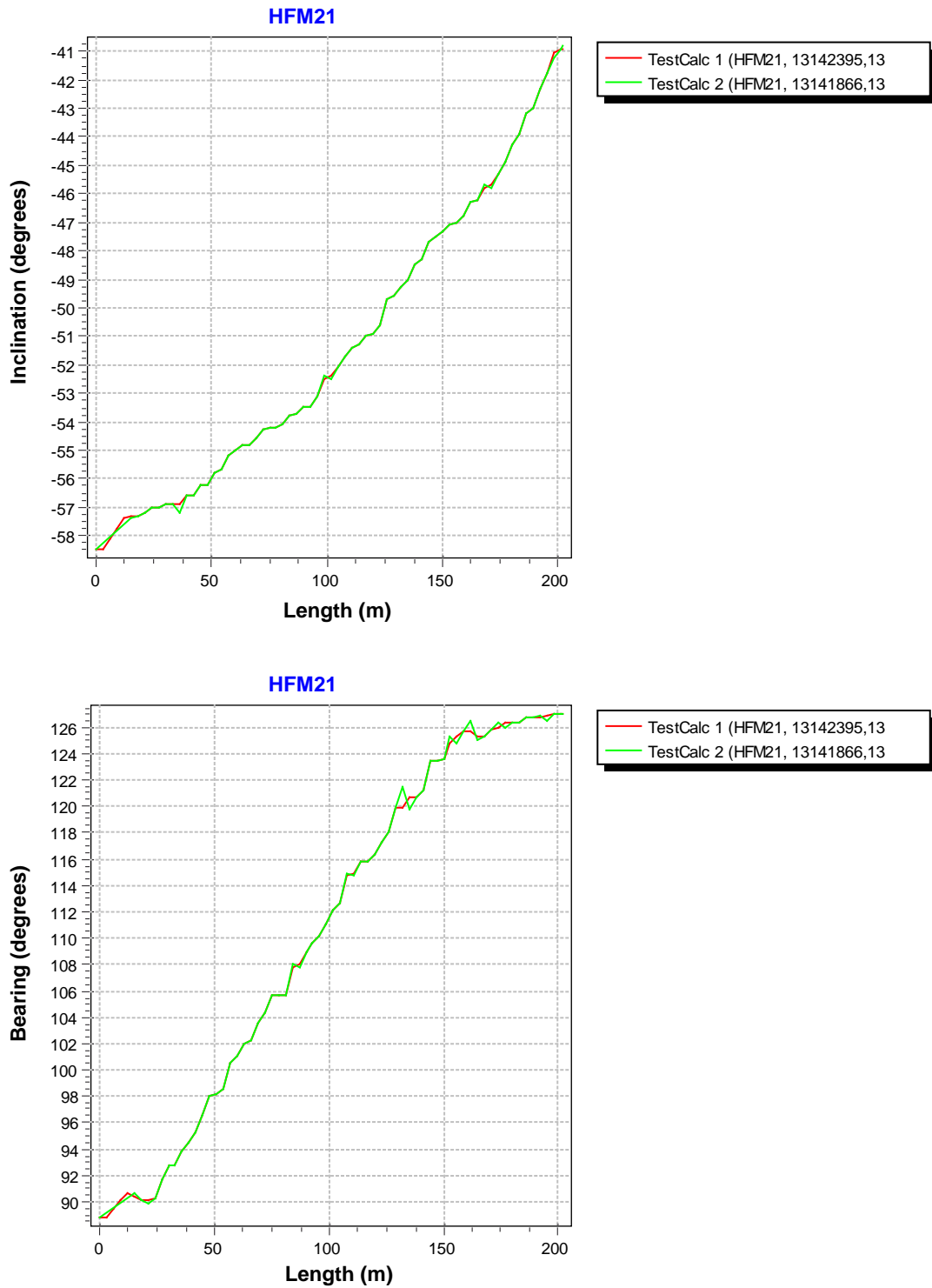


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activities specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM21	13141866	EG157	Magnetic - accelerometer measurement	2004-06-09 07:30	15.00	202.00	F	061220 12:18
HFM21	13036512	EG157	Magnetic - accelerometer measurement	2004-06-09 07:30	15.00	202.00	E	070823 08:19
HFM21	13142395	EG154	Borehole deviation multiple measurements	2006-12-20 16:50			I C	070111 08:11

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM21	13141866	BEARING	15.00	202.00	4.900
HFM21	13141866	INCLINATION	15.00	202.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
HFM21	6700125.57	1631074.05	3.98	0	0.00	-58.48	88.81	1.8	4.9	0.00
HFM21	6700125.56	1631088.52	-18.82	27	0.46	-57.00	91.72	1.8	4.9	1.24
HFM21	6700124.44	1631101.68	-38.85	51	0.87	-55.80	98.12	1.8	4.9	2.37
HFM21	6700121.15	1631116.86	-60.92	78	1.36	-54.20	105.62	1.8	4.9	3.70
HFM21	6700116.54	1631130.39	-80.20	102	1.81	-52.40	112.12	1.8	4.9	4.92
HFM21	6700110.12	1631143.96	-98.92	126	2.28	-49.70	118.02	1.8	4.9	6.21
HFM21	6700100.72	1631159.21	-119.11	153	2.85	-47.10	124.72	1.8	4.9	7.75
HFM21	6700088.50	1631176.19	-140.60	183	3.51	-43.90	126.42	1.8	4.9	9.54
HFM21	6700080.06	1631187.45	-153.37	202	3.95	-40.90	127.02	1.8	4.9	10.75

Borehole description HFM22

Figure 1 gives a technical description of HFM22.

Technical data

Borehole HFM22

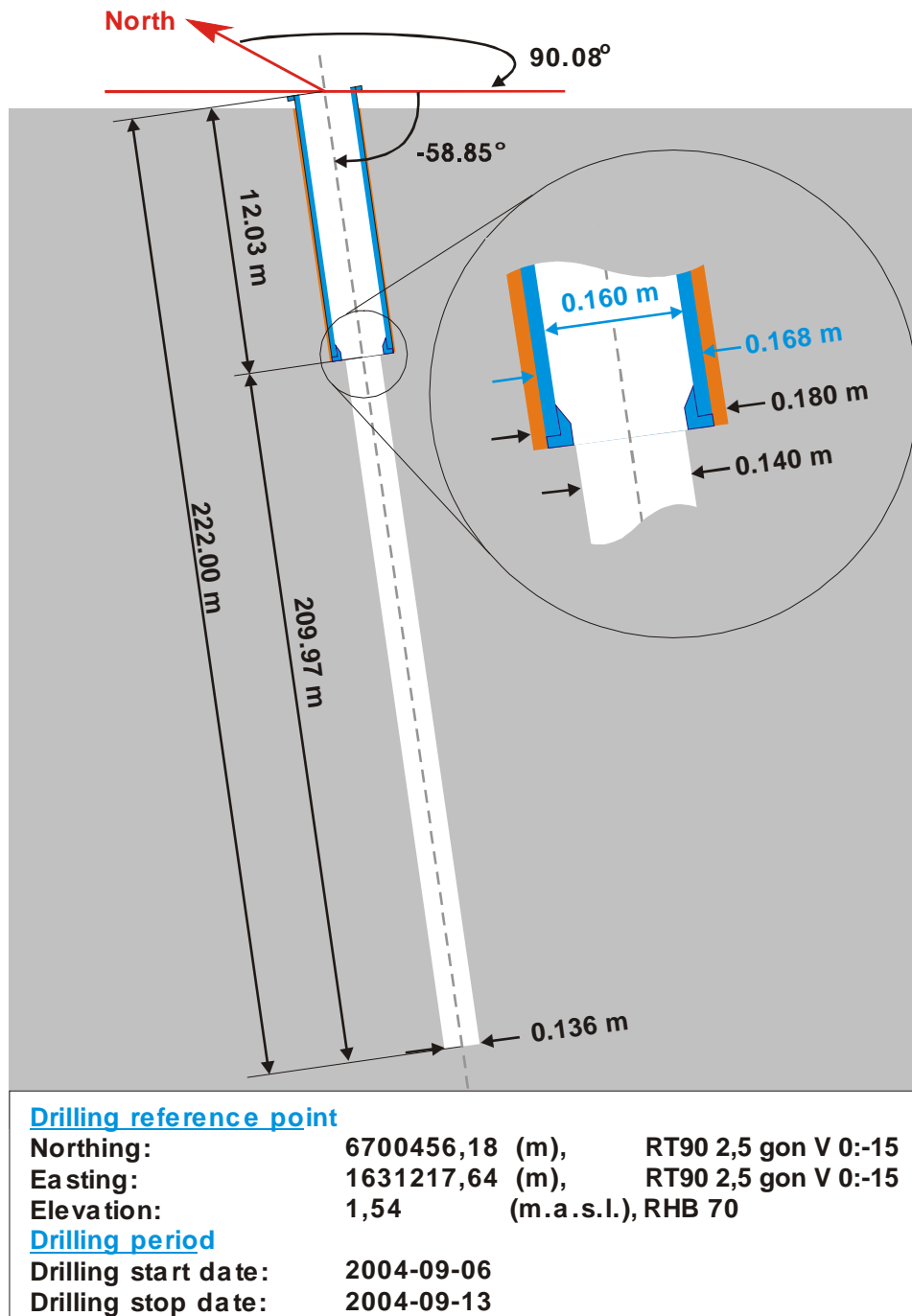


Figure 1. Technical description of HFM22.

Deviation measurement in HFM22

The only deviation measurement in HFM22 was performed with the Mag/acc (Flexit) instrument. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurement (ID 13142186) was executed every three metres downwards between the length 15–222 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activity ID 13036513 was based on the same measurement, but was adjusted with wrong magnetic declination and was therefore error marked. No geomagnetic disturbance exceeding 0.5 degrees in declination was observed on the date of the Mag/acc measurements, see Figure 2.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142396) the Mag/acc measurement (ID 13142186) was used. Table 2 shows the contents of the EG154-file used for the calculation of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively (see Section 4.4.2), and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activity listed in Table 1.

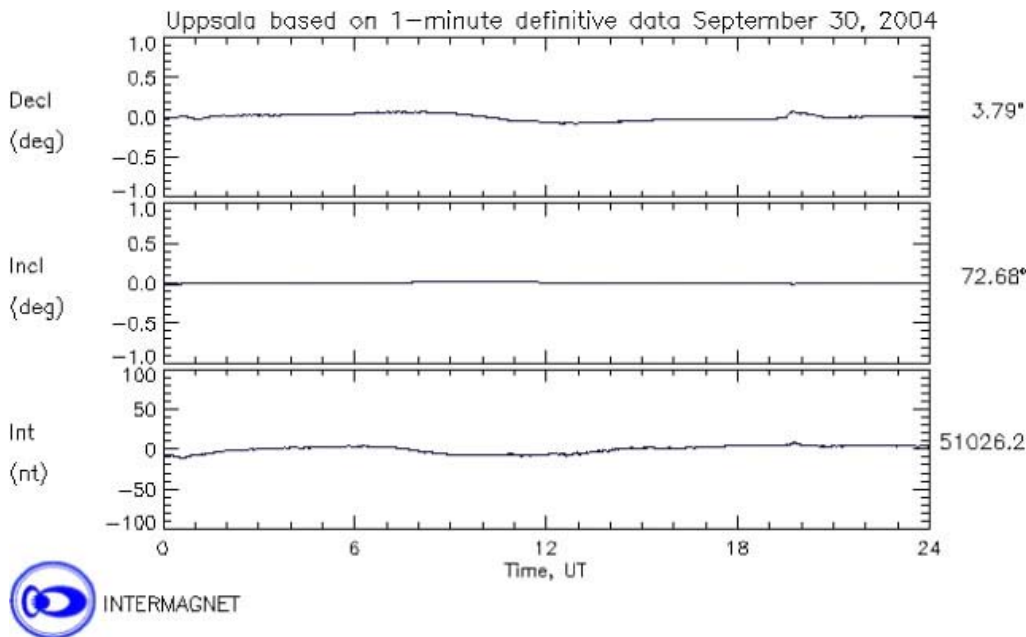


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2004-09-30. The upper curve shows the declination.

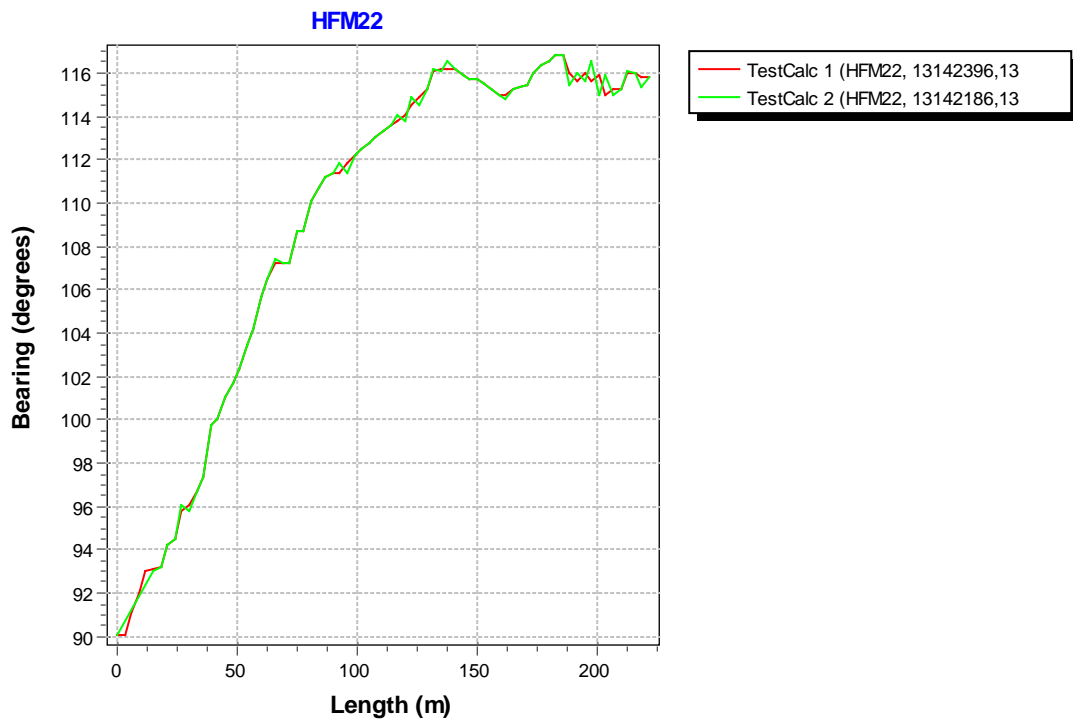
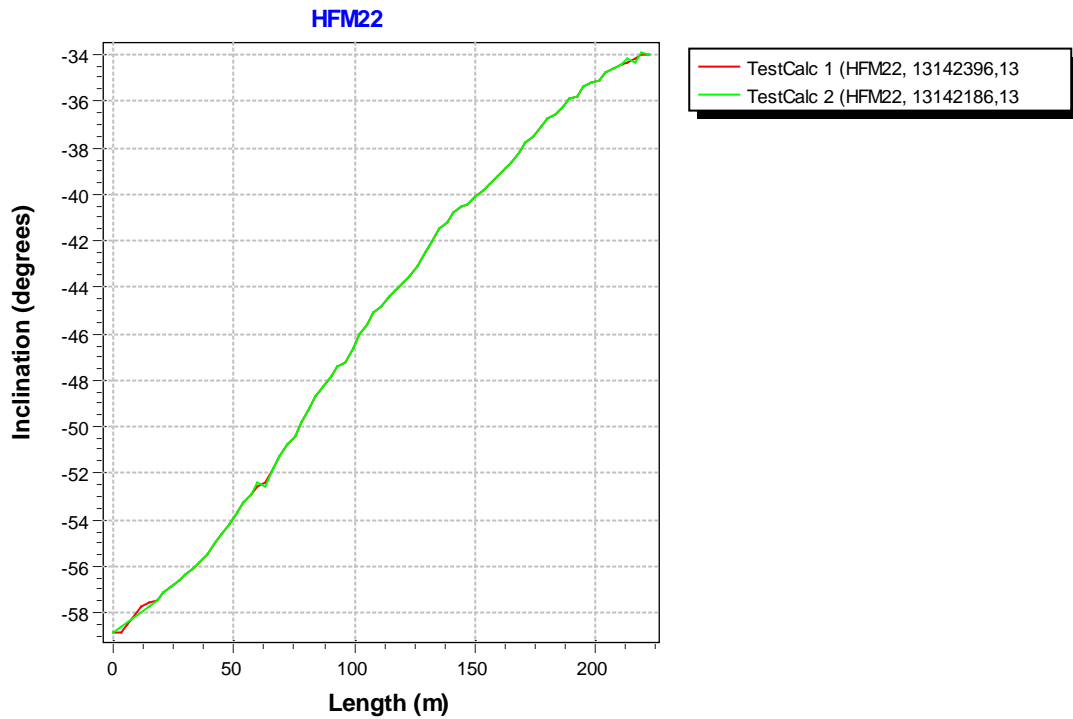


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activities specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM22	13036513	EG157	Magnetic - accelerometer measurement	2004-09-30 12:15:00	15.00	222.00	E	061220 12:34
HFM22	13142186	EG157	Magnetic - accelerometer measurement	2004-09-30 12:15:00	15.00	222.00	F	061220 12:34
HFM22	13142396	EG154	Borehole deviation multiple measurements	2006-12-20 17:00:00			I C	070111 08:11

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM22	13142186	BEARING	15.00	222.00	4.900
HFM22	13142186	INCLINATION	15.00	222.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_UNCERT	INCLINATION	BEARING	INCLINATION_UNCERT	BEARING_UNCERT	RADIUS_UNCERT
HFM22	6700456.18	1631217.64	1.54	0	0.00	-58.85	90.08	1.8	4.9	0.00
HFM22	6700455.65	1631230.37	-18.79	24	0.40	-56.90	94.52	1.8	4.9	1.09
HFM22	6700453.37	1631245.48	-41.04	51	0.88	-53.70	102.32	1.8	4.9	2.41
HFM22	6700449.33	1631259.64	-59.99	75	1.35	-50.40	108.67	1.8	4.9	3.67
HFM22	6700442.90	1631276.46	-80.09	102	1.92	-46.00	112.52	1.8	4.9	5.21
HFM22	6700434.15	1631296.14	-100.96	132	2.60	-42.10	116.12	1.8	4.9	7.06
HFM22	6700424.22	1631316.73	-120.39	162	3.32	-38.90	115.02	1.8	4.9	9.02
HFM22	6700412.69	1631340.40	-140.27	195	4.15	-35.40	116.02	1.8	4.9	11.27
HFM22	6700403.07	1631360.44	-155.59	222	4.84	-34.00	115.82	1.8	4.9	13.17

Borehole description HFM23

Figure 1 gives a technical description of HFM23.

Technical data

Borehole HFM23

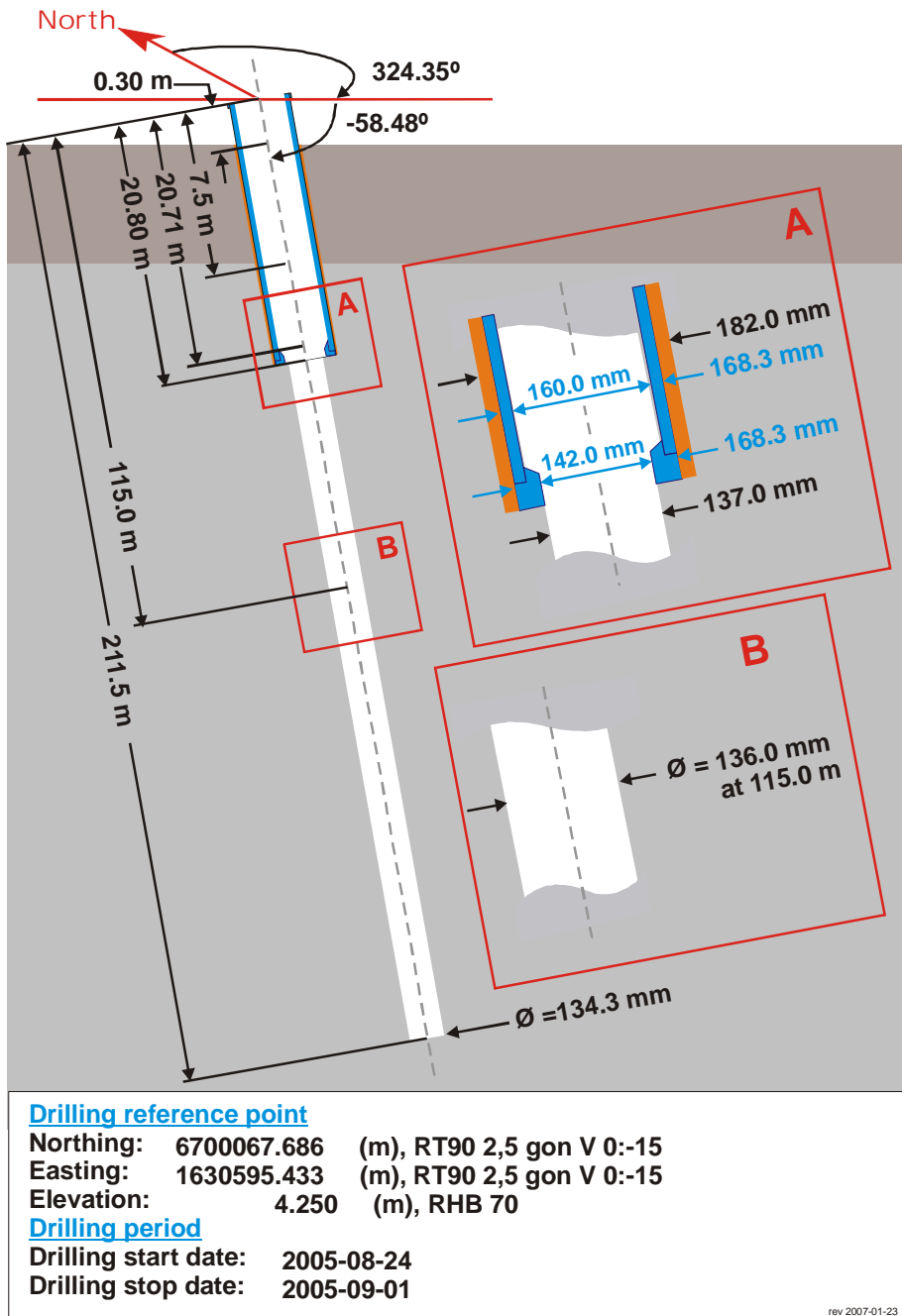


Figure 1. Technical description of HFM23.

Deviation measurement in HFM23

In total four deviation measurements were performed in HFM23 with the Mac/acc (Flexit) instrument. The deviation logging activities are tabulated in Sicada Activity Log, see Table 1.

Three Mag/acc measurements (ID 13141776, 13141777 and 13140977) were executed every three metres downwards between the length 24–114 m, 24–155 m and 3–204 m respectively with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activities ID 13101934 and 13118861 were based on the same measurements as above, but were adjusted with wrong magnetic declination and were therefore error marked. No geomagnetic disturbance exceeding 0.5 degrees in declination was observed on the dates of the Mag/acc measurements, see Figure 2a and 2b.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142372) the Mag/acc measurements (ID 13141776, 13141777 and 13140977) were used. Table 2 shows the contents of the EG154-file used for calculation of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. The inclination and bearing uncertainties are calculated automatically, and based on these values the “Radius uncertainty” is calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

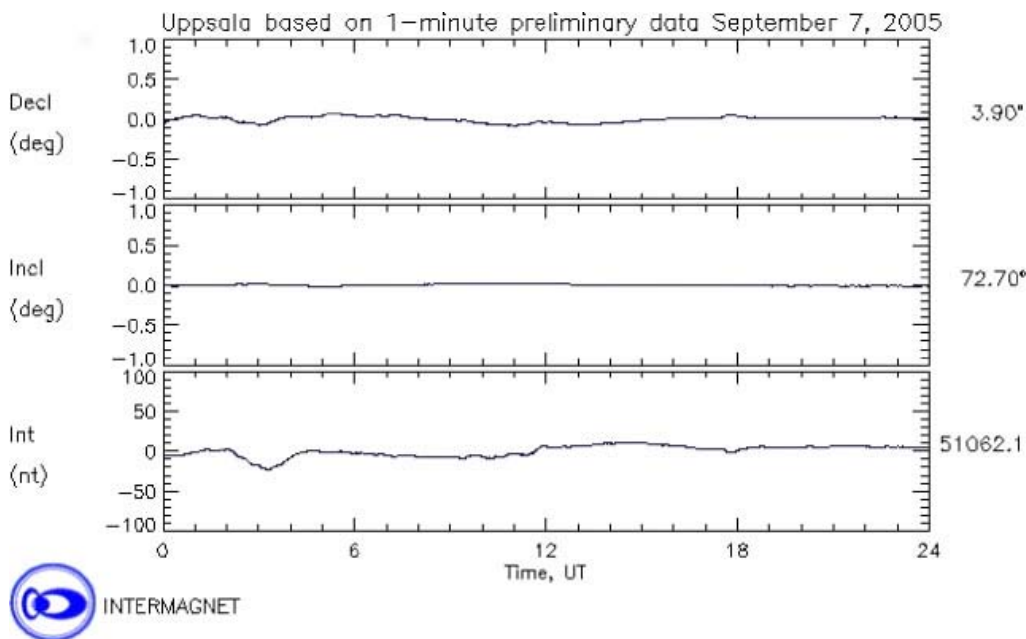


Figure 2a. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2005-09-07. The upper curve shows the declination.

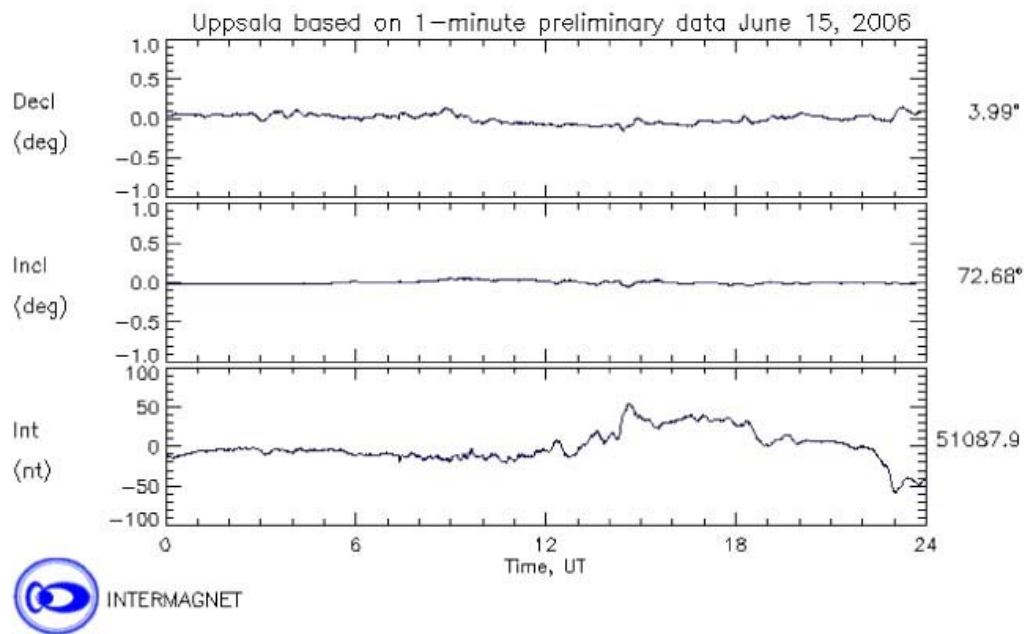
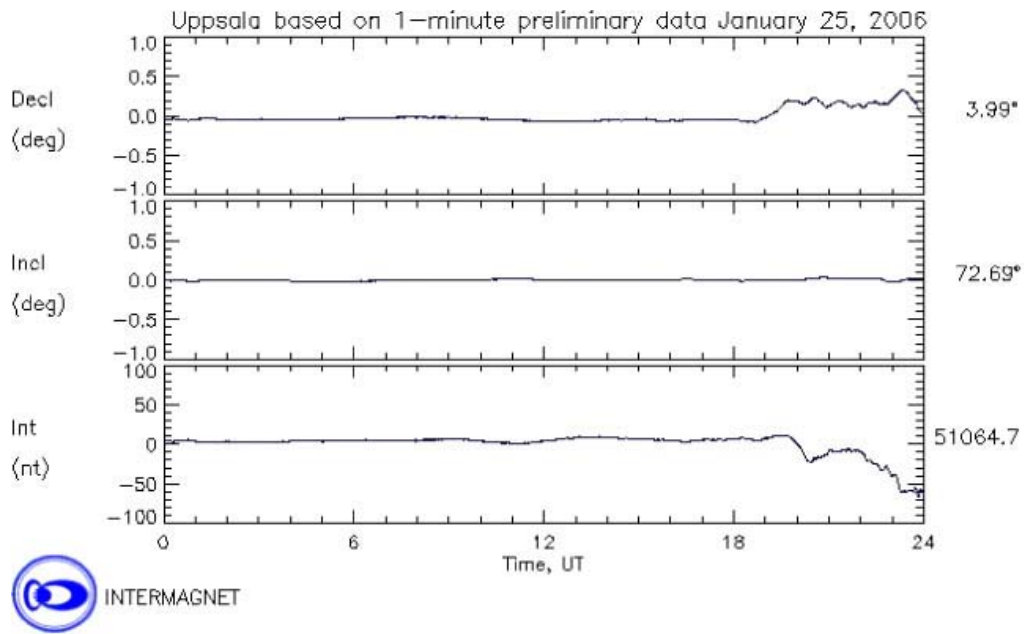


Figure 2b. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2006-01-25 and 2006-06-15. The upper curve shows the declination.

