

**P-09-42**

**Forsmark site investigation  
Hydro monitoring program  
Report for May 2008–April 2009**

Göran Nyberg, Eva Wass  
Geosigma AB

June 2009

**Svensk Kärnbränslehantering AB**  
Swedish Nuclear Fuel  
and Waste Management Co  
Box 250, SE-101 24 Stockholm  
Phone +46 8 459 84 00



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# **Forsmark site investigation Hydro monitoring program Report for May 2008–April 2009**

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*Keywords:* AP PF 400-07-051, AP PF 400-08-009, Groundwater, Borehole, Instrumentation, Measurement methods, Monitoring, HMS, Forsmark.

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](http://www.skb.se).

A pdf version of this document can be downloaded from [www.skb.se](http://www.skb.se).

## Abstract

This document reports data obtained within the hydro monitoring activity, which is part of the programme for monitoring of geoscientific parameters and biological objects within the Forsmark investigation area. Monitoring commenced during the Forsmark site investigations 2002–2007, and a monitoring programme was stipulated to continue as an independent project starting in July 2007, after completion of Project Forsmark site investigations in June 2007. The objectives of the groundwater monitoring are to support the hydrogeological characterization of the area and to document the groundwater conditions during undisturbed conditions, the so called “baseline”. Later, if and when ground excavation and construction works for a deep repository will be performed at Forsmark, another object is to observe the possible impact on the groundwater levels of these actions.

Data presented in this report were collected during the period of May 2008 until April 2009 and include groundwater levels in deep as well as shallow core drilled and percussion drilled boreholes in bedrock and soil, as well as some surface-water levels. Meteorological and hydrological data and some service parameters, which also have been collected within this activity, are presented elsewhere.

The data collecting system in HMS (Hydro Monitoring System) consists of measurement stations (computers) that communicate with and collect data from a number of dataloggers. The computers are connected to the SKB Ethernet LAN. All data are collected by means of various transducers connected to different types of data loggers: Minitroll, LevelTroll, Mitec and Datataker.

In order to calibrate registrations from the data loggers, manual levelling of the groundwater table of all borehole sections is made, normally once every month. The logger data are converted to water levels using calibration constants. All collected data are quality-checked once every three months. During this work, obviously erroneous data are omitted and calibration constants are corrected so that the monitored data comply with the manual levelling. At these occasions the status of the equipment is also checked and service might be initiated.

Diagrams of groundwater levels and groundwater pressure for the period of May 2008 – April 2009 (one data point per section and twenty-four hours) are presented in Appendix 2. The original data are stored in the primary data base Sicada. The data in this data base may then be used for further analysis.

There are no nonconformities with respect to the activity plan or the method description.

## Sammanfattning

Denna rapport redovisar data erhållna vid grundvattenmonitoring i Forsmark, vilket ingår i det program för monitoring av geovetenskapliga parametrar och biologiska objekt inom Forsmarks undersökningsområde som påbörjades under platsundersökningen 2002–2007. Därefter har det fattats beslut om att monitoringsprogrammet ska bedrivas som ett självständigt projekt med start i juli 2007, d.v.s. efter att projekt platsundersökning avslutades i juni 2007. Syftena med grundvattenmonitoringen är att stödja den hydrogeologiska karakteriseringen av platsen och att dokumentera grundvattenförhållanden före en eventuell tunneldrivning för ett djupförvar. Senare, om underjordsarbeten för ett undermarksförvar skulle bli aktuella i Forsmark, är ett annat syfte med monitoringen att observera eventuell inverkan av dessa aktiviteter på grundvattennivåerna.

Data presenterade i rapporten är insamlade under perioden maj 2008 till och med april 2009 och består av grundvattennivå i såväl djupa som grunda kärnborrade och hammarborrade borrhål i berg och jord samt dessutom ytvattennivå i några mätpunkter. Inom ramen för monitoringsprogrammet insamlas även meteorologiska och ythydrologiska data, vilka dock presenteras i andra rapporter.

Datainsamlingssystemet i HMS (Hydro Monitoring System) består av mätstationer (datorer) vilka kommunicerar med och samlar in data från ett antal dataloggrar. Datorerna är förbundna med SKB:s nätverk. Alla data samlas in med hjälp av givare förbundna med olika typer av dataloggrar: Minitroll, LevelTroll, Mitec och Datataker.

För att kunna kalibrera registreringarna från dataloggrarna utförs, vanligtvis en gång i månaden, manuell nivåregistrering (lodning) i alla borrhålssektioner. Loggerdata omvandlas till vattennivåer genom applicering av kalibreringskonstanter. Alla insamlade data kvalitetskontrolleras en gång i kvartalet. Under detta arbete tas uppenbart felaktiga data bort och kalibreringskonstanterna korrigeras så att automatiskt registrerade data överensstämmer med manuella nivåregistreringar. Vid dessa tillfällen kontrolleras utrustningens status och service kan initieras.

Diagram över grundvattennivåer och grundvattentryck för perioden maj 2008 – april 2009 (en datapunkt per sektion och 24 timmar) visas i Appendix 2. Originaldata lagras i primär databasen Sicada. Data från denna databas kan användas för vidare analyser.

Aktiviteten har utförts i överensstämmelse med aktivitetsplanen och metodbeskrivningen.

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# 1 Introduction

This document reports data obtained within the hydro monitoring activity, which is part of the programme for monitoring of geoscientific parameters and biological objects within the Forsmark investigation area /1/. Monitoring commenced during the Forsmark site investigations 2002–2007, and a monitoring programme was stipulated to continue as an independent project starting in July 2007, after completion of Project Forsmark Site investigation in June 2007.

The work was carried out in accordance with activity plans SKB AP PF 400-07-051 and SKB AP PF 400-08-009. Controlling documents for this activity are listed in Table 1-1. The activity plans and the method description are SKB's internal controlling documents. The site investigation internal reports, Table 1-2, present the results from the quality check performed once every three months, see Section 4.4.

Data presented in this report were collected during May 2008 – April 2009. Groundwater levels from deep as well as shallow core drilled and percussion drilled boreholes in bedrock and soil, as well as some surface-water levels, are included in the data set.

The HMS (Hydro Monitoring System) is used to collect and store all data.

The original data are stored in the primary database Sicada and are traceable by the Activity Plan number.

**Table 1-1. Controlling documents.**

<b>Activity Plans</b>	<b>Number</b>	<b>Version</b>
Platsundersökning Forsmark	AP PF 400-07-051	1.0
Hydrologisk och hydrogeologisk monitoring 2008		
Platsprojekt Forsmark	AP PF 400-08-009	1.0
Hydrologisk och hydrogeologisk monitoring 2009		
<b>Method Descriptions</b>	<b>Number</b>	<b>Version</b>
Metodbeskrivning för grundvattenmonitoring vid SKB:s platsundersökningar	SKB MD 360.002	1.0

**Table 1-2. Monitoring reports.**

<b>Site investigation Internal Reports (in Swedish)</b>	<b>Number</b>
Platsprojekt Forsmark/SFR3	PIR-08-47
Kvalitetskontroll av yt- och grundvattenmonitoring Period februari–maj 2008	
Platsprojekt Forsmark/SFR3	PIR-08-48
Kvalitetskontroll av yt- och grundvattenmonitoring Period maj–september 2008	
Platsprojekt Forsmark	PIR-09-05
Kvalitetskontroll av yt- och grundvattenmonitoring Period september 2008–januari 2009	
Platsprojekt Forsmark	In prep.
Kvalitetskontroll av yt- och grundvattenmonitoring Period januari–maj 2009	

## 2 Objectives and scope

The objectives of the part of the hydro monitoring programme presented in this report are to determine baseline conditions, i.e. the natural variations of the groundwater levels prior to the potential excavation for a nuclear waste repository and to support the hydro-geological site characterisation. Later, if and when ground excavation and construction works for a deep repository will be performed at Forsmark, another objective will be to observe the possible impact on the groundwater levels of these operations.

Data collected within this activity are:

- groundwater level in boreholes drilled from the ground surface (including core- and percussion-drilled boreholes in solid rock and monitoring wells in soil),
- water level, water temperature and electrical conductivity of surface waters measured in flumes at runoff stations, presented elsewhere except for six surface water levels presented in this report,
- meteorological data from SMHI (Swedish Meteorological and Hydrological Institute), although presented elsewhere.

There are also some parameters that are used for monitoring the hardware performance and the environment in which the hardware is used. However, these parameters are not reported herein.

The objects that were monitored and for which the results are presented in this report may be divided into the following categories:

- 25 core-drilled boreholes in hard rock,
- 37 percussion-drilled boreholes in hard rock,
- 51 monitoring wells in soil (percussion drilled),
- 6 surface-water level gauges.

The locations of the boreholes are shown in Figure 2-1. Coordinates of all boreholes in the reference system RT90 2.5 gon V 0:–15 and elevation at top of casing (TOC) in the reference system RHB70 are provided in Sicada.



Figure 2-1. Overview of the Forsmark site investigation area with boreholes and surface-water level gauges.



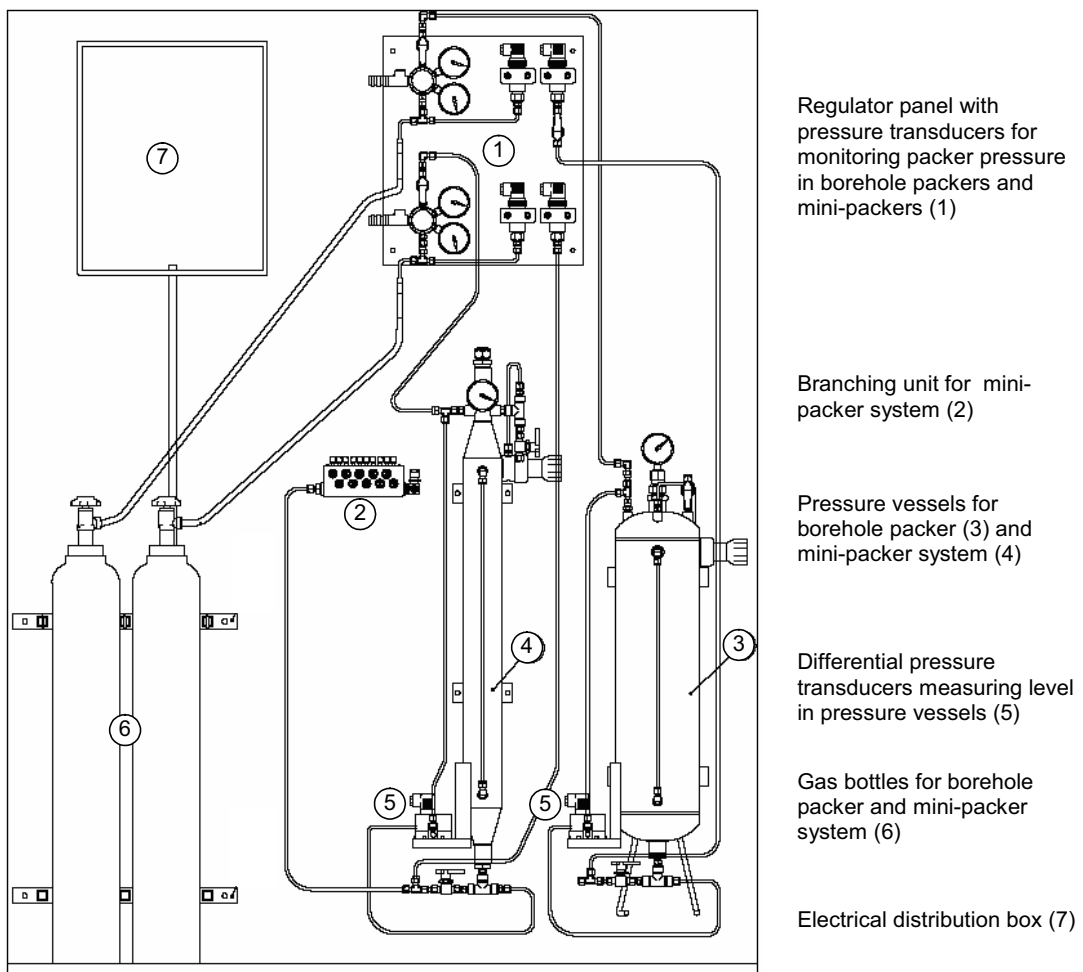
### 3 Equipment

#### 3.1 Straddle packer system and ground surface equipment

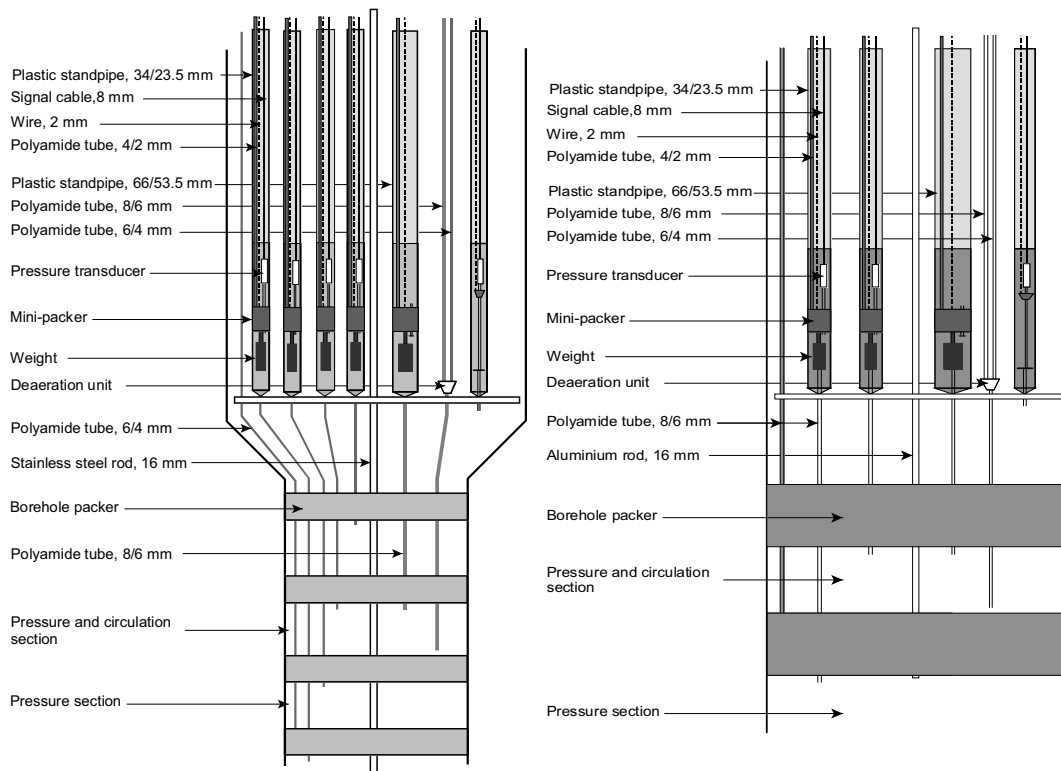
A drawing of the equipment at the ground surface used for percussion- and core-drilled boreholes is shown in Figure 3-1.

Drawings of the straddle-packer equipment for permanent instrumentation in core- and percussion-drilled boreholes are presented in Figure 3-2.

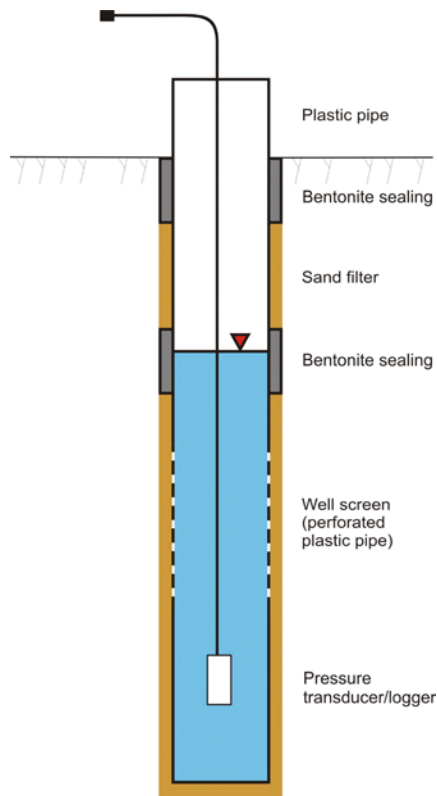
In Figure 3-3 the instrumentation in monitoring wells in soil is shown. In open percussion and core boreholes, as in the monitoring wells in soil, a transducer or data logger is submerged in the groundwater without any accessorial equipment.



*Figure 3-1. Example of ground surface equipment for percussion- and core-drilled boreholes.*



**Figure 3-2.** Example of permanent instrumentation in core-drilled boreholes (left) and percussion-drilled boreholes (right) supplied with circulation sections, i.e. a borehole section which enables circulation of the groundwater enclosed in the section as well as water sampling.



**Figure 3-3.** Explanatory sketch of instrumentation in monitoring wells in soil.

### 3.2 Data collection system

The data collection system, which is part of the Hydro Monitoring System (HMS), consists of measurement stations (computers), which collect data from a number of data sources, see Figure 3-4. The computers are connected to the SKB Ethernet LAN (Local Area Network).

All data are collected by means of pressure transducers connected to different types of data loggers or by manual levelling. The following data loggers are used:

**Minitroll:** a single-channel data logger of stand-alone type where the transducer is integrated in the logger. The logger is submerged in the groundwater and has the capacity to store 80 000 data.

**Leveltroll:** the successor to Minitroll, which is no longer manufactured. It is a logger that in most respects is equal to Minitroll, but has the capacity to store 350 000 data.

**Mitec:** a data logger connected on-line by means of GSM telephony. A pressure transducer of the type Druck PTX is connected to the logger. Only the transducer is submerged in the groundwater. The logger has eight channels, but during monitoring in boreholes, only one channel is used for pressure monitoring and one for monitoring of the battery voltage.

**Datataker:** a data logger connected on-line by means of radio or network. The logger has 42 channels and is used only for monitoring in percussion- and core-drilled boreholes.

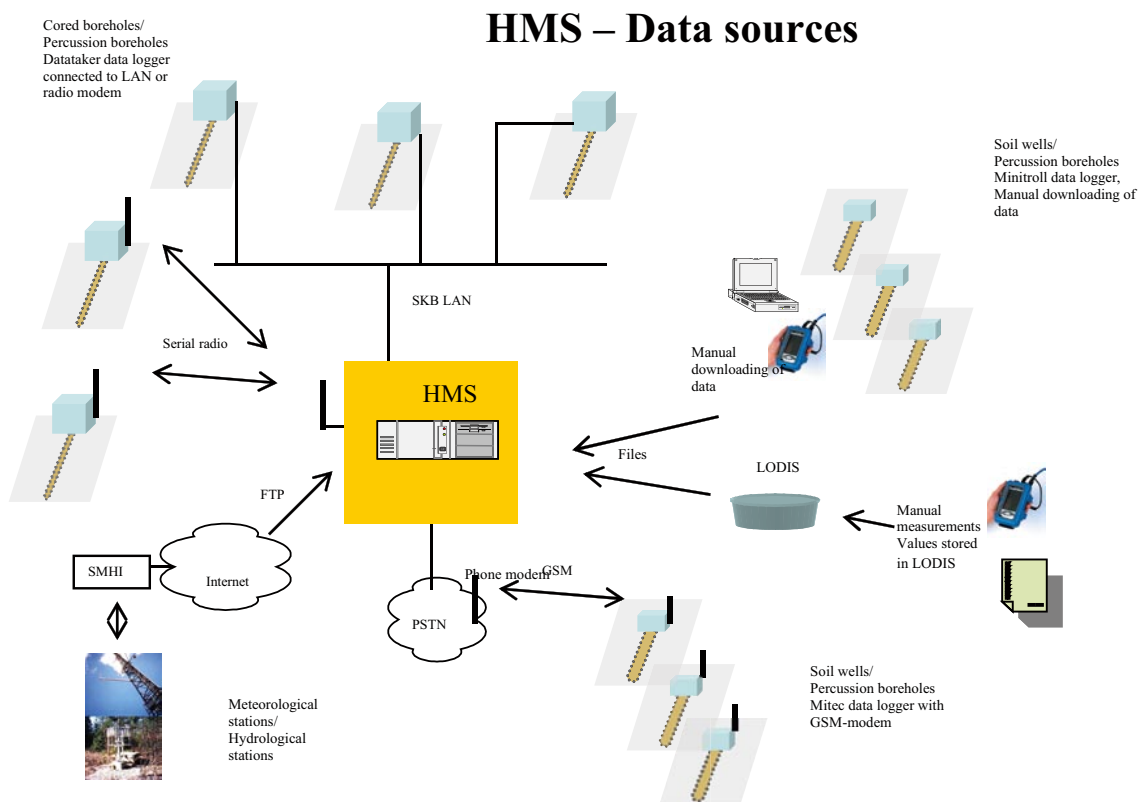


Figure 3-4. HMS data sources.

## **4 Execution**

### **4.1 General**

Data are collected to the measurement system, HMS, as described in Chapter 3.

The on-line system is designed to handle short interruptions in the communication. Data can be stored for at least a couple of hours in the loggers. All data are finally stored in the measurement station. Tape backup is made of all data.

Monitored data that have been quality assured are transferred quarterly to the site characterization database, Sicada.

### **4.2 Field work**

Manual levelling is generally carried out once a month in the surface boreholes. At the same time, the equipment is checked and maintenance is performed.

All data from stand-alone type loggers are manually dumped into a portable PC and then transmitted to the measurement station, normally once every three months.

### **4.3 Data handling**

#### **4.3.1 Calibration method for surface boreholes**

Manual levelling of all borehole sections is made, normally once every month, in order to calibrate the registrations from the data loggers.

The logger data from the surface boreholes are converted to water levels by means of a linear calibration equation. It is also necessary to subtract the air pressure since all transducers give the absolute pressure. Converted logger data are compared with results from manual levelling. If the two differ, calibration constants (offset) are adjusted until an acceptable agreement is obtained.

#### **4.3.2 Recording interval**

For stand-alone and GSM-connected data loggers, measurements of the groundwater level are normally made with five minutes intervals. For all other data loggers connected on-line, levels are normally measured once every ten minutes.

Measured values are not stored unless they differ from the previously stored value by more than 0.1 m (1 kPa) for percussion- and core-drilled boreholes, and 0.05 m for monitoring wells in soil. In addition to this, a value is stored every two hours.

### **4.4 Quality assurance**

Once every week, an inspection of all collected data is performed. The purpose of this is to verify that all loggers are sending data and that all transducers are functioning.

Quarterly, all data collected are subject to a quality check. During this Q/A, obviously erroneous data are omitted and calibration constants are corrected so that the monitored data comply with the manual levelling data (see Section 4.3.1). At this occasion, the status of the equipment is also checked and service might be initiated.

## **4.5 Nonconformities**

There are no nonconformities with respect to the activity plan or the method description.

## 5 Results

### 5.1 General

Original data from the reported activity are stored in the primary database Sicada. Data are traceable in Sicada by the Activity Plan number (AP PF 400-07-051 and AP PF 400-08-009). Only data in 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. However, such revision of the database will not necessarily result in a revision of this report, although the normal procedure is that major data revisions entail a revision of the corresponding P-report. Minor data revisions are normally presented as supplements, available at [www.skb.se](http://www.skb.se).

### 5.2 Groundwater levels

Monitored borehole sections are listed in Appendix 1.

Diagrams of groundwater levels and of six surface-water levels are presented in Appendix 2. All levels in the diagrams are given as metres above sea level in the national elevation system (RHB70). Data from previously reported periods can be found in earlier reports /2/, /3/, /4/, /5/ or /6/.

Daily values are presented for each section in the diagrams. The data point shown is the first stored data point after midnight. When registrations are missing, manually levelled data, if available, are inserted.

Boreholes included in the monitoring system in Forsmark:

- Core-drilled boreholes (25): KFM01A–D, KFM02A–B, KFM03A–B, KFM04A, KFM05A, KFM06A–C, KFM07A–C, KFM08A–D, KFM09A–B, KFM10A, KFM11A, KFM12A.
- Percussion-drilled boreholes (37): HFM01–HFM05, HFM07–HFM38.
- Monitoring wells in soil (51): SFM0001, SFM0003–SFM0006, SFM0008, SFM0010–SFM0015, SFM0017, SFM0019, SFM0021–SFM0023, SFM0025–SFM0028, SFM0030, SFM0033, SFM0034, SFM0036, SFM0049, SFM0057, SFM0058, SFM0061, SFM0062, SFM0067–SFM0073, SFM0075, SFM0077–SFM0081, SFM0084, SFM0087, SFM0091, SFM0095, SFM0104–SFM0107.

Besides from the boreholes above, the report also presents monitoring results from:

- Surface-water level gauges (6) SFM0038 (=PFM010038) - SFM0042, SFM0064

#### 5.2.1 General comments

Results from monitoring in boreholes as well as in surface-water are presented in diagrams. Level data from all sections in each borehole and from surface-water gauges are presented for the period of May 2008 until April 2009.