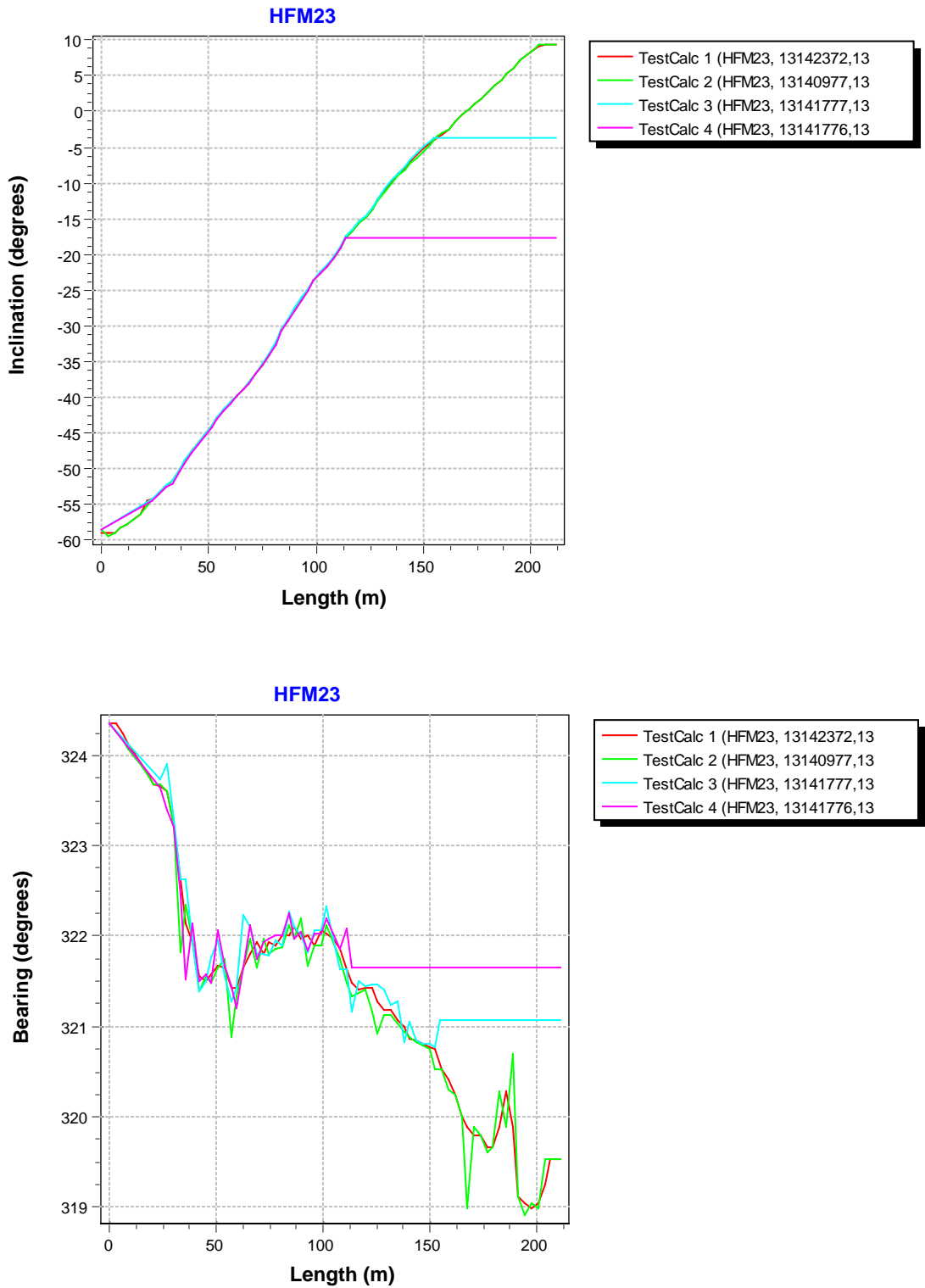


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activities specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM23	13141776	EG157	Magnetic - accelerometer measurement	2005-09-07 16:00:00	24.00	114.00	CF	061221 08:16
HFM23	13141777	EG157	Magnetic - accelerometer measurement	2006-01-25 13:40:00	24.00	155.00	F	061220 08:55
HFM23	13101934	EG157	Magnetic - accelerometer measurement	2006-01-25 13:40:00	24.00	155.00	EF	061219 13:19
HFM23	13118861	EG157	Magnetic - accelerometer measurement	2006-06-15 08:00:00	3.00	204.00	EF	061219 13:20
HFM23	13140977	EG157	Magnetic - accelerometer measurement	2006-06-15 12:20:00	3.00	204.00	F	061219 13:20
HFM23	13142372	EG154	Borehole deviation multiple measurements	2006-12-21 08:15:00			I C	070110 12:58

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM23	13140977	BEARING	24.00	204.00	
HFM23	13140977	INCLINATION	3.00	204.00	
HFM23	13141776	BEARING	24.00	114.00	
HFM23	13141776	INCLINATION	24.00	114.00	
HFM23	13141777	BEARING	24.00	155.00	
HFM23	13141777	INCLINATION	24.00	155.00	

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_UNCERT	INCLINATION	BEARING	INCLINATION_UNCERT	BEARING_UNCERT	RADIUS_UNCERT
HFM23	6700067.69	1630595.43	4.25	0	0.00	-58.94	324.35	0.26	0.3	0.00
HFM23	6700081.07	1630585.68	-20.74	30	0.08	-52.42	323.23	0.26	0.3	0.14
HFM23	6700095.48	1630574.35	-40.50	57	0.16	-41.85	321.42	0.26	0.3	0.26
HFM23	6700116.56	1630557.79	-59.61	90	0.28	-27.70	321.97	0.26	0.3	0.41
HFM23	6700208.15	1630482.51	-72.78	211.5	0.82	9.35	319.53	0.26	0.3	1.03

Borehole description HFM24

Figure 1 gives a technical description of HFM24.

Technical data

Borehole HFM24

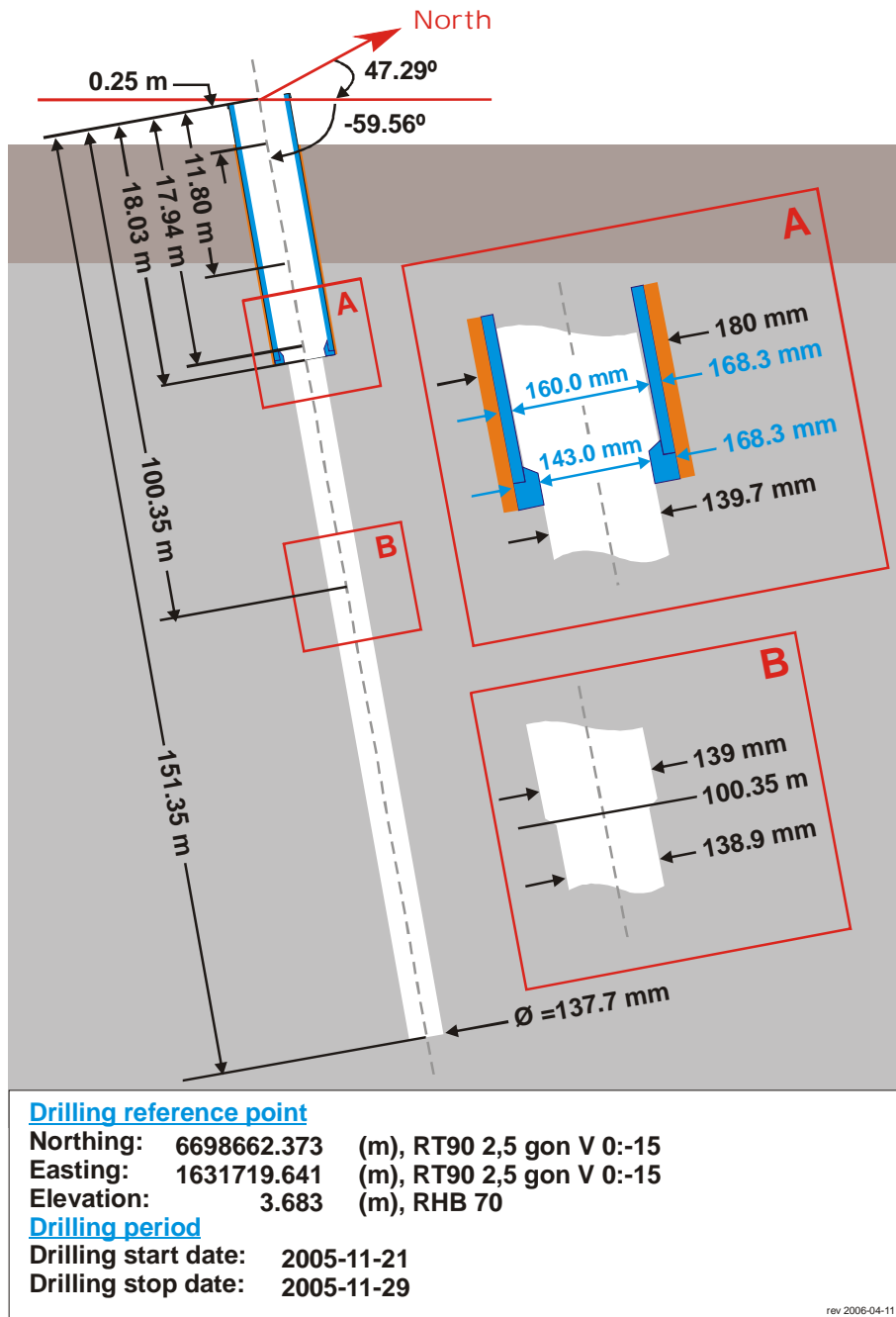


Figure 1. Technical description of HFM24.

Deviation measurement in HFM24

The only deviation measurements in HFM24 was performed with the Mac/acc (Flexit) instrument. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurement (ID 13140999) was executed every three metres downwards between the length 21–150 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activity ID 13101933 was based on the same measurement, but was adjusted with wrong magnetic declination and was therefore error marked. No geomagnetic disturbance exceeding 0.5 degrees in declination was observed on the date of the Mag/acc measurement, see Figure 2.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142200) the Mag/acc measurement (ID 13140999) was used. Table 2 shows the contents of the EG154-file used for the calculation of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively (see Section 4.4.2), and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

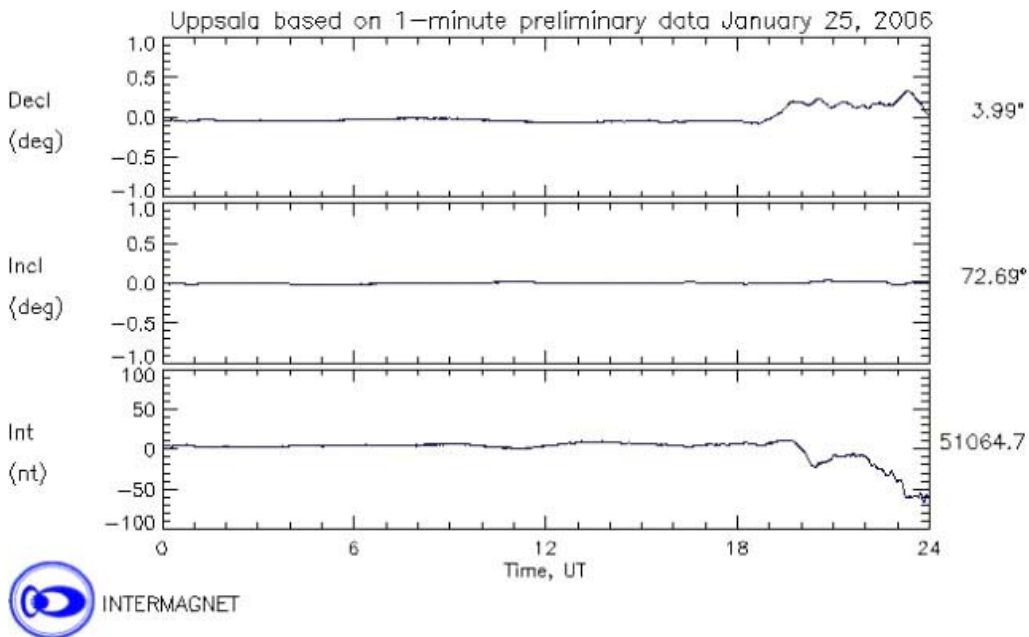


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2006-01-25. The upper curve shows the declination.

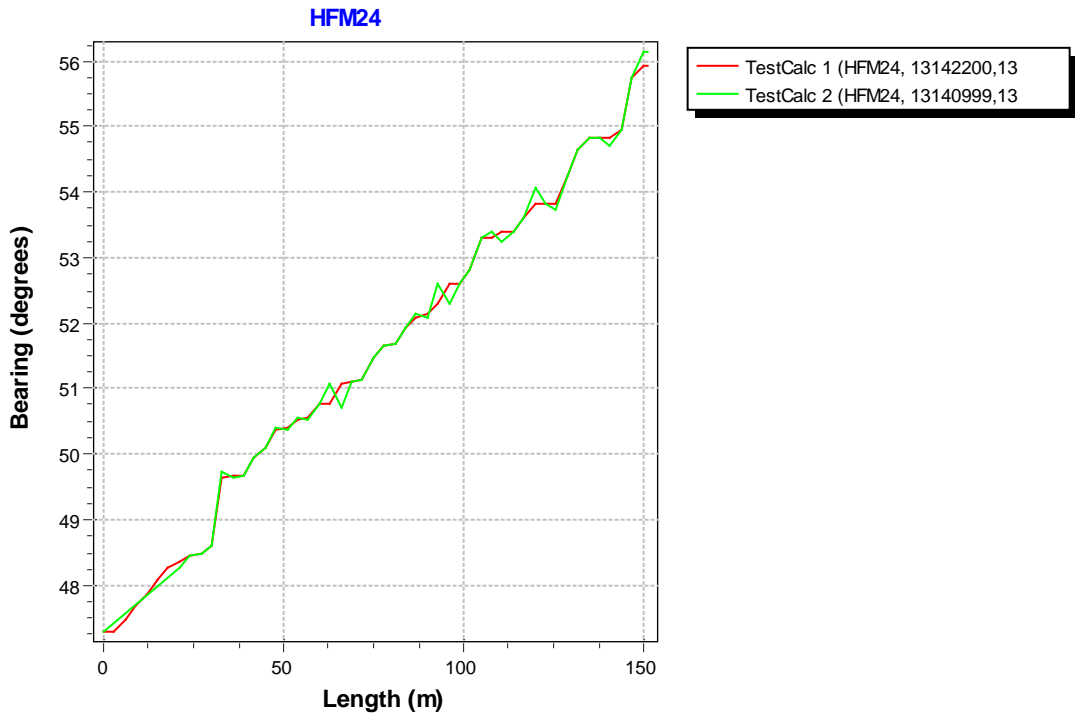
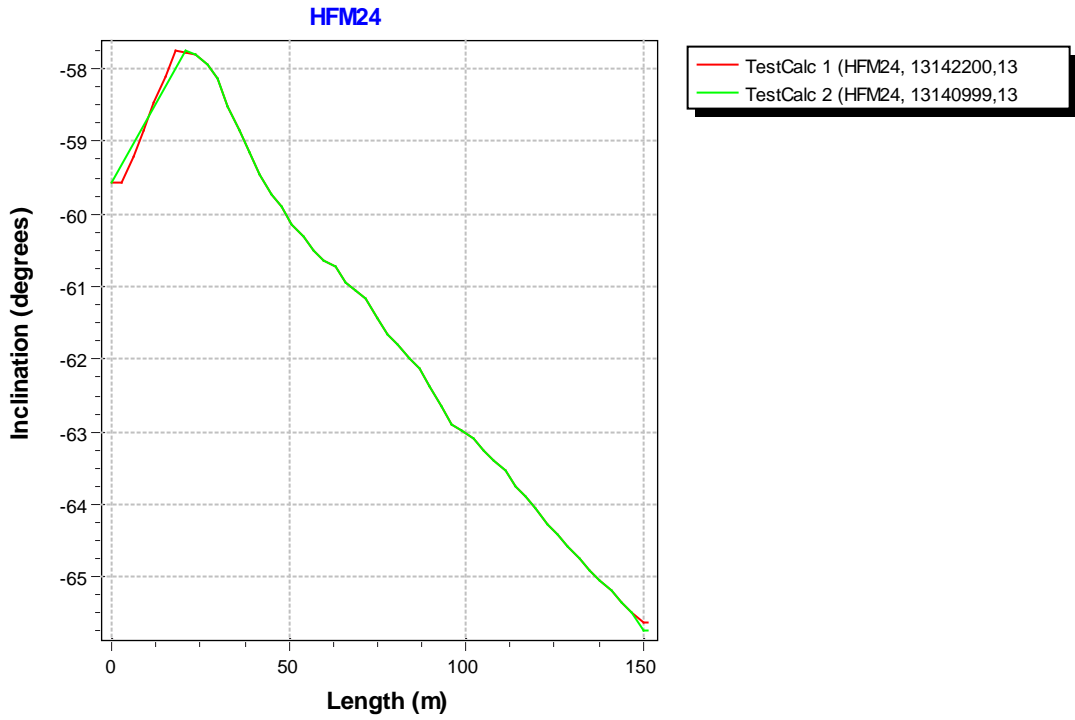


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activities specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM24	13101933	EG157	Magnetic - accelerometer measurement	2006-01-25 10:00:00	21.00	150.00	EF	061219 13:21
HFM24	13140999	EG157	Magnetic - accelerometer measurement	2006-01-25 10:00:00	21.00	150.00	F	061219 13:21
HFM24	13142200	EG154	Borehole deviation multiple measurements	2006-12-19 16:30:00			I C	070111 08:12

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM24	13140999	BEARING	21.00	150.00	4.900
HFM24	13140999	INCLINATION	21.00	150.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
HFM24	6698662.37	1631719.64	3.68	0	0.00	-59.56	47.29	1.8	4.9	0.00
HFM24	6698671.83	1631730.12	-19.33	27	0.44	-57.94	48.48	1.8	4.9	1.21
HFM24	6698679.80	1631739.52	-39.92	51	0.83	-60.15	50.39	1.8	4.9	2.26
HFM24	6698687.20	1631748.61	-60.87	75	1.20	-61.43	51.47	1.8	4.9	3.26
HFM24	6698693.26	1631756.35	-79.43	96	1.50	-62.89	52.59	1.8	4.9	4.09
HFM24	6698699.69	1631764.94	-100.89	120	1.84	-64.05	53.83	1.8	4.9	5.01
HFM24	6698704.93	1631772.25	-119.87	141	2.12	-65.19	54.82	1.8	4.9	5.77
HFM24	6698707.37	1631775.79	-129.28	151.35	2.26	-65.61	55.94	1.8	4.9	6.14

Borehole description HFM25

Figure 1 gives a technical description of HFM25.

Technical data

Borehole HFM25

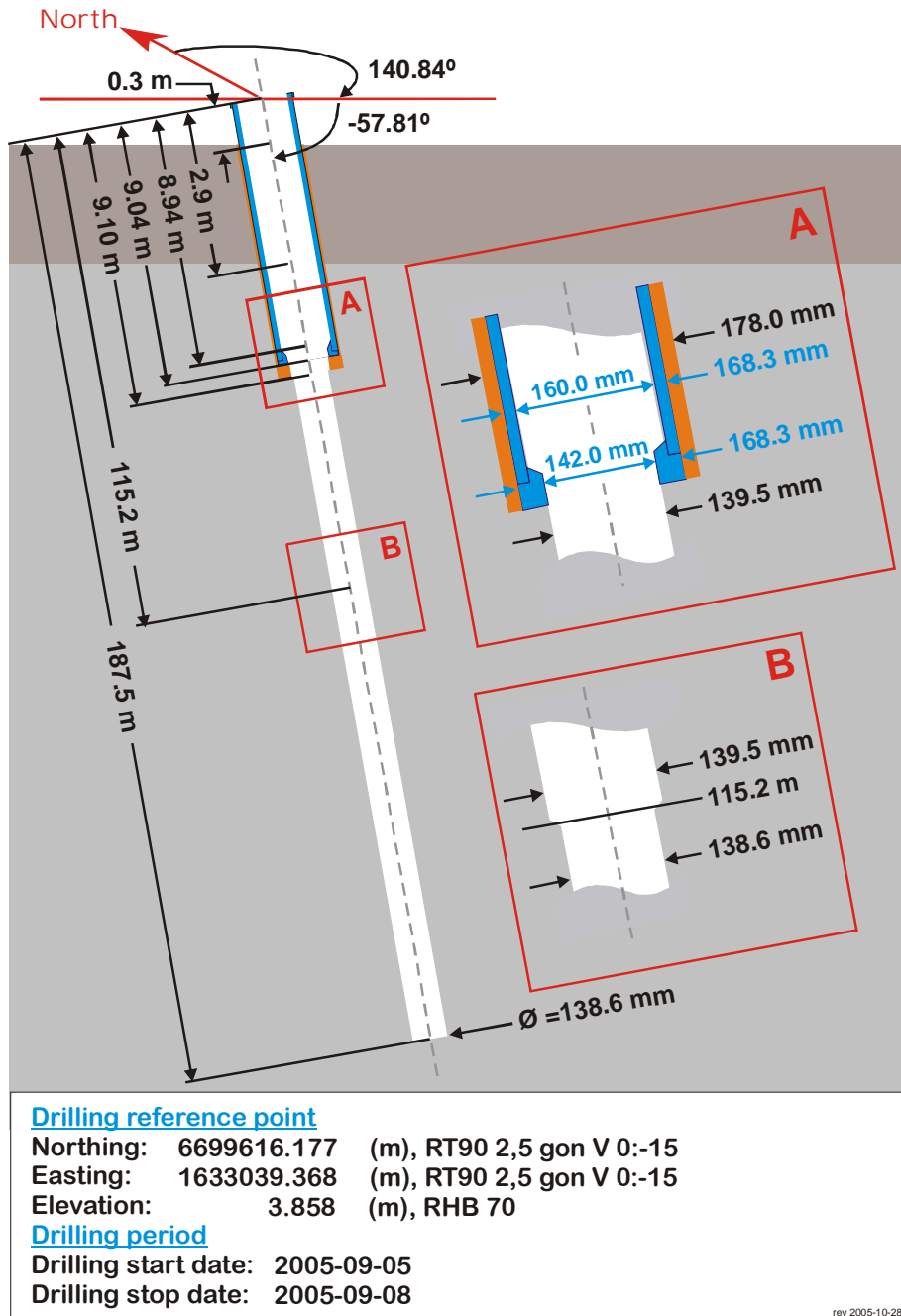


Figure 1. Technical description of HFM25.

Deviation measurement in HFM25

The only deviation measurement performed in HFM25 was with the Mac/acc, Flexit instrument. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

The Mag/acc measurement (ID 13141000) was executed every three metres downward between the length 12–186 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activity ID 13104241 was based on the same measurement, but was adjusted with wrong magnetic declination and was therefore error marked. No geomagnetic disturbance exceeding 0.5 degrees in declination was observed on the date and time of the Mag/acc measurements, see Figure 2.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142201) the Mag/acc measurement (ID 13141000) was used. Table 2 shows the contents of the EG154-file used for the calculation of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively (see Section 4.4.2), and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 3 show the resulting deviation data together with the other, not error marked, deviation activity listed in Table 1.

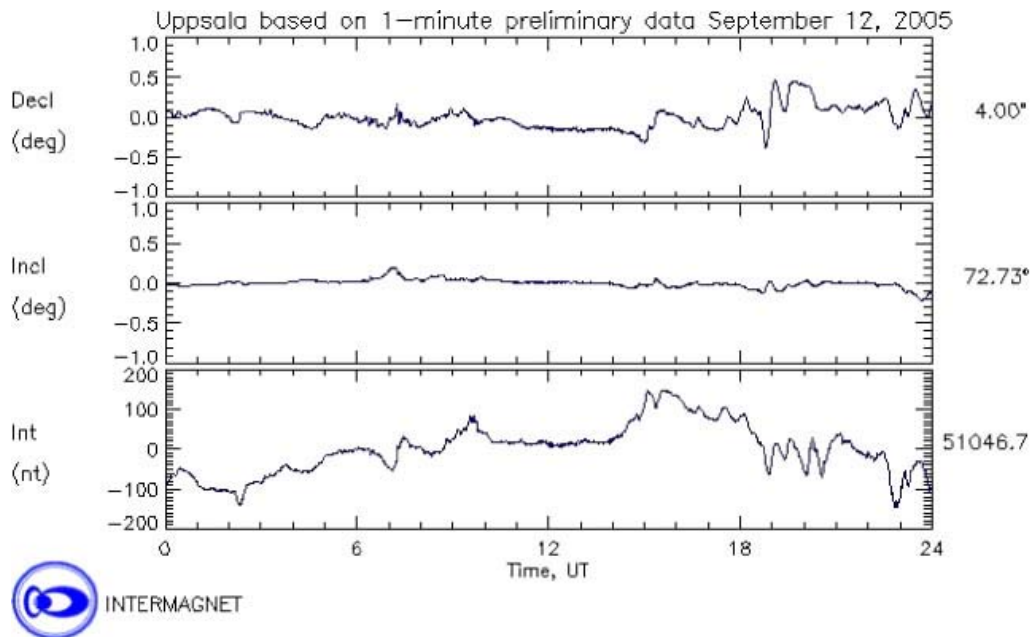


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2005-09-12. The upper curve shows the declination.

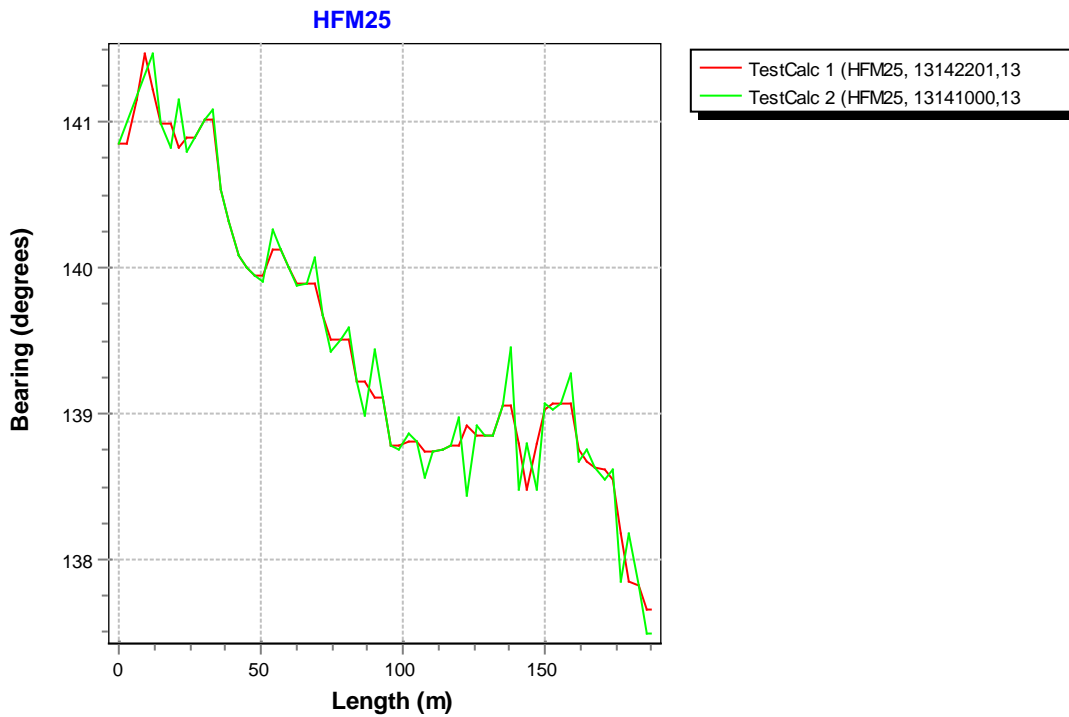
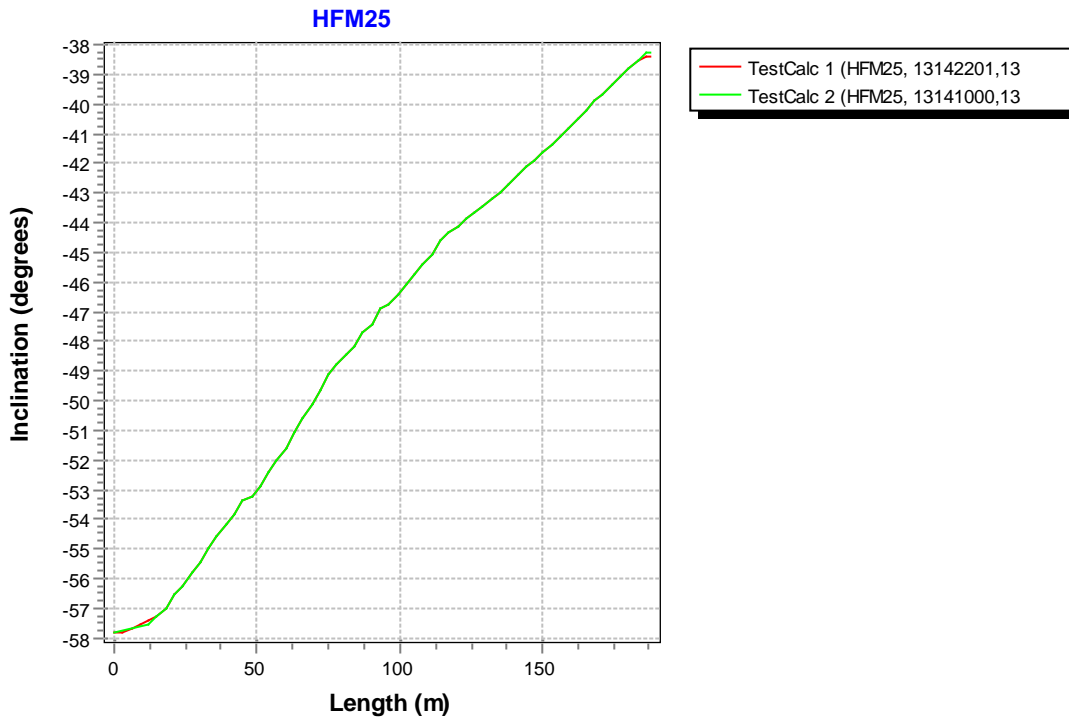


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activities specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM25	13141000	EG157	Magnetic - accelerometer measurement	2005-09-12 13:03:00	12.00	186.00	F	061219 13:23
HFM25	13104241	EG157	Magnetic - accelerometer measurement	2005-09-12 13:03:00	12.00	186.00	EF	061219 13:23
HFM25	13142201	EG154	Borehole deviation multiple measurements	2006-12-19 17:00:00			I C	070111 08:12

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM25	13141000	BEARING	12.00	186.00	4.900
HFM25	13141000	INCLINATION	12.00	186.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_UNCERT	INCLINATION	BEARING	INCLINATION_UNCERT	BEARING_UNCERT	RADIUS_UNCERT
HFM25	6699616.18	1633039.37	3.86	0	0.00	-57.81	140.84	1.8	4.9	0.00
HFM25	6699604.79	1633048.58	-18.82	27	0.46	-55.76	140.88	1.8	4.9	1.25
HFM25	6699592.59	1633058.69	-40.68	54	0.96	-52.43	140.13	1.8	4.9	2.61
HFM25	6699580.95	1633068.51	-59.22	78	1.44	-48.81	139.51	1.8	4.9	3.92
HFM25	6699567.10	1633080.52	-79.05	105	2.02	-45.76	138.81	1.8	4.9	5.49
HFM25	6699550.92	1633094.68	-99.96	135	2.70	-42.96	139.05	1.8	4.9	7.33
HFM25	6699534.03	1633109.42	-119.89	165	3.40	-40.22	138.67	1.8	4.9	9.25
HFM25	6699521.02	1633121.04	-134.10	187.5	3.95	-38.42	137.65	1.8	4.9	10.74

Borehole description HFM26

Figure 1 gives a technical description of HFM26.

Technical data

Borehole HFM26

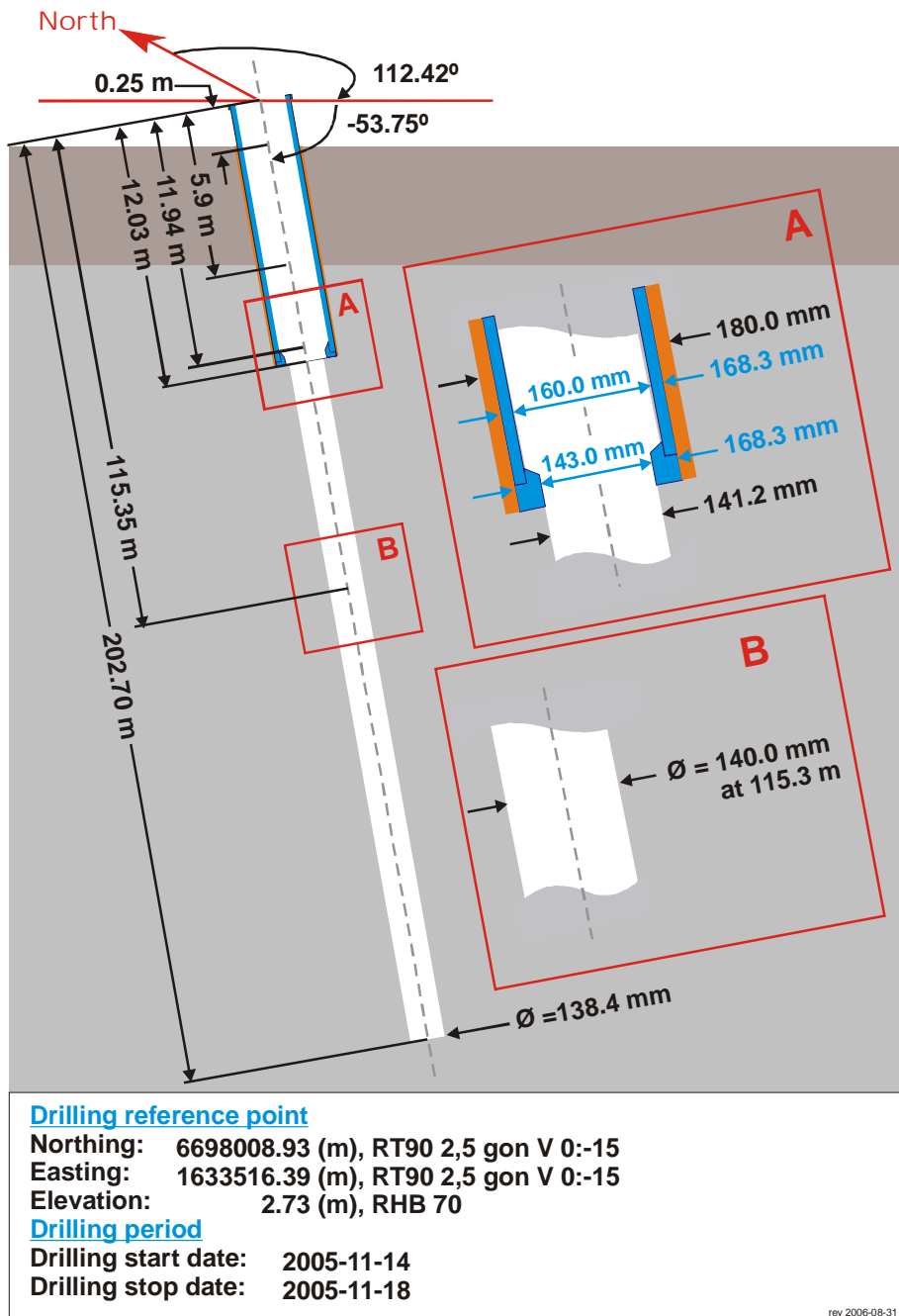


Figure 1. Technical description of HFM26.

Deviation measurement in HFM26

The only deviation measurement performed in HFM26 was with the Mac/acc, Flexit instrument. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurement (ID 13142188) was executed every three metres downwards between the length 15–198 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activity ID 13104251 was based on the same measurement, but was adjusted with wrong magnetic declination and was therefore error marked. No geomagnetic disturbance exceeding 0.5 degrees in declination was observed on the date of the Mag/acc measurement, see Figure 2.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142398) the Mag/acc measurement (ID 13142188) was used. Table 2 shows the contents of the EG154-file used for the calculation of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively (see Section 4.4.2), and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 3 show the resulting deviation data together with the other, not error marked, deviation activity listed in Table 1.

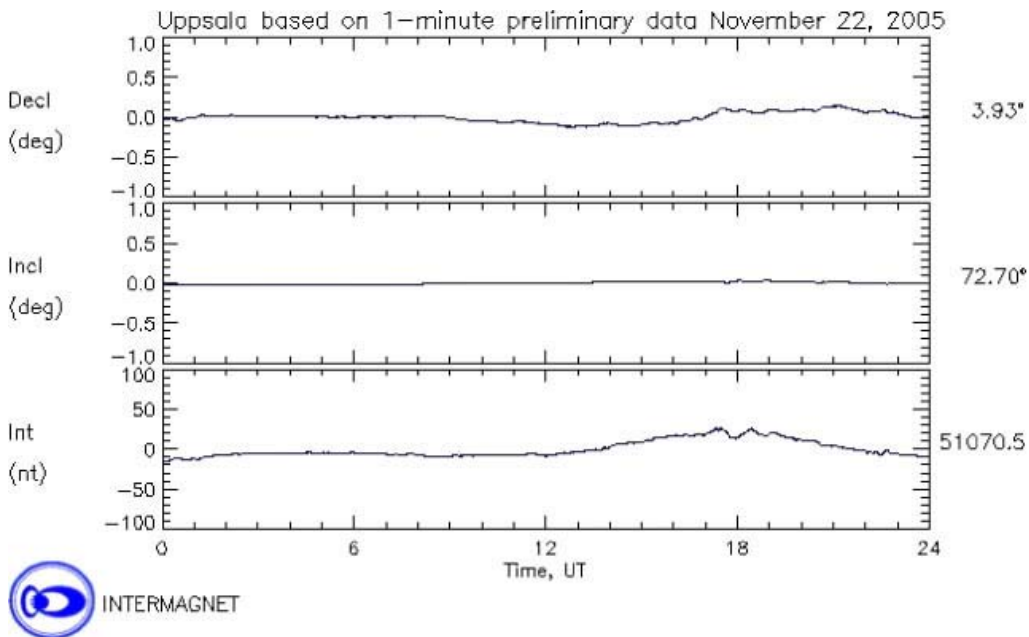


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2005-11-22. The upper curve shows the declination.

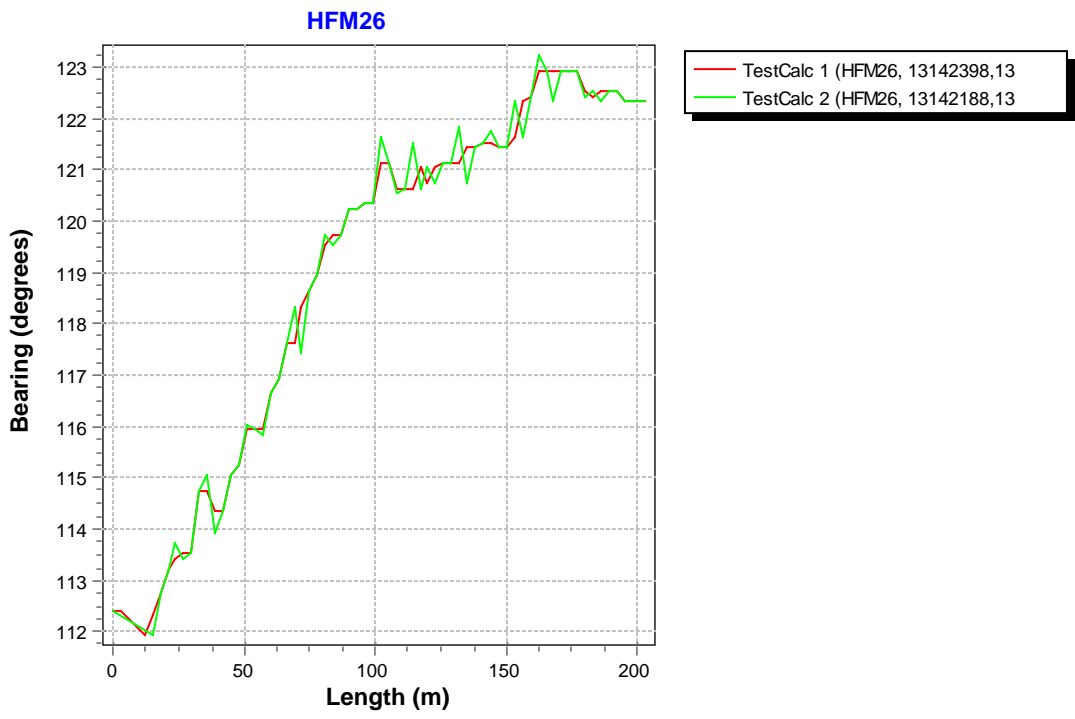
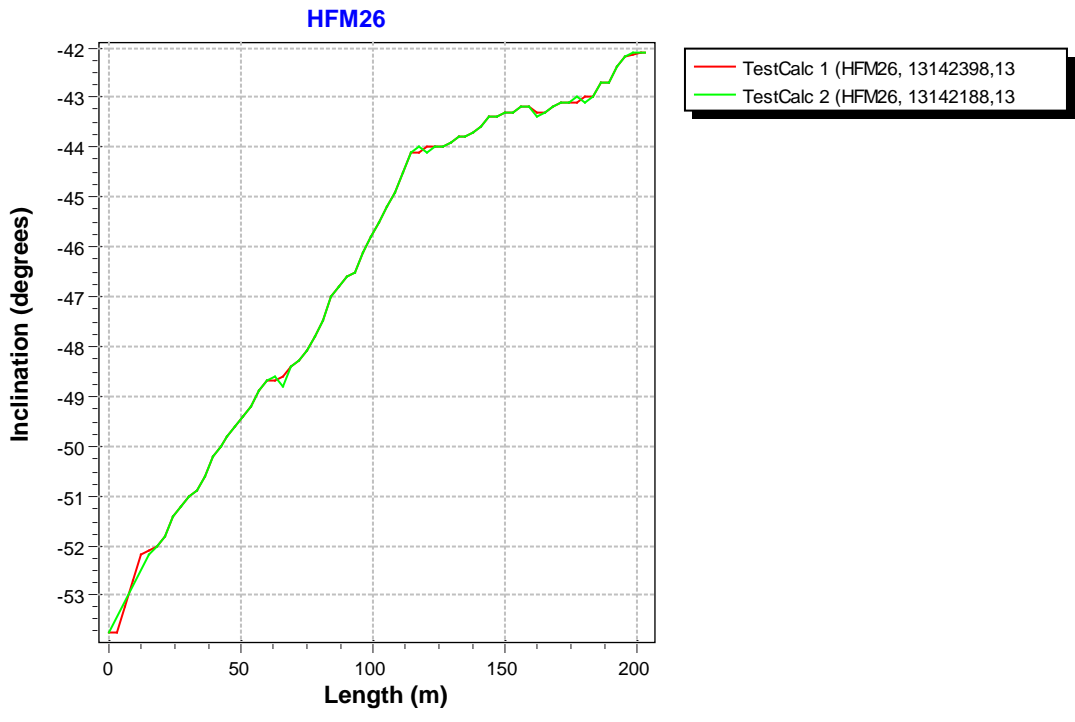


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activities specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM26	13142188	EG157	Magnetic - accelerometer measurement	2005-11-22 08:00:00	15.00	198.00	F	061220 12:48
HFM26	13104251	EG157	Magnetic - accelerometer measurement	2005-11-22 08:00:00	15.00	201.00	EF	061220 12:48
HFM26	13142398	EG154	Borehole deviation multiple measurements	2006-12-20 19:00:00			I C	070111 08:12

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM26	13142188	BEARING	15.00	198.00	4.900
HFM26	13142188	INCLINATION	15.00	198.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
HFM26	6698008.93	1633516.39	2.73	0	0.00	-53.75	112.42	1.8	4.9	0.00
HFM26	6698001.84	1633533.32	-20.99	30	0.58	-51.00	113.54	1.8	4.9	1.57
HFM26	6697995.36	1633547.29	-39.40	54	1.06	-49.20	115.94	1.8	4.9	2.89
HFM26	6697987.06	1633563.16	-59.60	81	1.63	-47.50	119.54	1.8	4.9	4.42
HFM26	6697977.62	1633579.29	-79.08	108	2.22	-44.90	120.64	1.8	4.9	6.03
HFM26	6697966.51	1633597.77	-99.94	138	2.89	-43.70	121.44	1.8	4.9	7.87
HFM26	6697954.94	1633616.26	-120.53	168	3.58	-43.20	122.94	1.8	4.9	9.73
HFM26	6697943.06	1633634.80	-140.91	198	4.27	-42.15	122.34	1.8	4.9	11.61
HFM26	6697941.20	1633637.74	-144.06	202.7	4.38	-42.10	122.34	1.8	4.9	11.91

Borehole description HFM27

Figure 1 gives a technical description of HFM27.

Technical data

Borehole HFM27

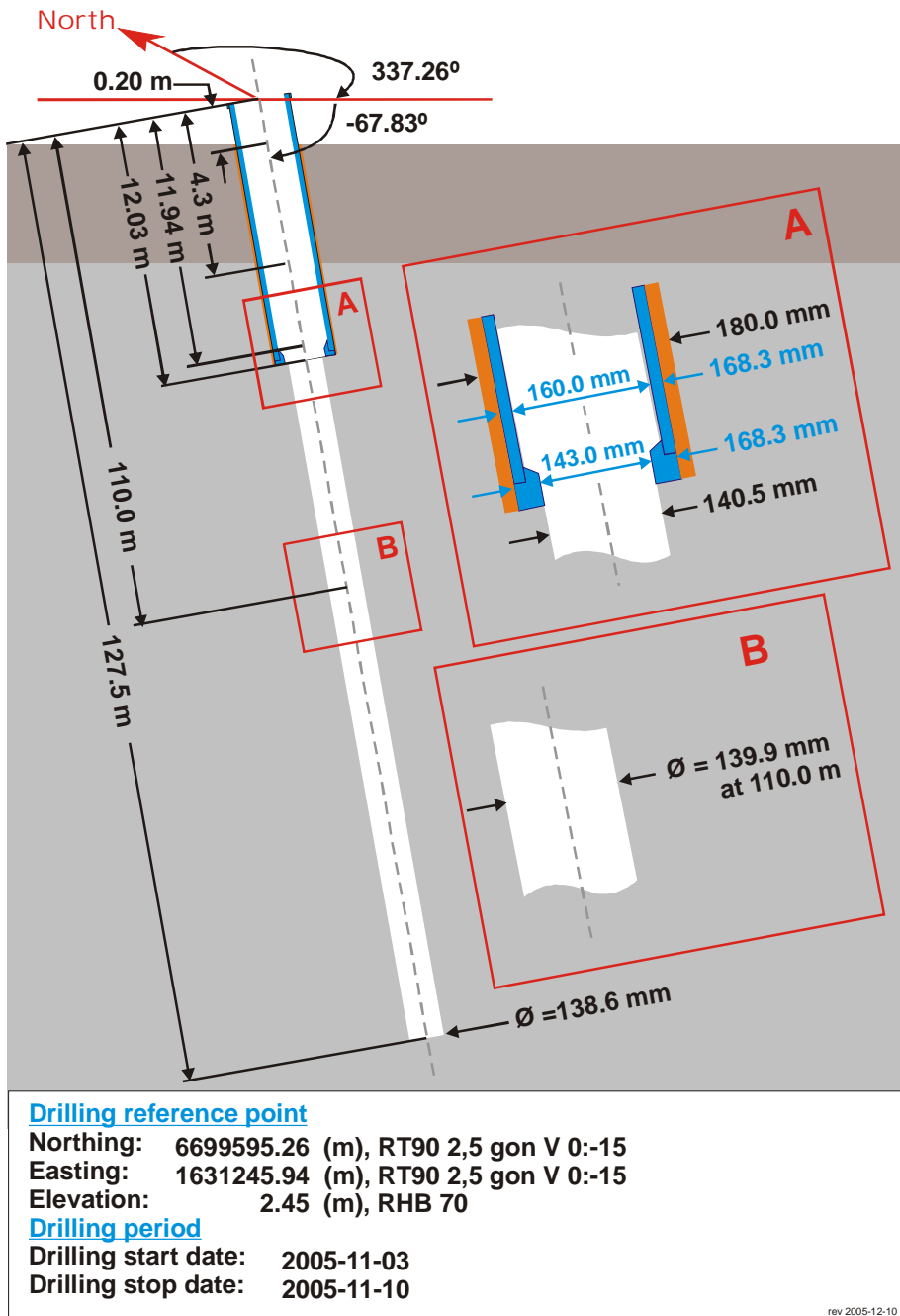


Figure 1. Technical description of HFM27.

Deviation measurement in HFM27

The only deviation measurement performed in HFM27 was with the Mag/acc, Flexit instrument. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurements (ID 13141038) was executed every three metres downwards between the length 15–126 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activity ID 13104253 was based on the same measurement, but was adjusted with wrong magnetic declination and was therefore error marked. No geomagnetic disturbance exceeding 0.5 degrees was observed on the date of the Mag/acc measurement, see Figure 2.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142210) the Mag/acc measurement (ID 13141038) was used. Table 2 shows the contents of the EG154-file used for the calculation of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively (see Section 4.4.2), and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activity listed in Table 1.

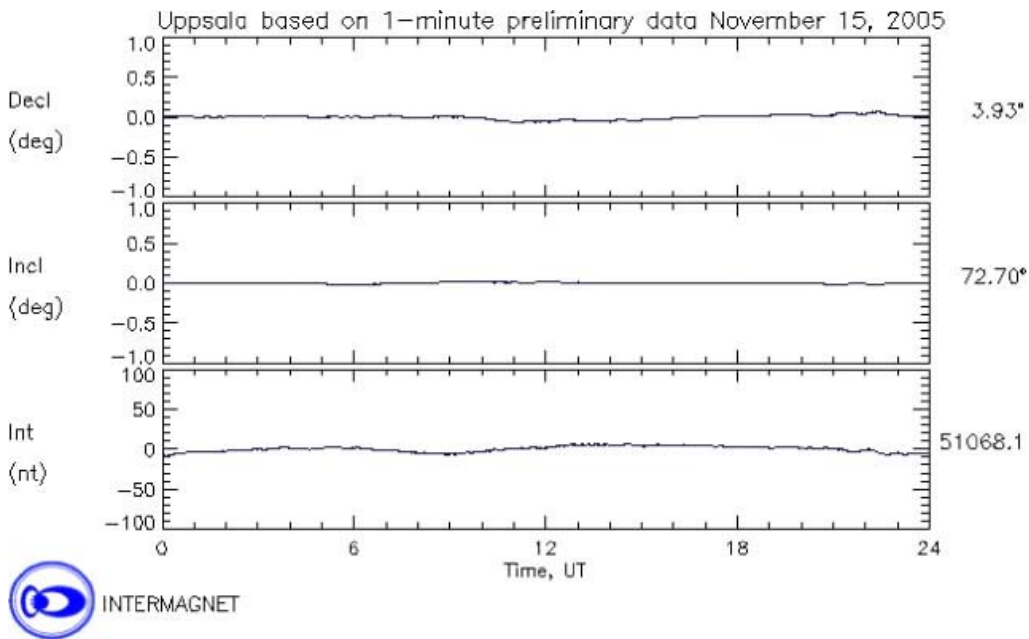


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2005-11-15. The upper curve shows the declination.

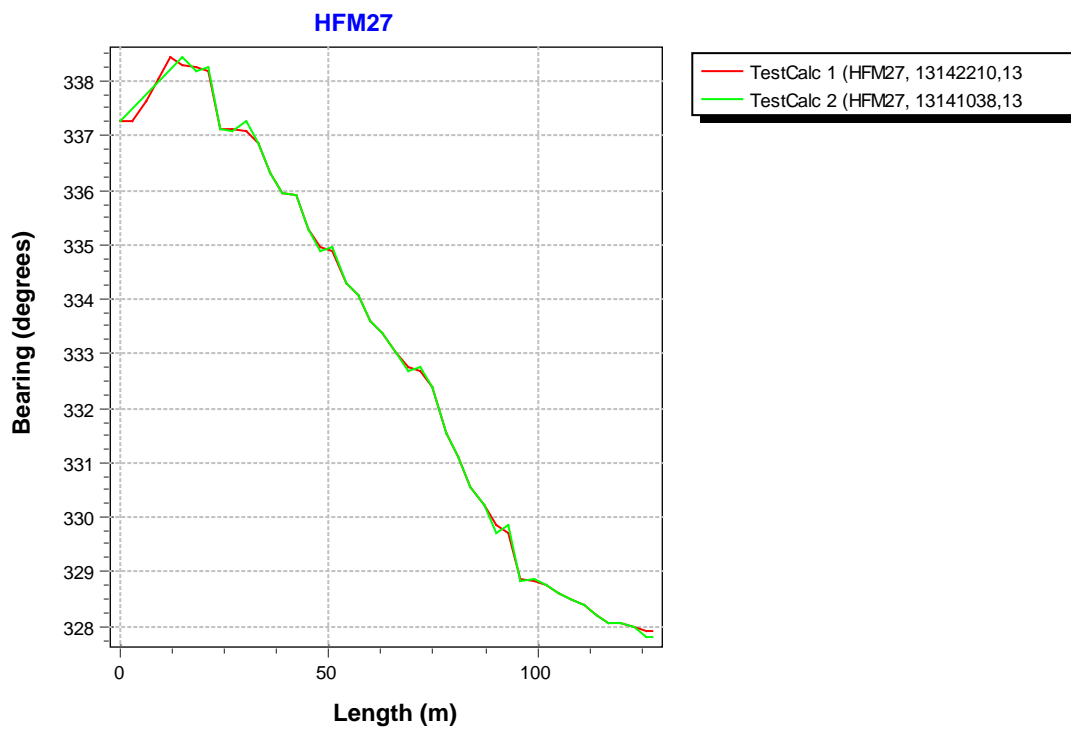
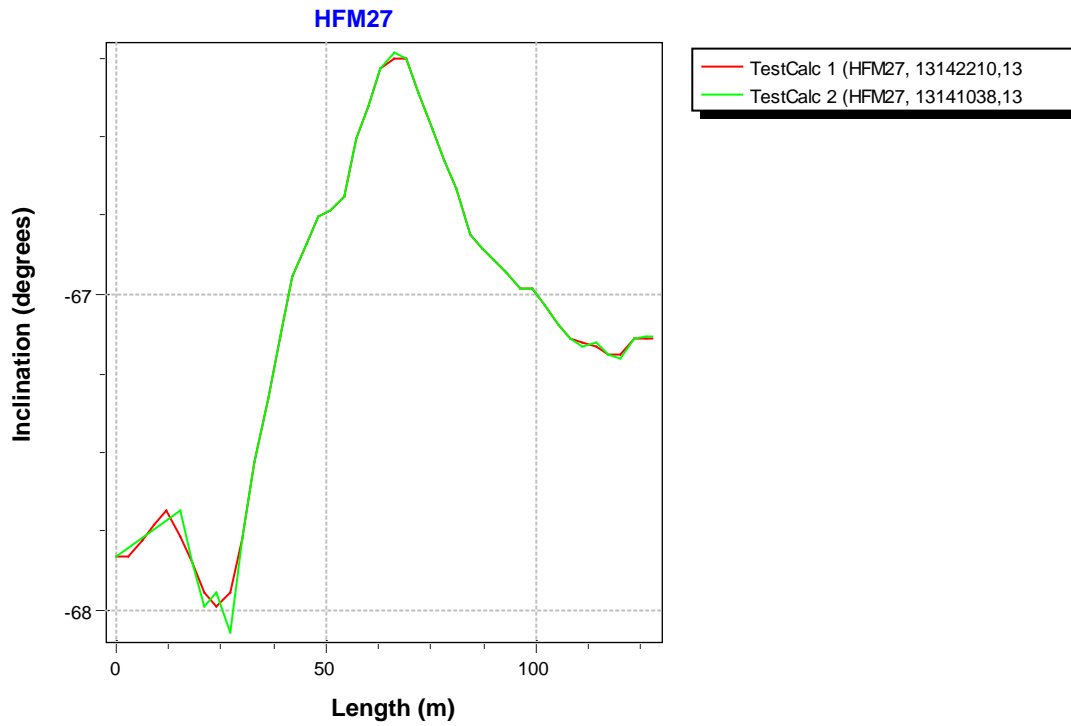


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activities specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM27	13141038	EG157	Magnetic - accelerometer measurement	2005-11-15 07:50:00	15.00	126.00	F	061219 13:24
HFM27	13104253	EG157	Magnetic - accelerometer measurement	2005-11-15 07:50:00	15.00	126.00	EF	061219 13:24
HFM27	13142210	EG154	Borehole deviation multiple measurements	2006-12-19 17:15:00			I C	070111 08:12

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM27	13141038	BEARING	15.00	126.00	4.900
HFM27	13141038	INCLINATION	15.00	126.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_UNCERT	INCLINATION	BEARING	INCLINATION_UNCERT	BEARING_UNCERT	RADIUS_UNCERT
HFM27	6699595.26	1631245.94	2.44	0	0.00	-67.83	337.26	1.8	4.9	0.00
HFM27	6699603.66	1631242.53	-19.78	24	0.28	-67.99	337.11	1.8	4.9	0.77
HFM27	6699611.05	1631239.31	-39.17	45	0.54	-66.84	335.29	1.8	4.9	1.46
HFM27	6699619.65	1631235.13	-61.18	69	0.84	-66.25	332.77	1.8	4.9	2.28
HFM27	6699626.97	1631231.14	-80.46	90	1.10	-66.89	329.86	1.8	4.9	2.99
HFM27	6699633.98	1631226.90	-99.79	111	1.36	-67.15	328.37	1.8	4.9	3.69
HFM27	6699639.42	1631223.52	-115.00	127.5	1.56	-67.13	327.89	1.8	4.9	4.24

Borehole description HFM28

Figure 1 gives a technical description of HFM28.