The symbols used in the diagrams for boreholes divided into a number of sections by a straddle packer system (maximum 10 sections) are:

- The lowermost section = Section 1     ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○
- Section 2     + + + + + + + + + +
- Section 3     × × × × × × × × × ×
- Section 4     □ □ □ □ □ □ □ □ □ □
- Section 5     ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇
- Section 6     △ △ △ △ △ △ △ △ △ △
- Section 7     ◁ ◁ ◁ ◁ ◁ ◁ ◁ ◁ ◁ ◁
- Section 8     ▽ ▽ ▽ ▽ ▽ ▽ ▽ ▽ ▽ ▽
- Section 9     ▷ ▷ ▷ ▷ ▷ ▷ ▷ ▷ ▷ ▷
- Section 10     ✱ ✱ ✱ ✱ ✱ ✱ ✱ ✱ ✱ ✱

The symbol used for boreholes with only one section (for example monitoring wells in soil) and for surface-water gauges is: ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○.

Sometimes it is difficult to differentiate registrations from individual sections in the diagrams. However, since the main purpose of this report is to present an overall view of the long-term variations, it was not found advantageous to show more detailed diagrams from individual sections. Detailed diagrams during periods of hydraulic tests and/or water sampling are presented in reports from the different tests.

Due to failures in the mechanical or electronic equipment, data are sometimes missing for longer or shorter periods. This is not commented on below. For more comments on the diagrams, see Site investigation Internal Reports, Table 1-2.

Remarks are given when the registration for some reason has a deviating appearance. When registrations are missing, manually levelled data, if available, are inserted.

In many boreholes, the groundwater level shows large and rapid variations. This is often due to pumping, water sampling, tracer tests etc in the vicinity of the monitored object. Such activities have though decreased substantially after completion of Project Forsmark Site investigation. However, also the current monitoring programme is to some extent associated with activities of this kind.

Packers may deflate due to leakage, which can be difficult to discover. If a section in a borehole suddenly shows a pressure that is close to the pressure in a neighbouring section, the reason might be deflated packers.

### 5.2.2 Comments on some of the diagrams

The increasing groundwater levels seen in most of the boreholes during August 2008 are caused by high precipitation.

The groundwater in many of the monitoring wells in soil has been reported to be frozen in December 2008 through March 2009. Obviously erroneous data due to freezing have been eliminated.

**KFM01A, KFM06A and KFM08A:** The anomalous behaviour for section 1 in KFM01A and KFM06A and section 3 in KFM08A is caused by low transmissivity and/or poor communication between the standpipe and the section in combination with a relatively large difference between the stand-pipe level and the pressure in the borehole section. When the mini-packer is released, in connection to the monthly levellings, a sudden jump to the level in the standpipe occurs. Thereafter, when the mini-packer is inflated again, the pressure is slowly approaching the actual pressure in the borehole section.

**KFM07B:** The uppermost section, section 3, has probably no hydraulic connection with the groundwater system due to grouting of a long section in this borehole which was drilled mainly for performance of rock stress measurements. No natural movements or responses in the groundwater level can be seen since the borehole was instrumented in the spring 2007. Measurement in section 3 was terminated in March 2009.

**SFM0005:** The borehole is reported to be dry from the middle of June 2008 to the beginning of August 2008.

**SFM0006:** The borehole is reported to be dry from the end of June 2008 to the beginning of August 2008.

**SFM0010 and SFM0058:** The boreholes seem to be mostly dry during a period from June/July to the beginning of August 2008. However, manual levellings performed during this period could not confirm this and therefore no data have been omitted.



## 6 References

- /1/ **SKB 2007.** Forsmark site investigation. Programme for long-term observations of geosphere and biosphere after completed site investigations. SKB R-07-34, Svensk Kärnbränslehantering AB.
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- /3/ **Nyberg G, Wass E, 2005.** Forsmark site investigation. Hydro Monitoring Program. Report for August 2004 – July 2005. SKB P-05-245, Svensk Kärnbränslehantering AB.
- /4/ **Nyberg G, Wass E, 2006.** Forsmark site investigation. Hydro Monitoring Program. Report for August 2005 – September 2006. SKB P-06-263, Svensk Kärnbränslehantering AB.
- /5/ **Nyberg G, Wass E, 2007.** Forsmark site investigation. Hydro monitoring program. Report for October 2006 – March 2007. SKB P-07-113, Svensk Kärnbränslehantering AB.
- /6/ **Nyberg G, Wass E, 2008.** Forsmark site investigation. Hydro monitoring program. Report for April 2007 – April 2008. SKB P-08-72, Svensk Kärnbränslehantering AB.

## Monitored borehole sections and Surface-water level gauges

### Percussion- and core-drilled boreholes in hard rock.

Borehole	Section no	Start date	Stop date	Secup (mbl) <sup>#</sup>	Seclow (mbl)	Circ Section	Elevation Secup (m RHB70)	Elevation SecMid (m RHB70)
HFM01	1	2003-06-16	2003-09-08	0.00	200.20		1.73	-96.89
	1	2005-08-11	2006-10-25	0.00	200.20		1.73	-96.89
	1	2006-10-26		46.50	200.20		-43.91	-119.90
	2	2006-10-26		33.50	45.50	x	-31.10	-37.02
	3	2006-10-26		0.00	32.50		1.73	-14.15
HFM02	1	2002-12-10	2003-01-23	0.00	100.00		3.05	-46.90
	1	2003-01-23	2004-03-15	0.00	100.00		3.05	-46.90
	1	2004-03-18		49.00	100.00		-45.90	-71.38
	2	2004-03-18		38.00	48.00	x	-34.91	-39.91
	3	2004-03-18		0.00	37.00		3.05	-15.43
HFM03	1	2003-01-30	2004-03-05	0.00	26.00		3.15	-9.84
	1	2004-03-18		19.00	26.00		-15.83	-19.32
	2	2004-03-18		0.00	18.00		3.15	-5.84
HFM04	1	2002-12-10	2003-12-10	0.00	221.70		3.87	-106.58
	1	2003-12-10	2004-02-23	0.00	221.70		3.87	-106.58
	1	2004-03-02		66.90	221.70		-62.81	-139.61
	2	2004-03-02		57.90	65.90	x	-53.83	-57.82
	3	2004-03-02		0.00	56.90		3.87	-24.46
HFM05	1	2004-05-12	2007-05-28	0.00	200.10		7.67	-92.09
	1	2007-05-30		139.00	200.10		-130.59	-160.51
	2	2007-05-30		0.00	138.00		7.67	-61.20
HFM07	1	2003-02-17	2003-02-21	0.00	122.50		5.78	-55.27
	1	2003-02-21	2003-12-10	0.00	122.50		5.78	-55.27
	1	2003-12-10		0.00	122.50		5.78	-55.27
HFM08	1	2003-02-27	2003-03-14	0.00	143.50		7.13	-64.49
	1	2003-03-17	2003-07-09	101.50	143.50		-94.02	-114.72
	2	2003-03-17	2003-07-09	82.00	100.50		-74.69	-83.87
	3	2003-03-17	2003-07-09	0.00	81.00		7.13	-33.29
	1	2004-03-05	2005-02-08	0.00	143.50		7.13	-64.49
	1	2005-02-09		117.00	143.50		-109.31	-122.33
	2	2005-02-09		0.00	116.00		7.13	-50.78
HFM09	1	2003-08-20	2003-10-27	0.00	50.25		5.15	-18.26
	1	2003-10-27		0.00	50.25		5.15	-18.26
HFM10	1	2003-12-16	2004-11-02	0.00	150.00		4.99	-65.40
	1	2004-11-04		100.00	150.00		-88.51	-111.42
	2	2004-11-04		0.00	99.00		4.99	-41.54
HFM11	1	2003-09-09	2003-09-30	0.00	182.35		7.56	-59.14
	1	2004-01-22	2005-03-15	0.00	182.35		7.56	-59.14
	1	2005-03-16		54.00	182.35		-32.67	-77.75
	2	2005-03-16		0.00	53.00		7.56	-12.36
HFM12	1	2003-09-30	2003-10-03	0.00	209.55		7.03	-69.52
	1	2004-01-22	2005-03-15	0.00	209.55		7.03	-69.52
	1	2005-03-18		57.50	209.55		-35.83	-89.06
	2	2005-03-18		0.00	56.50		7.03	-14.38
HFM13	1	2003-10-03	2004-11-08	0.00	175.60		5.69	-70.91
	1	2004-12-16		159.00	175.60	x	-132.64	-139.74
	2	2004-12-16		101.00	158.00		-82.41	-107.18
	3	2004-12-16		0.00	100.00		5.69	-37.81

Borehole	Section no	Start date	Stop date	Secup (mbl)#	Seclow (mbl)	Circ Section	Elevation Secup (m RHB70)	Elevation SecMid (m RHB70)
HFM14	1	2003-10-13	2003-10-15	0.00	150.50		3.91	-62.22
	1	2003-11-10	2004-01-21	0.00	150.50		3.91	-62.22
	1	2004-01-21		0.00	150.50		3.91	-62.22
HFM15	1	2003-11-03	2004-01-21	0.00	99.50		3.88	-31.08
	1	2004-01-23	2005-01-31	0.00	99.50		3.88	-31.08
	1	2005-02-04		85.00	99.50	x	-55.70	-60.63
	2	2005-02-04		0.00	84.00		3.88	-25.65
HFM16	1	2003-11-26	2004-09-29	0.00	132.50		3.21	-62.93
	1	2004-09-29	2005-11-17	0.00	132.50		3.21	-62.93
	1	2005-11-28		68.00	132.50		-64.67	-96.80
	2	2005-11-28		54.00	67.00	x	-50.69	-57.18
	3	2005-11-28		0.00	53.00		3.21	-23.20
HFM17	1	2003-12-10		0.00	210.65		3.75	-100.94
HFM18	1	2004-05-04	2005-12-07	0.00	180.65		5.04	-70.75
	1	2005-12-07		42.00	180.65		-30.53	-87.90
	2	2005-12-07		28.00	41.00		-18.75	-24.22
	3	2005-12-07		0.00	27.00		5.04	-6.49
HFM19	1	2004-02-13	2004-04-29	151.00	185.20		-117.64	-130.83
	2	2004-02-13	2004-04-29	111.00	150.00		-86.76	-101.84
	3	2004-02-13	2004-04-29	0.00	110.00		3.66	-42.31
	1	2004-05-07	2004-09-29	0.00	185.20		3.66	-72.42
	1	2005-01-25		168.00	185.20	x	-130.75	-137.36
	2	2005-01-25		104.00	167.00		-81.32	-105.69
	3	2005-01-25		0.00	103.00		3.66	-39.47
HFM20	1	2004-06-03	2005-02-18	0.00	301.00		2.97	-147.33
	1	2005-03-03		131.00	301.00		-127.84	-212.74
	2	2005-03-03		101.00	130.00		-97.85	-112.34
	3	2005-03-03		49.00	100.00		-45.88	-71.36
	4	2005-03-03		0.00	48.00		2.97	-20.95
HFM21	1	2004-06-09	2004-06-14	38.00	202.00		-28.03	-94.29
	2	2004-06-09	2004-06-14	0.00	37.00		3.98	-11.68
	1	2004-06-14	2006-09-26	0.00	202.00		3.98	-79.41
	1	2006-09-30		107.00	202.00		-84.14	-120.20
	2	2006-09-30		33.00	106.00		-23.84	-54.02
	3	2006-09-30		22.00	32.00	x	-14.62	-18.82
	4	2006-09-30		0.00	21.00		3.98	-4.94
HFM22	1	2004-09-13	2004-09-16	0.00	222.00		1.54	-86.49
	1	2004-10-20		0.00	222.00		1.54	-86.49
HFM23	1	2005-09-05		0.00	211.50		4.25	-66.08
HFM24	1	2005-12-06	2006-11-28	18.03	151.35		-11.74	-69.40
	1	2006-12-01		66.00	151.35		-52.98	-90.73
	2	2006-12-01		36.00	65.00		-26.99	-39.49
	3	2006-12-01		0.00	35.00		3.68	-11.29
HFM25	1	2007-06-18		0.00	187.50		3.86	-70.90
HFM26	1	2006-03-15		0.00	202.70		2.73	-74.36
HFM27	1	2005-12-06	2006-04-24	12.03	127.50		-8.69	-61.88
	1	2006-04-27		59.00	127.50		-52.03	-83.45
	2	2006-04-27		46.00	58.00	x	-40.09	-45.60
	3	2006-04-27		25.00	45.00		-20.70	-29.96
	4	2006-04-27		0.00	24.00		2.44	-8.66
HFM28	1	2006-03-16		0.00	151.20		4.27	-70.65
HFM29	1	2006-03-15		0.00	199.70		4.47	-84.10
HFM30	1	2006-05-18	2007-04-17	0.00	200.75		3.13	-81.56
	1	2007-04-23		177.00	200.75		-149.47	-160.01
	2	2007-04-23		74.00	176.00		-58.71	-103.27

Borehole	Section no	Start date	Stop date	Secup (mbl)#	Seclow (mbl)	Circ Section	Elevation Secup (m RHB70)	Elevation SecMid (m RHB70)
	3	2007-04-23		61.00	73.00		-47.63	-52.73
	4	2007-04-23		0.00	60.00		3.13	-21.66
HFM31	1	2006-05-22		0.00	200.75		6.07	-86.83
HFM32	1	2006-01-26		98.00	202.65		-96.27	-147.51
	2	2006-01-26		32.00	97.00		-30.95	-63.24
	3	2006-01-26		26.00	31.00	x	-24.97	-27.46
	4	2006-01-26		0.00	25.00		0.97	-11.50
HFM33	1	2006-05-18		0.00	140.20		2.62	-55.84
HFM34	1	2006-06-13	2006-07-03	0.00	200.75		2.45	-82.92
	1	2006-07-05		91.00	200.75		-75.12	-119.83
	2	2006-07-05		22.00	90.00		-16.35	-45.52
	3	2006-07-05		0.00	21.00		2.45	-6.52
HFM35	1	2006-08-17		182.00	200.75		-137.33	-143.89
	2	2006-08-17		151.00	181.00		-115.43	-126.09
	3	2006-08-17		34.00	150.00		-26.57	-71.87
	4	2006-08-17		0.00	33.00		1.90	-12.10
HFM36	1	2006-09-05	2007-06-27	0.00	152.55		8.41	-53.52
	1	2007-12-13		69.00	152.55		-47.86	-79.91
	2	2007-12-13		46.00	68.00		-29.74	-38.46
	3	2007-12-13		0.00	45.00		8.41	-10.64
HFM37	1	2006-09-05		0.00	191.75		11.39	-74.10
HFM38	1	2006-06-28	2007-02-26	0.00	200.75		2.21	-74.85
	1	2007-03-01		42.00	200.75		-31.40	-89.55
	2	2007-03-01		24.00	41.00		-17.21	-23.98
	3	2007-03-01		0.00	23.00		2.21	-7.13
KFM01A	1	2003-06-17	2003-12-16	132.00	1,001.49		-128.22	-558.63
	2	2003-06-17	2003-12-16	110.00	131.00		-106.34	-116.78
	3	2003-06-17	2003-12-16	0.00	109.00		3.13	-51.12
	1	2004-02-24	2004-05-07	0.00	1,001.49		3.13	-493.66
	1	2004-06-04	2004-10-25	0.00	1,001.49		3.13	-493.66
	1	2004-11-26		431.00	1,001.49		-424.77	-705.14
	2	2004-11-26		374.00	430.00		-368.37	-396.09
	3	2004-11-26		205.00	373.00		-200.75	-284.12
	4	2004-11-26		131.00	204.00		-127.22	-163.50
	5	2004-11-26		109.00	130.00	x	-105.34	-115.79
	6	2004-11-26		0.00	108.00		3.13	-50.62
KFM01B	1	2004-10-14		142.00	500.52		-135.77	-308.72
	2	2004-10-14		101.00	141.00		-95.80	-115.31
	3	2004-10-14		0.00	100.00		3.09	-45.92
KFM01C	1	2006-06-22		238.00	450.05		-177.03	-255.81
	2	2006-06-22		59.00	237.00		-41.96	-109.26
	3	2006-06-22		0.00	58.00		2.91	-19.19
KFM01D	1	2007-04-11		439.00	800.24		-347.25	-482.27
	2	2007-04-11		429.00	438.00	x	-339.57	-343.03
	3	2007-04-11		322.00	428.00		-257.20	-298.16
	4	2007-04-11		311.00	321.00	x	-248.63	-252.53
	5	2007-04-11		253.00	310.00		-202.87	-225.52
	6	2007-04-11		154.00	252.00		-122.99	-162.79
	7	2007-04-11		0.00	153.00		2.95	-59.60
KFM02A	1	2004-03-29	2004-04-28	0.00	1,002.44		7.35	-492.20
	1	2004-05-12	2004-10-22	0.00	1,002.44		7.35	-492.20
	1	2005-04-11	2005-05-17	0.00	1,002.44		7.35	-492.20
	1	2005-06-13		889.00	1,002.44		-876.80	-932.87
	2	2005-06-13		519.00	888.00		-509.90	-693.08
	3	2005-06-13		490.00	518.00	x	-481.04	-494.97

Borehole	Section no	Start date	Stop date	Secup (mbl)#	Seclow (mbl)	Circ Section	Elevation Secup (m RHB70)	Elevation SecMid (m RHB70)
	4	2005-06-13		443.00	489.00		-434.23	-457.14
	5	2005-06-13		411.00	442.00	x	-402.36	-417.80
	6	2005-06-13		241.00	410.00		-232.98	-317.18
	7	2005-06-13		133.00	240.00		-125.31	-178.66
	8	2005-06-13		0.00	132.00		7.35	-58.46
KFM02B	1	2007-06-21		507.00	573.87		-492.18	-525.05
	2	2007-06-21		491.00	506.00	x	-476.45	-483.83
	3	2007-06-21		432.00	490.00		-418.38	-446.93
	4	2007-06-21		410.00	431.00	x	-396.71	-407.05
	5	2007-06-21		246.00	409.00		-235.07	-315.41
	6	2007-06-21		131.00	245.00		-121.67	-177.89
	7	2007-06-21		0.00	130.00		7.62	-56.51
KFM03A	1	2003-12-15	2004-01-28	0.00	1,001.19		8.29	-490.66
	1	2004-08-06	2004-11-15	0.00	1,001.19		8.29	-490.66
	1	2005-05-09		969.50	1,001.19	x	-956.73	-972.45
	2	2005-05-09		820.50	968.50		-808.79	-882.28
	3	2005-05-09		651.00	819.50		-640.30	-724.04
	4	2005-05-09		633.50	650.00	x	-622.90	-631.10
	5	2005-05-09		472.50	632.50		-462.70	-542.31
	6	2005-05-09		402.50	471.50		-393.00	-427.35
	7	2005-05-09		351.50	401.50		-342.21	-367.11
	8	2005-05-09		0.00	350.50		8.29	-166.53
KFM03B	1	2005-01-27		52.00	101.54		-43.34	-68.01
	2	2005-01-27		0.00	51.00		8.47	-16.94
KFM04A	1	2004-02-24	2004-04-07	0.00	1,001.42		8.77	-420.65
	1	2004-06-30	2006-01-17	0.00	1,001.42		8.77	-420.65
	1	2006-06-27	2006-08-28	169.00	1,001.42		-139.99	-487.98
	2	2006-06-27	2006-08-28	0.00	168.00		8.77	-64.76
	1	2006-12-22		496.00	1,001.42		-416.86	-613.90
	2	2006-12-22		391.00	495.00		-330.90	-373.85
	3	2006-12-22		246.00	390.00		-207.20	-269.10
	4	2006-12-22		230.00	245.00	x	-193.32	-199.83
	5	2006-12-22		186.00	229.00		-154.93	-173.74
	6	2006-12-22		164.00	185.00		-135.59	-144.83
	7	2006-12-22		0.00	163.00		8.77	-62.55
KFM05A	1	2004-06-11	2004-12-07	0.00	1,002.71		5.53	-419.89
	1	2005-08-30		699.00	1,002.71		-581.43	-704.40
	2	2005-08-30		490.00	698.00		-410.57	-495.72
	3	2005-08-30		273.00	489.00		-229.88	-320.33
	4	2005-08-30		254.00	272.00	x	-213.75	-221.40
	5	2005-08-30		115.00	253.00		-94.20	-153.86
	6	2005-08-30		0.00	114.00		5.53	-43.82
KFM06A	1	2005-10-18		827.00	1,000.64		-690.52	-759.54
	2	2005-10-18		749.00	826.00		-627.66	-658.83
	3	2005-10-18		738.00	748.00	x	-618.71	-622.78
	4	2005-10-18		363.00	737.00		-308.26	-464.36
	5	2005-10-18		341.00	362.00	x	-289.65	-298.54
	6	2005-10-18		247.00	340.00		-209.59	-249.29
	7	2005-10-18		151.00	246.00		-126.95	-167.98
	8	2005-10-18		0.00	150.00		4.10	-61.02
KFM06B	1	2005-09-05	2005-12-21	0.00	100.30		4.13	-45.71
	1	2006-01-09		51.00	100.33		-46.55	-71.05
	2	2006-01-09		27.00	50.00		-22.71	-34.13
	3	2006-01-09		0.00	26.00		4.13	-8.79
KFM06C	1	2006-06-07		873.00	1,000.91		-688.89	-735.68

Borehole	Section no	Start date	Stop date	Secup (mbl)#	Seclow (mbl)	Circ Section	Elevation Secup (m RHB70)	Elevation SecMid (m RHB70)
	2	2006-06-07		667.00	872.00		-534.94	-611.65
	3	2006-06-07		647.00	666.00	x	-519.89	-527.04
	4	2006-06-07		541.00	646.00		-439.09	-479.36
	5	2006-06-07		531.00	540.00	x	-431.37	-434.84
	6	2006-06-07		402.00	530.00		-330.76	-380.97
	7	2006-06-07		351.00	401.00		-290.04	-310.06
	8	2006-06-07		281.00	350.00		-233.15	-261.36
	9	2006-06-07		187.00	280.00		-155.52	-194.07
	10	2006-06-07		0.00	186.00		4.09	-76.03
KFM07A	1	2005-05-16	2005-10-10	271.00	1,001.55		-230.05	-534.19
	2	2005-05-16	2005-10-10	0.00	270.00		3.33	-113.30
	1	2005-11-09	2006-06-26	271.00	1,001.00		-230.05	-533.97
	2	2005-11-09	2006-06-26	100.35	270.00		-83.28	-156.60
	1	2007-02-02		973.00	1,002.10		-799.66	-810.35
	2	2007-02-02		963.00	972.00	x	-792.26	-795.59
	3	2007-02-02		226.00	961.00		-191.67	-499.24
	4	2007-02-02		191.00	225.00		-161.62	-176.23
	5	2007-02-02		149.00	190.00		-125.41	-143.10
	6	2007-02-02		0.00	148.00		3.33	-60.47
KFM07B	1	2006-05-03	2006-12-18	0.00	298.93		3.36	-117.39
	1	2007-01-12		203.00	298.93		-160.23	-199.20
	2	2007-01-12		75.00	202.00		-57.83	-108.74
	3	2007-01-12	2009-03-24	0.00	74.00		3.36	-26.90
KFM07C	1	2007-02-14		302.00	500.34		-297.03	-395.69
	2	2007-02-14		161.00	301.00		-156.81	-226.42
	3	2007-02-14		111.00	160.00		-107.11	-131.46
	4	2007-02-14		0.00	110.00		3.35	-51.42
KFM08A	1	2005-05-21	2005-05-31	0.00	1,001.19		2.49	-409.93
	1	2006-01-24	2006-05-16	506.00	1,001.19		-414.10	-596.64
	2	2006-01-24	2006-05-16	100.55	505.00		-84.11	-252.53
	1	2006-10-18	2007-10-18	0.00	1,001.19		2.49	-409.93
	1	2007-10-18		695.00	1,001.19		-554.89	-661.51
	2	2007-10-18		684.00	694.00	x	-546.94	-550.55
	3	2007-10-18		504.00	683.00		-412.56	-480.45
	4	2007-10-18		474.00	503.00		-389.27	-400.57
	5	2007-10-18		281.00	473.00		-234.76	-312.48
	6	2007-10-18		265.00	280.00	x	-221.64	-227.79
	7	2007-10-18		216.00	264.00		-181.15	-201.05
	8	2007-10-18		162.00	215.00		-135.99	-158.18
	9	2007-10-18		0.00	161.00		2.49	-67.05
KFM08B	1	2005-04-18	2006-02-02	0.00	200.54		2.25	-82.94
	1	2006-02-21		113.00	200.54		-93.68	-130.46
	2	2006-02-21		71.00	112.00		-58.14	-75.52
	3	2006-02-21		0.00	70.00		2.25	-27.57
KFM08C	1	2007-04-05		761.00	951.08		-630.87	-706.27
	2	2007-04-05		611.00	760.00		-510.27	-570.44
	3	2007-04-05		311.00	610.00		-262.83	-386.98
	4	2007-04-05		146.00	310.00		-123.75	-193.23
	5	2007-04-05		0.00	145.00		2.47	-60.29
KFM08D	1	2007-09-20		836.00	942.30		-667.16	-707.84
	2	2007-09-20		825.00	835.00	x	-658.71	-662.55
	3	2007-09-20		681.00	824.00		-546.70	-602.57
	4	2007-09-20		660.00	680.00	x	-530.20	-538.06
	5	2007-09-20		331.00	659.00		-266.64	-399.21
	6	2007-09-20		161.00	330.00		-128.26	-196.50