Technical data

Borehole HFM28

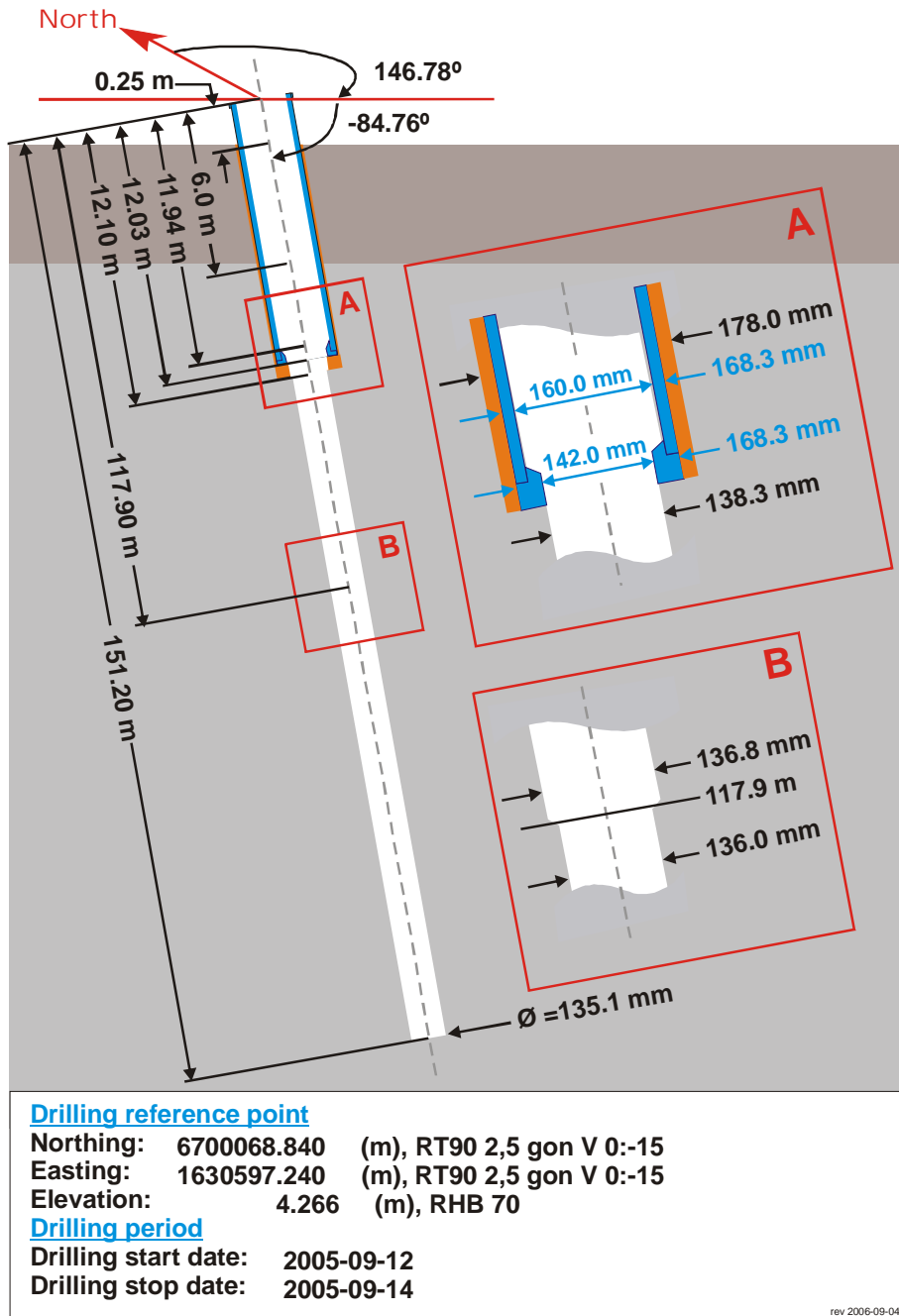


Figure 1. Technical description of HFM28.

Deviation measurement in HFM28

The only deviation measurement performed in HFM28 was with the Mag/acc, Flexit instrument. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurements (ID 13141041) was executed every three metres downwards between the length 15–149 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurement. The activity ID 13101932 was based on the same measurement, but was adjusted with wrong magnetic declination and was therefore error marked. No geomagnetic disturbance exceeding 0.5 degrees in declination was observed on the date of the Mag/acc measurement, see Figure 2.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142211) the Mag/acc measurement (ID 13141041) was used. Table 2 shows the contents of the EG154-file used for the calculation of the deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively (see Section 4.4.2), and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activity listed in Table 1.

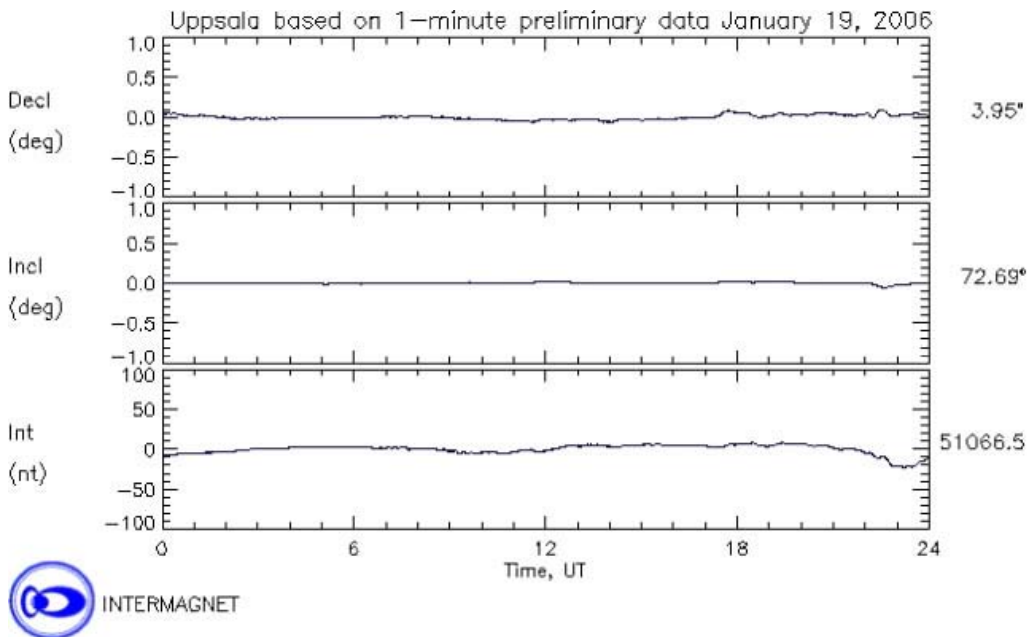


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2006-01-19. The upper curve shows the declination.

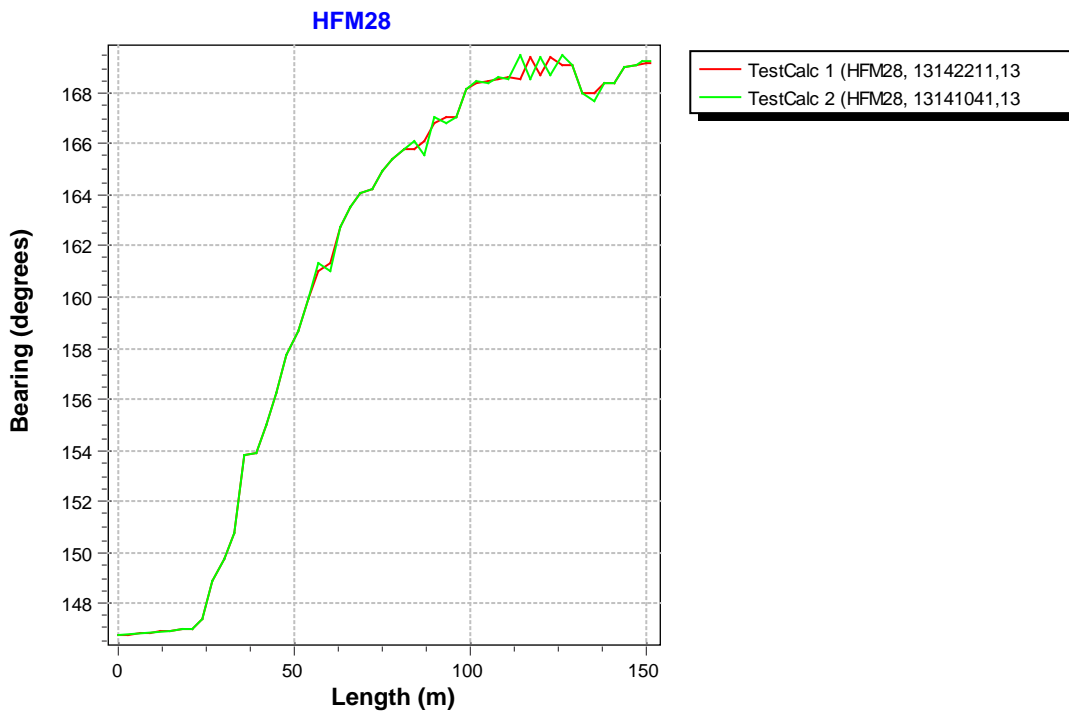
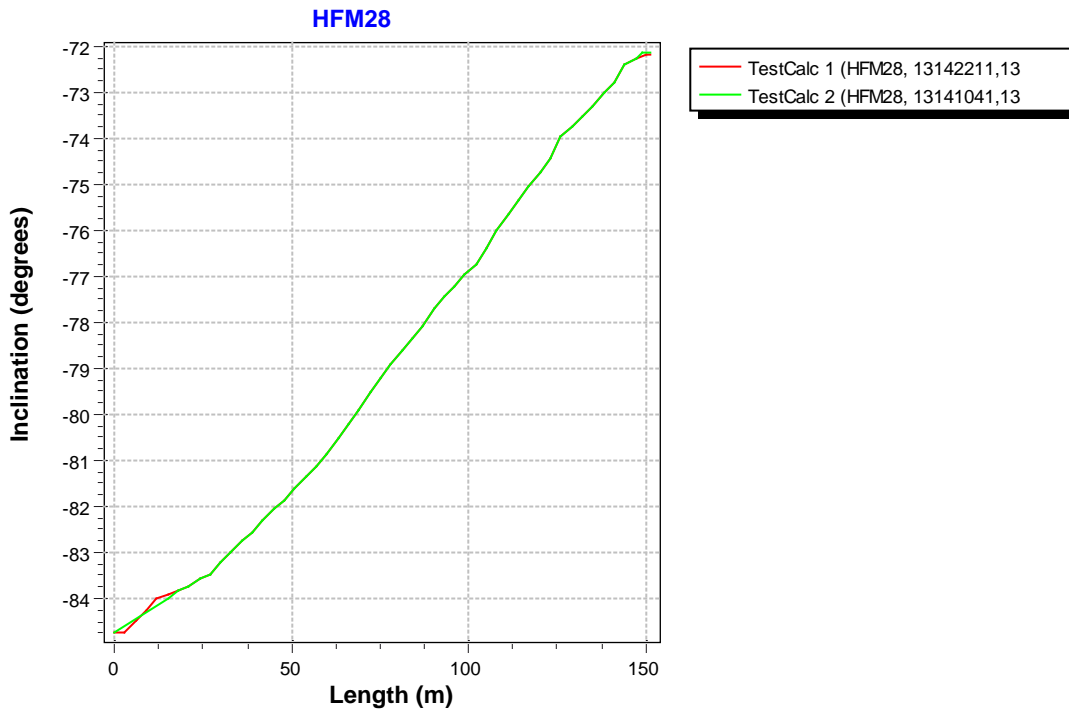


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activities specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM28	13101932	EG157	Magnetic - accelerometer measurement	2006-01-19 08:30:00	15.00	149.00	EF	061219 13:25
HFM28	13141041	EG157	Magnetic - accelerometer measurement	2006-01-19 08:30:00	15.00	149.00	F	061219 13:25
HFM28	13142211	EG154	Borehole deviation multiple measurements	2006-12-19 17:30:00			I C	070111 08:12

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM28	13141041	BEARING	15.00	149.00	4.900
HFM28	13141041	INCLINATION	15.00	149.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_UNCERT	INCLINATION	BEARING	INCLINATION_UNCERT	BEARING_UNCERT	RADIUS_UNCERT
HFM28	6700068.84	1630597.24	4.27	0	0.00	-84.76	146.78	1.8	4.9	0.00
HFM28	6700066.79	1630598.57	-19.61	24	0.08	-83.59	147.39	1.8	4.9	0.75
HFM28	6700064.49	1630599.79	-40.45	45	0.16	-82.05	156.28	1.8	4.9	1.41
HFM28	6700061.48	1630600.86	-61.20	66	0.26	-80.26	163.54	1.8	4.9	2.07
HFM28	6700058.25	1630601.74	-78.88	84	0.37	-78.39	165.81	1.8	4.9	2.64
HFM28	6700053.77	1630602.75	-99.38	105	0.52	-76.41	168.48	1.8	4.9	3.30
HFM28	6700048.51	1630603.79	-119.68	126	0.69	-73.99	169.05	1.8	4.9	3.96
HFM28	6700042.54	1630605.00	-139.77	147	0.88	-72.26	169.08	1.8	4.9	4.62
HFM28	6700041.28	1630605.24	-143.77	151.2	0.92	-72.21	169.14	1.8	4.9	4.75

Borehole description HFM29

Figure 1 gives a technical description of HFM29.

Technical data

Borehole HFM29

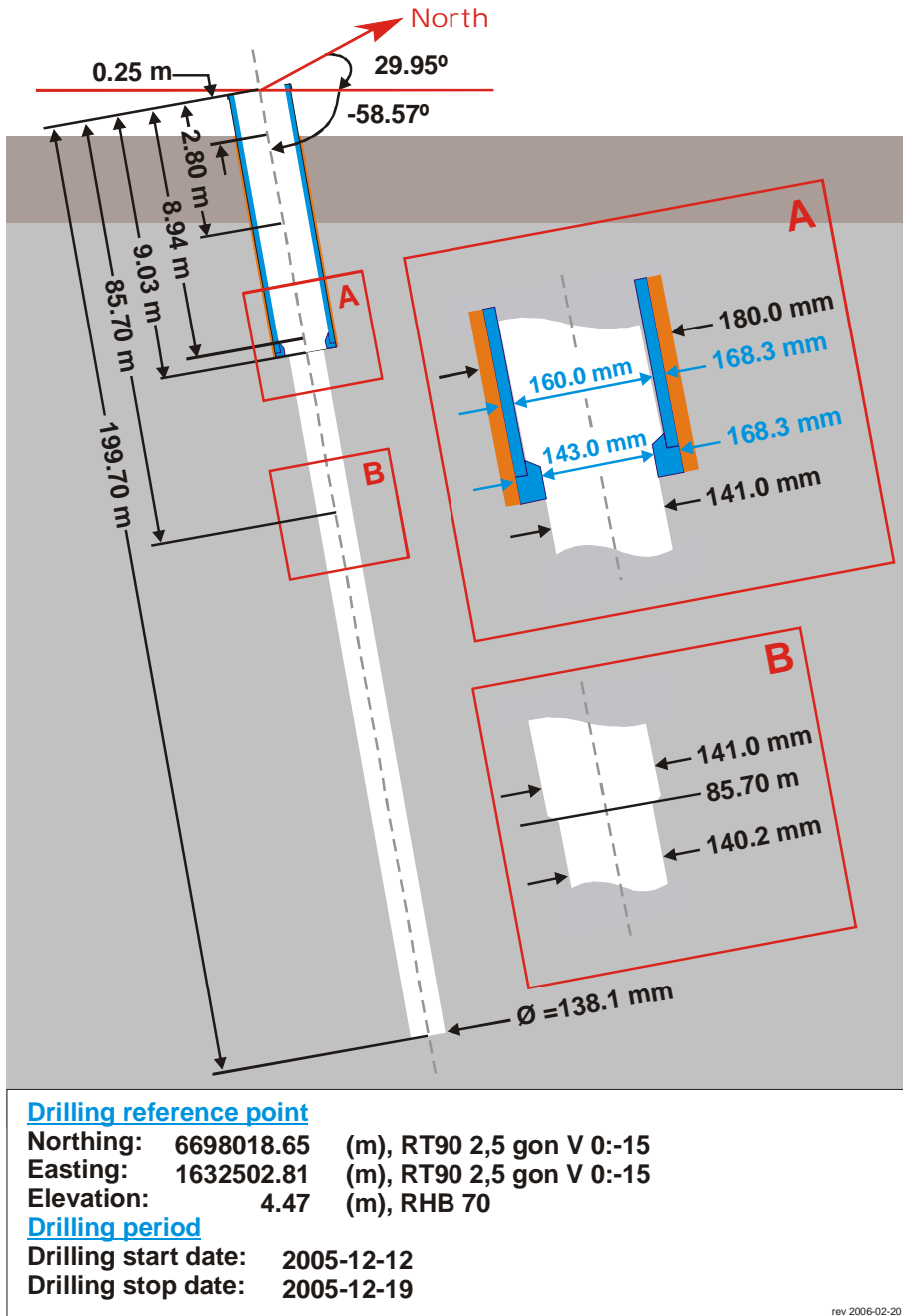


Figure 1. Technical description of HFM29.

Deviation measurement in HFM29

The only deviation measurement in HFM29 was performed with the Mag/acc, Flexit instrument. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurements (ID 13141043) was executed every three metres downwards between the length 12–198 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activity ID 13104258 was based on the same measurement, but was adjusted with wrong magnetic declination and was therefore error marked. No geomagnetic disturbance exceeding 0.5 degrees in declination was observed on the date of the Mag/acc measurement, see Figure 2.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142213) the Mag/acc measurement (ID 13141043) was used. Table 2 shows the contents of the EG154-file for the calculation of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively (see Section 4.4.2), and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activity listed in Table 1.

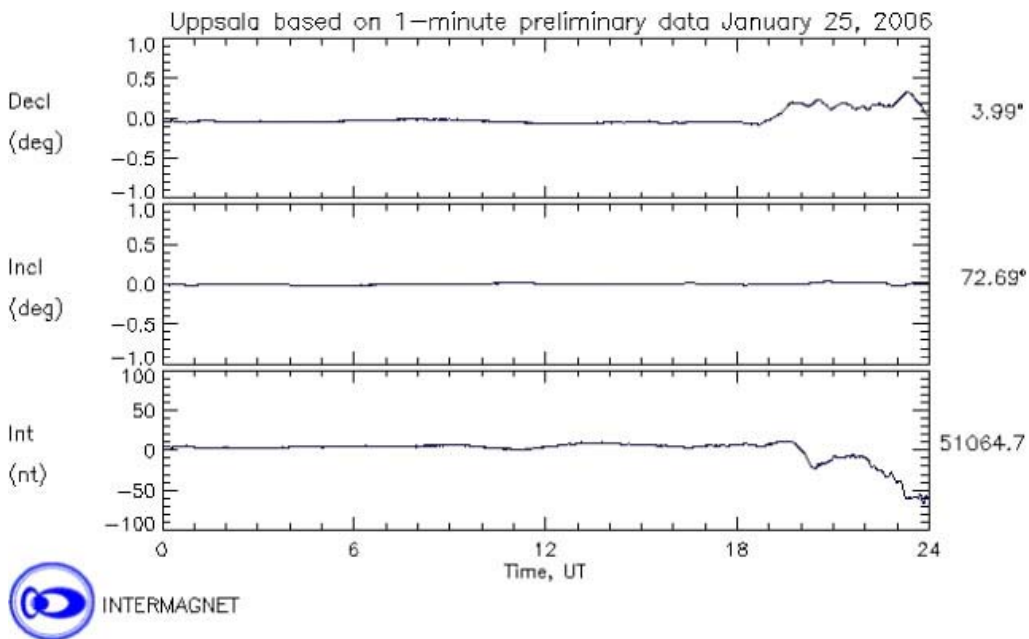


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2006-01-25. The upper curve shows the declination.

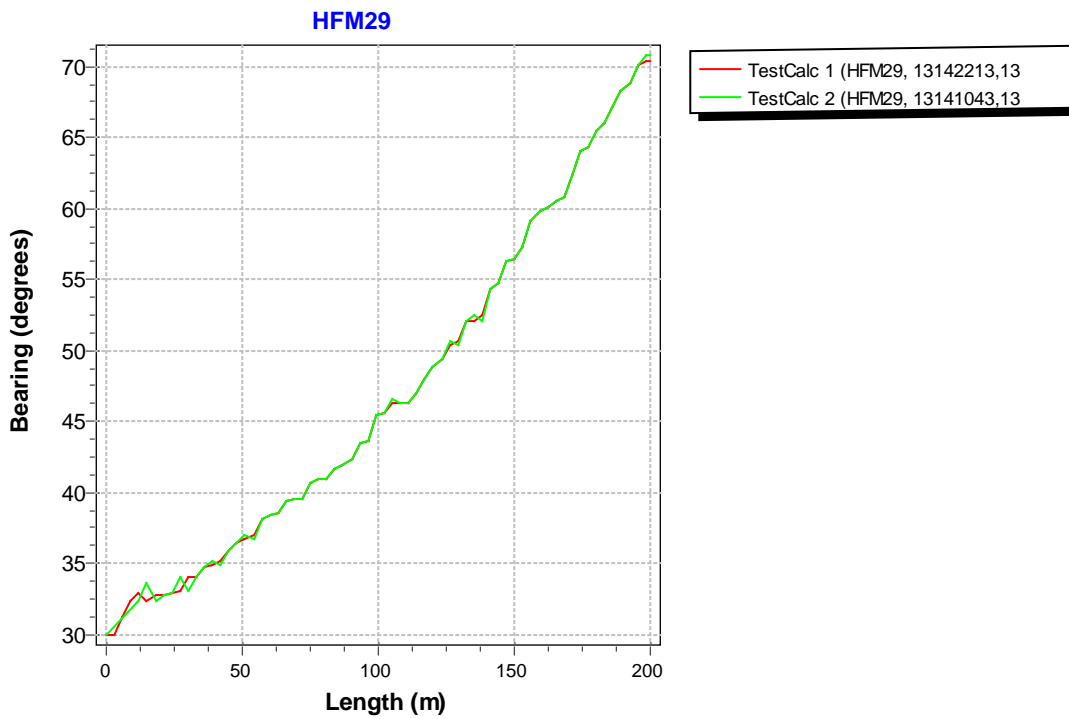
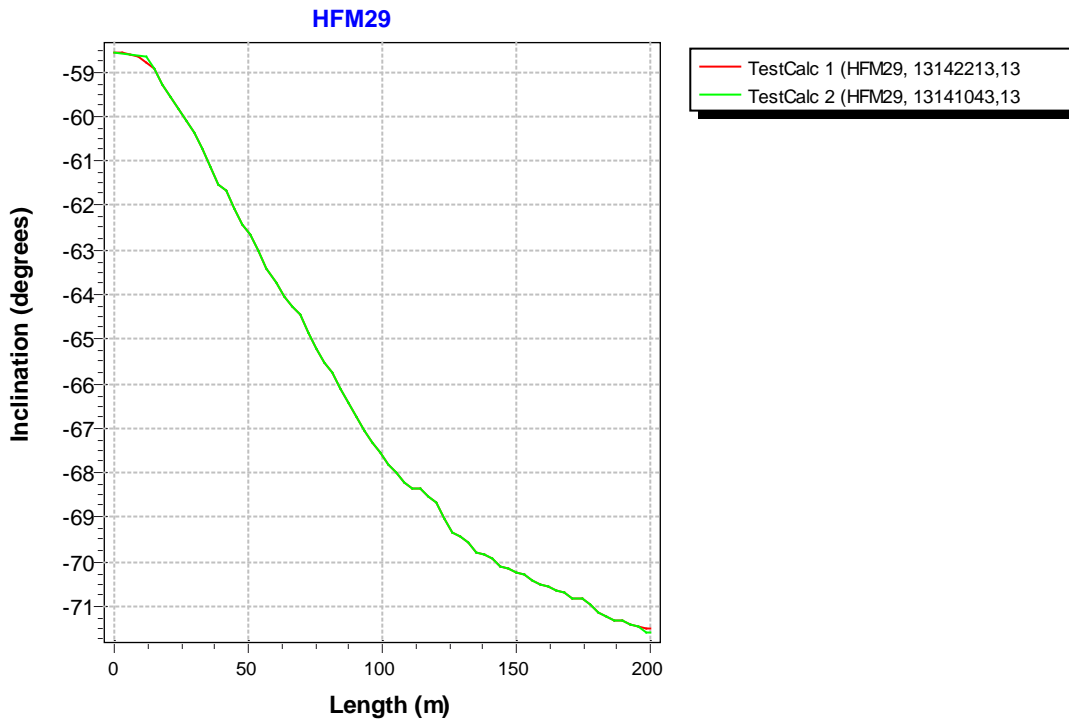


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activity specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM29	13141043	EG157	Magnetic - accelerometer measurement	2006-01-25 08:30:00	12.00	198.00	F	061219 13:26
HFM29	13104258	EG157	Magnetic - accelerometer measurement	2006-01-25 08:30:00	12.00	198.00	EF	061219 13:26
HFM29	13142213	EG154	Borehole deviation multiple measurements	2006-12-19 17:45:00			IC	070111 08:12

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM29	13141043	BEARING	12.00	198.00	4.900
HFM29	13141043	INCLINATION	12.00	198.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_UNCERT	INCLINATION	BEARING	INCLINATION_UNCERT	BEARING_UNCERT	RADIUS_UNCERT
HFM29	6698018.65	1632502.81	4.47	0	0.00	-58.57	29.95	1.8	4.9	0.00
HFM29	6698031.65	1632511.01	-21.29	30	0.48	-60.36	33.97	1.8	4.9	1.31
HFM29	6698039.82	1632516.76	-39.76	51	0.79	-62.67	36.74	1.8	4.9	2.16
HFM29	6698048.04	1632523.34	-61.33	75	1.12	-65.22	40.66	1.8	4.9	3.05
HFM29	6698054.33	1632528.98	-80.55	96	1.39	-67.31	43.62	1.8	4.9	3.77
HFM29	6698059.78	1632534.65	-100.02	117	1.63	-68.54	48.04	1.8	4.9	4.44
HFM29	6698064.51	1632540.38	-119.66	138	1.87	-69.82	52.56	1.8	4.9	5.10
HFM29	6698068.45	1632546.30	-139.42	159	2.09	-70.51	59.81	1.8	4.9	5.76
HFM29	6698071.69	1632552.42	-159.24	180	2.31	-71.14	65.41	1.8	4.9	6.42
HFM29	6698074.03	1632558.27	-177.91	199.7	2.50	-71.51	70.45	1.8	4.9	7.04

Borehole description HFM30

Figure 1 gives a technical description of HFM30.

Technical data

Borehole HFM30

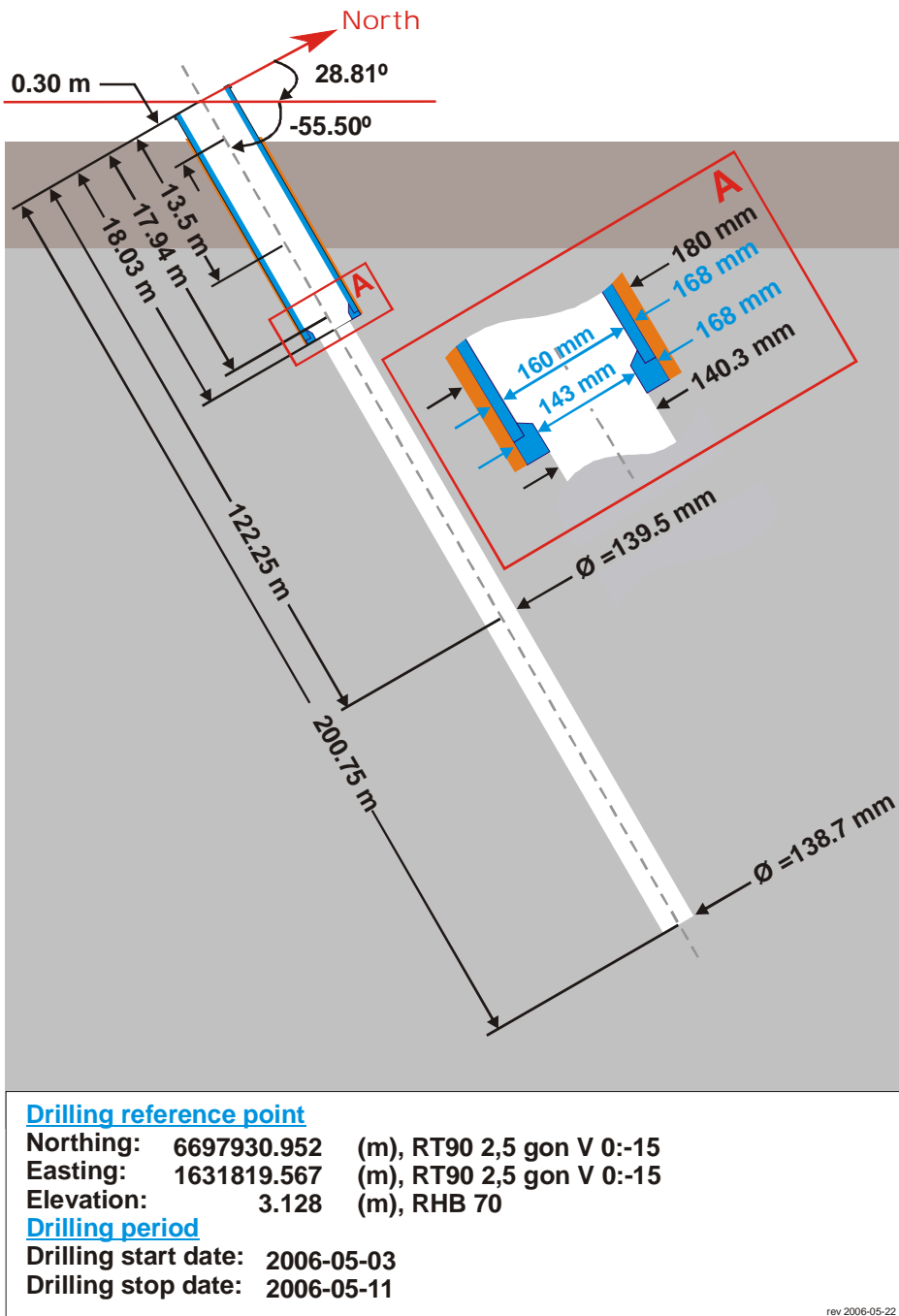


Figure 1. Technical description of HFM30.

Deviation measurement in HFM30

The only deviation measurement in HFM30 was performed with the Mag/acc, Flexit instrument. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurements (ID 13141075) was executed every three metres downwards between the length 3–198 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activity ID 13114996 was based on the same measurement, but was adjusted with wrong magnetic declination and was therefore error marked. No geomagnetic disturbance exceeding 0.5 degrees in declination was observed on the date of the Mag/acc measurement, see Figure 2.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142214) the Mag/acc measurement (ID 13141075) was used. Table 2 shows the contents of the EG154-file used for the calculations of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively (see Section 4.4.2), and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activity listed in Table 1.

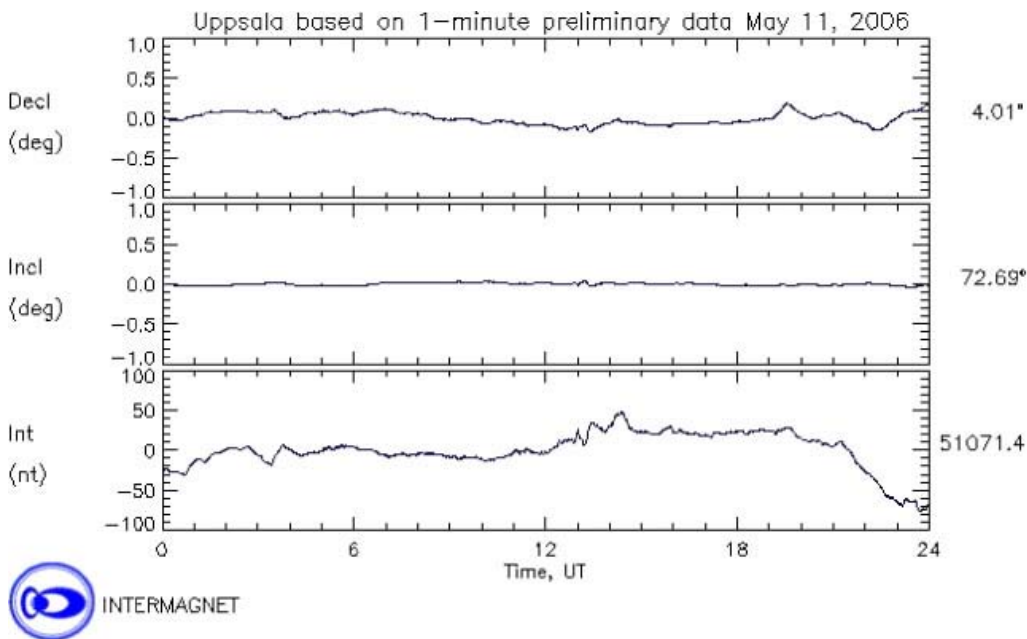


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2006-05-11. The upper curve shows the declination.

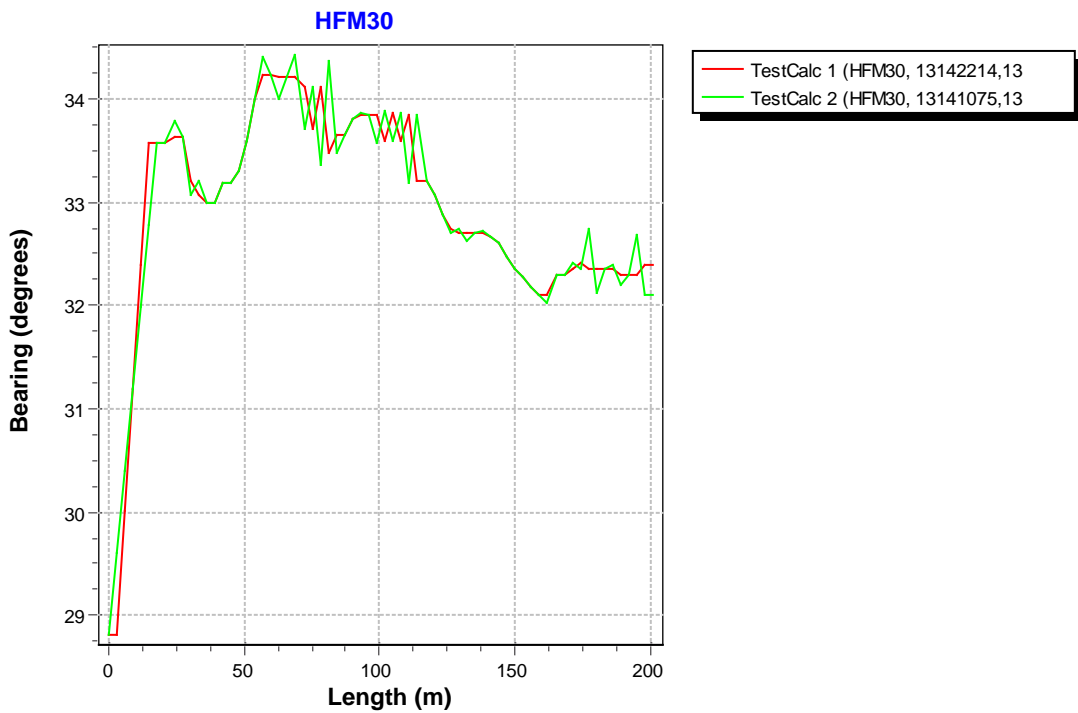
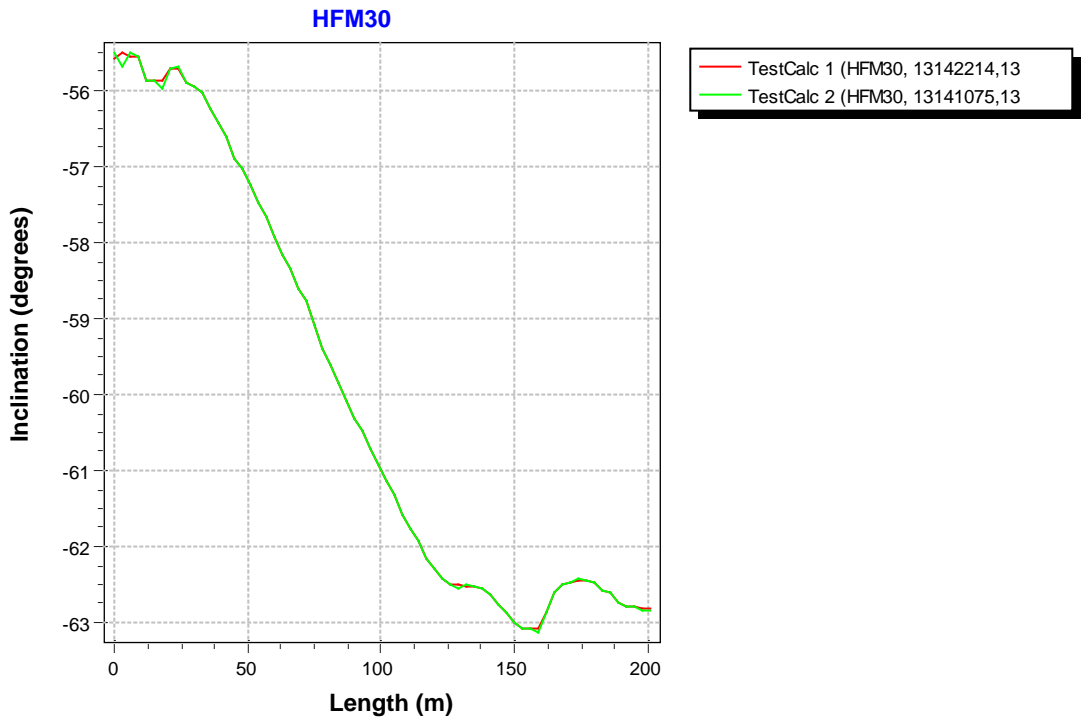


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activities specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM30	13141075	EG157	Magnetic - accelerometer measurement	2006-05-11 13:45:00	3.00	198.00	F	061219 13:27
HFM30	13114996	EG157	Magnetic - accelerometer measurement	2006-05-11 13:45:00	3.00	198.00	E	061219 13:27
HFM30	13142214	EG154	Borehole deviation multiple measurements	2006-12-19 18:00:00			I C	070111 08:12

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM30	13141075	BEARING	18.00	198.00	4.900
HFM30	13141075	INCLINATION	3.00	198.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_UNCERT	INCLINATION	BEARING	INCLINATION_UNCERT	BEARING_UNCERT	RADIUS_UNCERT
HFM30	6697930.95	1631819.57	3.13	0	0.00	-55.59	28.81	1.8	4.9	0.00
HFM30	6697943.85	1631827.62	-19.18	27	0.48	-55.89	33.63	1.8	4.9	1.30
HFM30	6697954.94	1631834.88	-39.19	51	0.89	-57.24	33.60	1.8	4.9	2.43
HFM30	6697965.43	1631841.99	-59.57	75	1.29	-59.07	33.71	1.8	4.9	3.51
HFM30	6697975.39	1631848.65	-80.36	99	1.66	-60.92	33.85	1.8	4.9	4.53
HFM30	6697983.71	1631854.16	-98.84	120	1.98	-62.27	33.08	1.8	4.9	5.38
HFM30	6697993.02	1631860.15	-120.13	144	2.32	-62.74	32.61	1.8	4.9	6.32
HFM30	6698001.10	1631865.26	-138.83	165	2.63	-62.59	32.29	1.8	4.9	7.14
HFM30	6698010.46	1631871.18	-160.12	189	2.97	-62.72	32.29	1.8	4.9	8.08
HFM30	6698015.00	1631874.05	-170.57	200.75	3.14	-62.81	32.39	1.8	4.9	8.54

Borehole description HFM31

Figure 1 gives a technical description of HFM31.

Technical data

Borehole HFM31

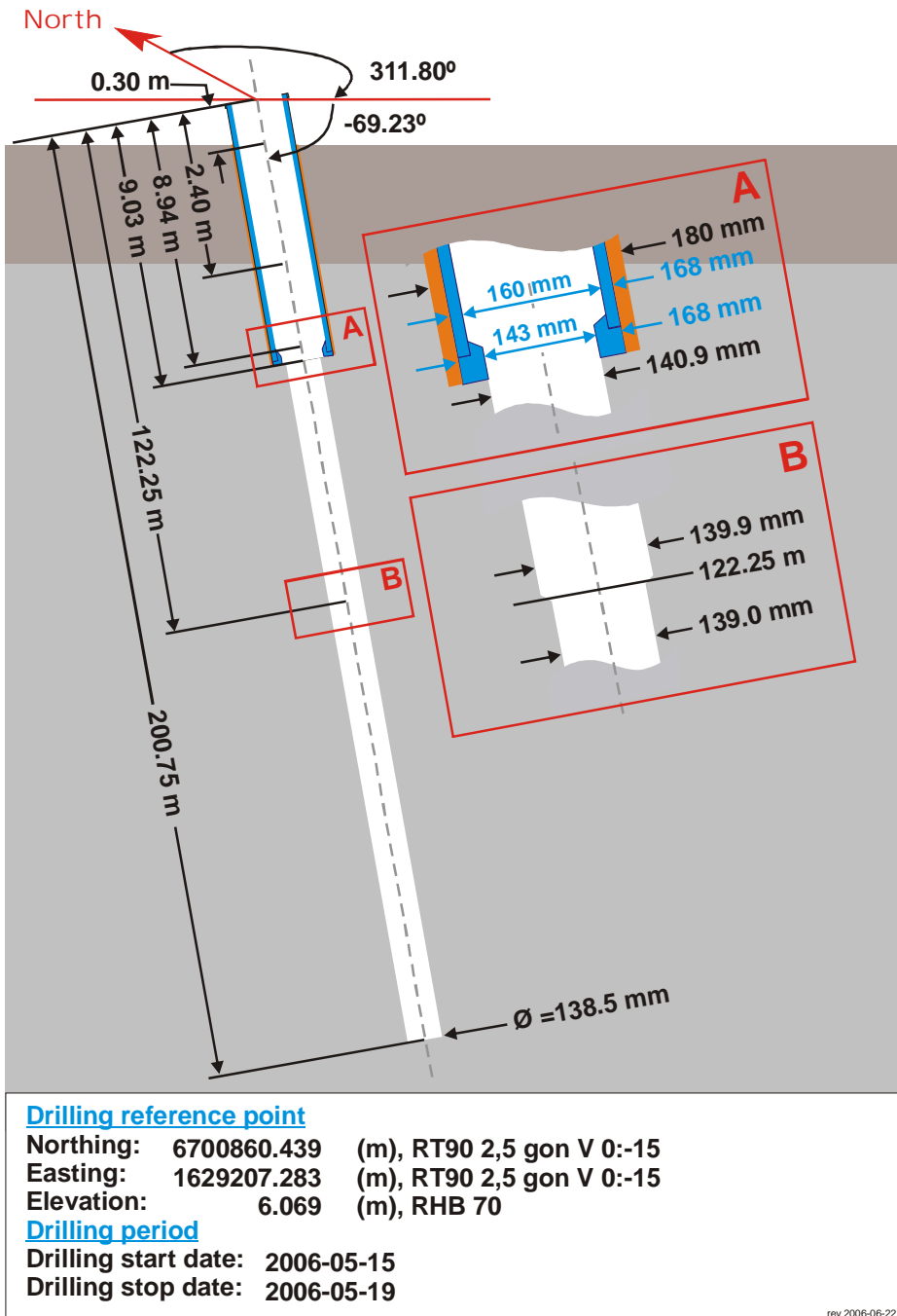


Figure 1. Technical description of HFM31.

Deviation measurement in HFM31

The only deviation measurement in HFM31 was performed with the Mag/acc, Flexit instrument. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurements (ID 13141337) was executed every three metres downwards between the length 3–198 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activity ID 13114997 was based on the same measurement, but was adjusted with wrong magnetic declination and was therefore error marked. No geomagnetic disturbance exceeding 0.5 degrees in declination was observed on the date of the Mag/acc measurement, see Figure 2.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142215) the Mag/acc measurement (ID 13141337) was used. Table 2 shows the contents of the EG154-file used for calculation of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively (see Section 4.4.2), and based on these values the “Radius uncertainty” was calculated for every measuring level..

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activity listed in Table 1.

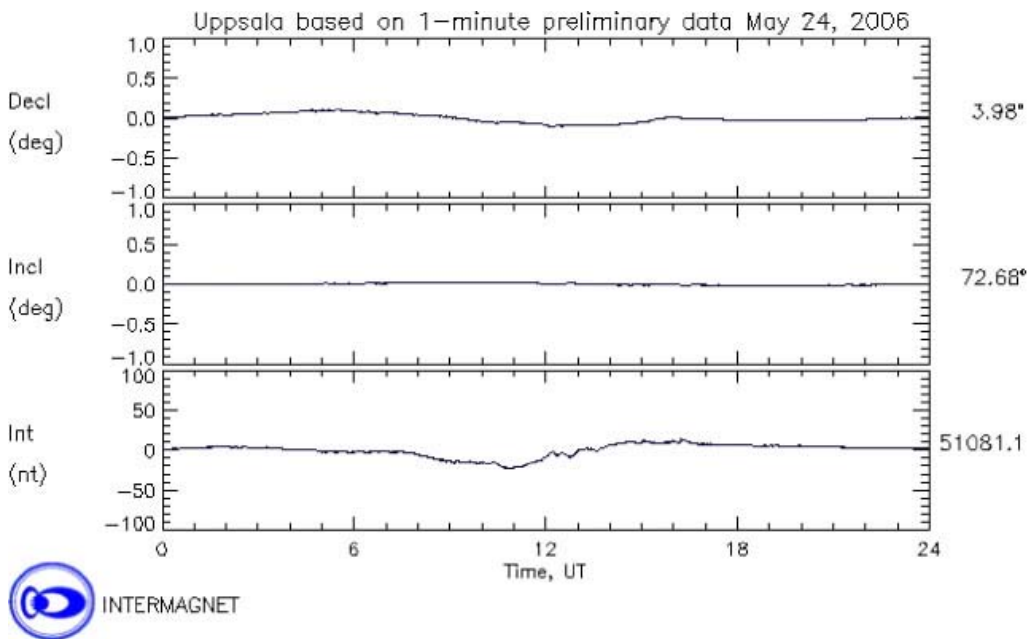


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2006-05-24. The upper curve shows the declination.

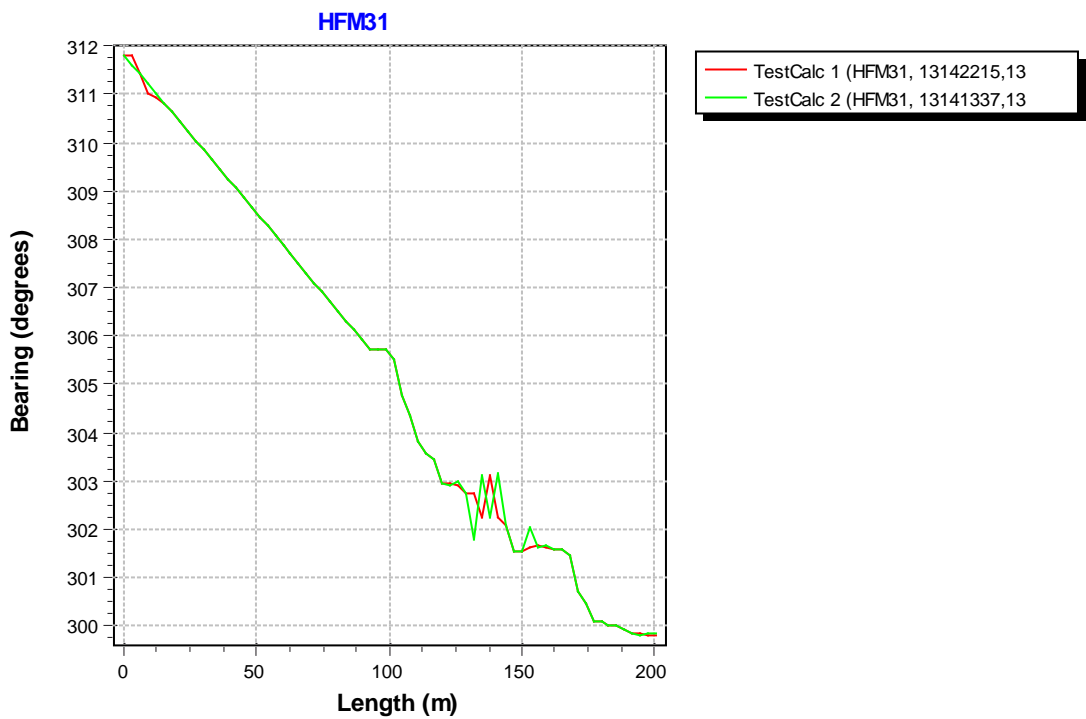
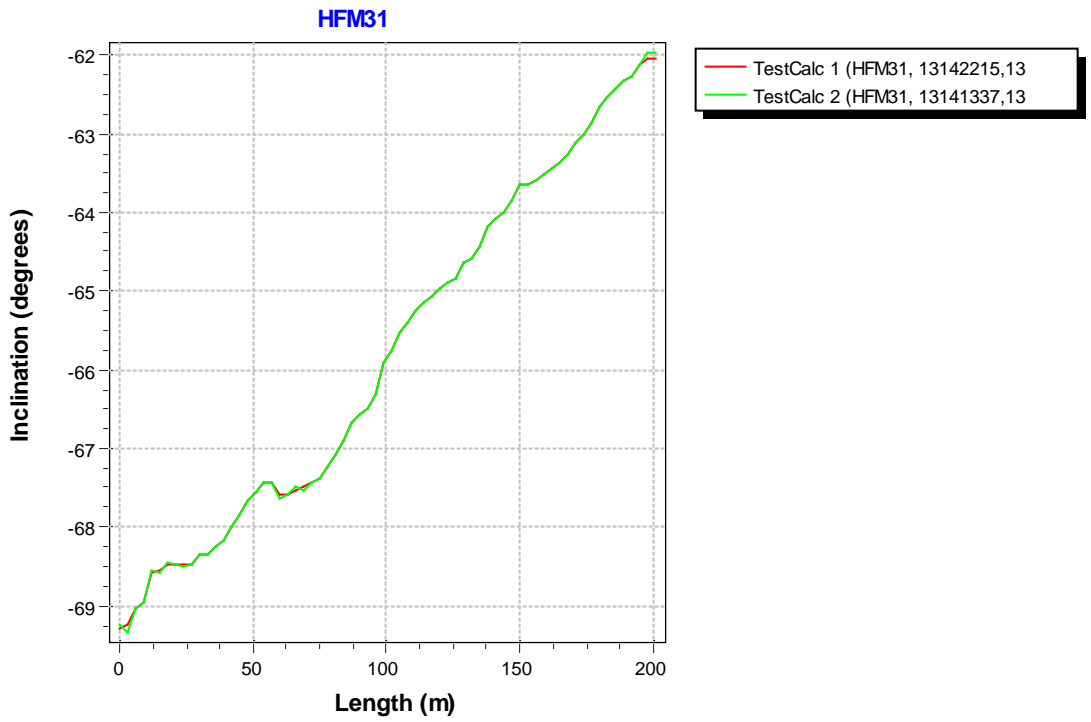


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activities specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM31	13114997	EG157	Magnetic - accelerometer measurement	2006-05-24 08:00:00	3.00	198.00	E	061219 13:28
HFM31	13141337	EG157	Magnetic - accelerometer measurement	2006-05-24 08:00:00	3.00	198.00	F	061219 13:28
HFM31	13142215	EG154	Borehole deviation multiple measurements	2006-12-19 18:15:00			I C	070111 08:13

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM31	13141337	BEARING	12.00	198.00	4.900
HFM31	13141337	INCLINATION	3.00	198.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
HFM31	6700860.44	1629207.28	6.07	0	0.00	-69.29	311.80	1.8	4.9	0.00
HFM31	6700866.85	1629199.88	-19.09	27	0.31	-68.47	310.04	1.8	4.9	0.85
HFM31	6700872.52	1629192.94	-41.36	51	0.59	-67.55	308.47	1.8	4.9	1.62
HFM31	6700877.44	1629186.60	-60.76	72	0.84	-67.43	307.10	1.8	4.9	2.30
HFM31	6700882.32	1629179.98	-80.09	93	1.10	-66.50	305.73	1.8	4.9	3.01
HFM31	6700887.26	1629172.90	-99.23	114	1.37	-65.15	303.56	1.8	4.9	3.75
HFM31	6700892.82	1629164.31	-120.93	138	1.70	-64.19	303.12	1.8	4.9	4.62
HFM31	6700897.72	1629156.44	-139.78	159	1.99	-63.53	301.62	1.8	4.9	5.42
HFM31	6700902.59	1629148.31	-158.52	180	2.29	-62.65	300.10	1.8	4.9	6.23
HFM31	6700907.40	1629139.95	-176.89	200.75	2.59	-62.05	299.83	1.8	4.9	7.05

Borehole description HFM32

Figure 1 gives a technical description of HFM32.

Technical data

Borehole HFM32

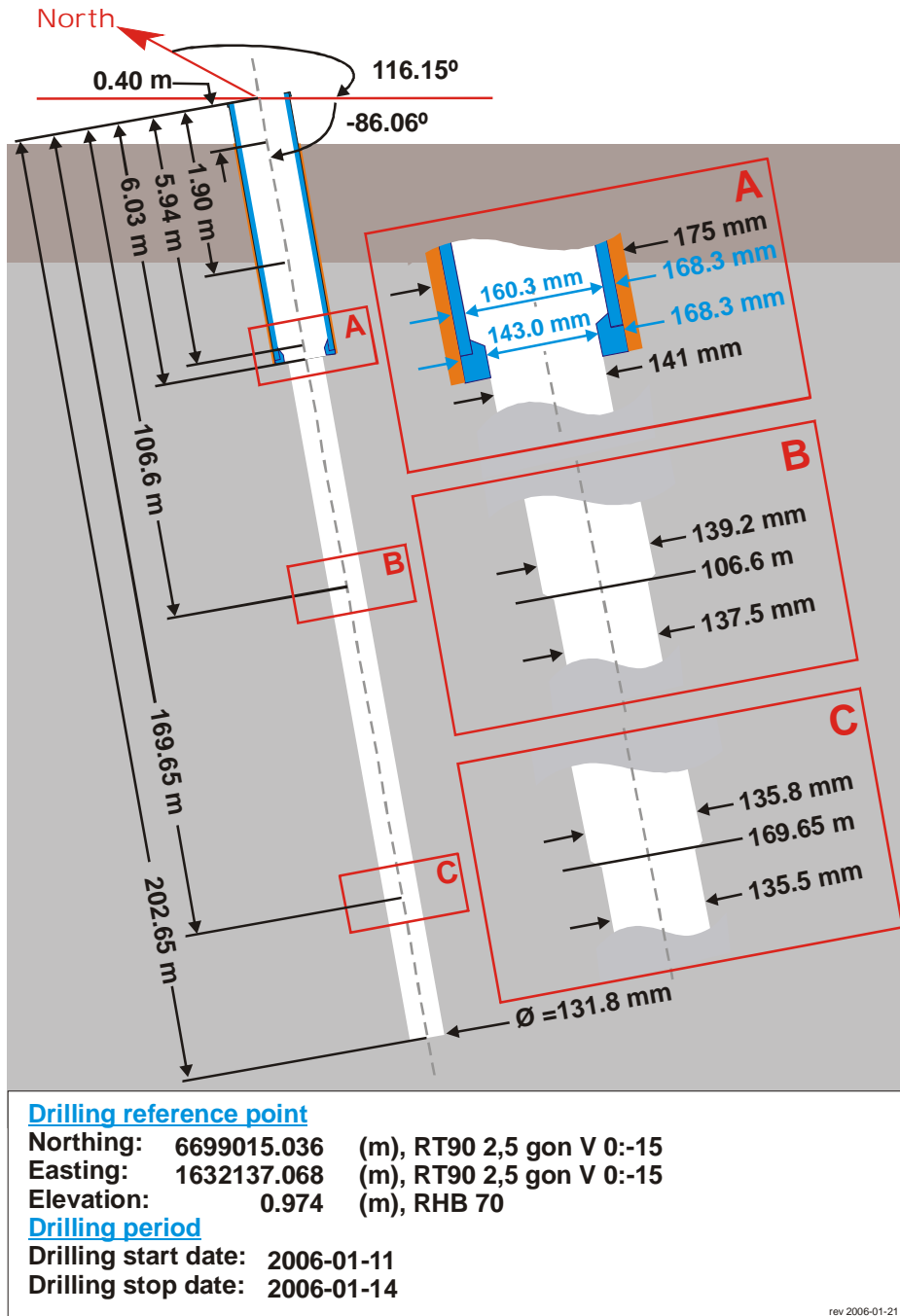


Figure 1. Technical description of HFM32.