Borehole	Section no	Start date	Stop date	Secup (mbl)#	Seclow (mbl)	Circ Section	Elevation Secup (m RHB70)	Elevation SecMid (m RHB70)
KFM09A	7	2007-09-20		0.00	160.00		2.61	-63.02
	1	2006-09-14		551.00	799.67		-445.62	-536.77
	2	2006-09-14		301.00	550.00		-248.28	-348.20
KFM09B	3	2006-09-14		0.00	300.00		4.29	-123.11
	1	2006-09-26		451.00	616.45		-353.72	-414.32
	2	2006-09-26		201.00	450.00		-159.18	-257.66
KFM10A	3	2006-09-26		0.00	200.00		4.30	-77.66
	1	2007-02-19		441.00	500.16		-303.45	-321.01
	2	2007-02-19		430.00	440.00	x	-296.80	-299.83
KFM11A	3	2007-02-19		353.00	429.00		-248.57	-272.72
	4	2007-02-19		153.00	352.00		-110.36	-181.24
	5	2007-02-19		0.00	152.00		4.51	-53.22
	1	2007-09-04		711.00	851.21		-602.55	-658.21
	2	2007-09-04		690.00	710.00	x	-585.75	-593.76
KFM12A	3	2007-09-04		457.00	689.00		-394.69	-491.25
	4	2007-09-04		446.00	456.00	x	-385.40	-389.62
	5	2007-09-04		361.00	445.00		-313.06	-348.95
	6	2007-09-04		131.00	360.00		-112.97	-213.41
	7	2007-09-04		0.00	130.00		2.95	-54.34
KFM12A	1	2007-11-13		491.00	601.04		-410.17	-455.86
	2	2007-11-13		281.00	490.00		-231.91	-321.29
	3	2007-11-13		270.00	280.00	x	-222.43	-226.74
	4	2007-11-13		166.00	269.00		-132.90	-177.19
	5	2007-11-13		0.00	165.00		10.74	-60.87

# mbl = metres borehole length from TOC (Top Of Casing).

#### Monitoring wells in soil and Surface-water level gauges.

Borehole	Section no	Section installed from to	Borehole Length# from to (m)		Comment
SFM0001	1	2002-05-23	0.0	4.95*	
	screen		3.95	4.95	
SFM0003	1	2002-05-30	0.0	11.0*	
	screen		8.98	10.98	
SFM0004	1	2002-12-03	0.0	6.02*	
	screen		5.02	6.02	
SFM0005	1	2002-12-10	0.0	3.21*	
	screen		2.21	3.21	
SFM0006	1	2003-01-10	0.0	4.21*	
	screen		3.21	4.21	
SFM0008	1	2003-02-17	0.0	6.14*	
	screen		5.14	6.14	
SFM0010	1	2003-03-27	0.0	3.0*	
	screen		1.0	2.0	
SFM0011	1	2003-03-26	0.0	5.5*	
	screen		3.5	4.5	
SFM0012	1	2003-02-24	0.0	6.35*	
	screen		5.35	6.35	
SFM0013	1	2003-03-26	0.0	6.5*	
	screen		4.48	5.48	
SFM0014	1	2003-02-18	0.0	4.0*	
	screen		2.0	3.0	

Borehole	Section no	Section installed		Borehole Length#		Comment
		from	to	from (m)	to (m)	
SFM0015	1	2003-02-20		0.0	7.34*	
	screen			6.34	7.34	
SFM0017	1	2003-02-20		0.0	6.0*	
	screen			4.0	5.0	
SFM0019	1	2003-02-20		0.0	6.5*	
	screen			4.5	5.5	
SFM0021	1	2003-03-24		0.0	4.0*	
	screen			2.0	3.0	
SFM0022	1	2004-02-05		0.0	5.8*	
	screen			5.3	5.8	
SFM0023	1	2003-02-21		0.0	5.42*	
	screen			4.42	5.42	
SFM0025	1	2003-02-25		0.0	7.06*	
	screen			6.06	7.06	
SFM0026	1	2003-03-18		0.0	18.0*	
	screen			16.0	17.0	
SFM0027	1	2003-04-09		0.0	9.0*	
	screen			7.0	8.0	
SFM0028	1	2003-03-12		0.0	9.0*	
	screen			7.0	8.0	
SFM0030	1	2003-03-04		0.0	6.0*	
	screen			4.0	5.0	
SFM0033	1	2003-03-04		0.0	5.0*	
	screen			3.0	4.0	
SFM0034	1	2003-03-10		0.0	4.0*	
	screen			2.0	3.0	
SFM0036	1	2003-03-11		0.0	4.0*	
	screen			1.99	2.99	
SFM0038	1	2003-05-22		**	**	Surface-water level gauge
	screen			**	**	
SFM0039	1	2003-02-27		0.0	4.39*	Surface-water level gauge
	screen			1.1	2.1	
SFM0040	1	2003-02-21		0.0	5.42*	Surface-water level gauge
	screen			1.5	2.5	
SFM0041	1	2003-02-20		0.0	7.34*	Surface-water level gauge
	screen			1.84	2.84	
SFM0042	1	2004-02-05		0.0	4.86*	Surface-water level gauge
	screen			0.8	1.4	
SFM0049	1	2003-03-28		0.0	6.0*	
	screen			4.0	5.0	
SFM0057	1	2003-08-06		0.0	4.55*	
	screen			3.45	4.55	
SFM0058	1	2003-11-26		0.0	3.85*	
	screen			2.85	3.85	
SFM0061	1	2003-11-17		0.0	8.06*	
	screen			6.02	8.06	
SFM0062	1	2004-02-05		0.0	3.75*	
	screen			3.25	3.65	
SFM0064	1	2004-02-12		0.0	5.37*	Surface-water level gauge
	screen			0.82	1.27	
SFM0067	1	2004-03-24		0.0	2.5*	
	screen			0.9	1.9	
SFM0068	1	2004-03-23		0.0	2.3*	
	screen			0.8	1.8	



Borehole	Section no	Section installed		Borehole Length <sup>#</sup>		Comment
		from	to	from (m)	to (m)	
SFM0069	1	2004-03-29		0.0	2.5*	
	screen			1.0	2.0	
SFM0070	1	2004-03-25		0.0	3.18*	
	screen			1.68	2.68	
SFM0071	1	2004-03-29		0.0	6.5*	
	screen			5.0	6.0	
SFM0072	1	2004-03-25		0.0	10.0*	
	screen			8.5	9.5	
SFM0073	1	2004-03-24		0.0	5.0*	
	screen			3.5	4.5	
SFM0075	1	2004-03-26		0.0	9.16*	
	screen			7.66	8.66	
SFM0077	1	2005-06-20		0.0	8.0*	
	screen			6.0	7.0	
SFM0078	1	2005-06-21		0.0	5.5*	
	screen			3.5	4.5	
SFM0079	1	2005-06-22		0.0	6.7*	
	screen			4.7	5.7	
SFM0080	1	2005-11-30		0.0	9.62*	
	screen			8.62	9.62	
SFM0081	1	2006-01-25		0.0	5.25*	
	screen			4.85	5.25	
SFM0084	1	2006-02-28		0.0	4.1*	
	screen			3.7	4.1	
SFM0087	1	2006-03-07		0.0	2.35*	
	screen			2.0	2.2	
SFM0091	1	2006-02-28		0.0	2.3*	
	screen			1.9	2.3	
SFM0095	1	2006-02-15		0.0	7.0*	
	screen			5.0	6.0	
SFM0104	1	2006-02-24		0.0	6.0*	
	screen			4.0	5.0	
SFM0105	1	2006-02-23		0.0	4.0*	
	screen			2.0	3.0	
SFM0106	1	2006-02-22		0.0	4.85*	
	screen			3.0	4.0	
SFM0107	1	2006-02-21		0.0	7.0*	
	screen			5.0	6.0	

# From top of stand-pipe.

\* For the SFM-boreholes, the bottom of the section refers to the bottom of the plastic pipe installed in the borehole. The plastic pipe is screened.

\*\* Data are not found in Sicada.

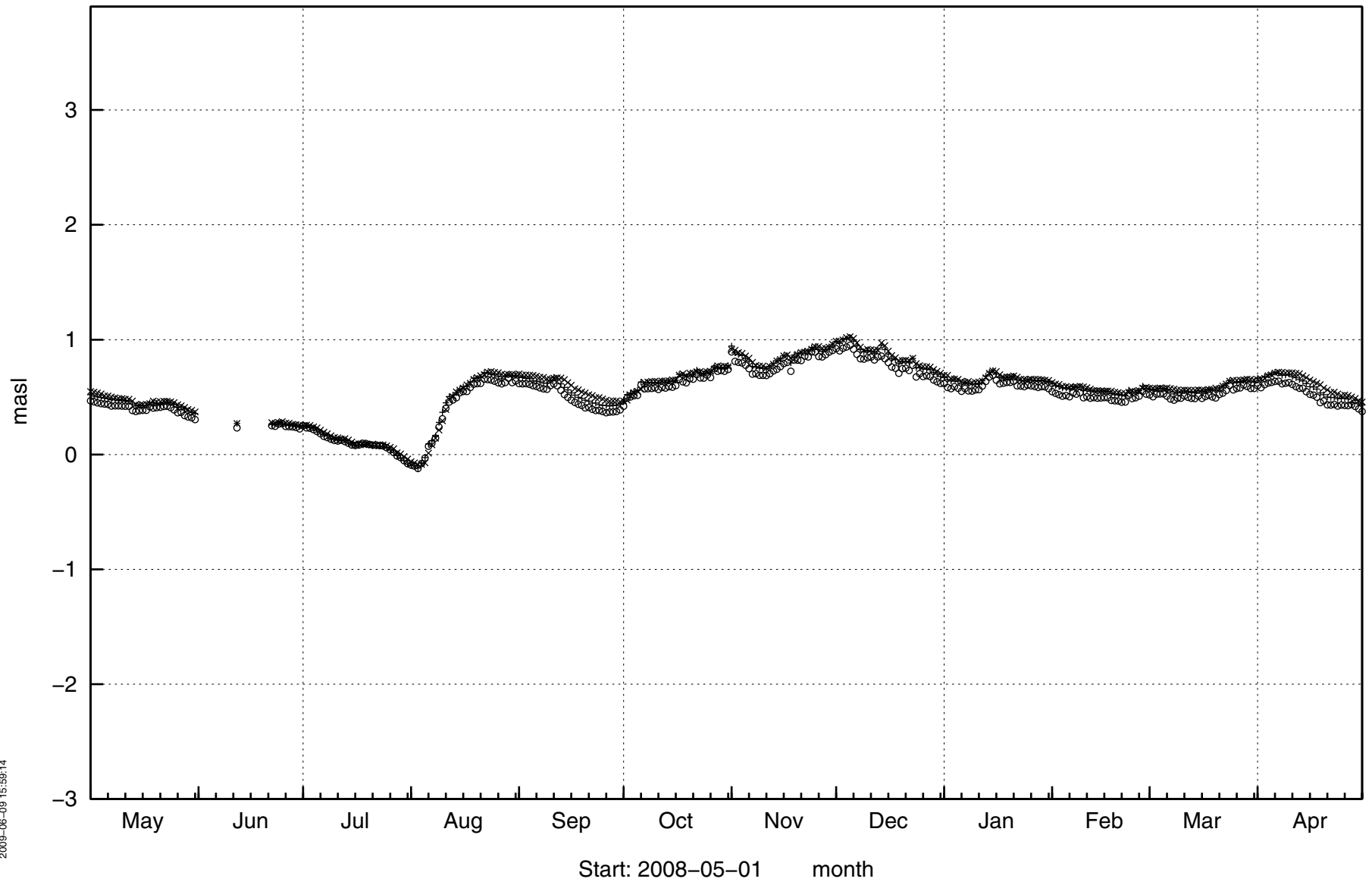
HFM01

Groundwater Level

Appendix 2

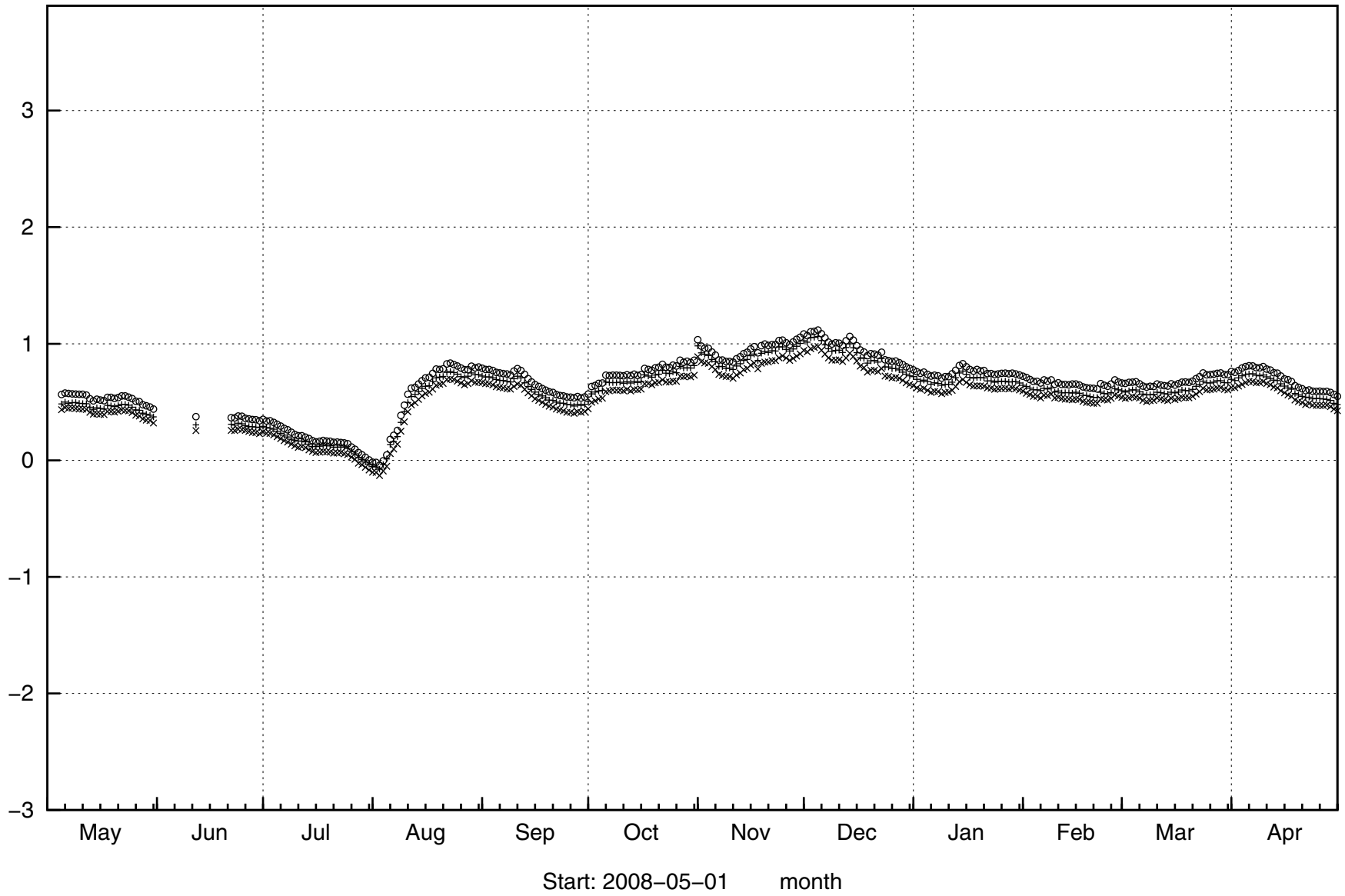
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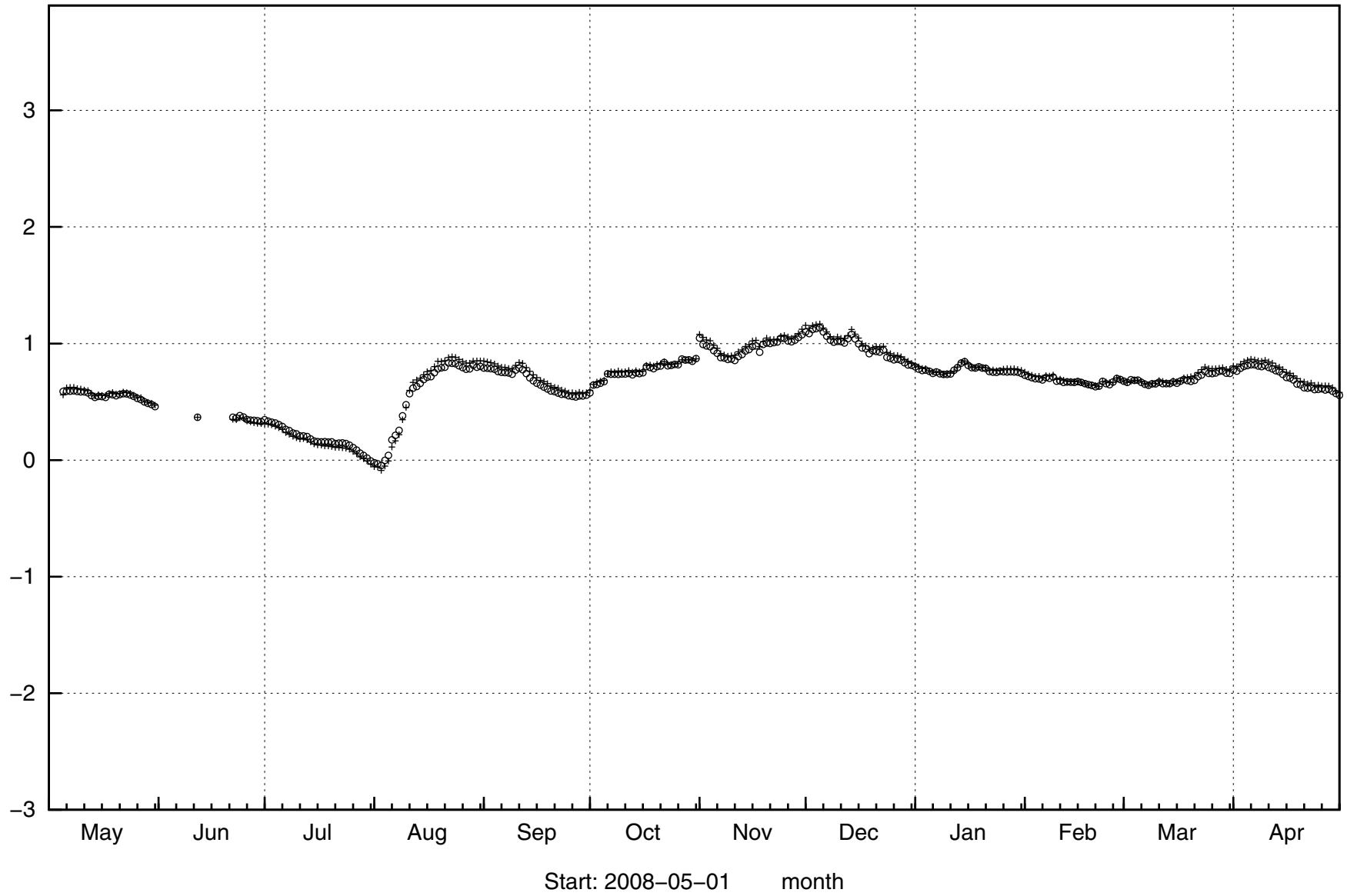


Start: 2008-05-01 month

HFM02



HFM03



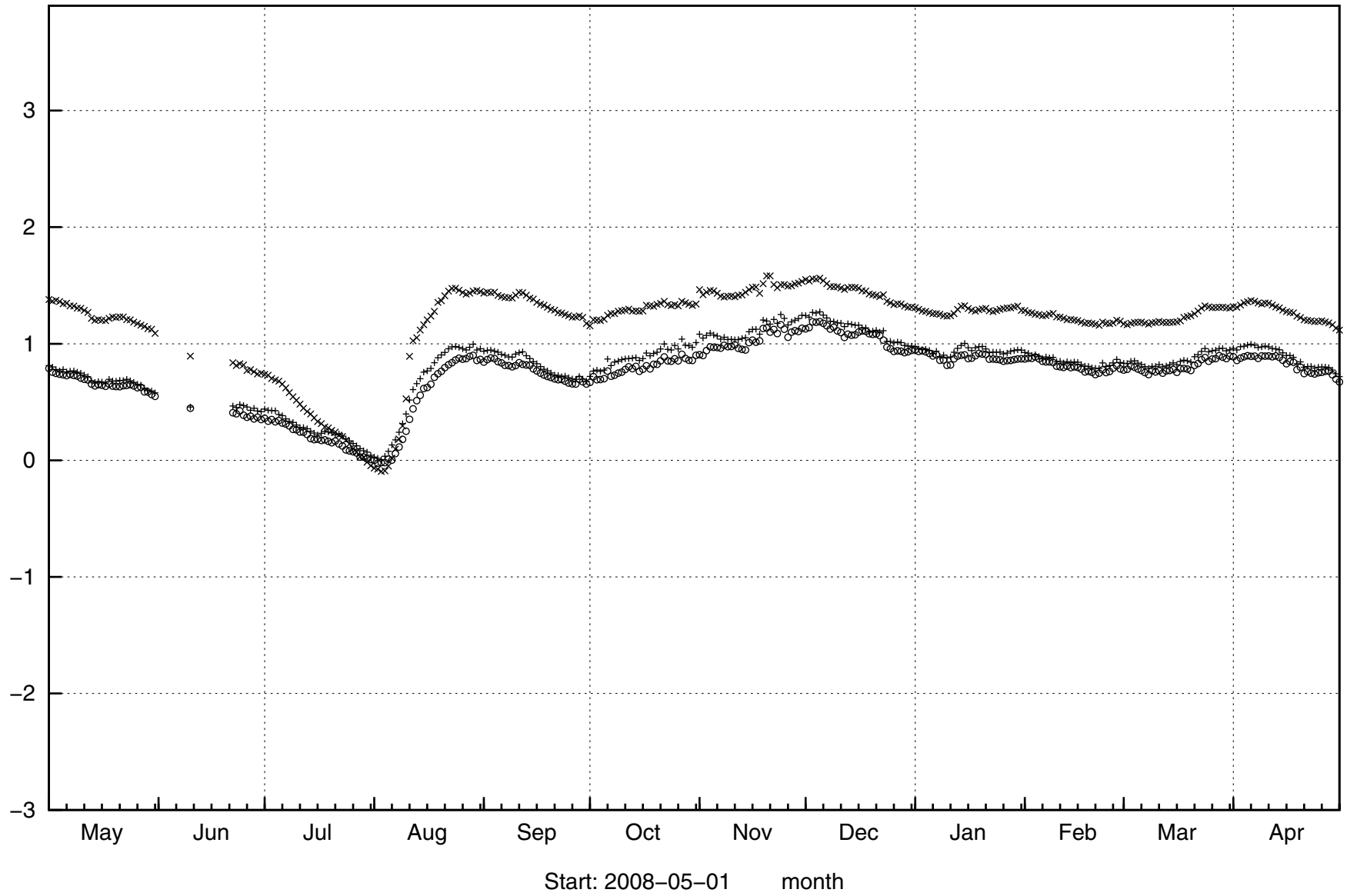
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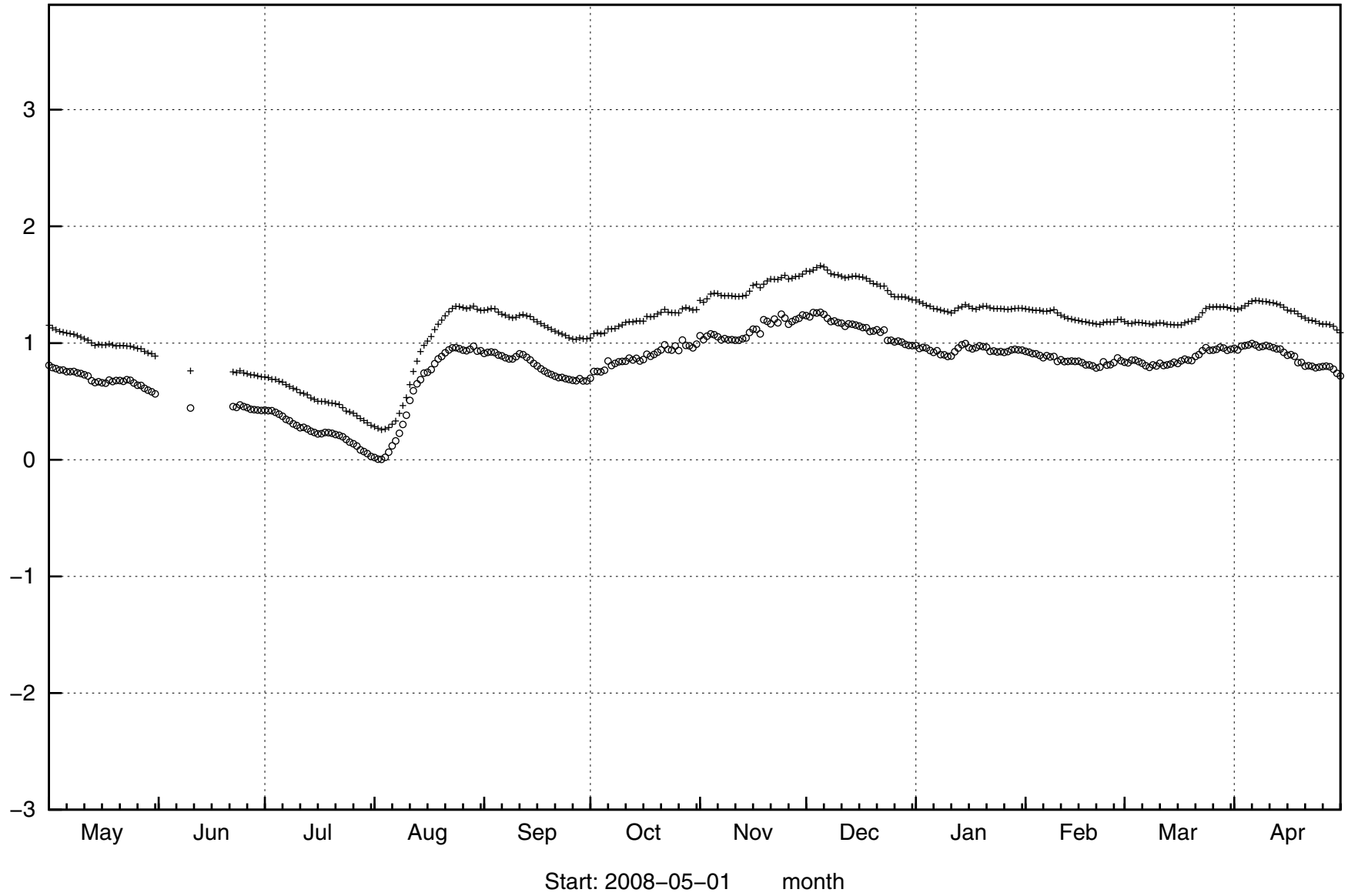
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34