Deviation measurement in HFM32

The only deviation measurement in HFM32 was performed with the Mag/acc, Flexit instrument. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurements (ID 13141347) was executed every three metres downwards between the length 3–201 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activity ID 13101931 was based on the same measurement, but was adjusted with wrong magnetic declination and was therefore error marked. No geomagnetic disturbance exceeding 0.5 degrees in declination was observed on the date of the Mag/acc measurement, see Figure 2.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142216) the Mag/acc measurement (ID 13141347) was used. Table 2 shows the contents of the EG154-file used for calculation of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively (see Section 4.4.2), and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activity listed in Table 1.

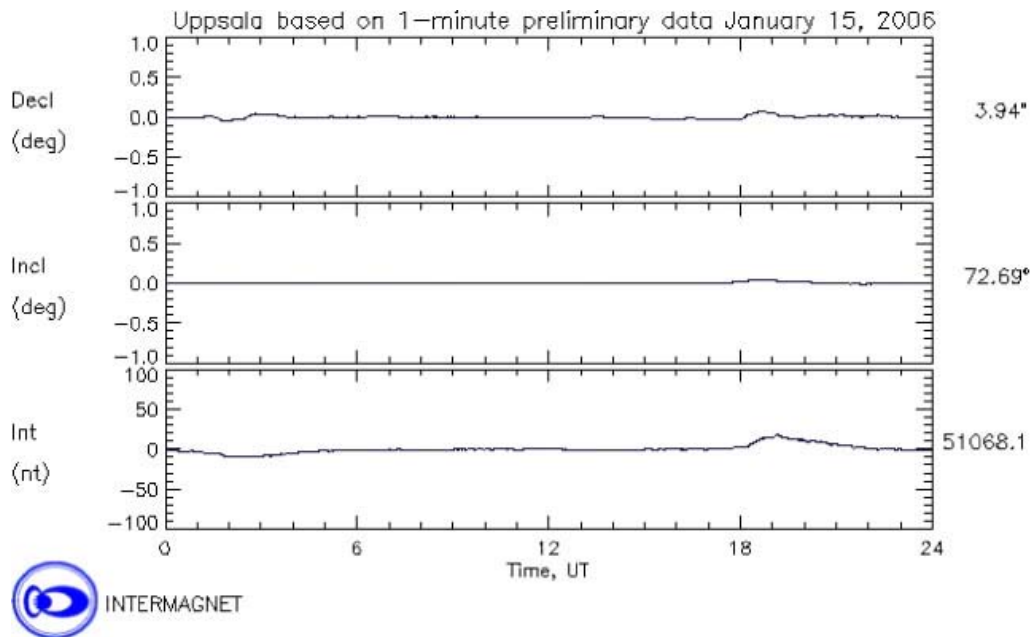


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2006-01-15. The upper curve shows the declination.

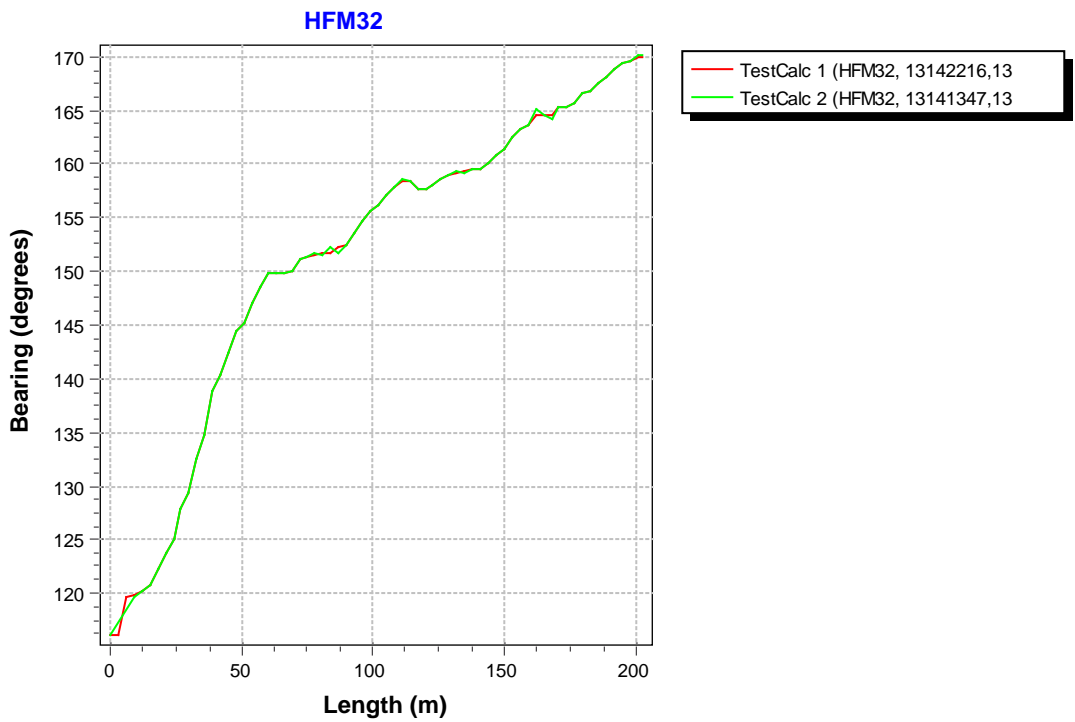
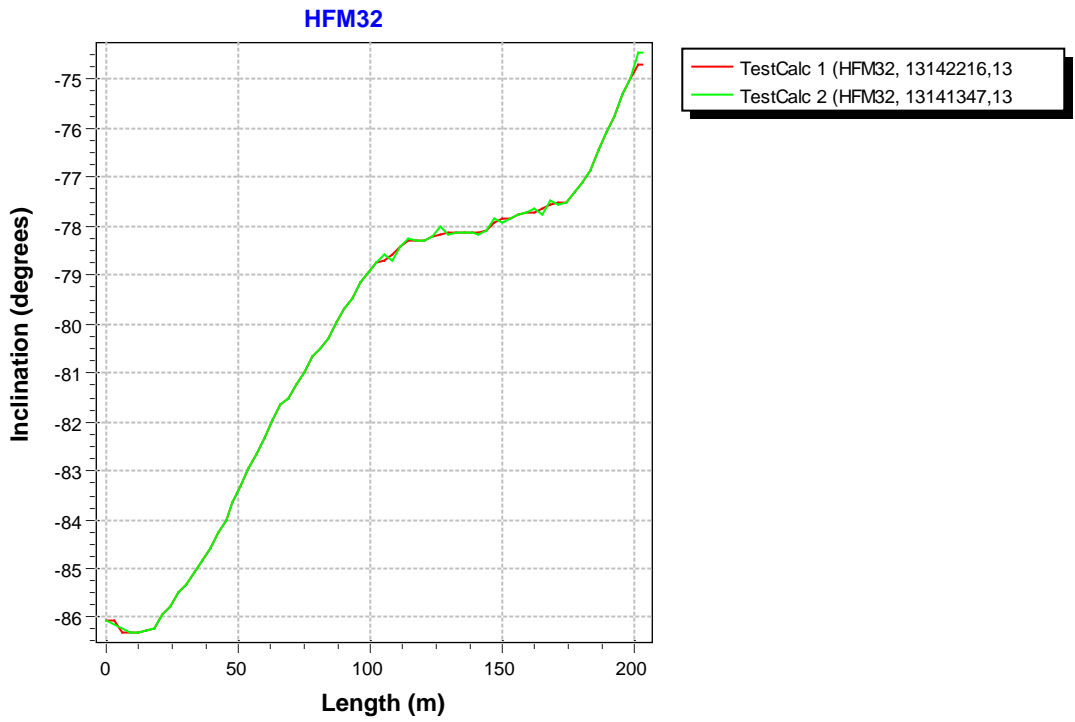


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activities specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM32	13141347	EG157	Magnetic - accelerometer measurement	2006-01-15 10:00:00	9.00	201.00	F	061219 13:29
HFM32	13101931	EG157	Magnetic - accelerometer measurement	2006-01-15 10:00:00	9.00	201.00	EF	061219 13:29
HFM32	13142216	EG154	Borehole deviation multiple measurements	2006-12-19 18:20:00			I C	070111 08:13

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM32	13141347	BEARING	9.00	201.00	4.900
HFM32	13141347	INCLINATION	9.00	201.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
HFM32	6699015.04	1632137.07	0.97	0	0.00	-86.06	116.15	1.8	4.9	0.00
HFM32	6699014.35	1632138.27	-19.98	21	0.04	-85.94	123.81	1.8	4.9	0.66
HFM32	6699013.17	1632139.58	-40.91	42	0.10	-84.26	140.41	1.8	4.9	1.32
HFM32	6699011.44	1632140.76	-58.78	60	0.17	-82.33	149.78	1.8	4.9	1.88
HFM32	6699008.69	1632142.30	-79.54	81	0.27	-80.50	151.73	1.8	4.9	2.54
HFM32	6699005.29	1632143.99	-100.20	102	0.39	-78.73	156.09	1.8	4.9	3.20
HFM32	6699001.40	1632145.59	-120.77	123	0.52	-78.21	158.07	1.8	4.9	3.86
HFM32	6698997.95	1632146.91	-138.39	141	0.64	-78.15	159.57	1.8	4.9	4.43
HFM32	6698993.75	1632148.27	-158.92	162	0.78	-77.74	164.59	1.8	4.9	5.09
HFM32	6698989.33	1632149.43	-179.41	183	0.92	-76.87	166.79	1.8	4.9	5.75
HFM32	6698984.55	1632150.37	-198.45	202.65	1.08	-74.71	169.89	1.8	4.9	6.37

Borehole description HFM33

Figure 1 gives a technical description of HFM33.

Technical data

Borehole HFM33

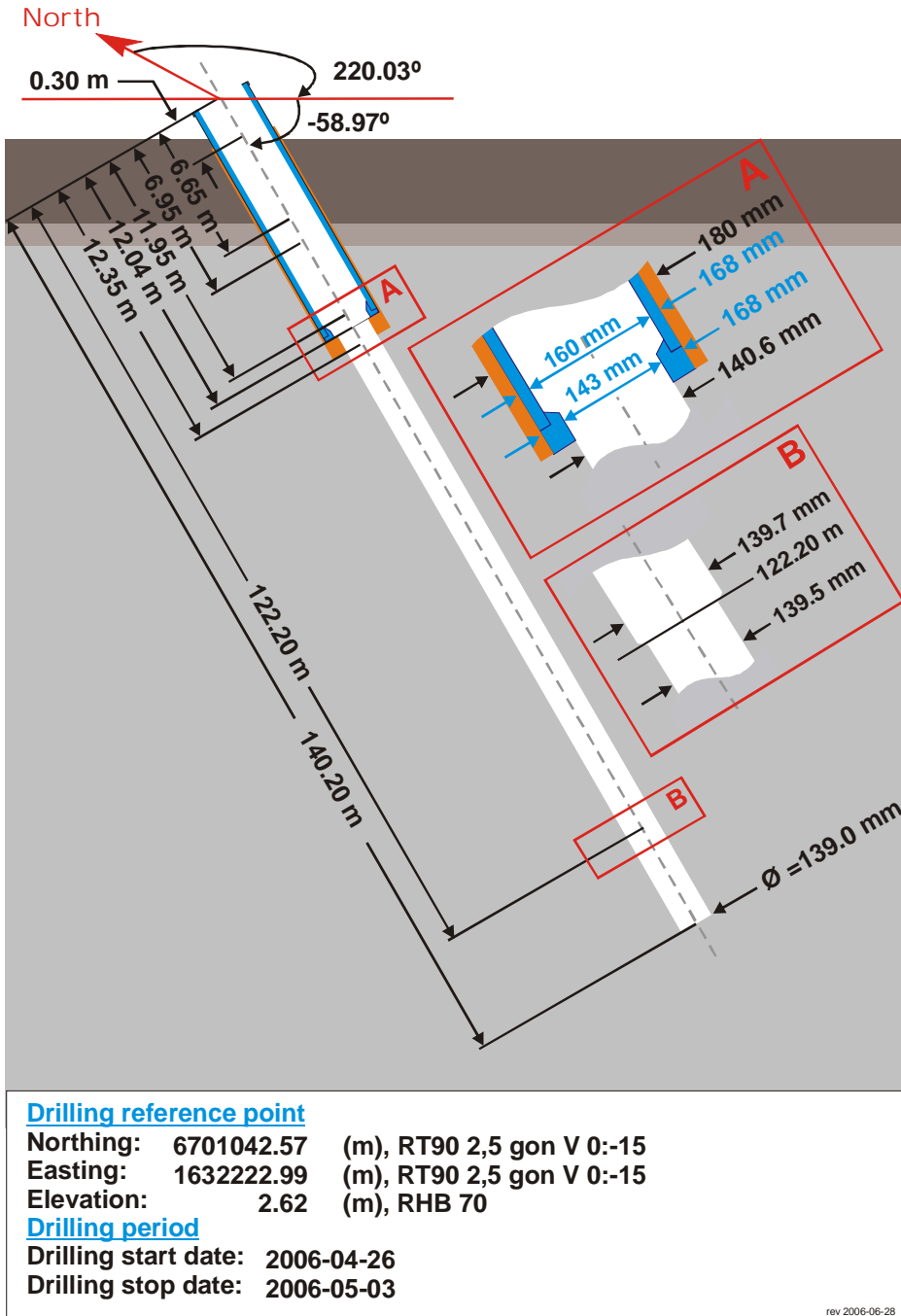


Figure 1. Technical description of HFM33.

Deviation measurement in HFM33

The only deviation measurement in HFM33 was performed with the Mag/acc, Flexit instrument. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurement (ID 13141388) was executed every three metres downwards between the length 3–138 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activity ID 13116727 was based on the same measurement, but was adjusted with wrong magnetic declination and was therefore error marked. No geomagnetic disturbance exceeding 0.5 degrees in declination was observed on the date of the Mag/acc measurement, see Figure 2.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142220) the Mag/acc measurement (ID 13141388) was used. Table 2 shows the contents of the EG154-file used for the calculation of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively (see Section 4.4.2), and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activity listed in Table 1.

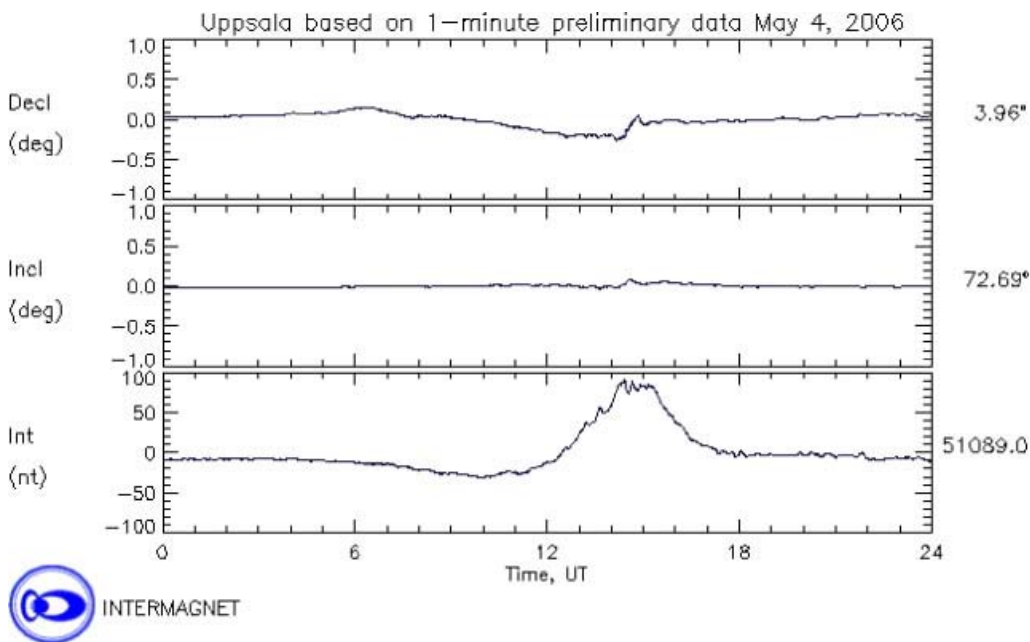


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2006-05-04. The upper curve shows the declination.

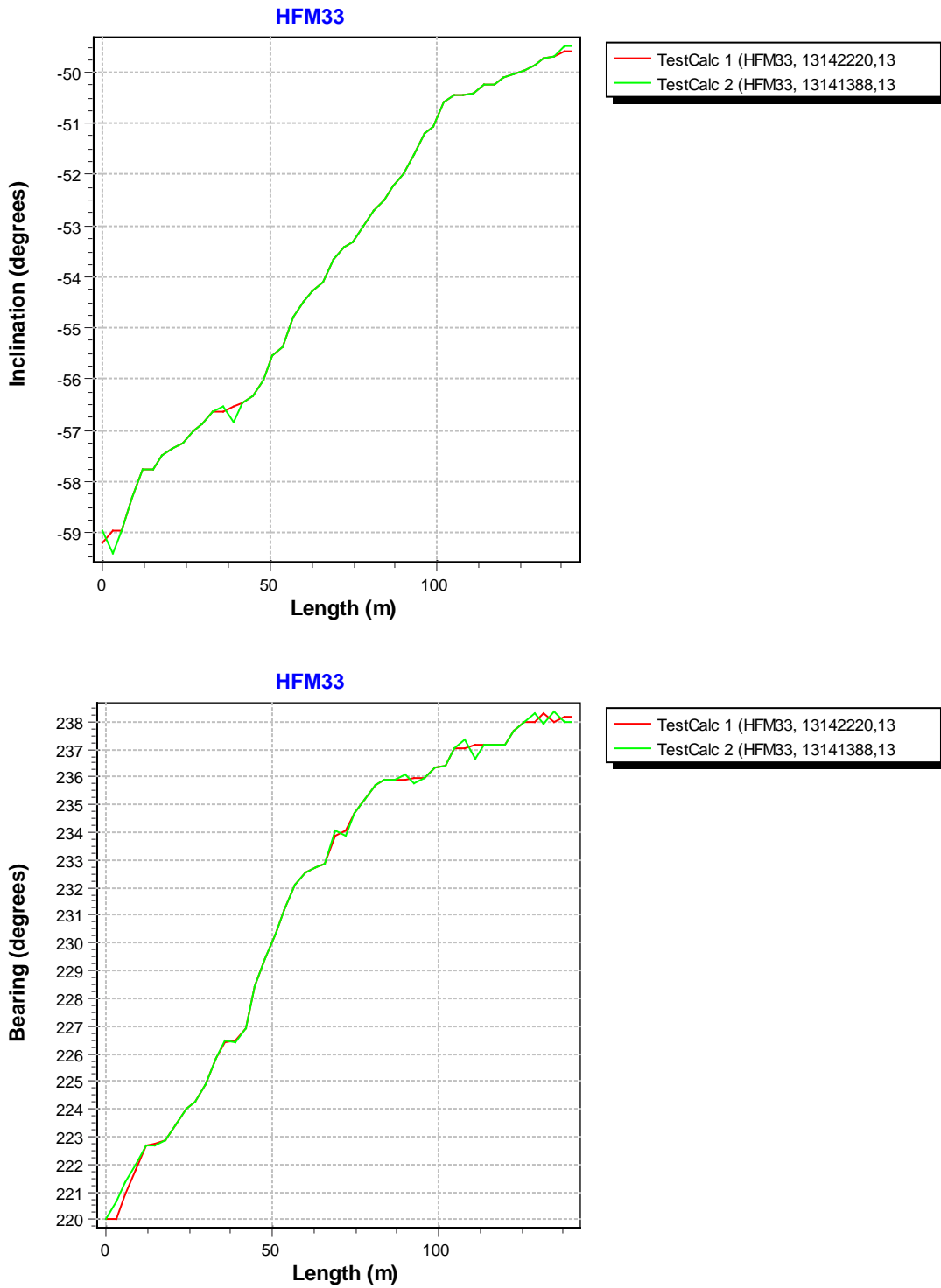


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activities specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM33	13116727	EG157		2006-05-04 12:50:00	3.00	138.00	E	061219 13:29
HFM33	13141388	EG157	Magnetic - accelerometer measurement	2006-05-04 12:50:00	3.00	138.00	F	061219 13:30
HFM33	13142220	EG154	Borehole deviation multiple measurements	2006-12-19 18:30:00			I C	070111 08:13

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM33	13141388	BEARING	15.00	138.00	4.900
HFM33	13141388	INCLINATION	3.00	138.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_UNCERT	INCLINATION	BEARING	INCLINATION_UNCERT	BEARING_UNCERT	RADIUS_UNCERT
HFM33	6701042.57	1632222.99	2.62	0	0.00	-59.19	220.03	1.8	4.9	0.00
HFM33	6701031.99	1632213.36	-20.28	27	0.45	-57.02	224.26	1.8	4.9	1.23
HFM33	6701022.95	1632203.67	-40.29	51	0.87	-55.55	230.32	1.8	4.9	2.36
HFM33	6701014.48	1632192.53	-59.78	75	1.31	-53.32	234.67	1.8	4.9	3.56
HFM33	6701005.15	1632178.79	-81.06	102	1.83	-50.60	236.39	1.8	4.9	4.98
HFM33	6700996.84	1632165.90	-99.52	126	2.32	-49.98	237.97	1.8	4.9	6.30
HFM33	6700991.99	1632158.11	-110.36	140.2	2.60	-49.59	238.18	1.8	4.9	7.08

Borehole description HFM34

Figure 1 gives a technical description of HFM34.

Technical data

Borehole HFM34

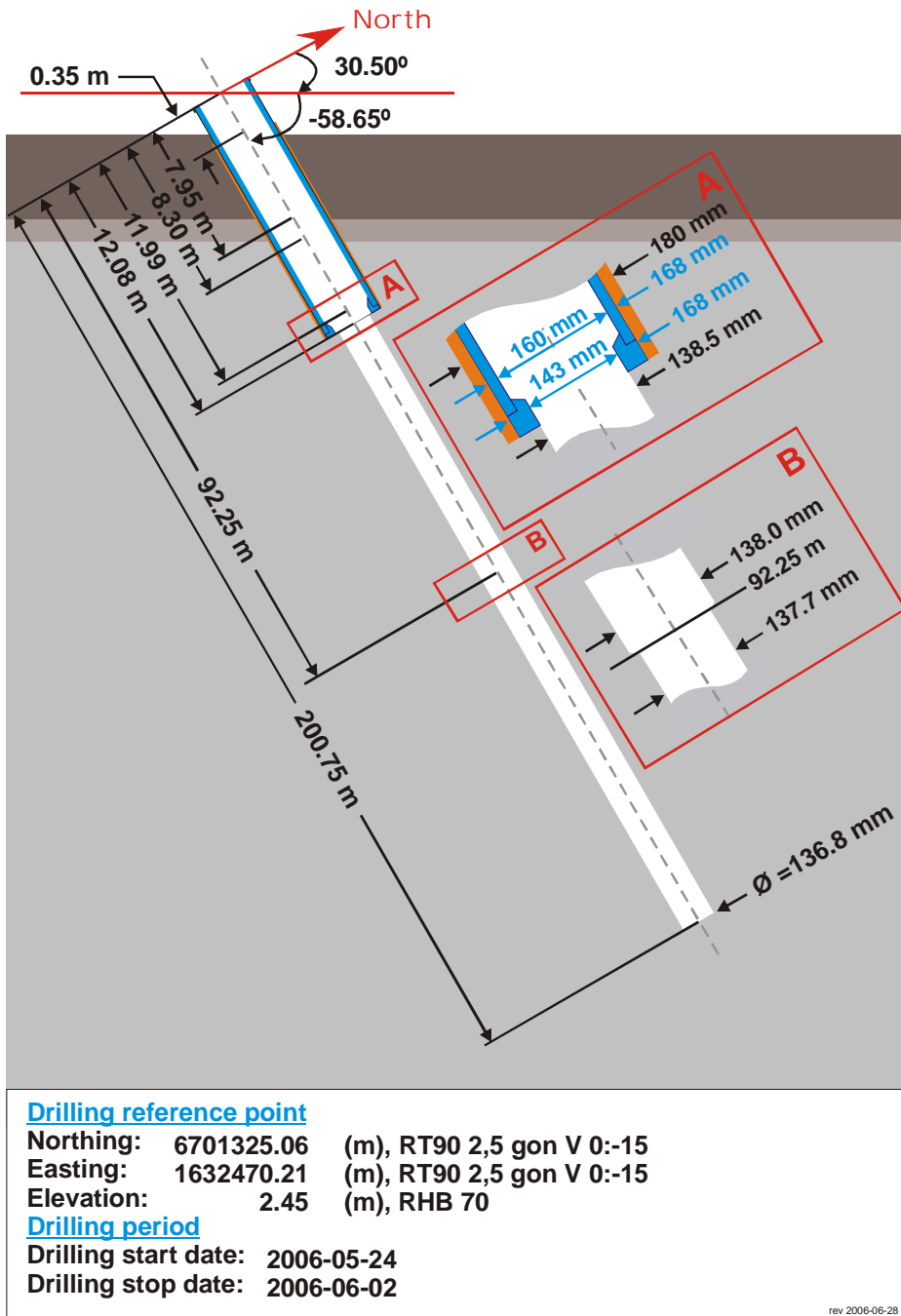


Figure 1. Technical description of HFM34.

Deviation measurement in HFM34

The only deviation measurement in HFM34 was performed with the Mag/acc, Flexit instrument. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurements (ID 13141427) was executed every three metres downwards between the length 3–198 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activity ID 13116729 was based on the same measurement, but was adjusted with wrong magnetic declination and was therefore error marked. No geomagnetic disturbance exceeding 0.5 degrees in declination was observed on the date of the Mag/acc measurement, see Figure 2.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142277) the Mag/acc measurement (ID 13141427) was used. Table 2 shows the contents of the EG154-file used for the calculation of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively (see Section 4.4.2), and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activity listed in Table 1.

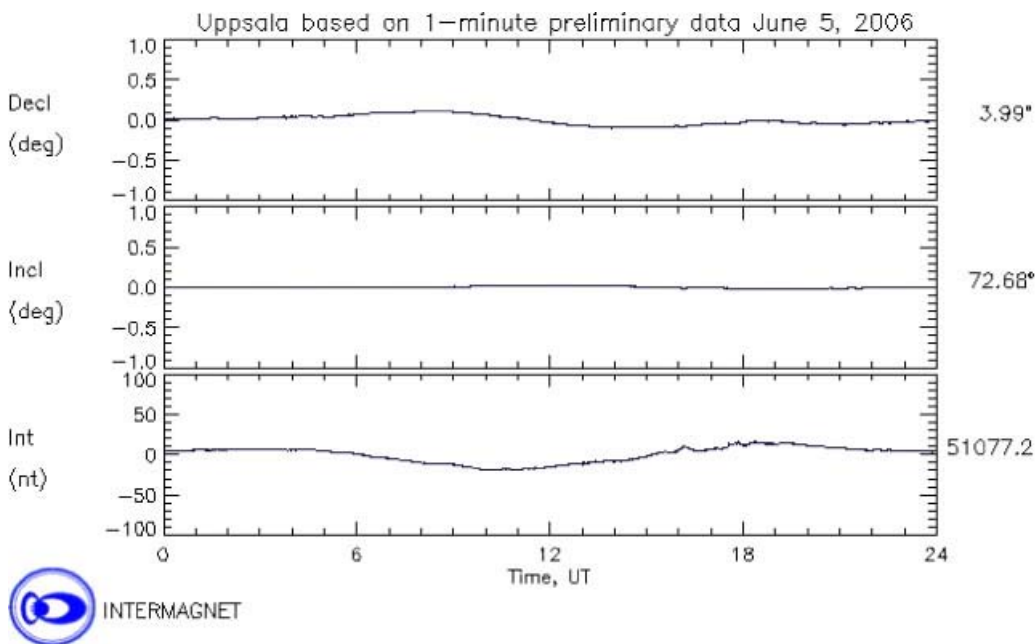


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2006-06-05. The upper curve shows the declination.