masl



HFM05



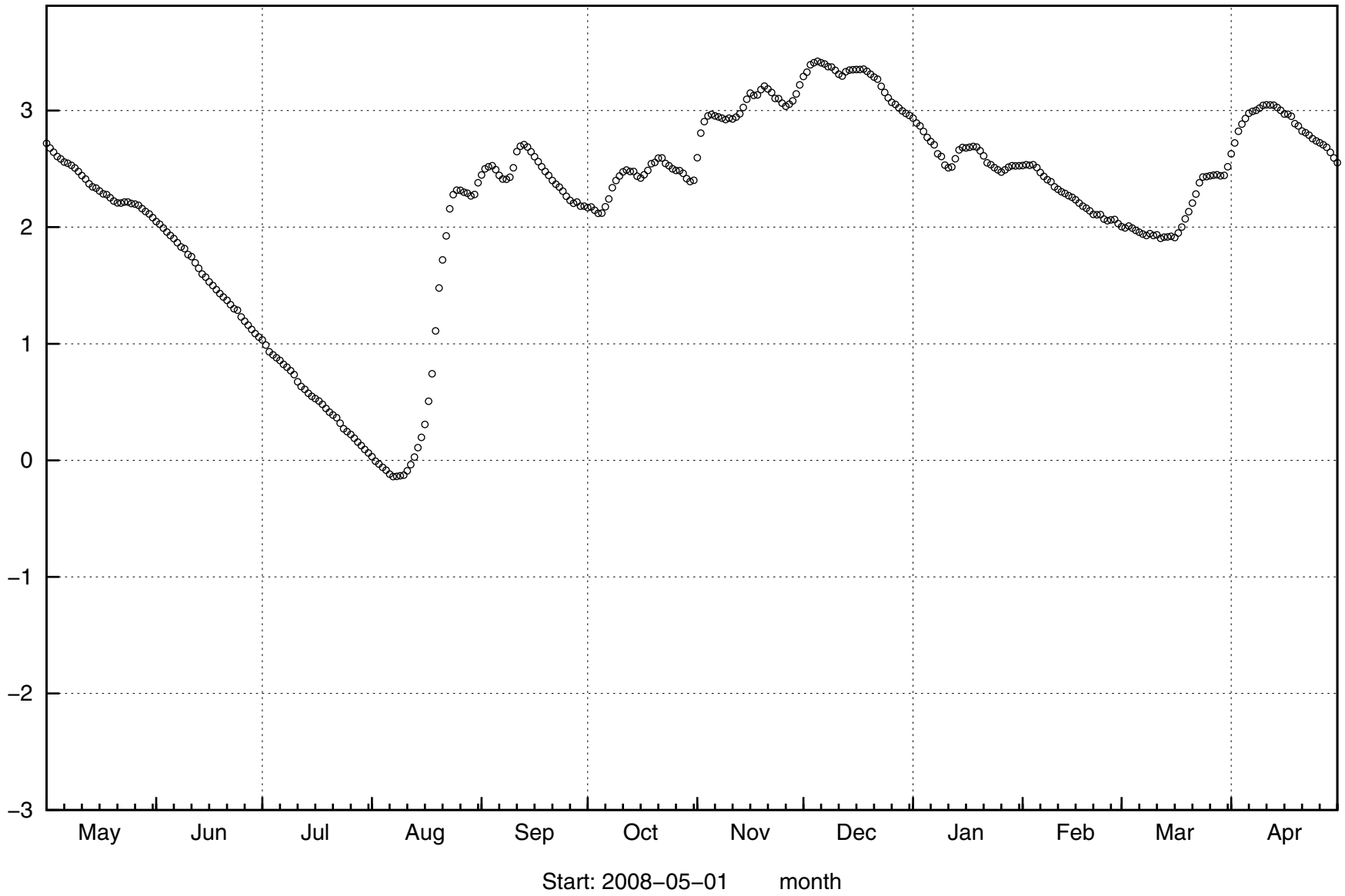
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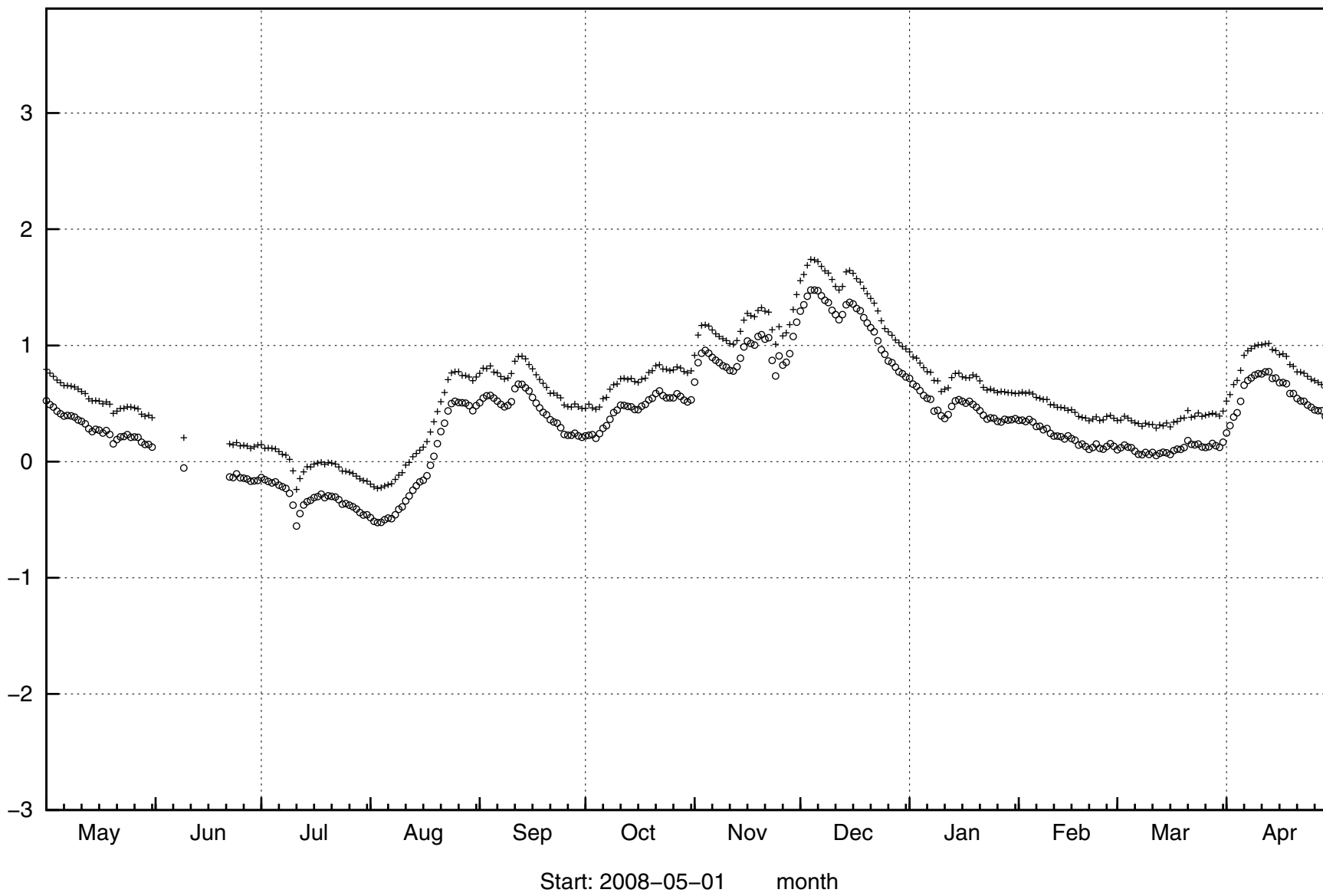
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Start: 2008-05-01 month

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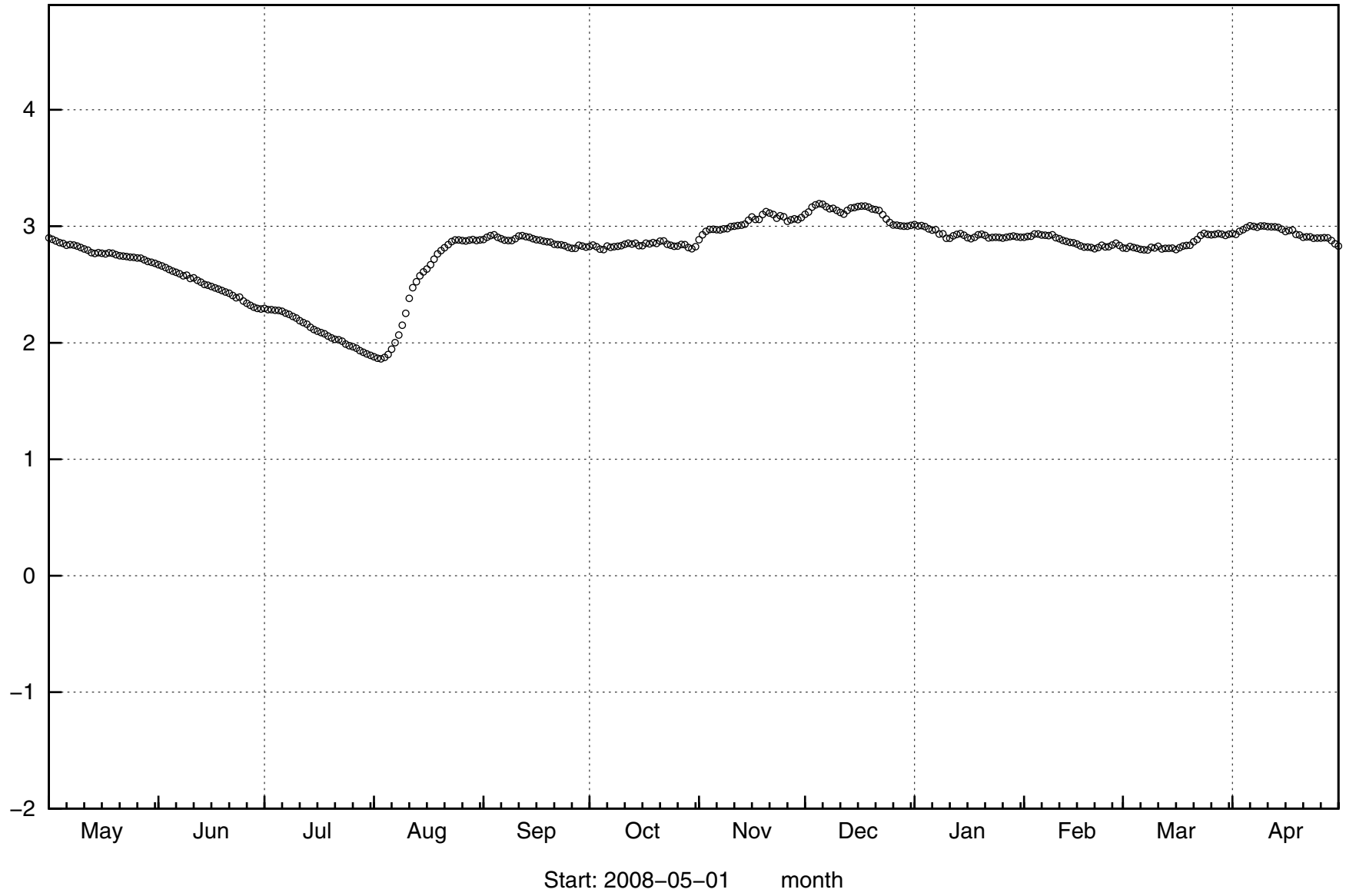


HFM08





HFM09



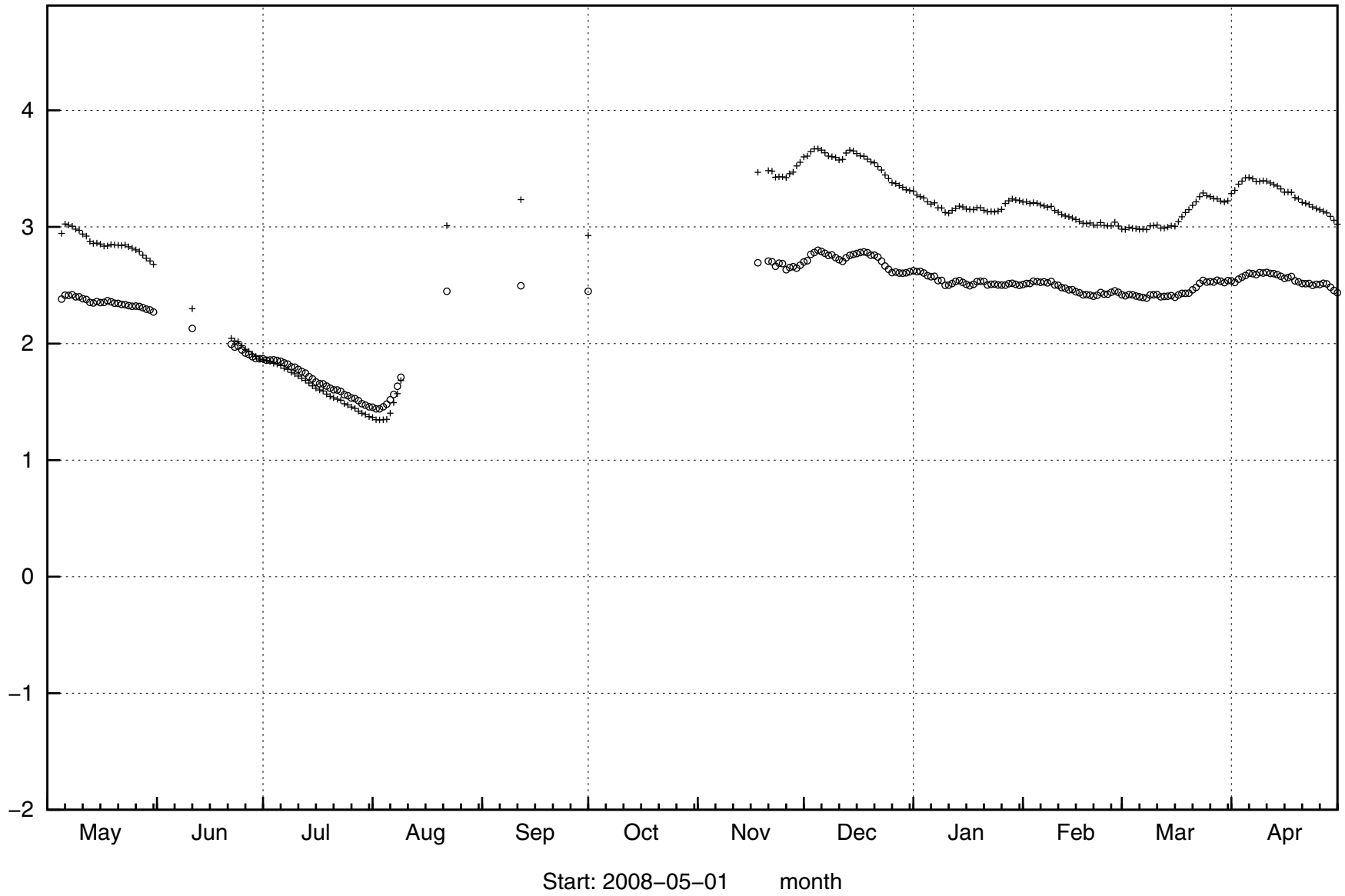
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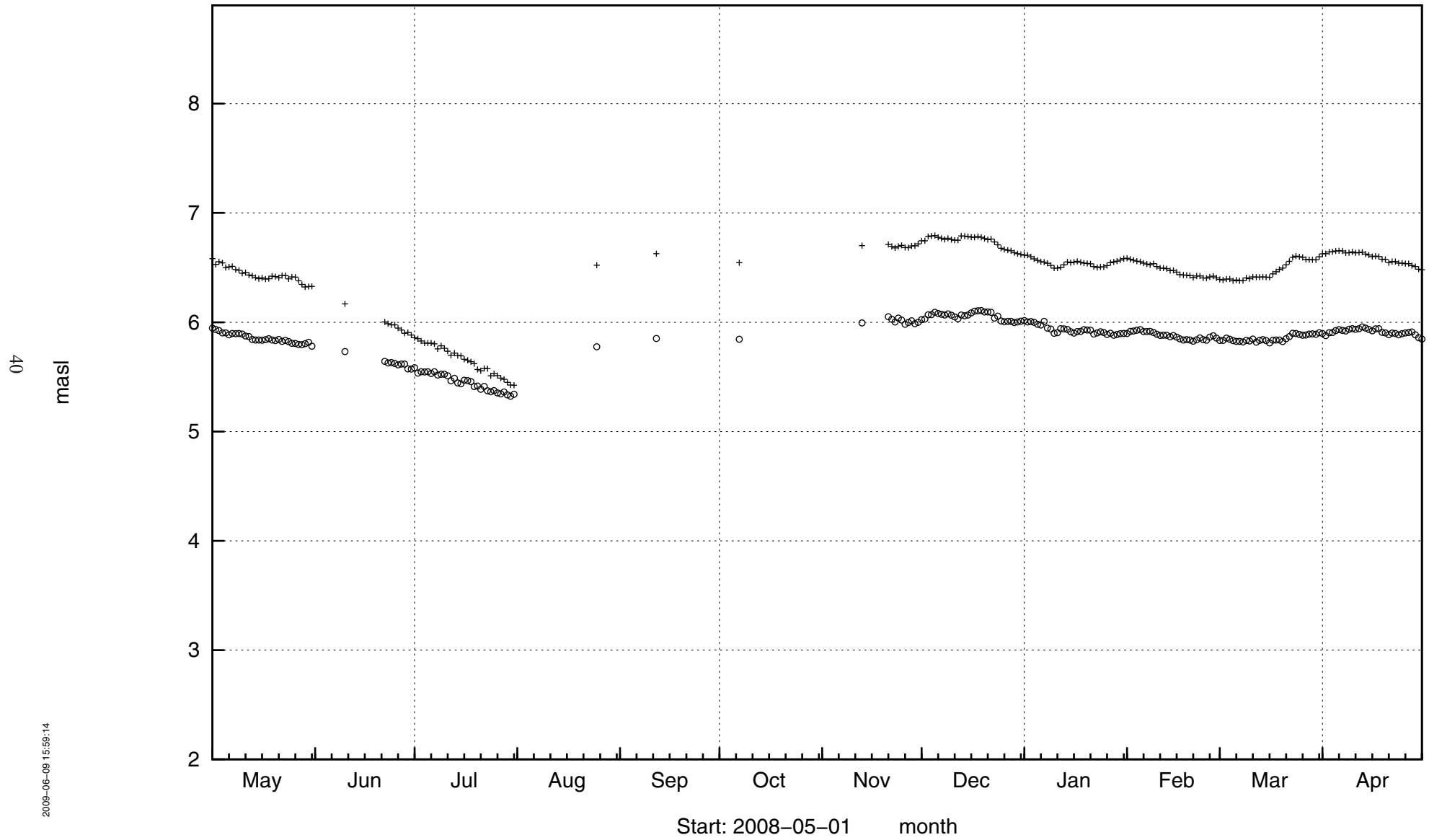
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Start: 2008-05-01 month

HFM10



# HFM11



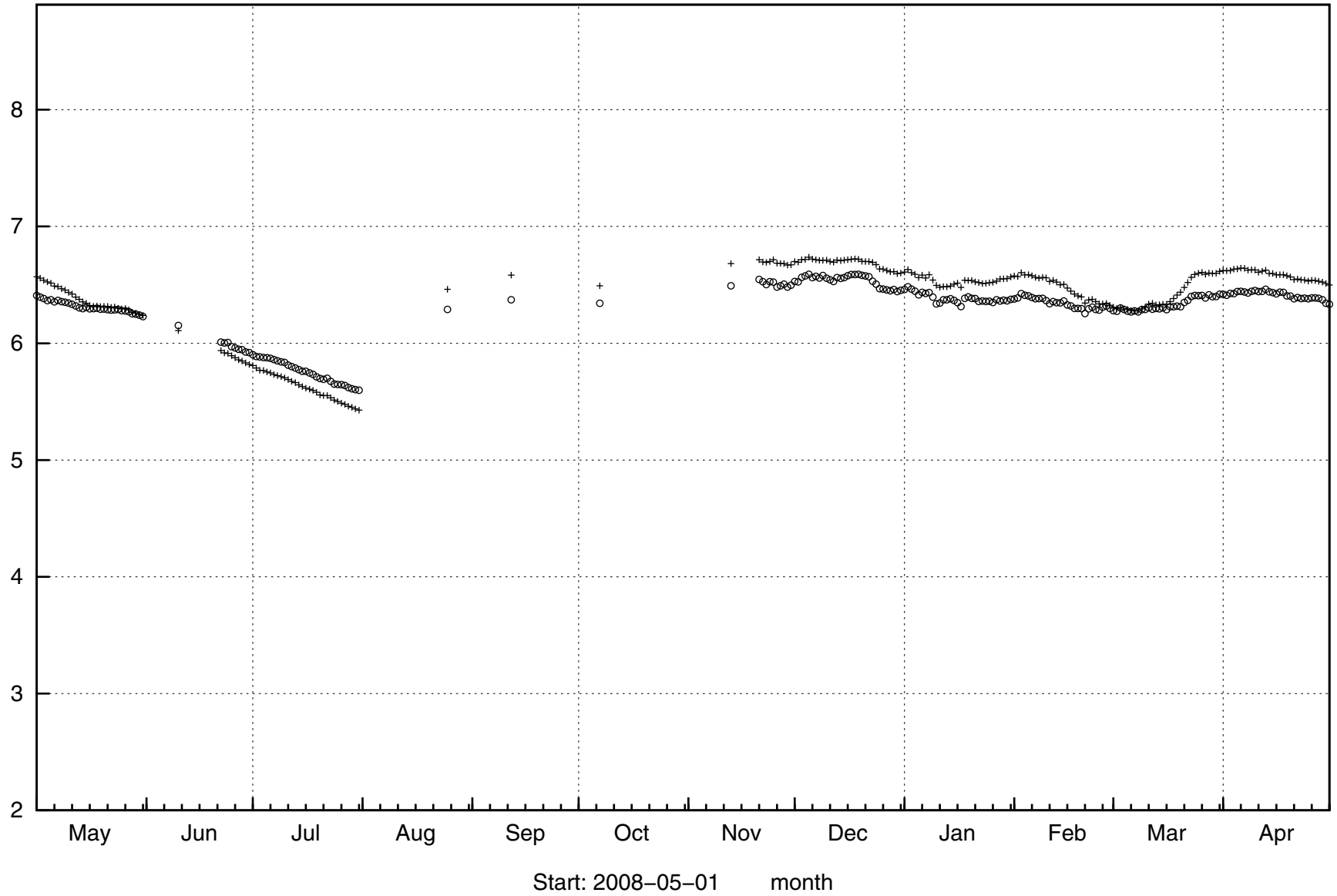
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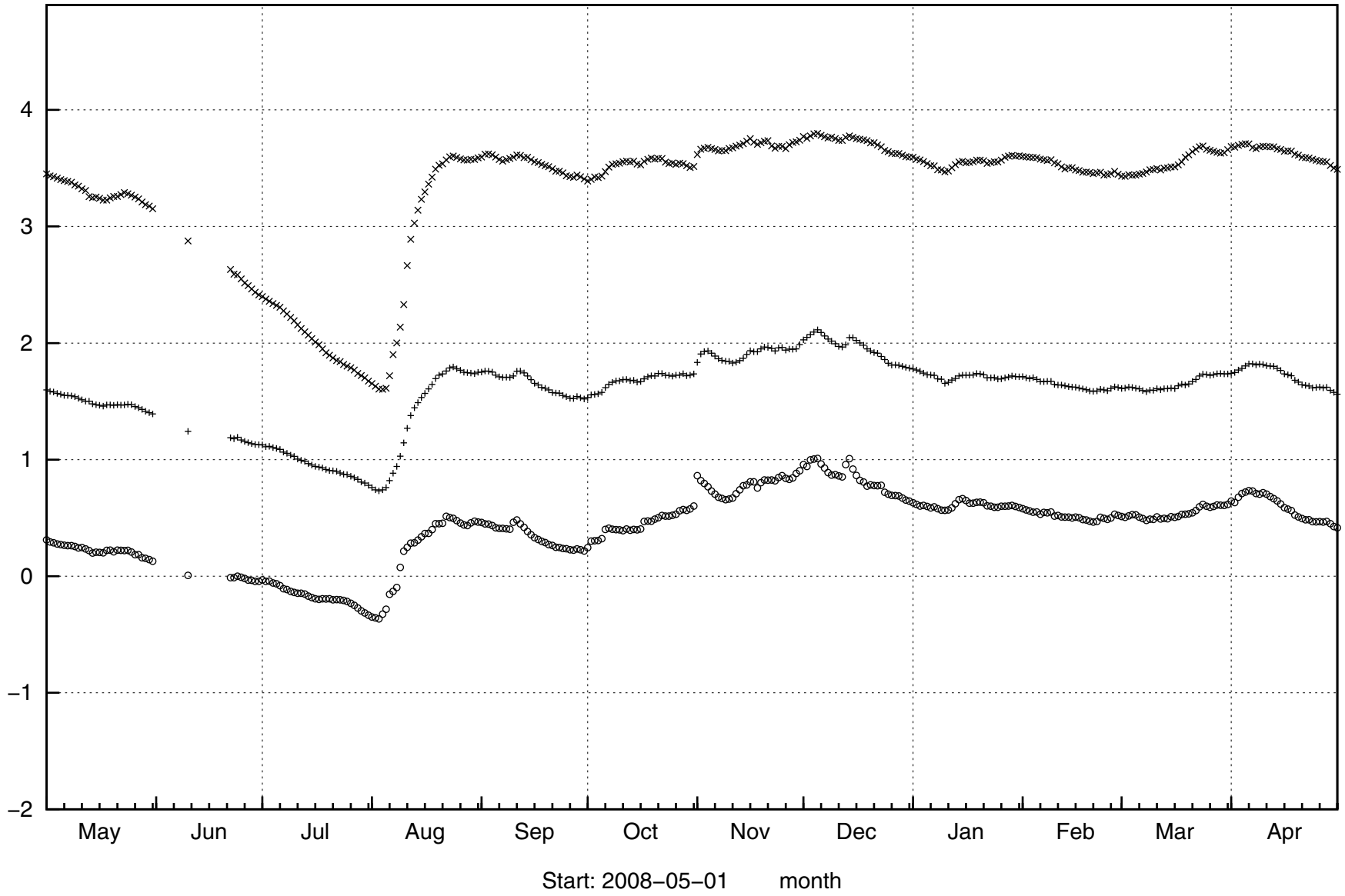
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Start: 2008-05-01 month

# HFM12



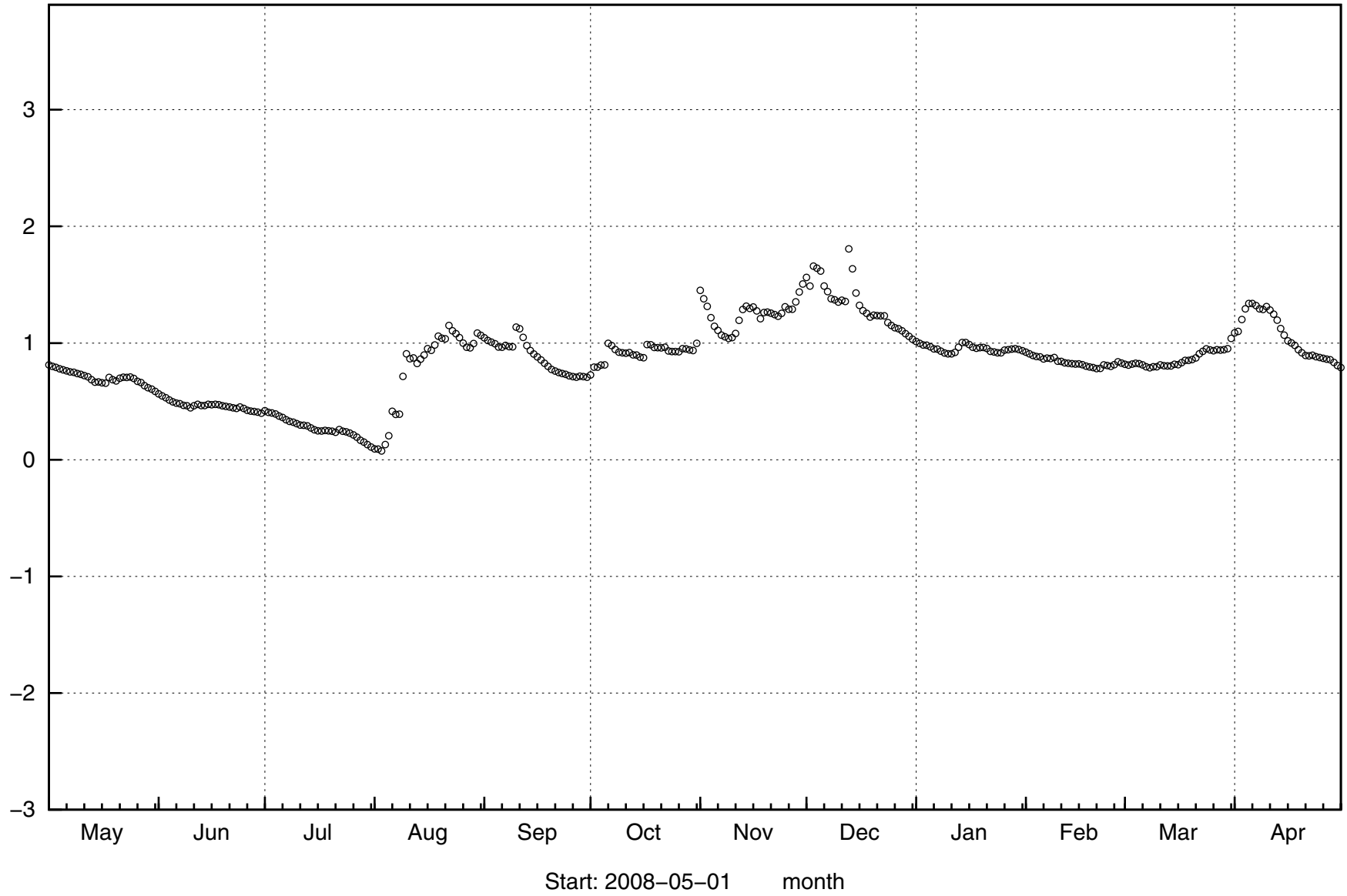
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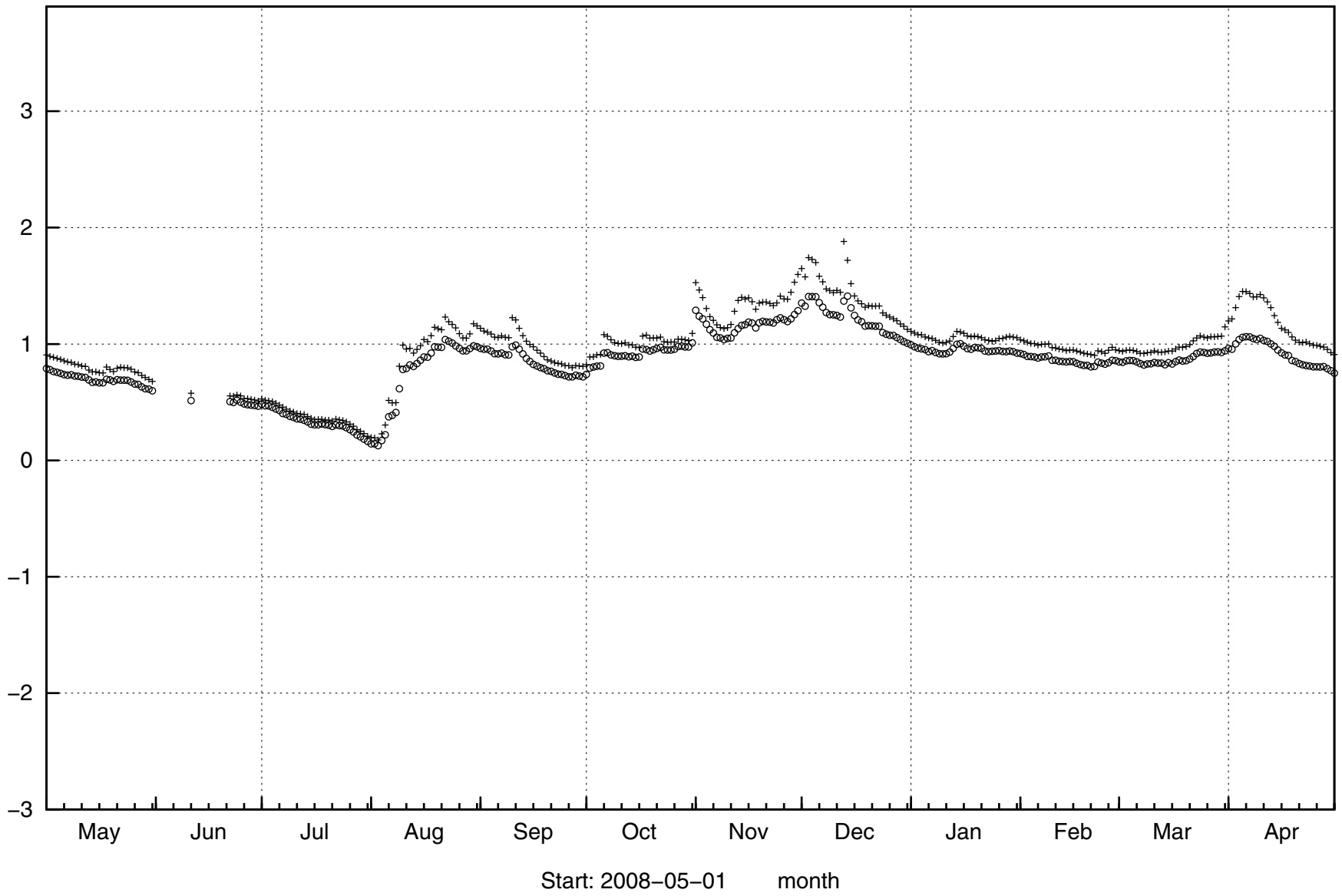
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43

mas



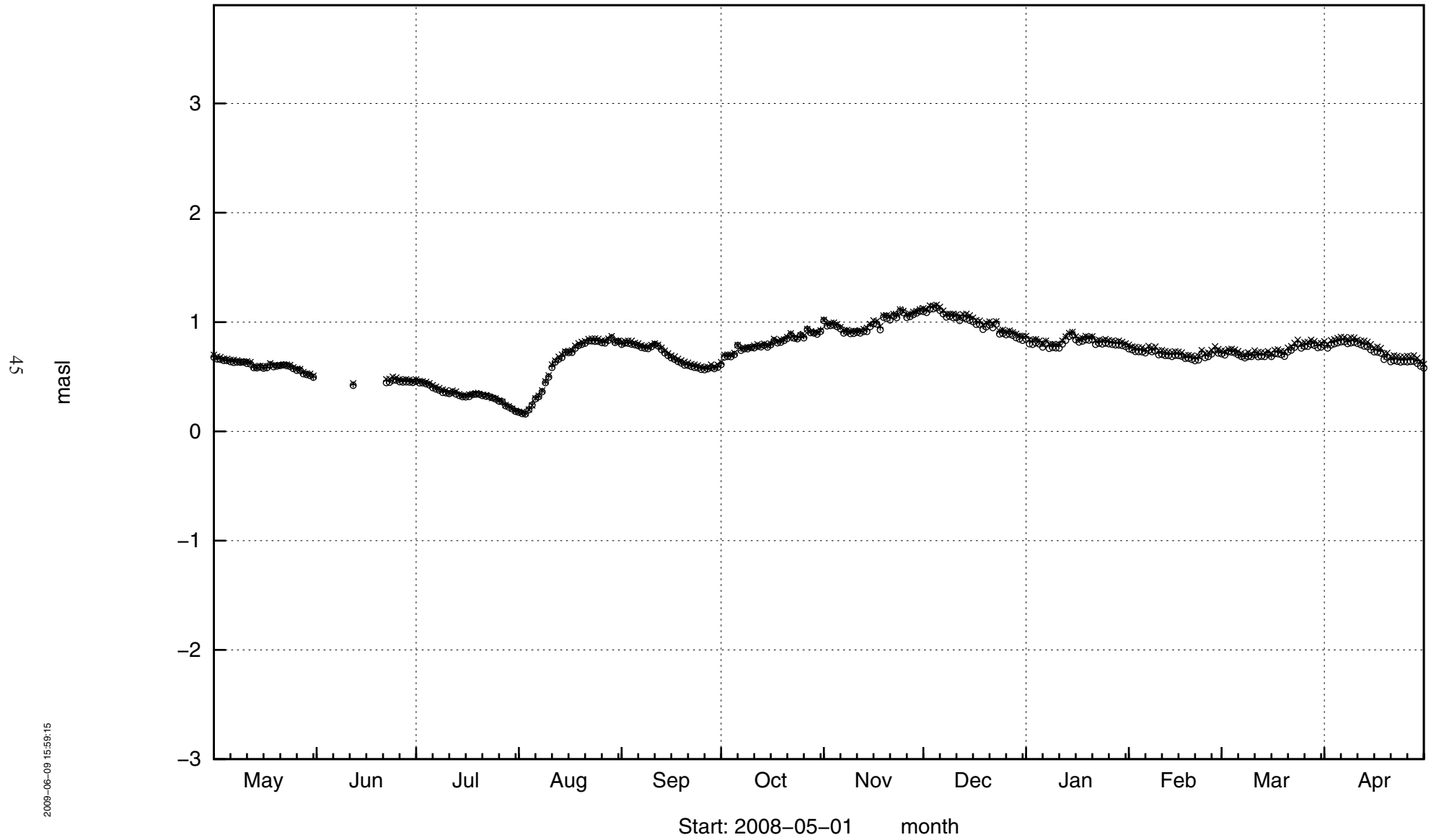
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44

2009-06-09 15:59:15

# HFM16



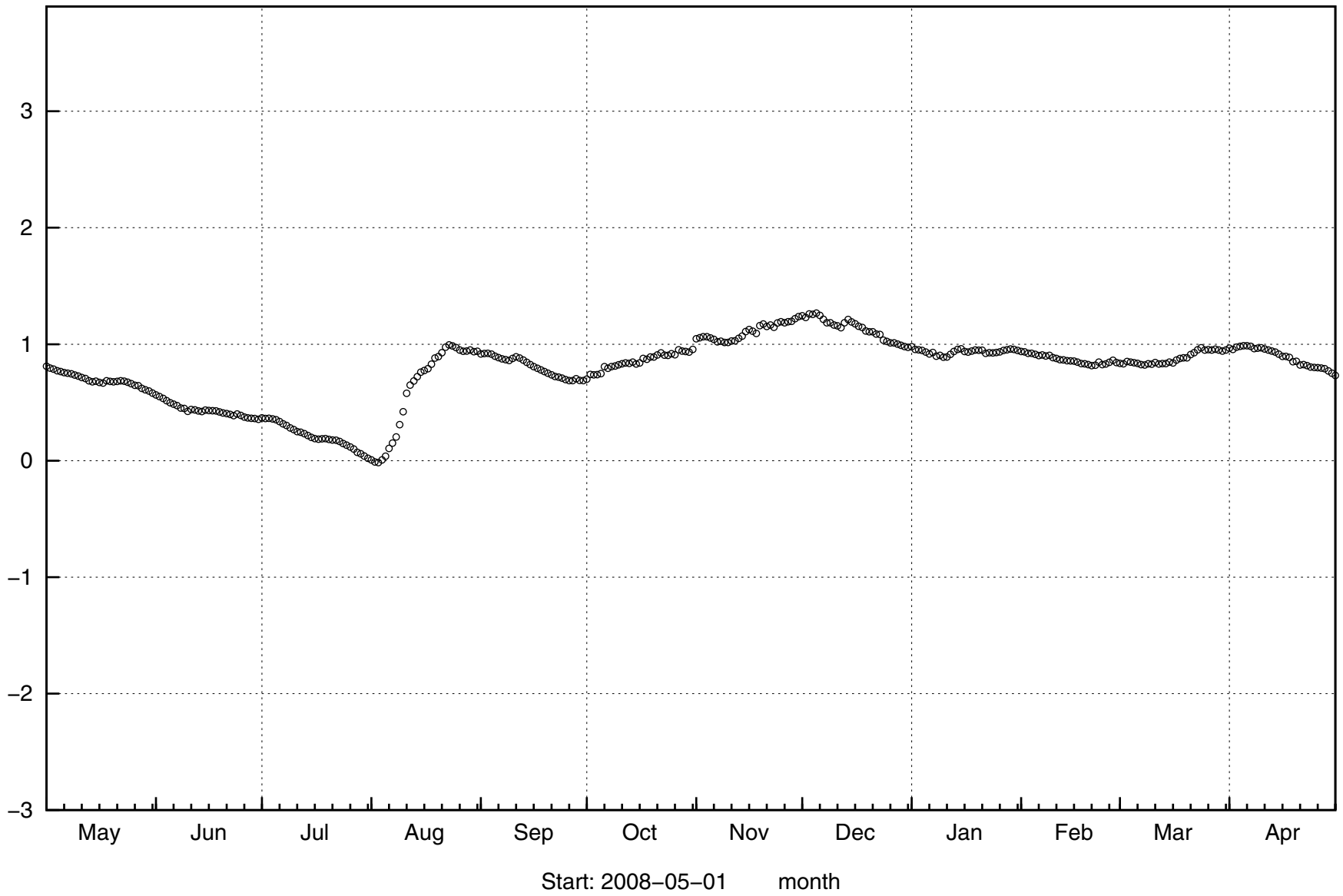
45

2008-06-09 15:59:15

Start: 2008-05-01 month



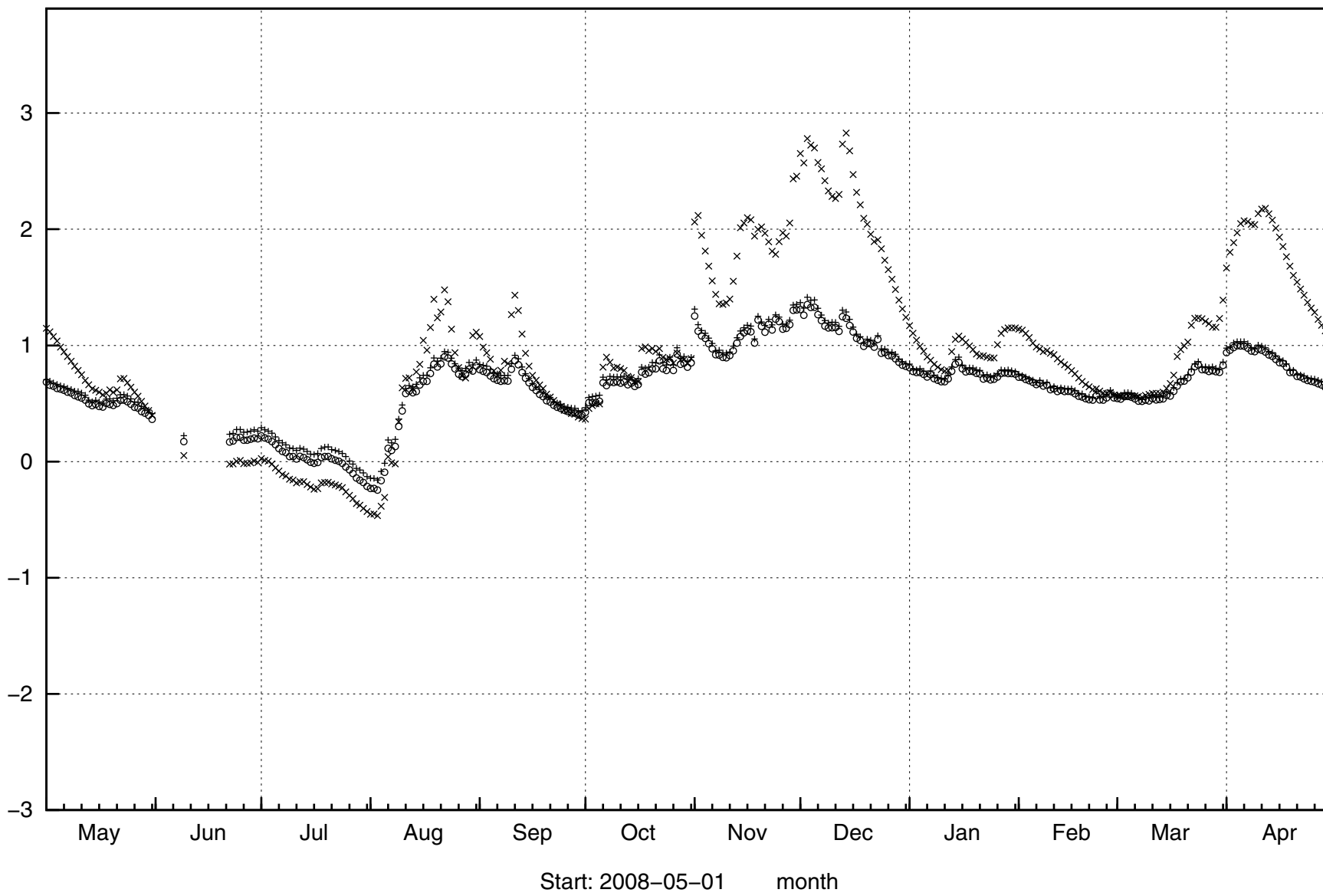
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46