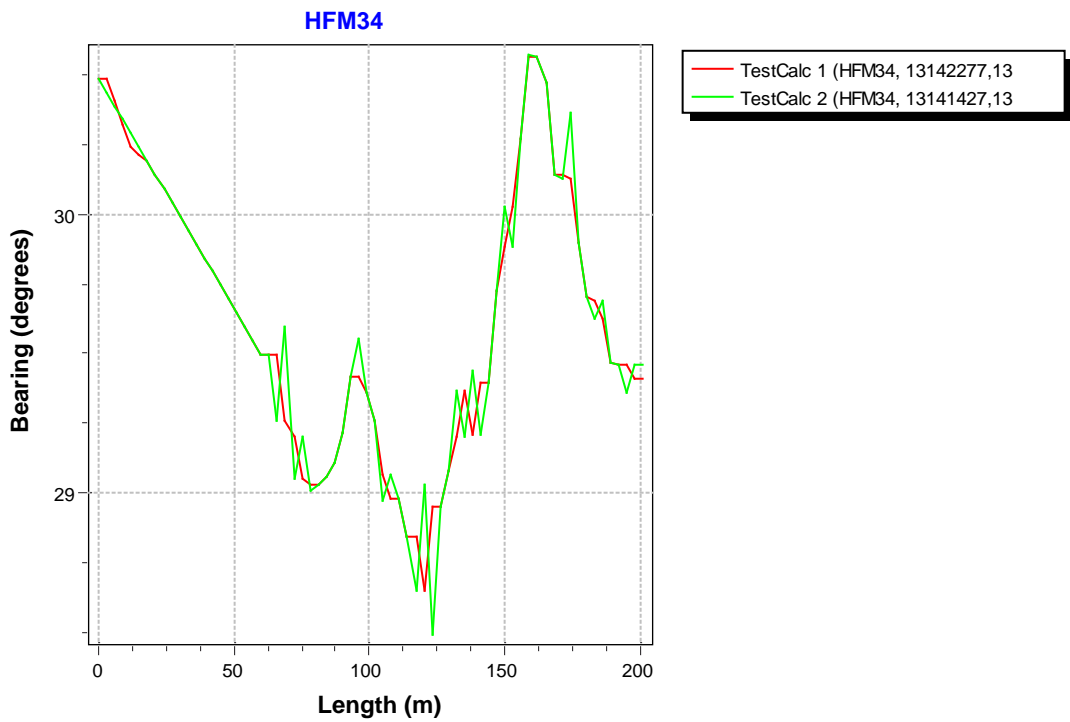
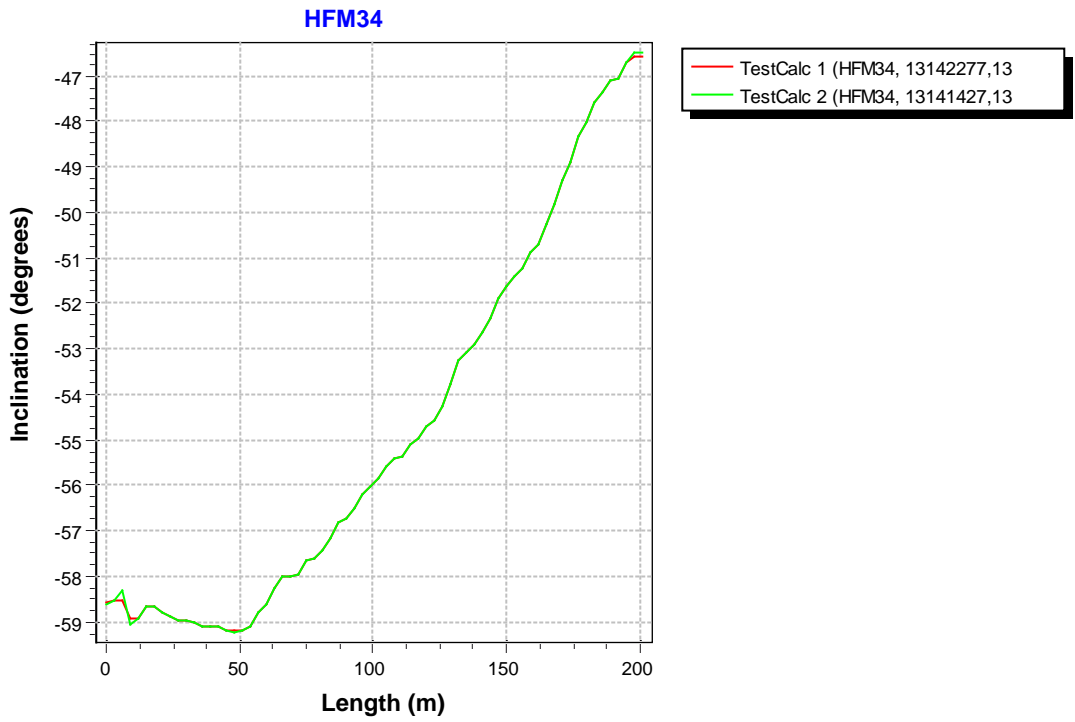


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activity specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM34	13141427	EG157	Magnetic - accelerometer measurement	2006-06-05 15:20:00	3.00	198.00	F	061219 13:30
HFM34	13116729	EG157	Magnetic - accelerometer measurement	2006-06-05 15:20:00	3.00	198.00	E	061219 13:30
HFM34	13142277	EG154	Borehole deviation multiple measurements	2006-12-19 18:40:00			I C	070111 08:13

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM34	13141427	BEARING	15.00	198.00	4.900
HFM34	13141427	INCLINATION	3.00	198.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_UNCERT	INCLINATION	BEARING	INCLINATION_UNCERT	BEARING_UNCERT	RADIUS_UNCERT
HFM34	6701325.06	1632470.21	2.45	0	0.00	-58.59	30.50	1.8	4.9	0.00
HFM34	6701337.16	1632477.27	-20.63	27	0.44	-58.98	30.05	1.8	4.9	1.20
HFM34	6701347.85	1632483.41	-41.23	51	0.83	-59.21	29.65	1.8	4.9	2.25
HFM34	6701357.41	1632488.81	-59.13	72	1.17	-57.98	29.20	1.8	4.9	3.19
HFM34	6701368.78	1632495.15	-79.29	96	1.58	-56.19	29.42	1.8	4.9	4.30
HFM34	6701380.67	1632501.76	-99.06	120	2.01	-54.73	28.65	1.8	4.9	5.47
HFM34	6701394.74	1632509.62	-120.72	147	2.52	-51.90	29.73	1.8	4.9	6.85
HFM34	6701407.83	1632517.25	-139.33	171	3.00	-49.29	30.15	1.8	4.9	8.15
HFM34	6701423.63	1632526.26	-159.29	198	3.57	-46.59	29.41	1.8	4.9	9.71
HFM34	6701425.27	1632527.18	-161.28	200.75	3.63	-46.59	29.41	1.8	4.9	9.87

Borehole description HFM35

Figure 1 gives a technical description of HFM35.

Technical data

Borehole HFM35

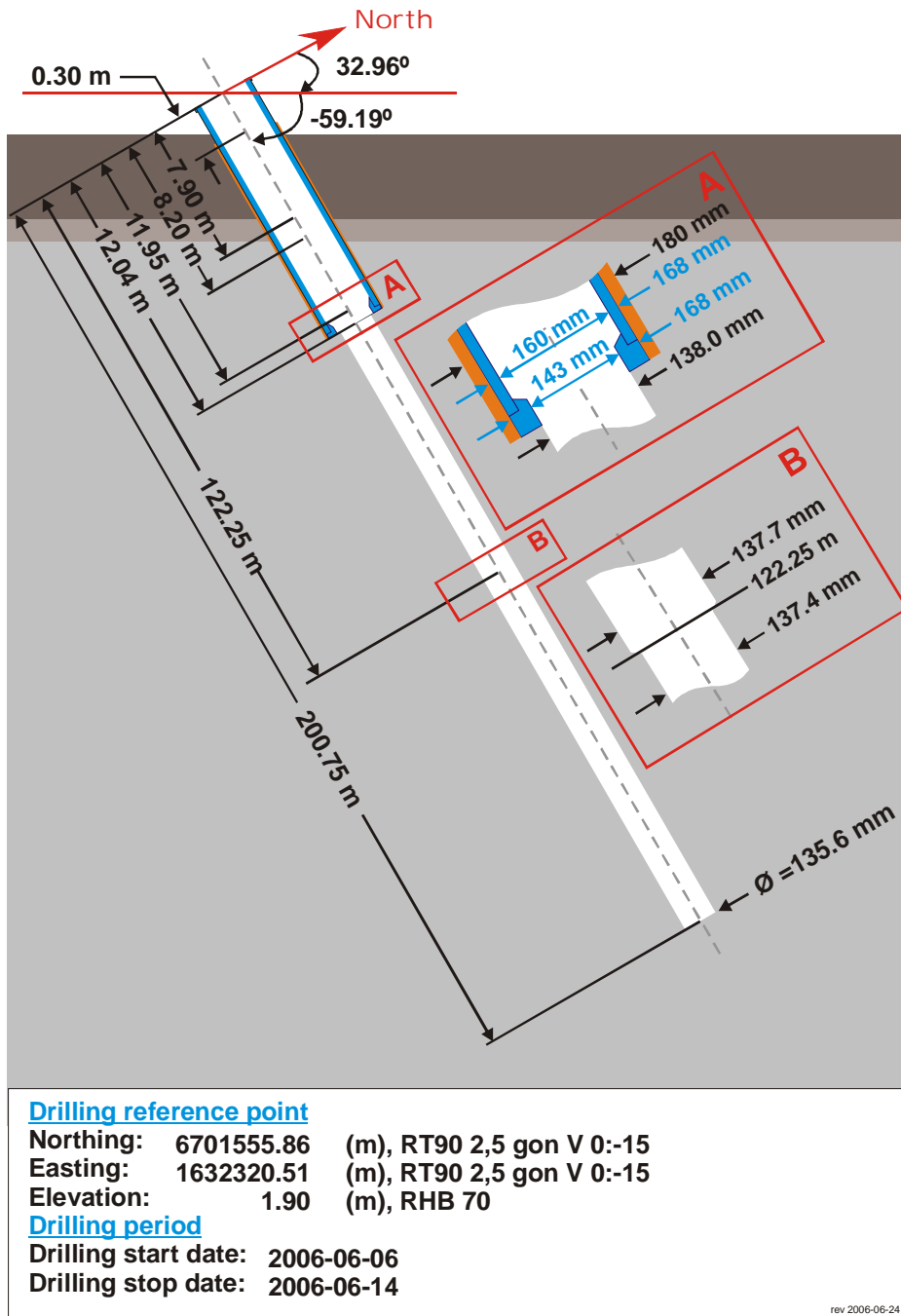


Figure 1. Technical description of HFM35.

Deviation measurement in HFM35

The only deviation measurement in HFM35 was performed with the Mag/acc, Flexit instrument. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurements (ID 13141478) was executed every three metres downwards between the length 3–198 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activity ID 13116731 was based on the same measurement, but was adjusted with wrong magnetic declination and was therefore error marked. No geomagnetic disturbance exceeding 0.5 degrees in declination was observed on the date of the Mag/acc measurement, see Figure 2.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142278) the Mag/acc measurement (ID 13141478) was used. Table 2 shows the contents of the EG154-file used for the calculation of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively (see Section 4.4.2), and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 3 show the resulting deviation data together with the other, not error marked, deviation activities listed in Table 1.

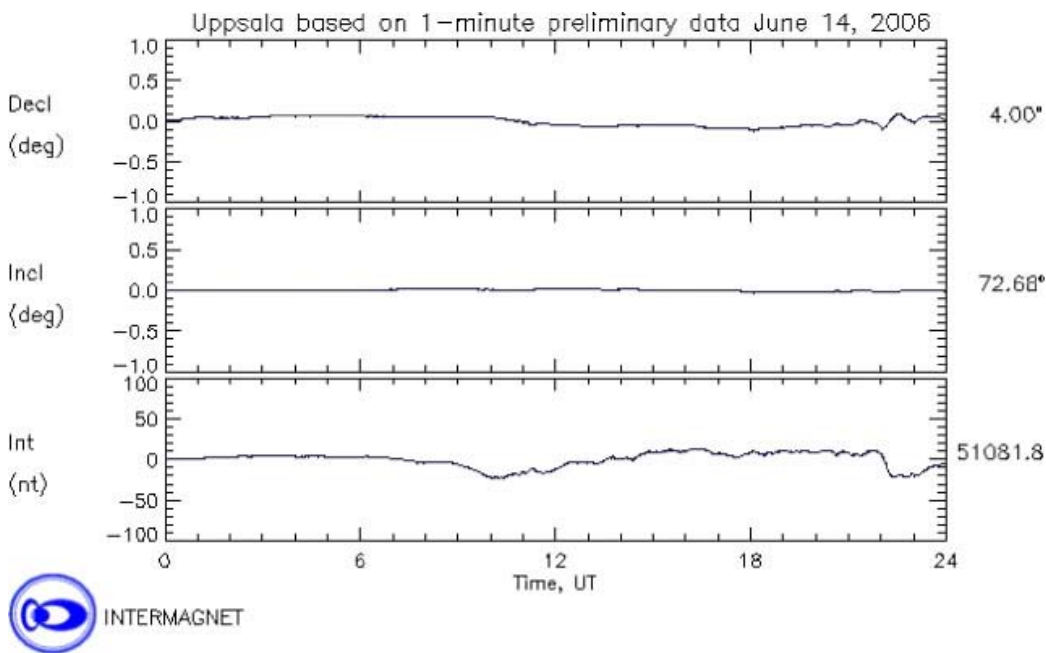


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2006-06-14. The upper curve shows the declination.

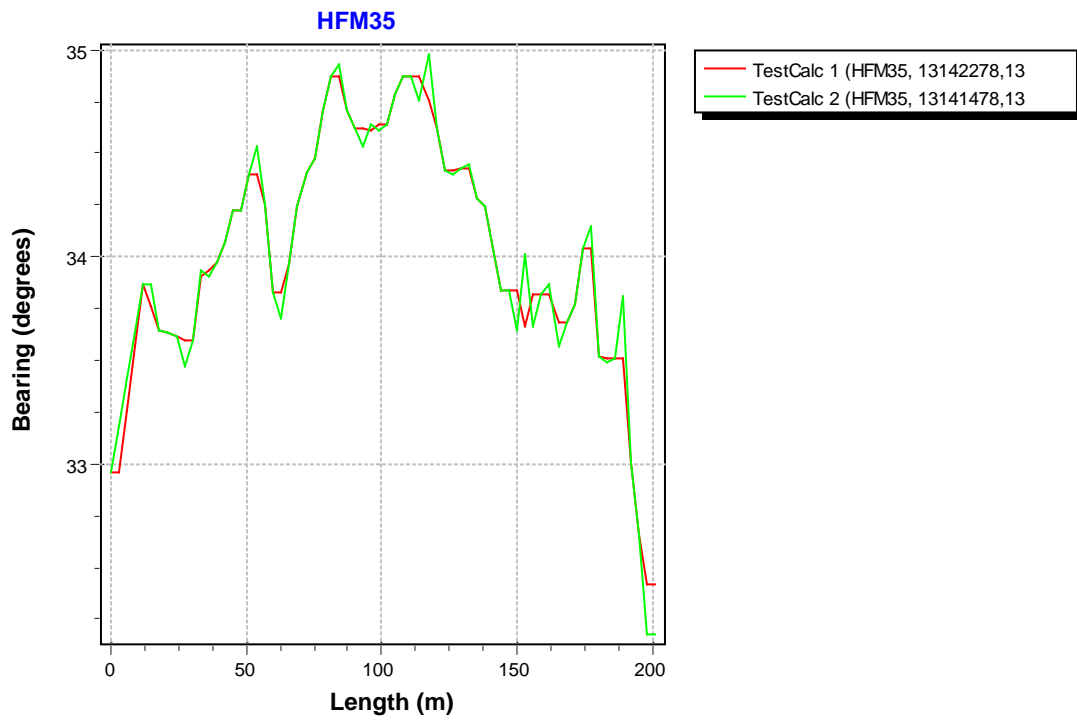
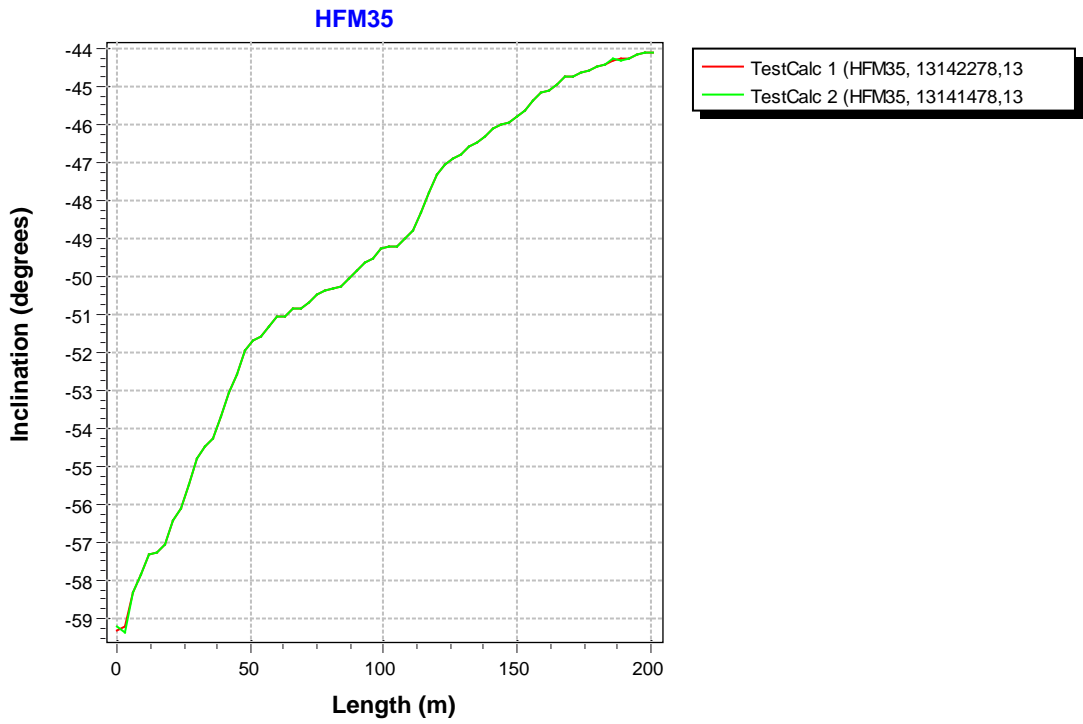


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activity specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM35	13116731	EG157	Magnetic - accelerometer measurement	2006-06-14 17:40:00	3.00	198.00	E	061219 13:31
HFM35	13141478	EG157	Magnetic - accelerometer measurement	2006-06-14 17:40:00	3.00	198.00	F	061219 13:31
HFM35	13142278	EG154	Borehole deviation multiple measurements	2006-12-19 18:50:00			I C	070111 08:13

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM35	13141478	BEARING	15.00	198.00	4.900
HFM35	13141478	INCLINATION	3.00	198.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_UNCERT	INCLINATION	BEARING	INCLINATION_UNCERT	BEARING_UNCERT	RADIUS_UNCERT
HFM35	6701555.86	1632320.51	1.90	0	0.00	-59.27	32.96	1.8	4.9	0.00
HFM35	6701567.98	1632328.54	-20.85	27	0.46	-55.48	33.60	1.8	4.9	1.25
HFM35	6701579.80	1632336.51	-40.15	51	0.91	-51.70	34.40	1.8	4.9	2.47
HFM35	6701593.85	1632346.07	-61.12	78	1.44	-50.37	34.71	1.8	4.9	3.93
HFM35	6701606.58	1632354.88	-79.47	102	1.93	-49.20	34.64	1.8	4.9	5.25
HFM35	6701621.42	1632365.15	-99.54	129	2.50	-46.81	34.43	1.8	4.9	6.80
HFM35	6701636.93	1632375.63	-119.00	156	3.09	-45.39	33.82	1.8	4.9	8.40
HFM35	6701654.64	1632387.46	-140.13	186	3.76	-44.33	33.51	1.8	4.9	10.22
HFM35	6701663.51	1632393.21	-150.42	200.75	4.09	-44.14	32.42	1.8	4.9	11.12

Borehole description HFM36

Figure 1 gives a technical description of HFM36.

Technical data

Borehole HFM36

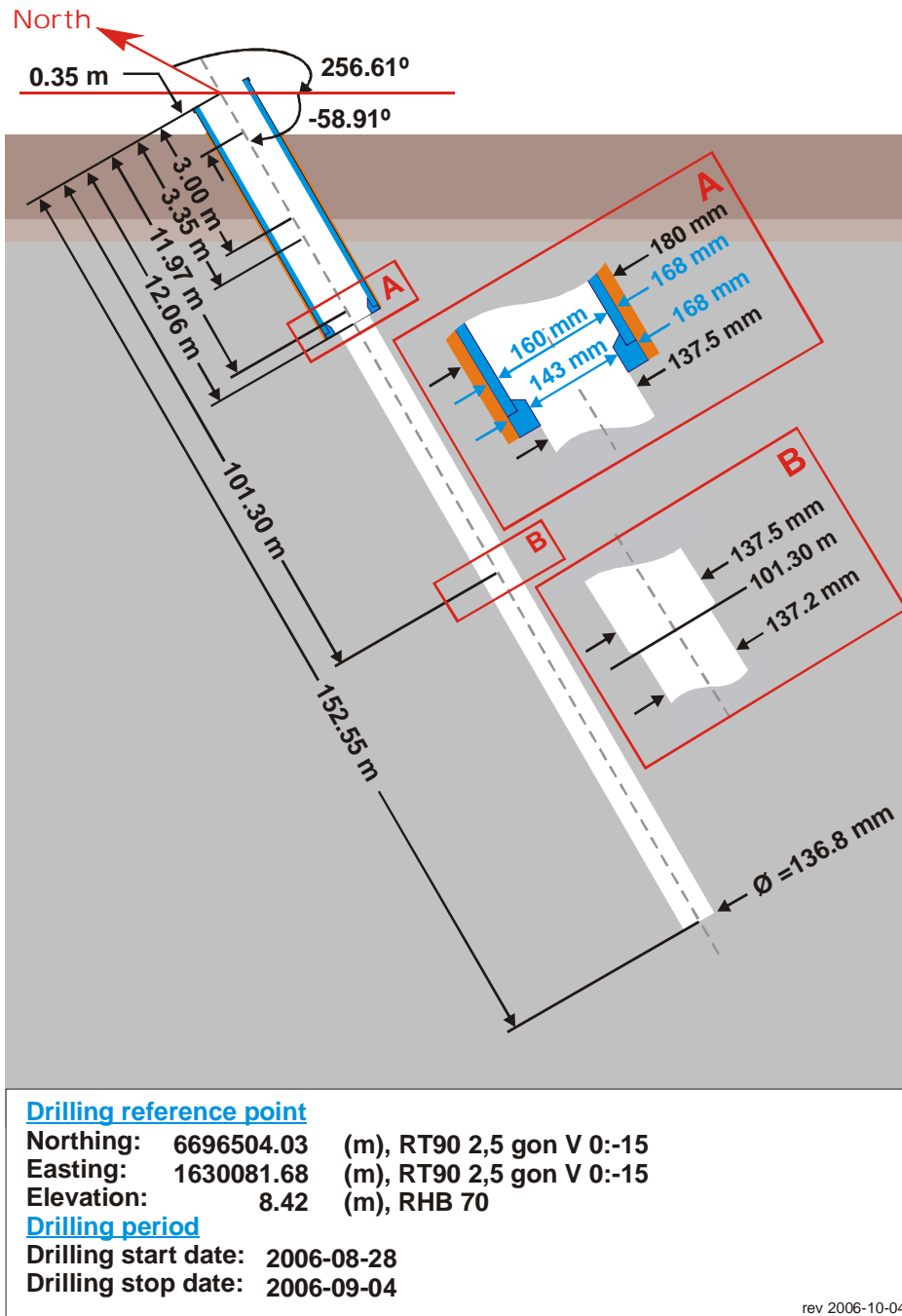


Figure 1. Technical description of HFM36.

Deviation measurement in HFM36

The only deviation measurement in HFM36 was performed with the Mag/acc, Flexit instrument. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurements (ID 13141428) was executed every three metres downwards between the length 3–150 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activity ID 13120325 was based on the same measurement, but was adjusted with wrong magnetic declination and was therefore error marked. No geomagnetic disturbance exceeding 0.5 degrees in declination was observed on the date of the Mag/acc measurement, see Figure 2.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142280) the Mag/acc measurement (ID 13141428) was used. Table 2 shows the contents of the EG154-file used for the calculations of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively (see Section 4.4.2), and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activity listed in Table 1.

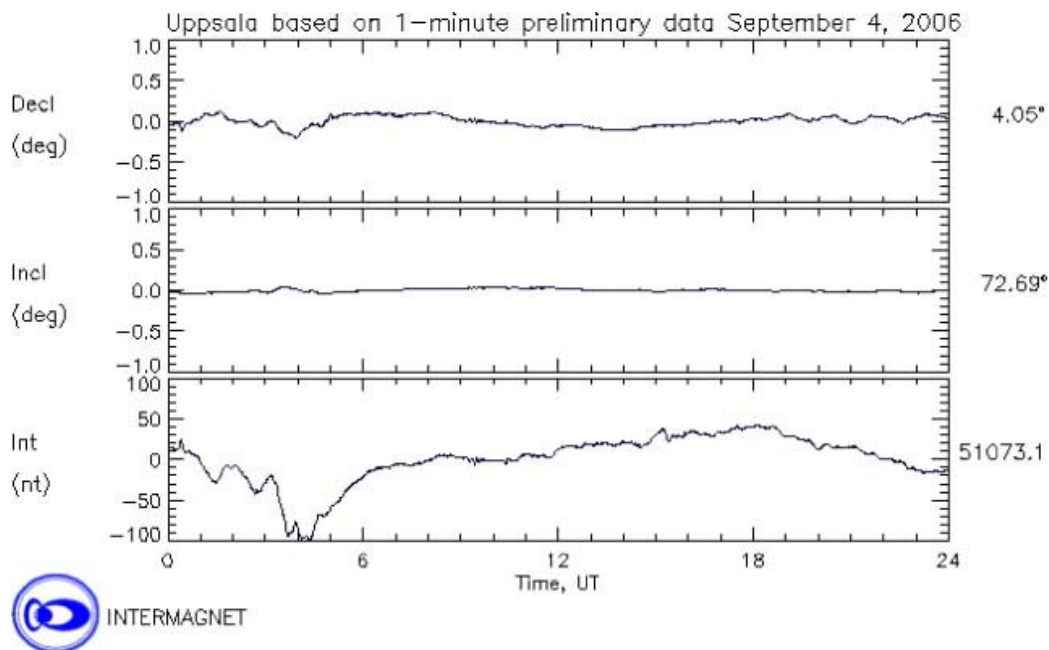


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2006-09-04. The upper curve shows the declination.