2008-06-09 15:59:15

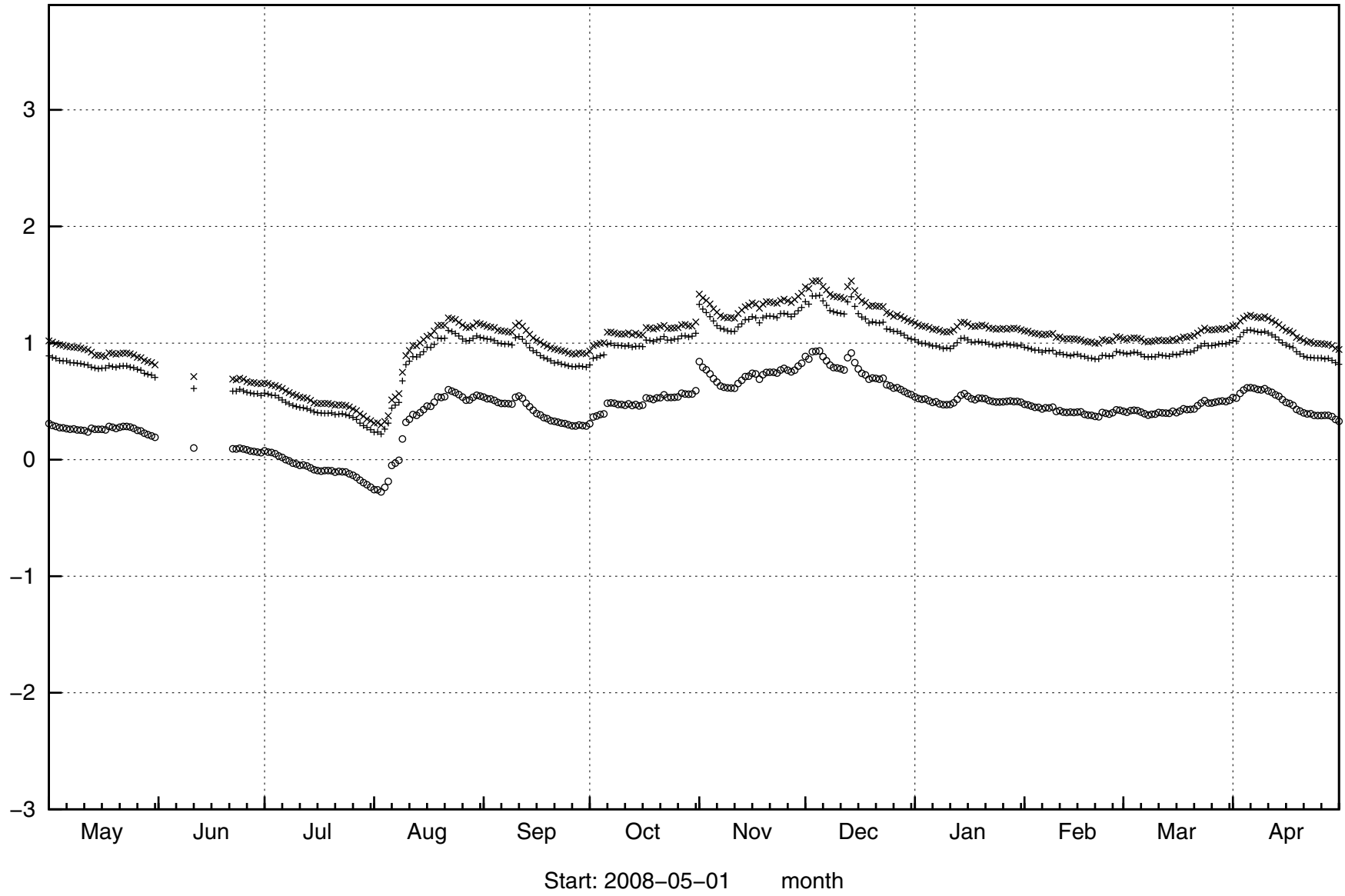
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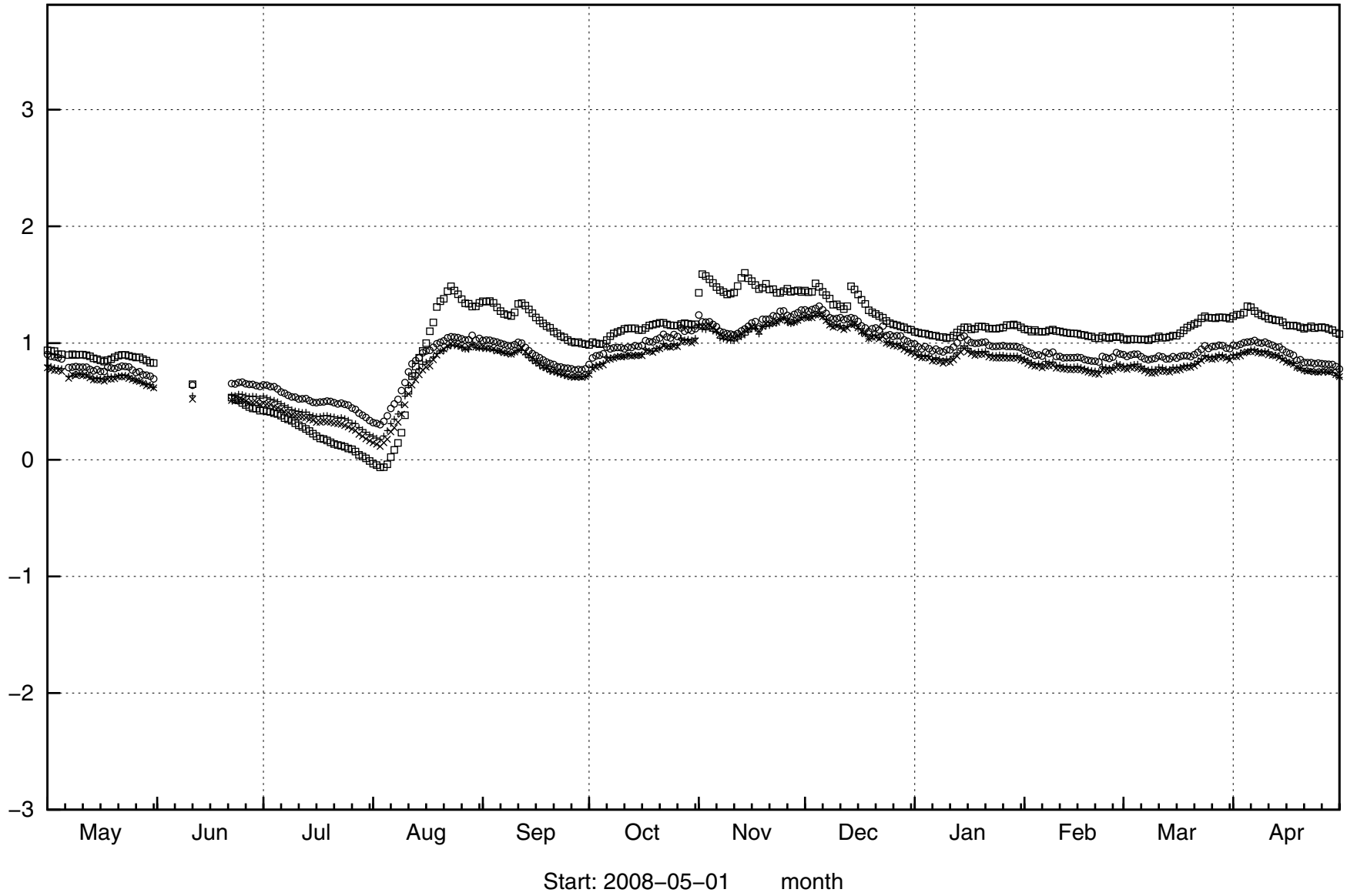
HFM19

48

masl



HFM20



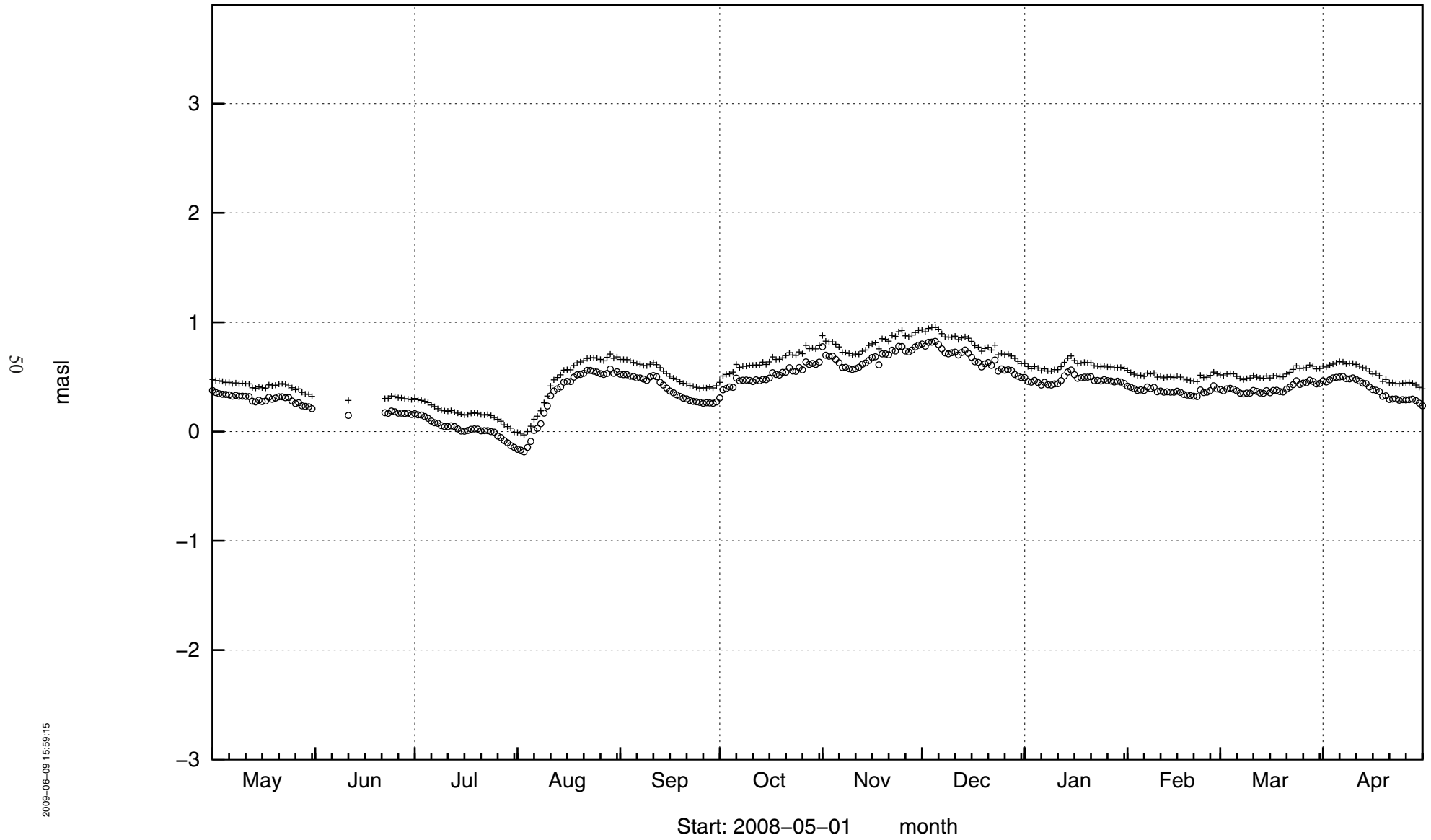
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Start: 2008-05-01 month

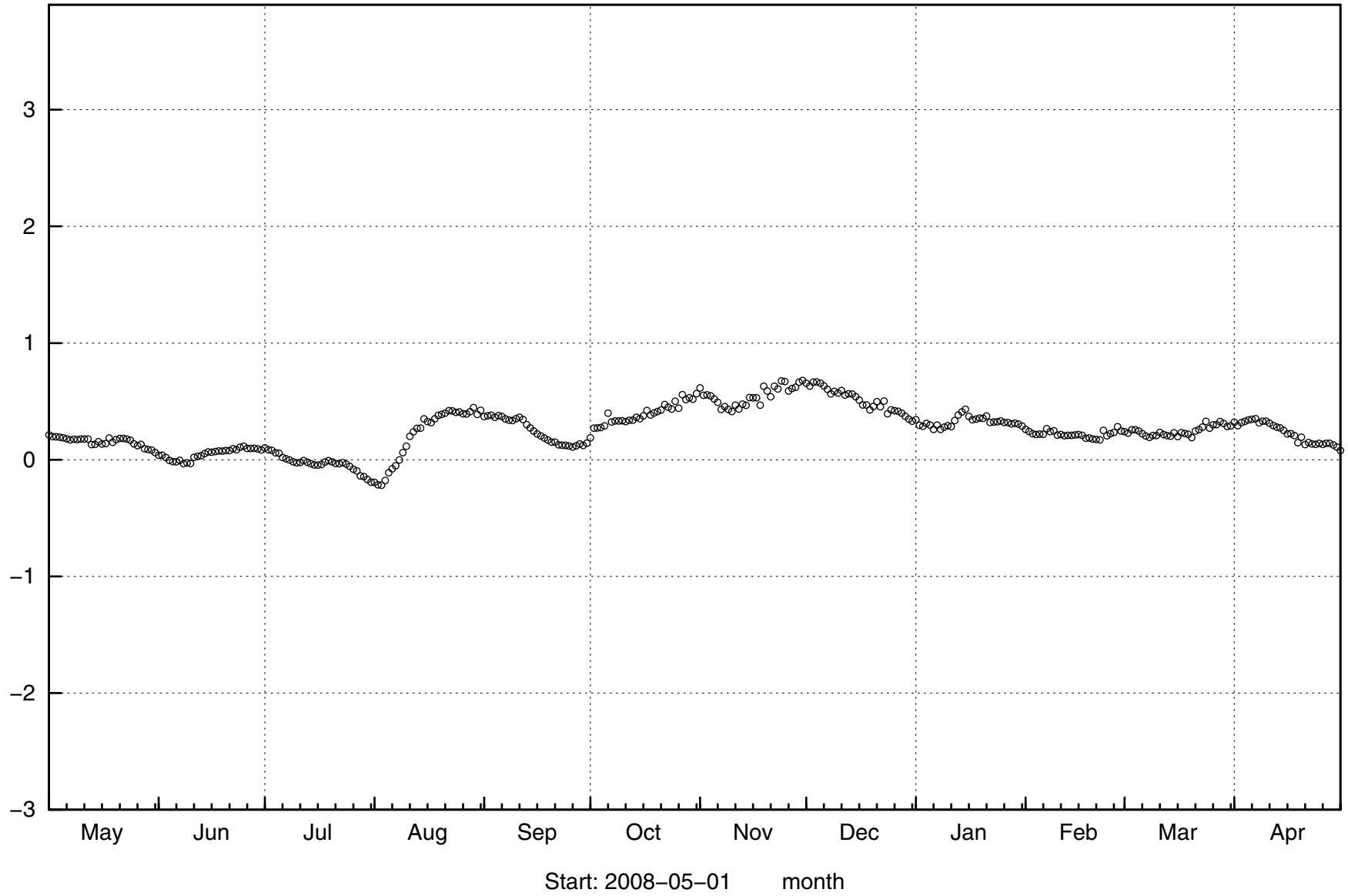
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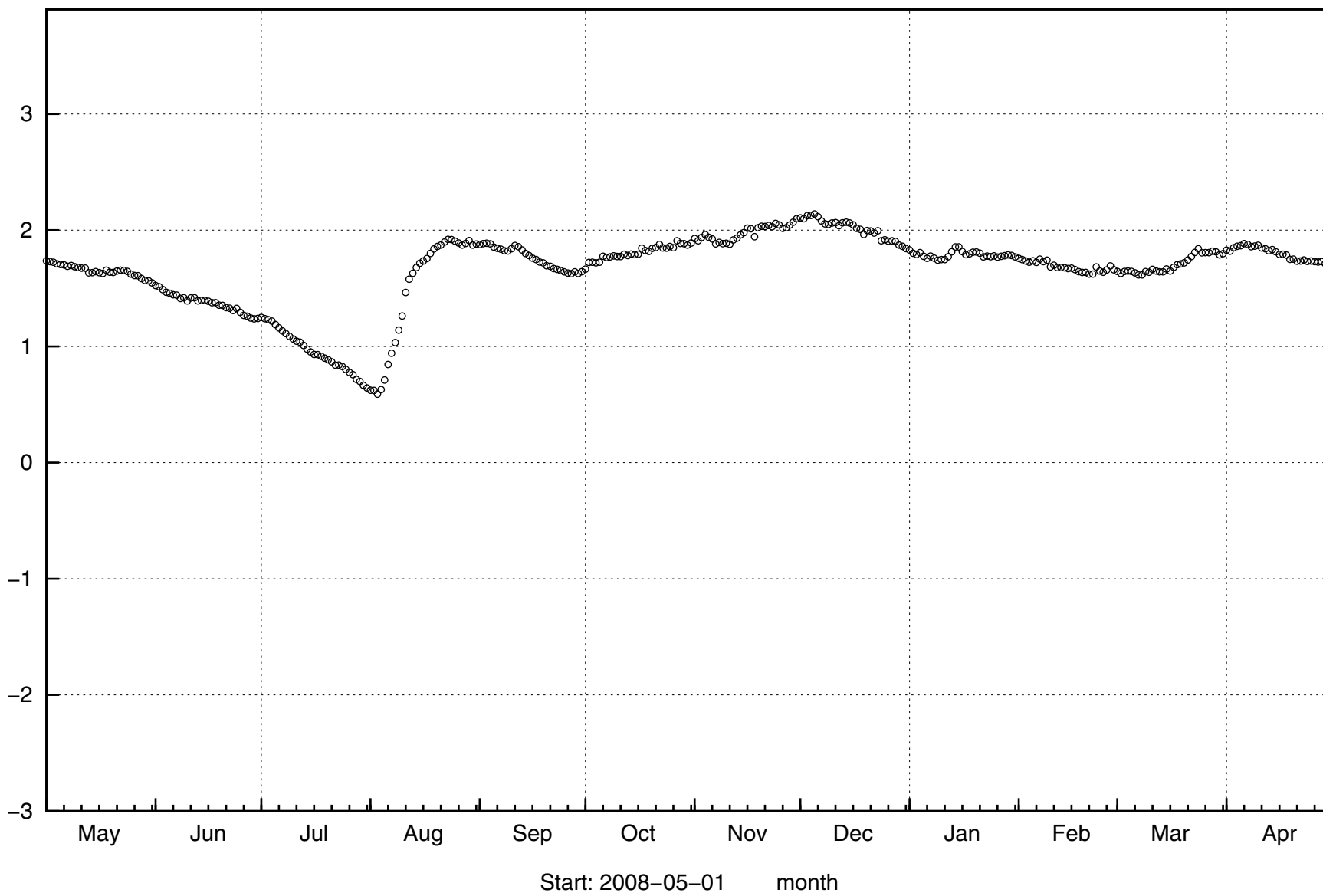
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51

masl



HFM23



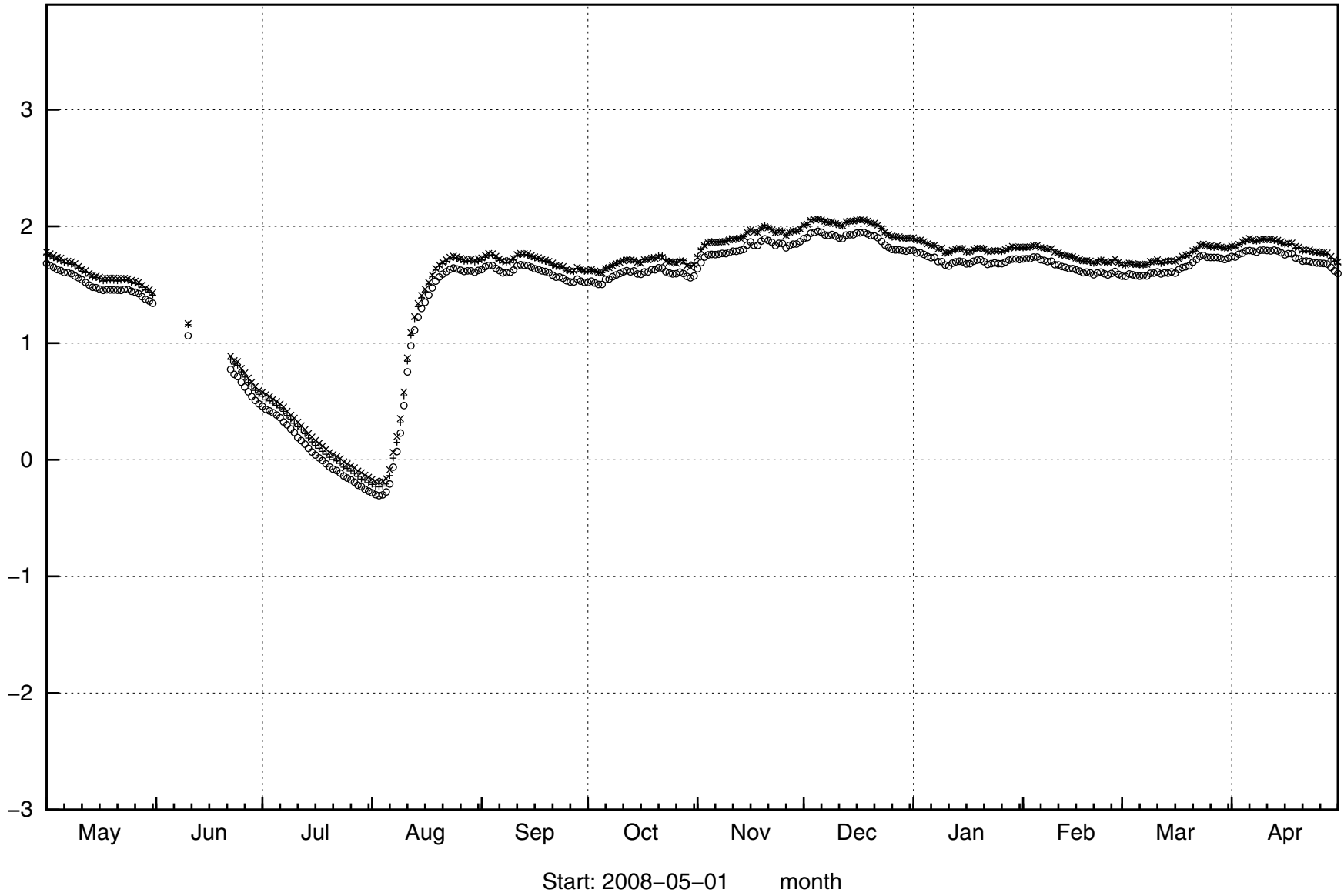
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2008-06-06 15:59:15

HFM24

53

masl

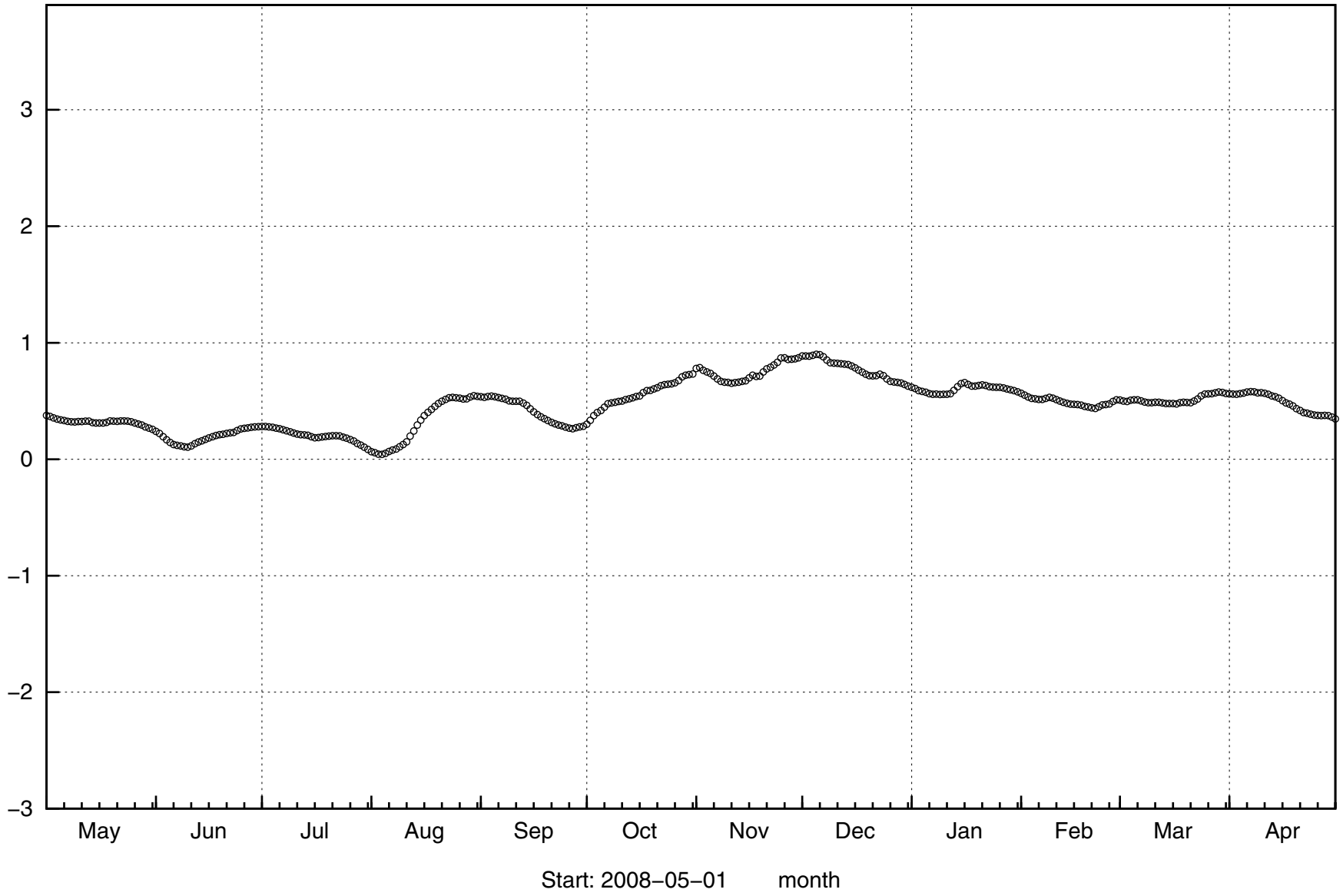




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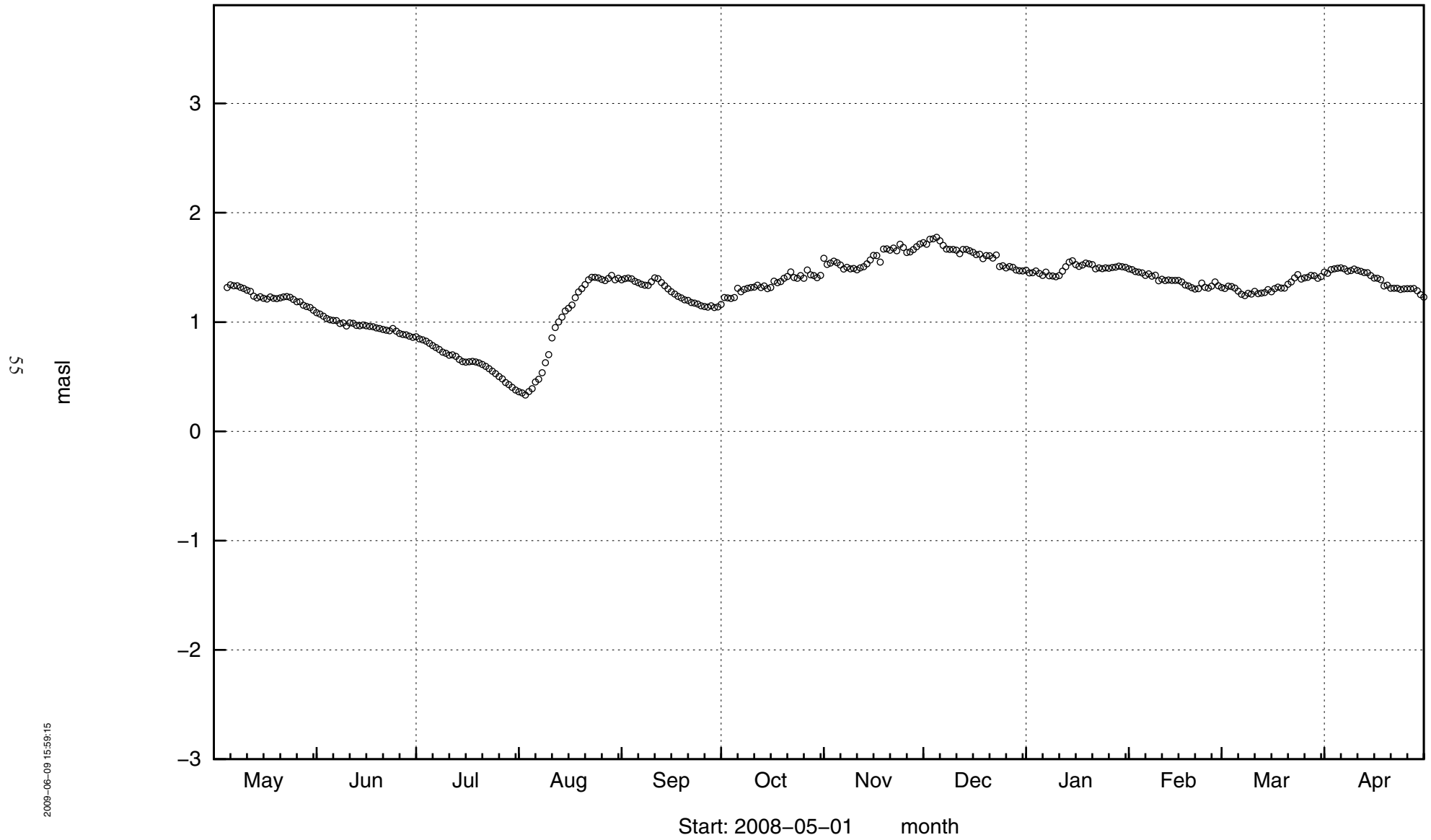
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2009-06-09 15:59:15

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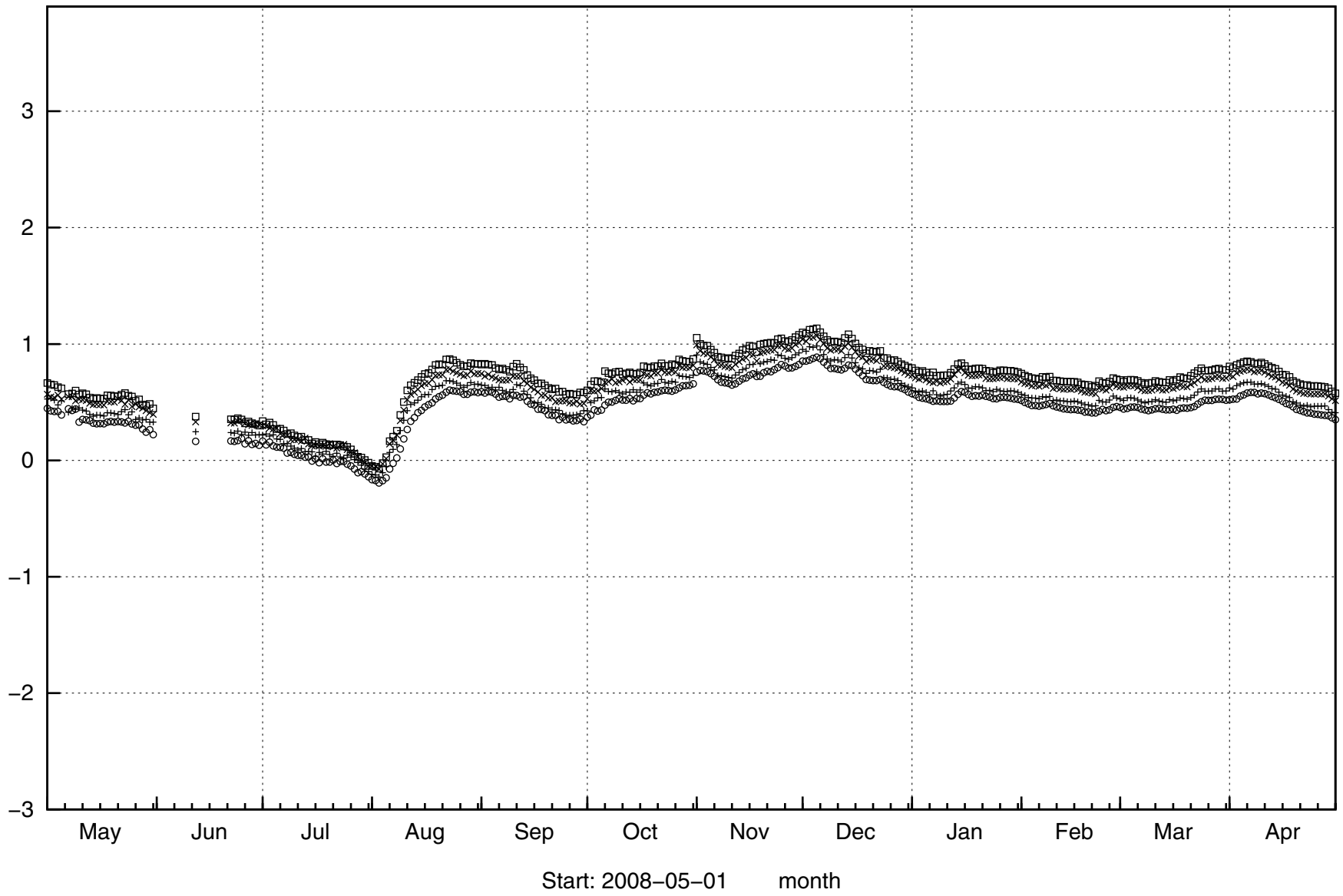


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Start: 2008-05-01 month

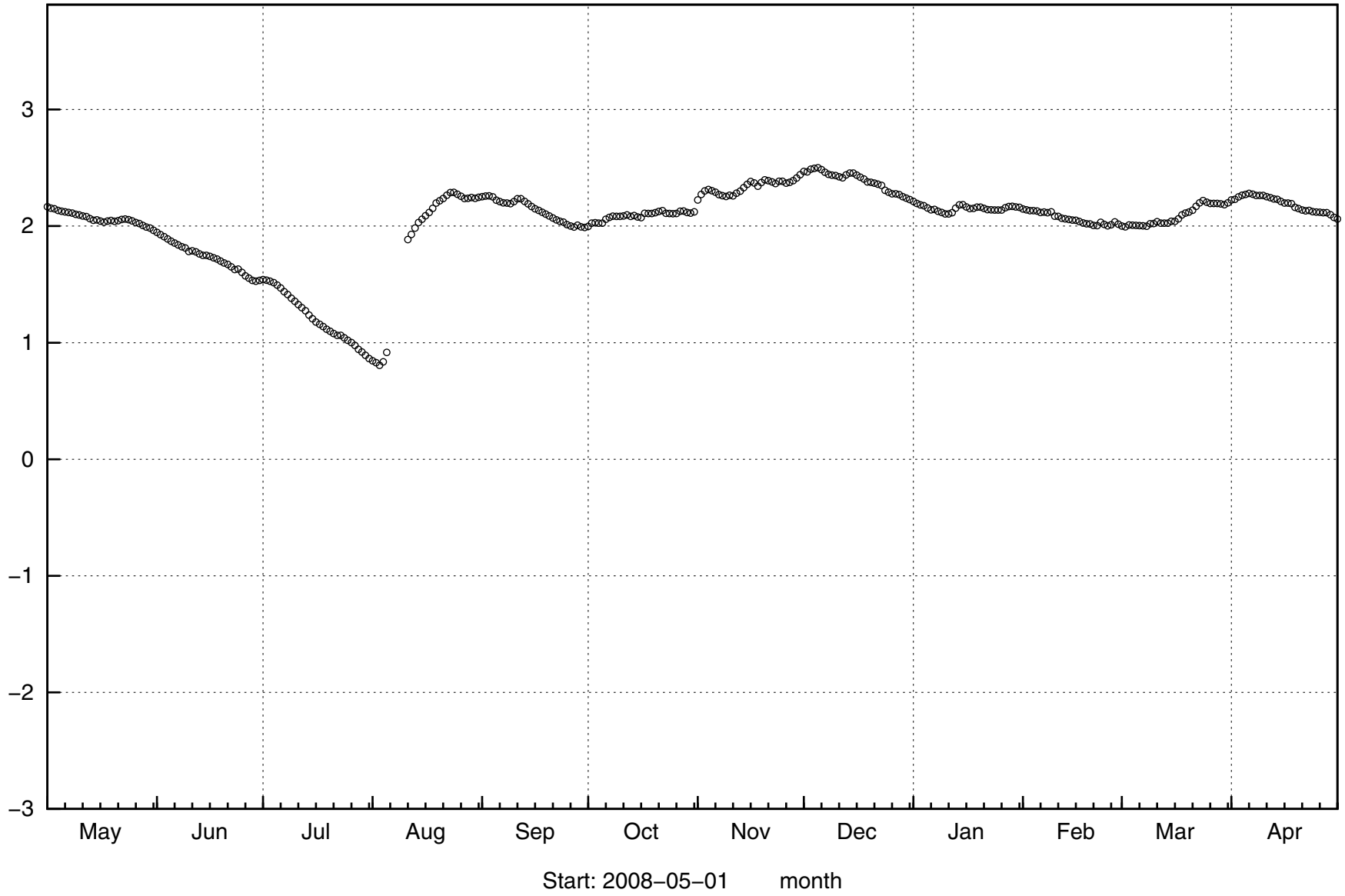
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95

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HFM28

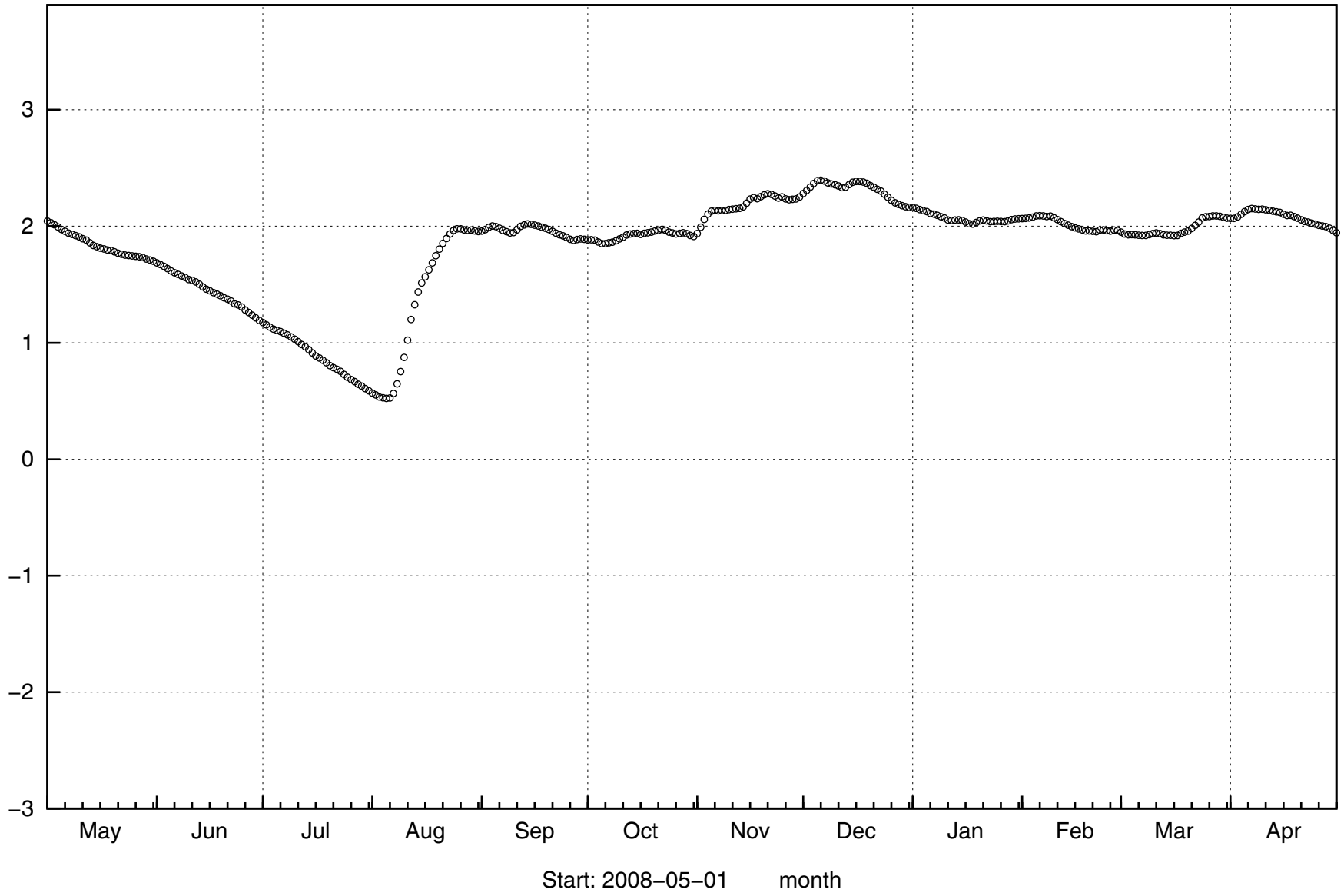


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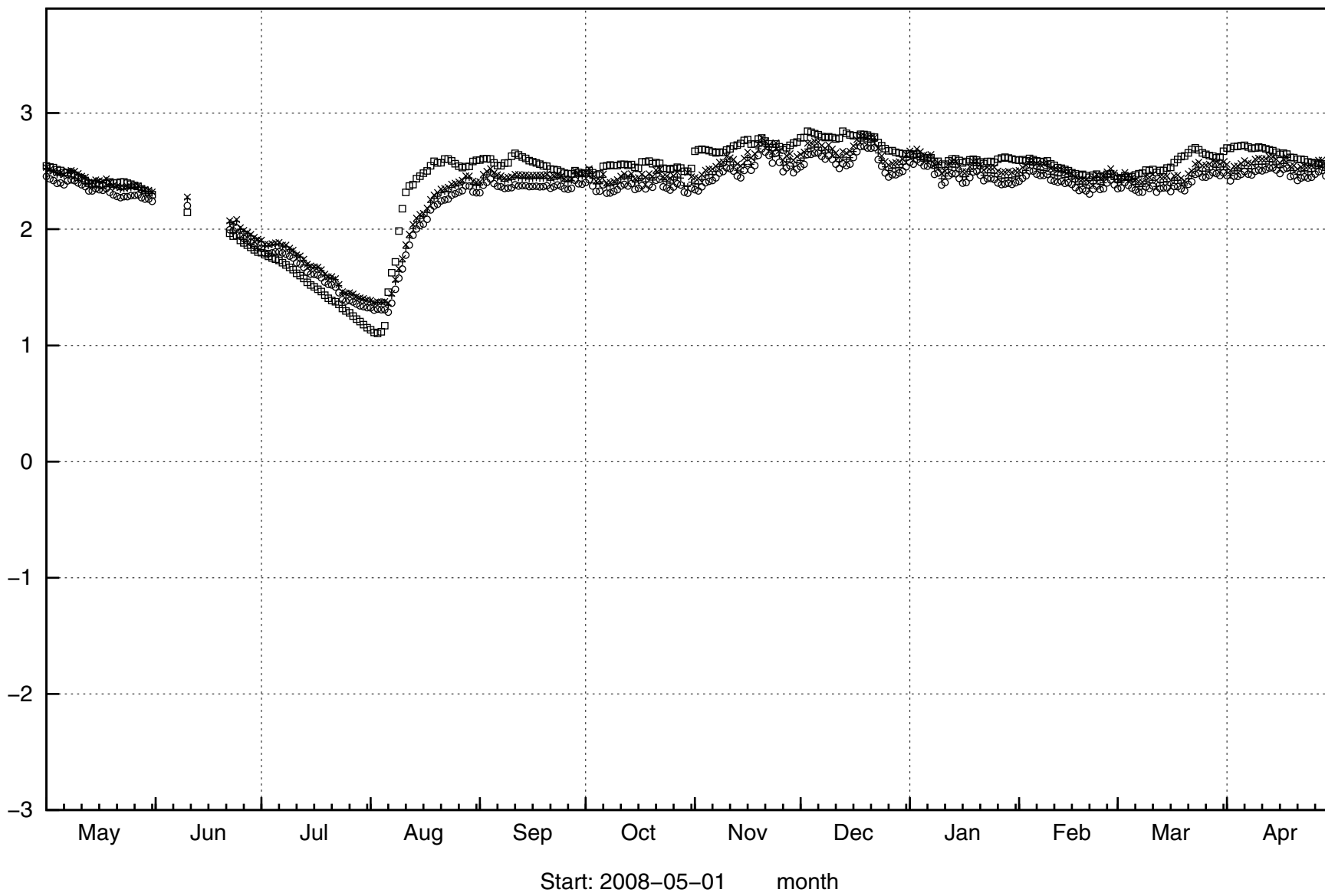
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HFM29

85  
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HFM30



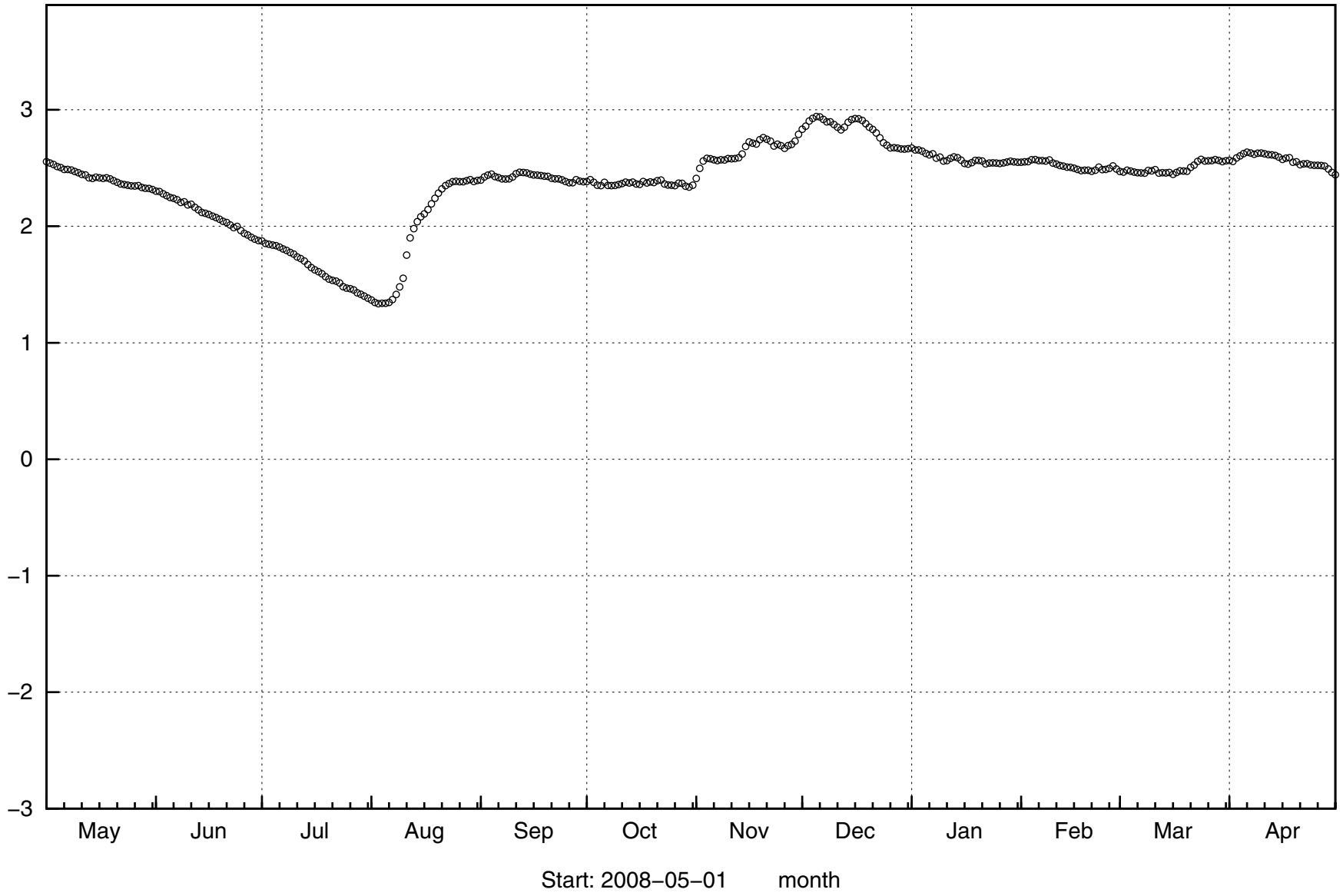
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Start: 2008-05-01 month