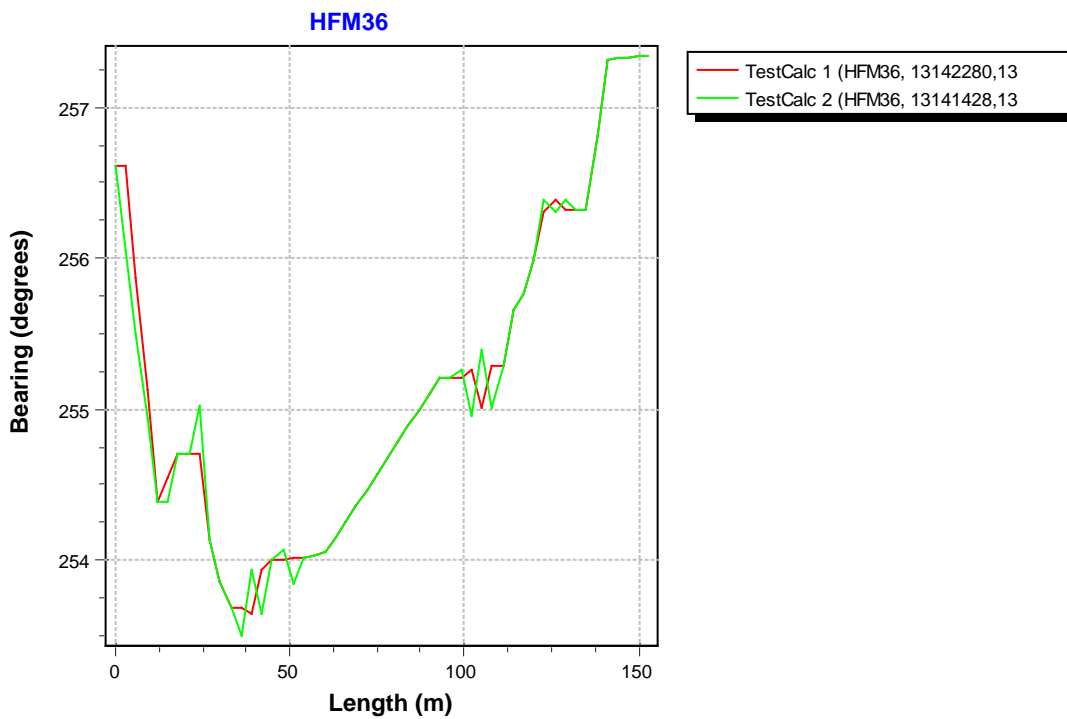
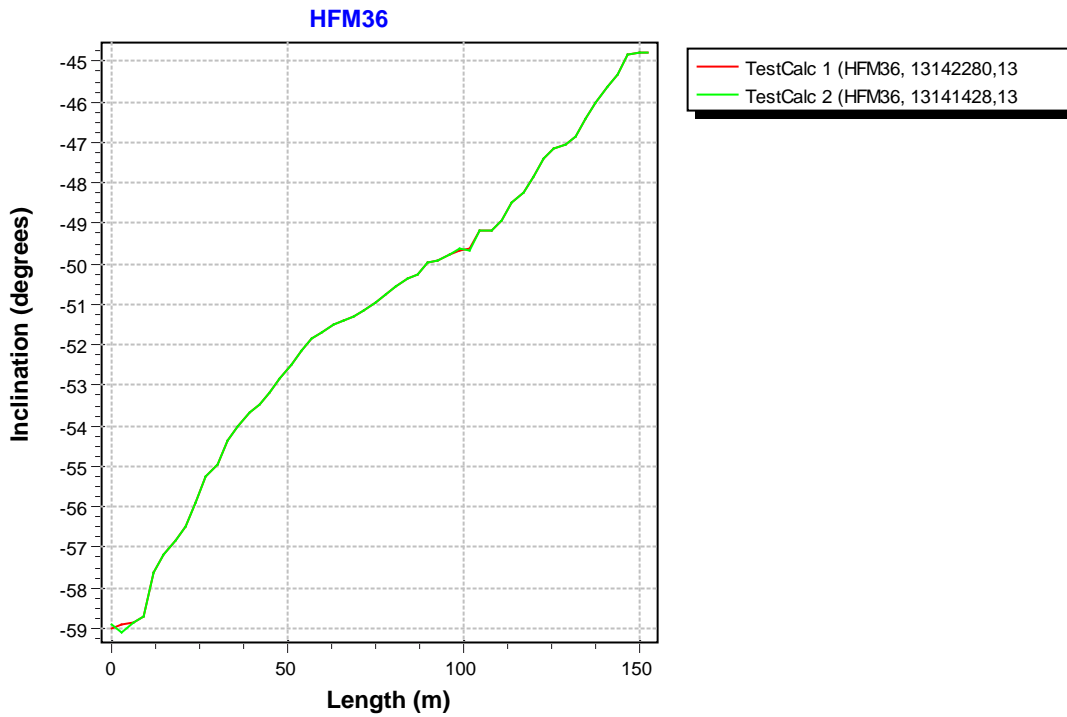


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activity specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM36	13120325	EG157	Magnetic - accelerometer measurement	2006-09-04 13:00:00	3.00	150.00	EF	061219 13:32
HFM36	13141428	EG157	Magnetic - accelerometer measurement	2006-09-04 13:00:00	3.00	150.00	F	061219 13:32
HFM36	13142280	EG154	Borehole deviation multiple measurements	2006-12-19 19:00:00			I C	070111 08:13

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM36	13141428	BEARING	15.00	150.00	4.900
HFM36	13141428	INCLINATION	3.00	150.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_UNCERT	INCLINATION	BEARING	INCLINATION_UNCERT	BEARING_UNCERT	RADIUS_UNCERT
HFM36	6696504.03	1630081.68	8.41	0	0.00	-59.01	256.61	1.8	4.9	0.00
HFM36	6696499.34	1630064.36	-19.26	33	0.57	-54.36	253.68	1.8	4.9	1.54
HFM36	6696494.83	1630048.73	-40.82	60	1.08	-51.68	254.05	1.8	4.9	2.94
HFM36	6696490.80	1630034.21	-59.49	84	1.55	-50.38	254.89	1.8	4.9	4.23
HFM36	6696486.32	1630017.32	-80.08	111	2.10	-48.92	255.29	1.8	4.9	5.72
HFM36	6696481.94	1629999.60	-99.96	138	2.68	-46.04	256.81	1.8	4.9	7.28
HFM36	6696479.69	1629989.60	-110.29	152.55	3.00	-44.80	257.33	1.8	4.9	8.16

Borehole description HFM37

Figure 1 gives a technical description of HFM37.

Technical data

Borehole HFM37

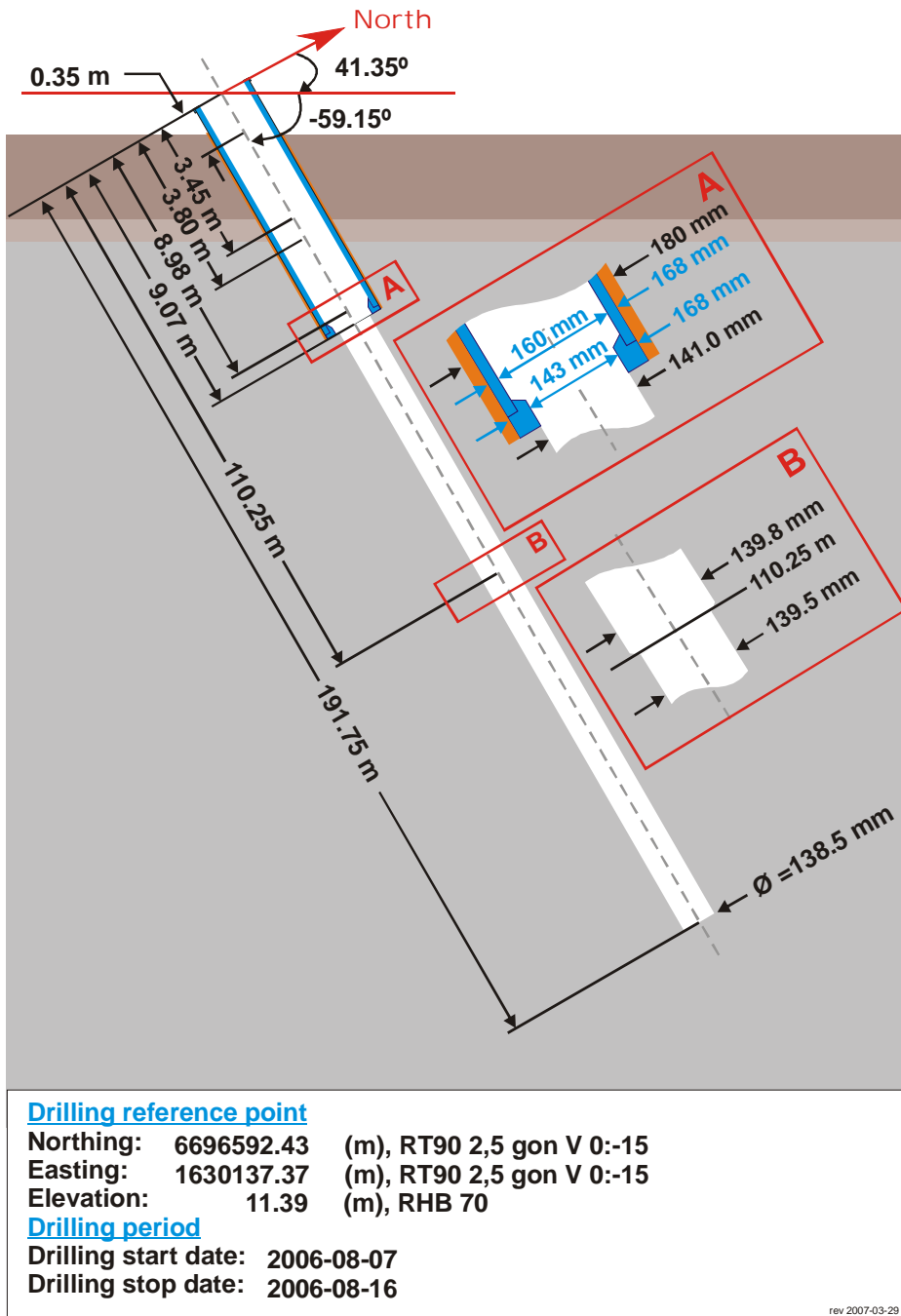


Figure 1. Technical description of HFM37.

Deviation measurement in HFM37

The only deviation measurement in HFM37 was performed with the Mag/acc, Flexit instrument. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurements (ID 13141482) was executed every three metres downwards between the length 3–189 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activity ID 13120327 was based on the same measurement, but was adjusted with wrong magnetic declination and was therefore error marked. No geomagnetic disturbance exceeding 0.5 degrees in declination was observed on the date of the Mag/acc measurement, see Figure 2.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142282) the Mag/acc measurement (ID 13141482) was used. Table 2 shows the contents of the EG154-file used for the calculation of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively (see Section 4.4.2), and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 3 shows the resulting deviation data together with the other, not error marked, deviation activity listed in Table 1.

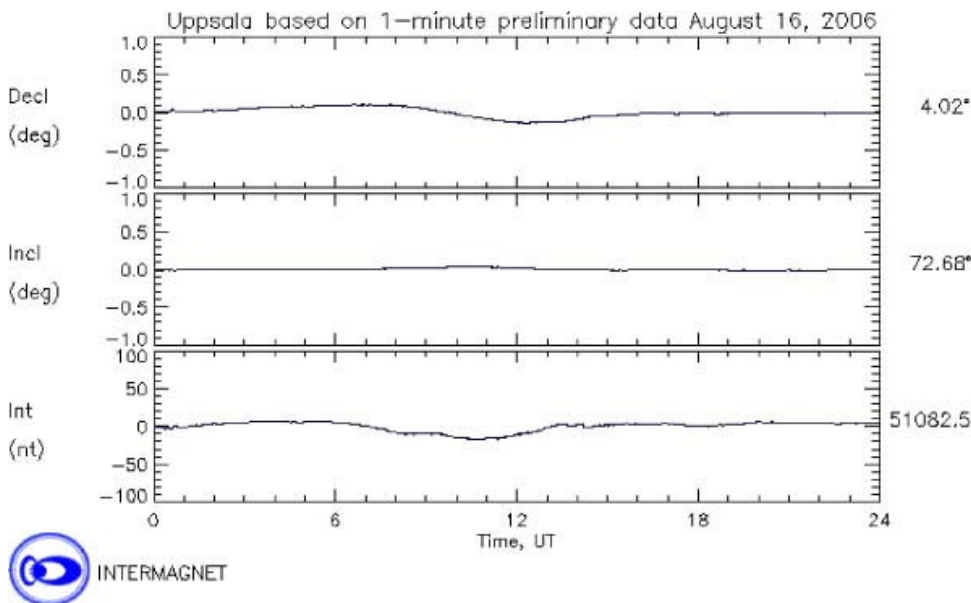


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2006-08-16. The upper curve shows the declination.

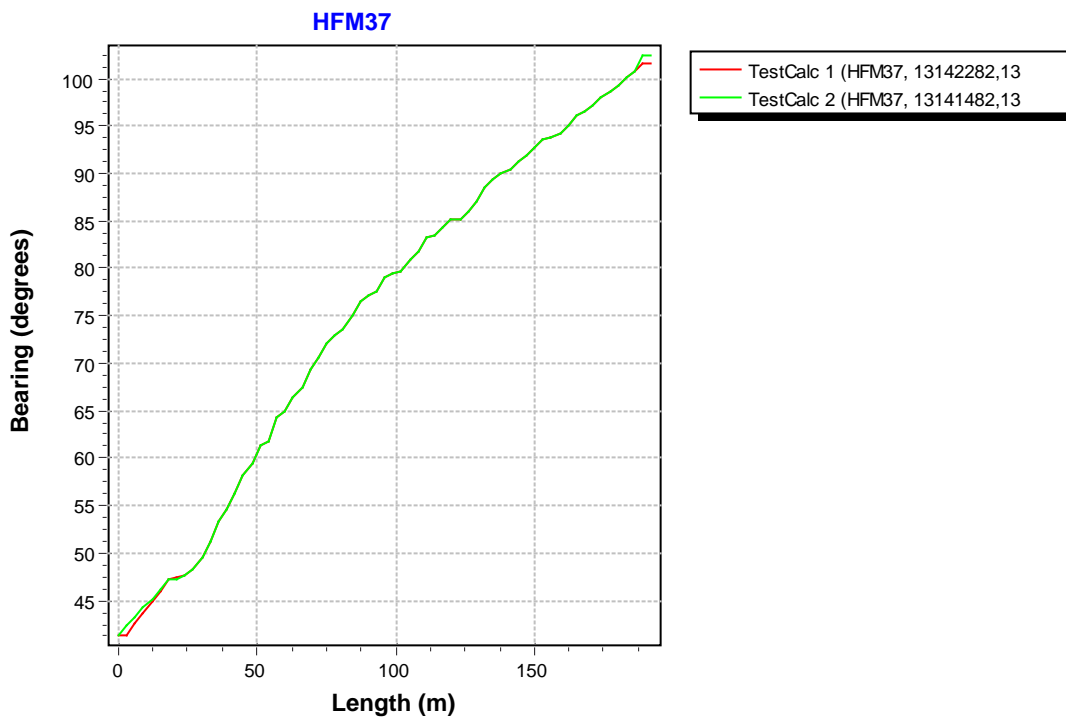
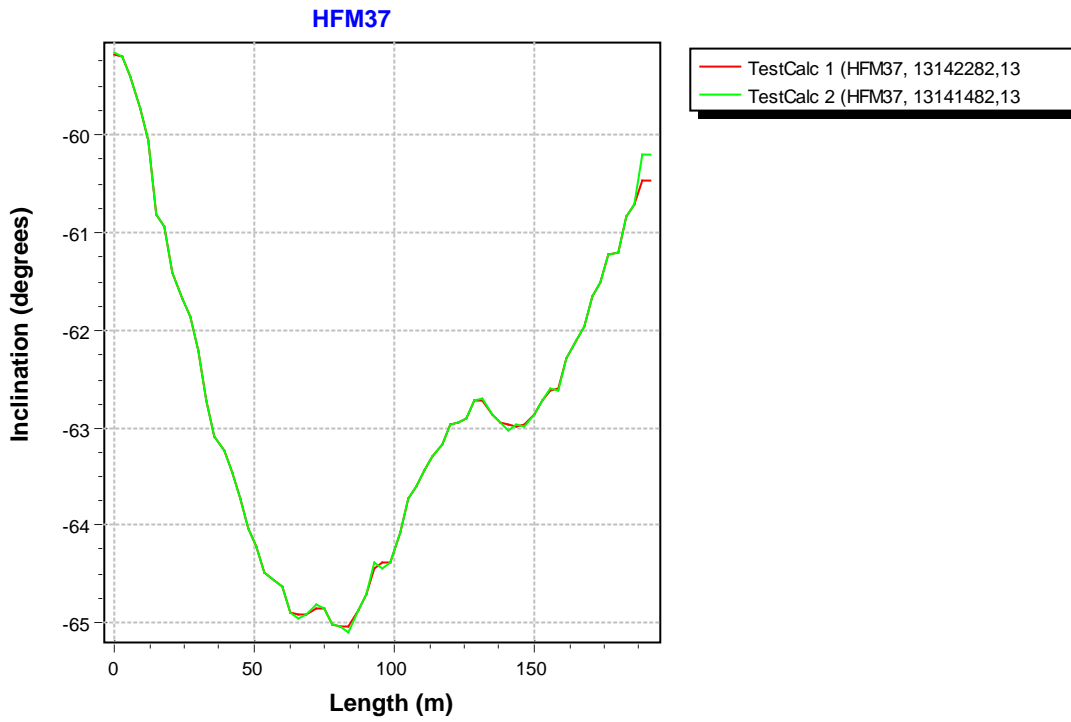


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activity specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM37	13120327	EG157	Magnetic - accelerometer measurement	2006-08-16 15:30:00	3.00	189.00	EF	061219 13:33
HFM37	13141482	EG157	Magnetic - accelerometer measurement	2006-08-16 15:30:00	3.00	189.00	F	061219 13:34
HFM37	13142282	EG154	Borehole deviation multiple measurements	2006-12-19 19:10:00			I C	070111 08:13

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM37	13141482	BEARING	21.00	189.00	4.900
HFM37	13141482	INCLINATION	3.00	189.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_UNCERT	INCLINATION	BEARING	INCLINATION_UNCERT	BEARING_UNCERT	RADIUS_UNCERT
HFM37	6696592.43	1630137.37	11.39	0	0.00	-59.17	41.35	1.8	4.9	0.00
HFM37	6696604.49	1630149.99	-20.07	36	0.55	-63.10	53.41	1.8	4.9	1.49
HFM37	6696609.31	1630157.88	-38.92	57	0.84	-64.57	64.23	1.8	4.9	2.27
HFM37	6696612.95	1630167.39	-60.64	81	1.16	-65.03	73.66	1.8	4.9	3.14
HFM37	6696614.91	1630176.17	-79.62	102	1.44	-64.08	79.78	1.8	4.9	3.91
HFM37	6696616.15	1630186.86	-101.06	126	1.78	-62.90	85.90	1.8	4.9	4.84
HFM37	6696616.26	1630196.43	-119.75	147	2.08	-62.97	91.94	1.8	4.9	5.65
HFM37	6696615.37	1630207.50	-141.03	171	2.43	-61.65	97.24	1.8	4.9	6.61
HFM37	6696613.67	1630217.41	-159.18	191.75	2.75	-60.45	101.63	1.8	4.9	7.47

Borehole description HFM38

Figure 1 gives a technical description of HFM38.

Technical data

Borehole HFM38



Figure 1. Technical description of HFM38.

Deviation measurement in HFM38

The only deviation measurement in HFM38 was performed with the Mag/acc, Flexit instrument. The deviation logging activity is tabulated in Sicada Activity Log, see Table 1.

One Mag/acc measurements (ID 13141480) was executed every three metres downwards between the length 3–192 m, with the Flexit instrument. Corrections of measured data are shown in the File References (Sicada) for the measurements. The activity ID 13116871 was based on the same measurement, but was adjusted with wrong magnetic declination and was therefore error marked. No geomagnetic disturbance exceeding 0.5 degrees in declination was observed on the date of the Mag/acc measurement, see Figure 2.

Borehole deviation multiple measurements

In the calculation of *Borehole deviation multiple measurements* (ID 13142283) the Mag/acc measurement (ID 13141480) was used. Table 2 shows the EG154-file used for the calculation of deviation data.

A subset of the resulting deviation file for every approximately 20 m elevation (from Object_location) is shown in Table 3. Because only one deviation activity was included in the EG154-file (Table 2) the inclination and bearing uncertainties were set manually to 1.8° and 4.9° respectively (see Section 4.4.2), and based on these values the “Radius uncertainty” was calculated for every measuring level.

Figure 3 show the resulting deviation data together with the other, not error marked, deviation activity listed in Table 1.

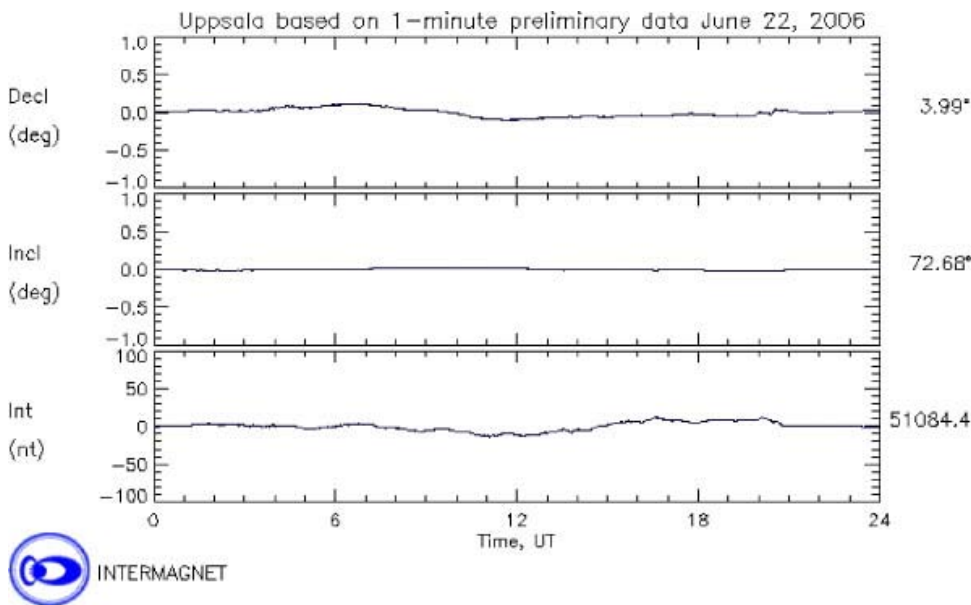


Figure 2. The geomagnetic field observed at the geomagnetic observatory in Uppsala on 2006-06-22. The upper curve shows the declination.

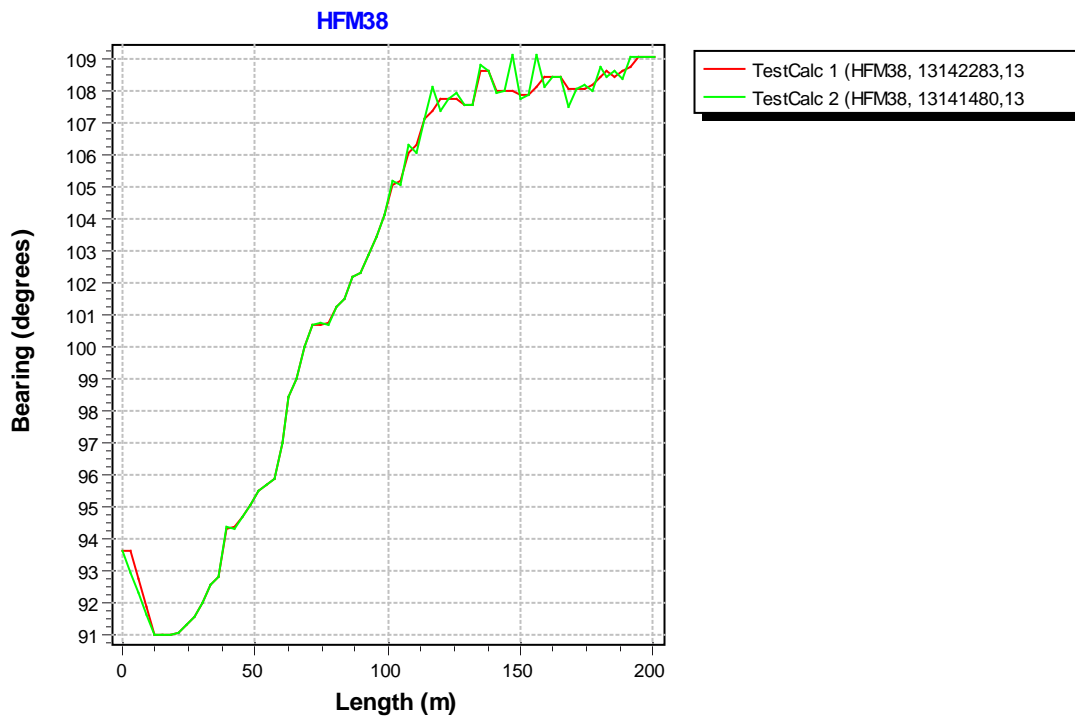
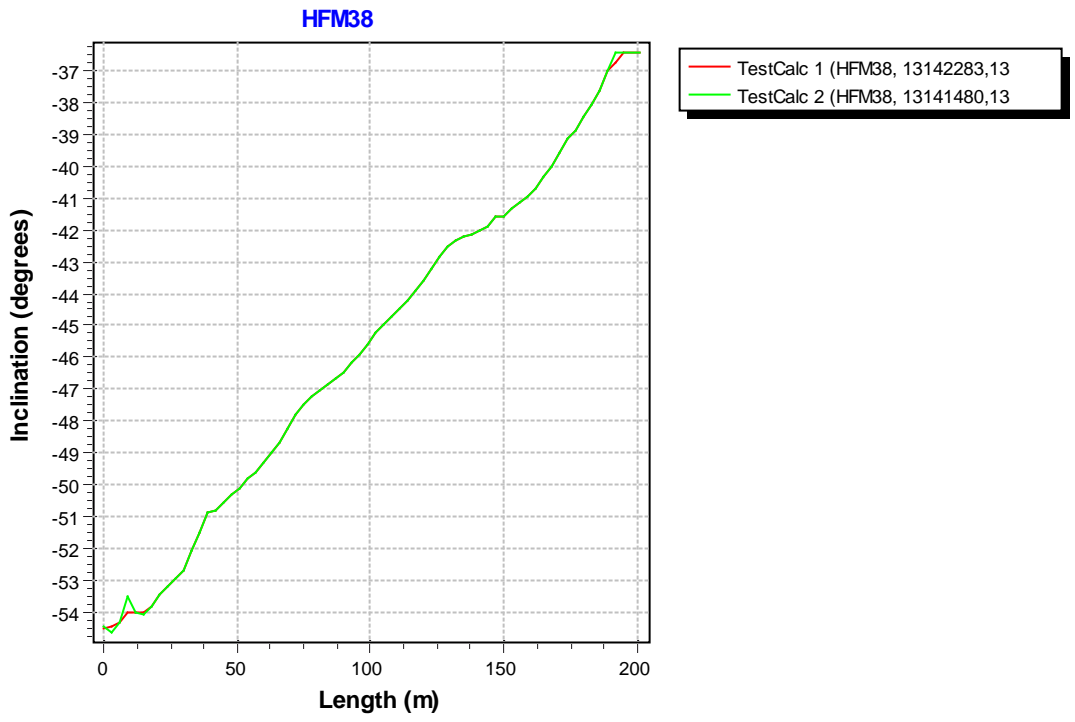


Figure 3. The Borehole deviation multiple measurements data (EG154, red line) together with the other, not error-marked deviation activity specified in Table 1. The upper diagram shows the inclination and the lower diagram shows the bearing.

Table 1. The deviation logging activities in Sicada.

IDCODE	ACTIVITY ID	ACTIVITY TYPE CODE	ACTIVITY	START DATE	SECUP (m)	SECLOW (m)	FLAGS	_INDAT
HFM38	13116871	EG157	Magnetic - accelerometer measurement	2006-06-22 09:40:00	3.00	192.00	E	061219 13:33
HFM38	13141480	EG157	Magnetic - accelerometer measurement	2006-06-22 09:40:00	3.00	192.00	F	061219 13:33
HFM38	13142283	EG154	Borehole deviation multiple measurements	2006-12-19 19:20:00			I C	070111 08:13

Table 2. Content of the EG154-file.

IDCODE	DEVIATION_ACTIVITY_ID	DEVIATION_ANGLE_TYPE	APPROVED_SECUP (m)	APPROVED_SECLOW (m)	MAN_ESTIM_ANGLE_UNCERT (degrees)
HFM38	13141480	BEARING	15.00	192.00	4.900
HFM38	13141480	INCLINATION	3.00	192.00	1.800

Table 3. Subset (for every approx. 20 m elevation) of the resulting "Object_location" in Sicada.

IDCODE	NORTHING	EASTING	ELEVATION	LENGTH	ELEVATION_ UNCERT	INCLINATION	BEARING	INCLINATION_ UNCERT	BEARING_ UNCERT	RADIUS_ UNCERT
HFM38	6700701.28	1631301.71	2.21	0	0.00	-54.56	93.62	1.8	4.9	0.00
HFM38	6700700.77	1631317.61	-19.61	27	0.50	-52.97	91.61	1.8	4.9	1.36
HFM38	6700699.61	1631334.50	-40.63	54	1.03	-49.80	95.70	1.8	4.9	2.81
HFM38	6700696.80	1631352.18	-60.83	81	1.60	-47.03	101.28	1.8	4.9	4.35
HFM38	6700692.45	1631370.43	-80.24	108	2.19	-44.70	106.10	1.8	4.9	5.95
HFM38	6700685.87	1631391.25	-100.80	138	2.88	-42.16	108.61	1.8	4.9	7.82
HFM38	6700678.85	1631412.68	-120.58	168	3.59	-40.00	108.07	1.8	4.9	9.75
HFM38	6700670.63	1631437.19	-140.68	200.75	4.40	-36.41	109.06	1.8	4.9	11.97