HFM31



09

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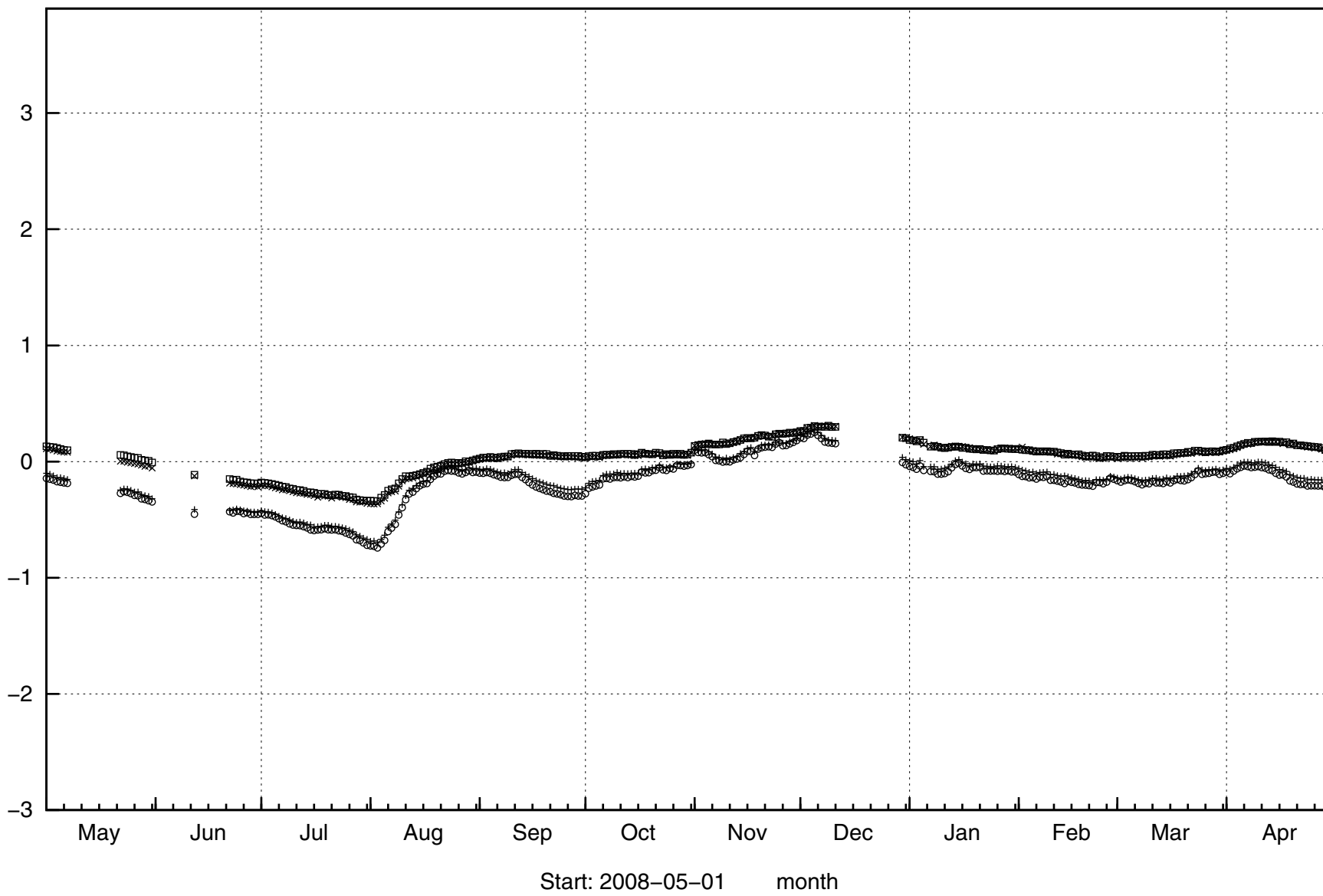
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Start: 2008-05-01 month

HFM32

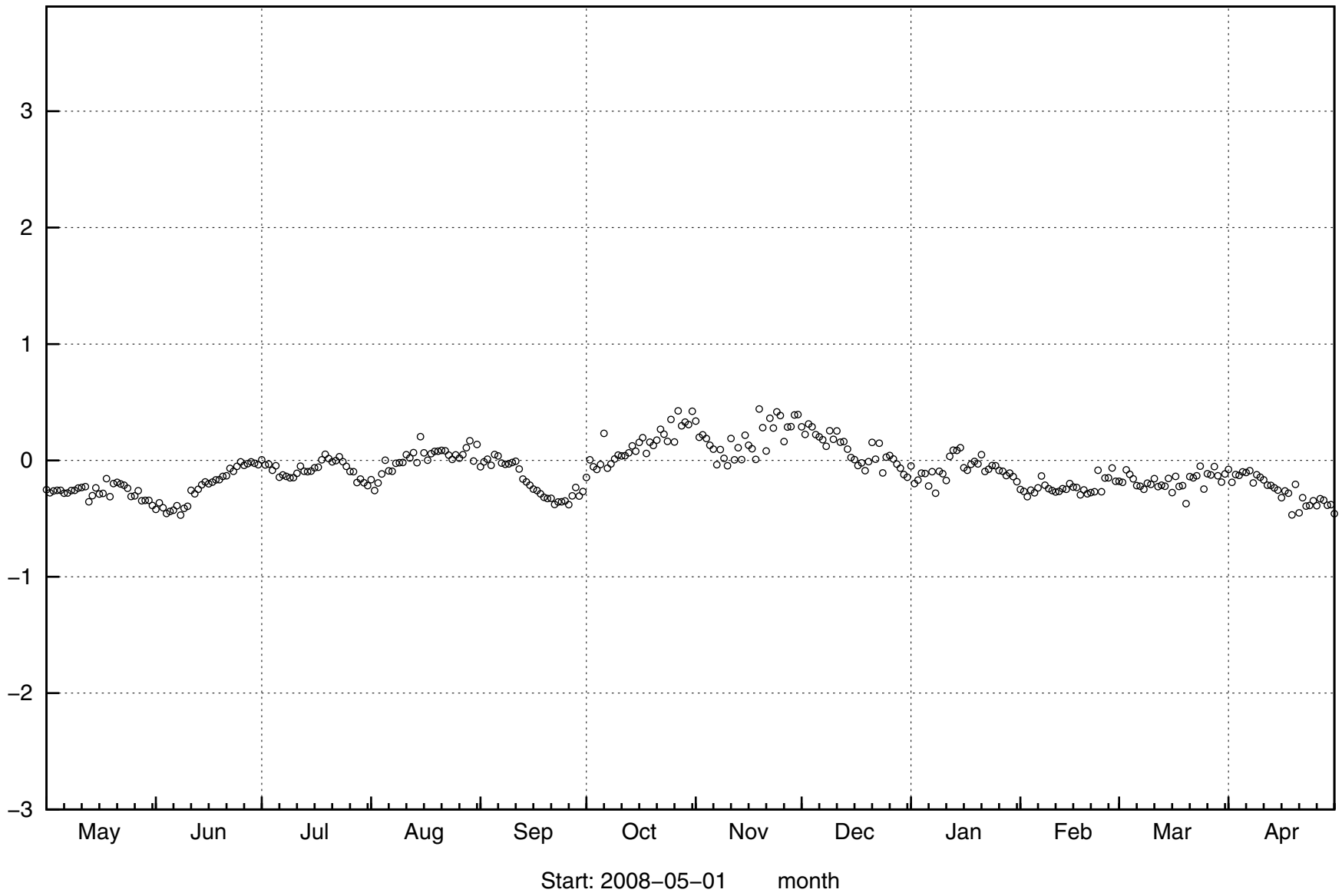
19

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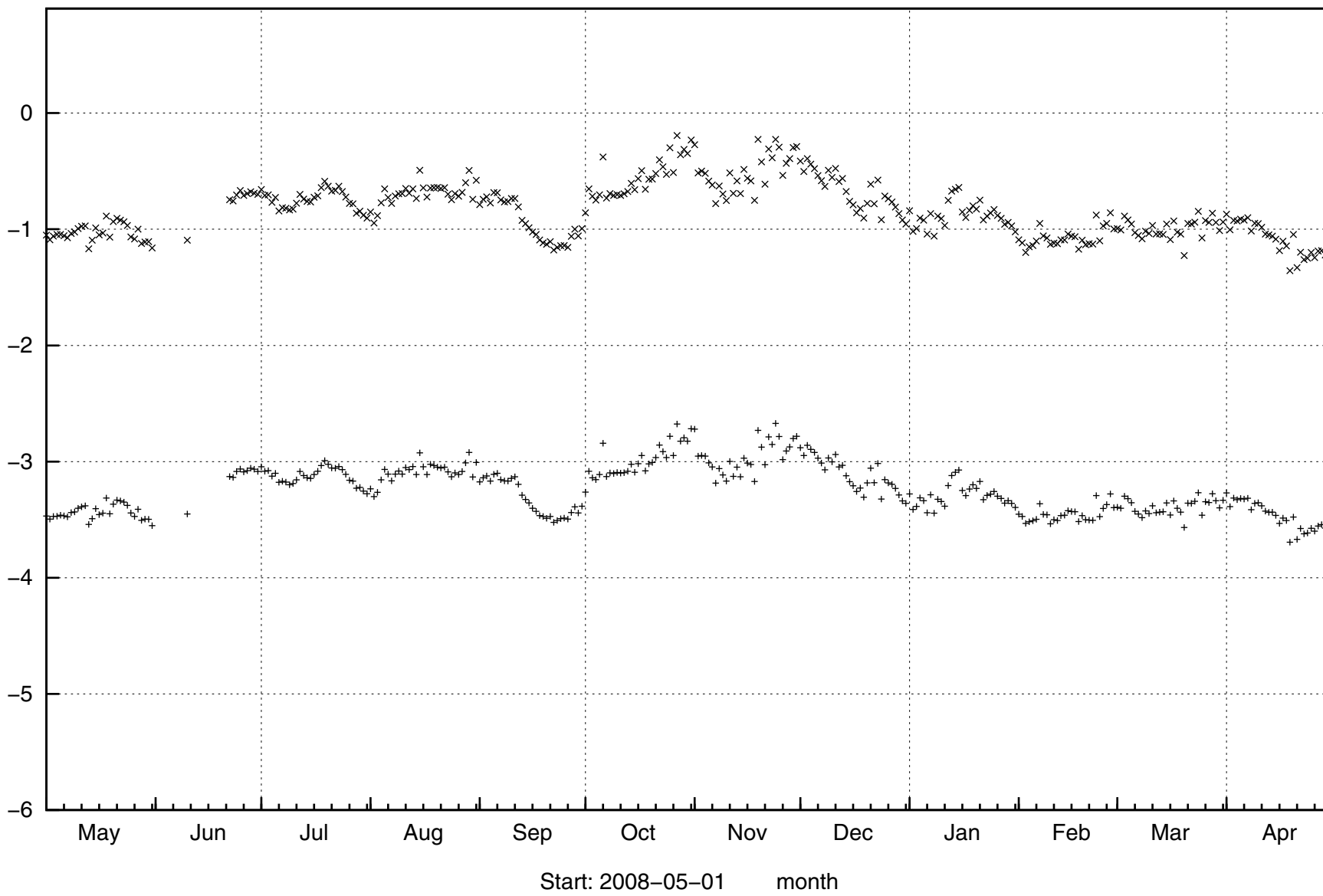
HFM33



62

2009-06-09 15:59:15

# HFM34



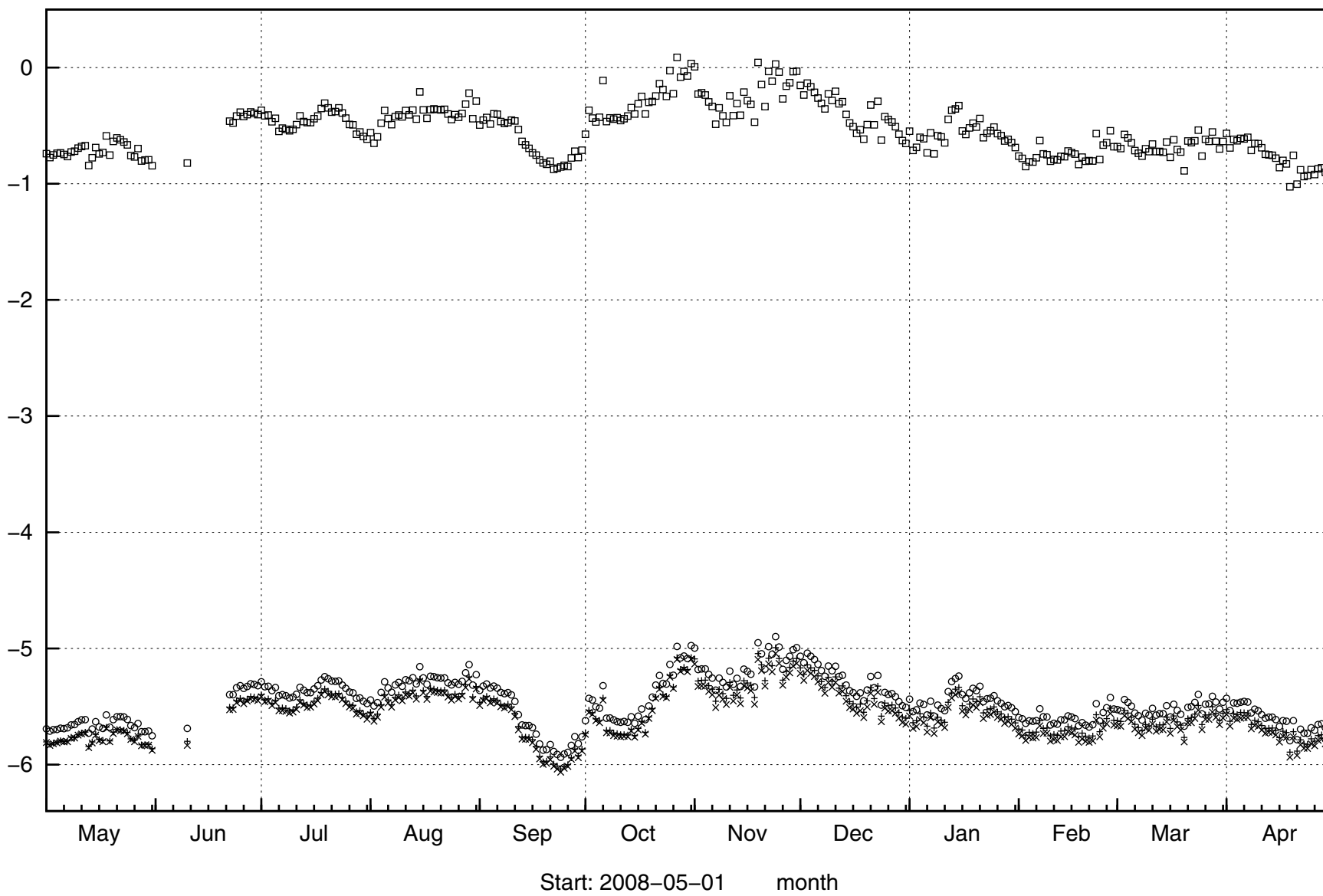
63

masl

2009-06-09 15:59:16

Start: 2008-05-01 month

# HFM35



64

masl

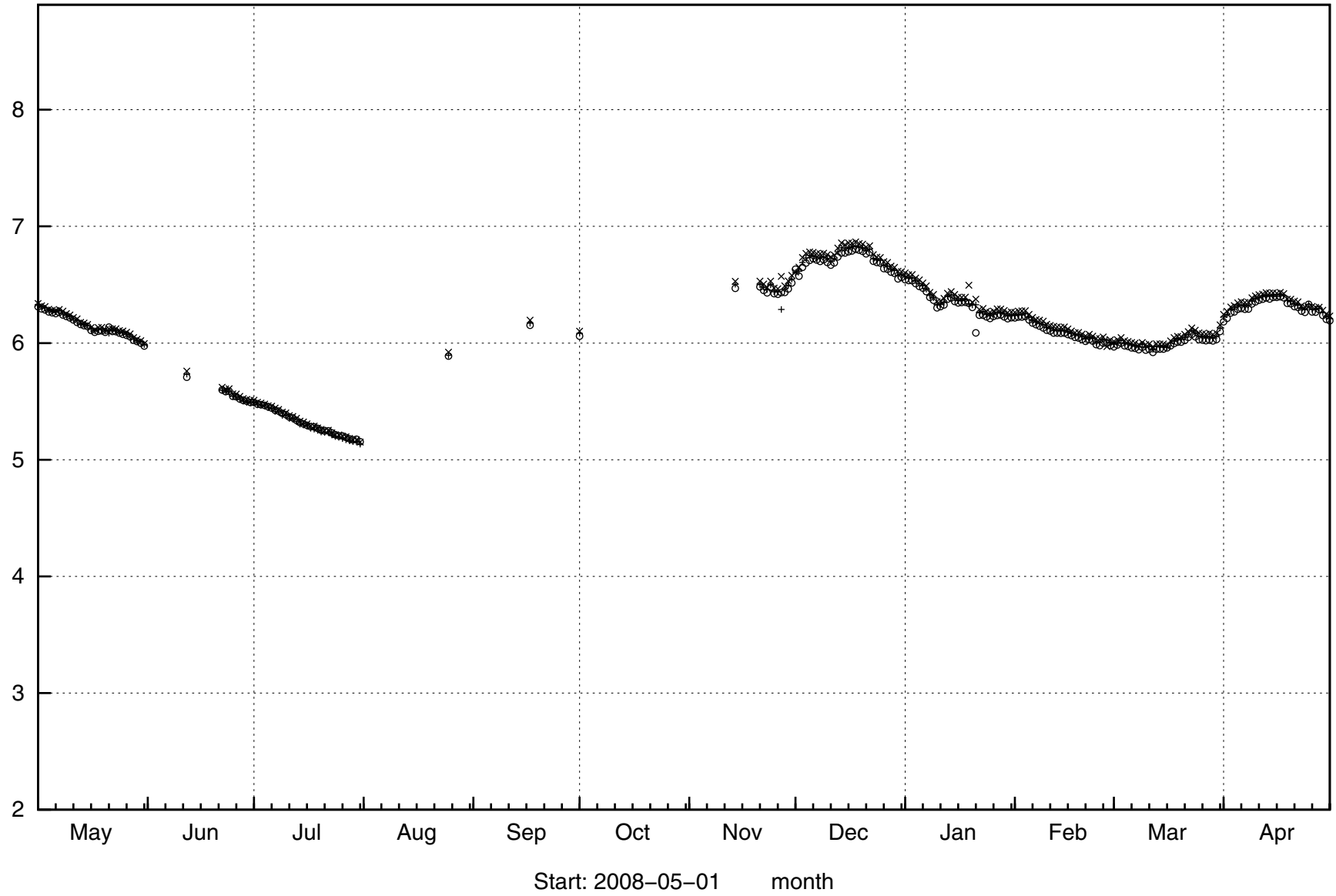
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Start: 2008-05-01 month

HFM36

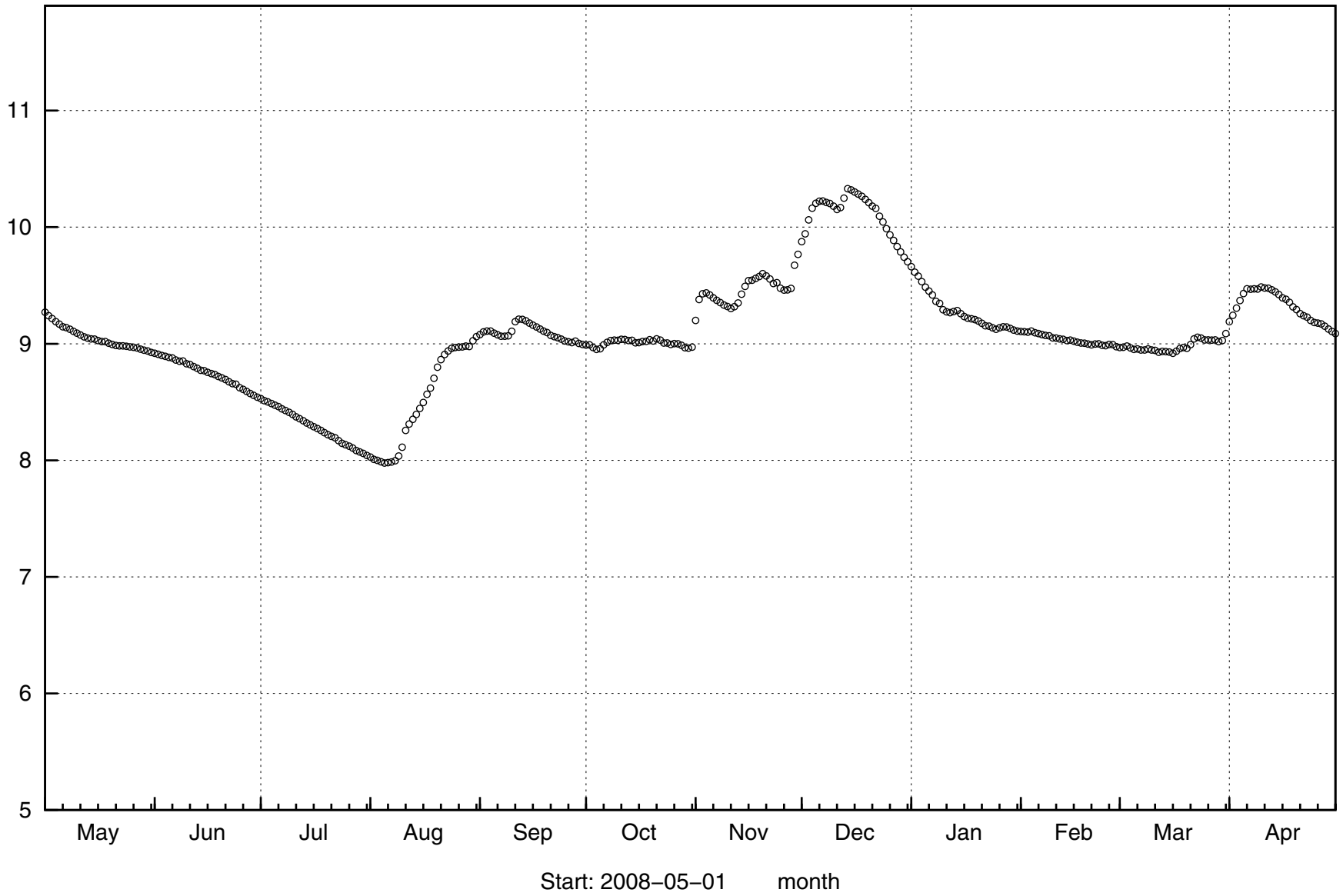
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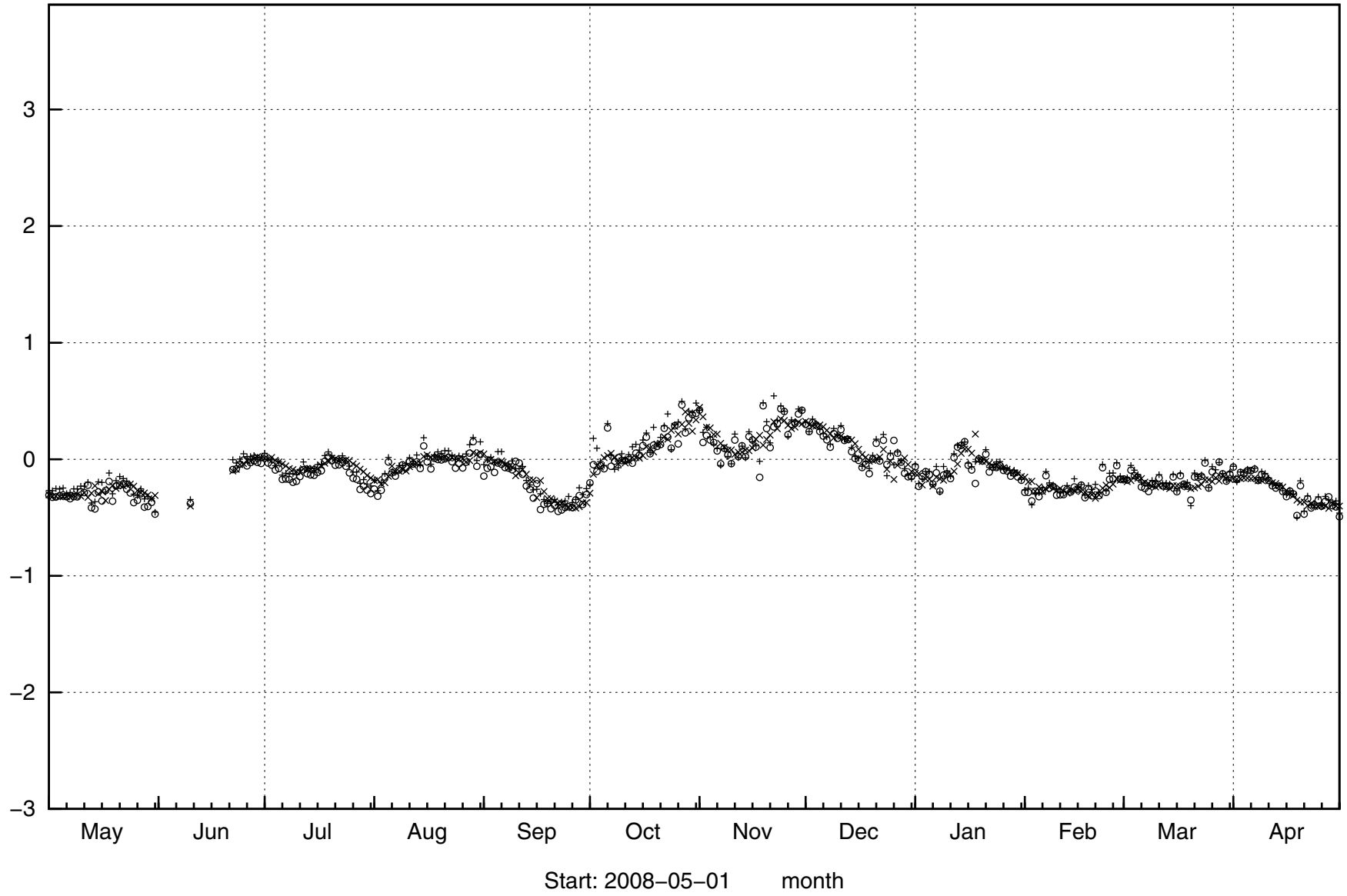


HFM37

99  
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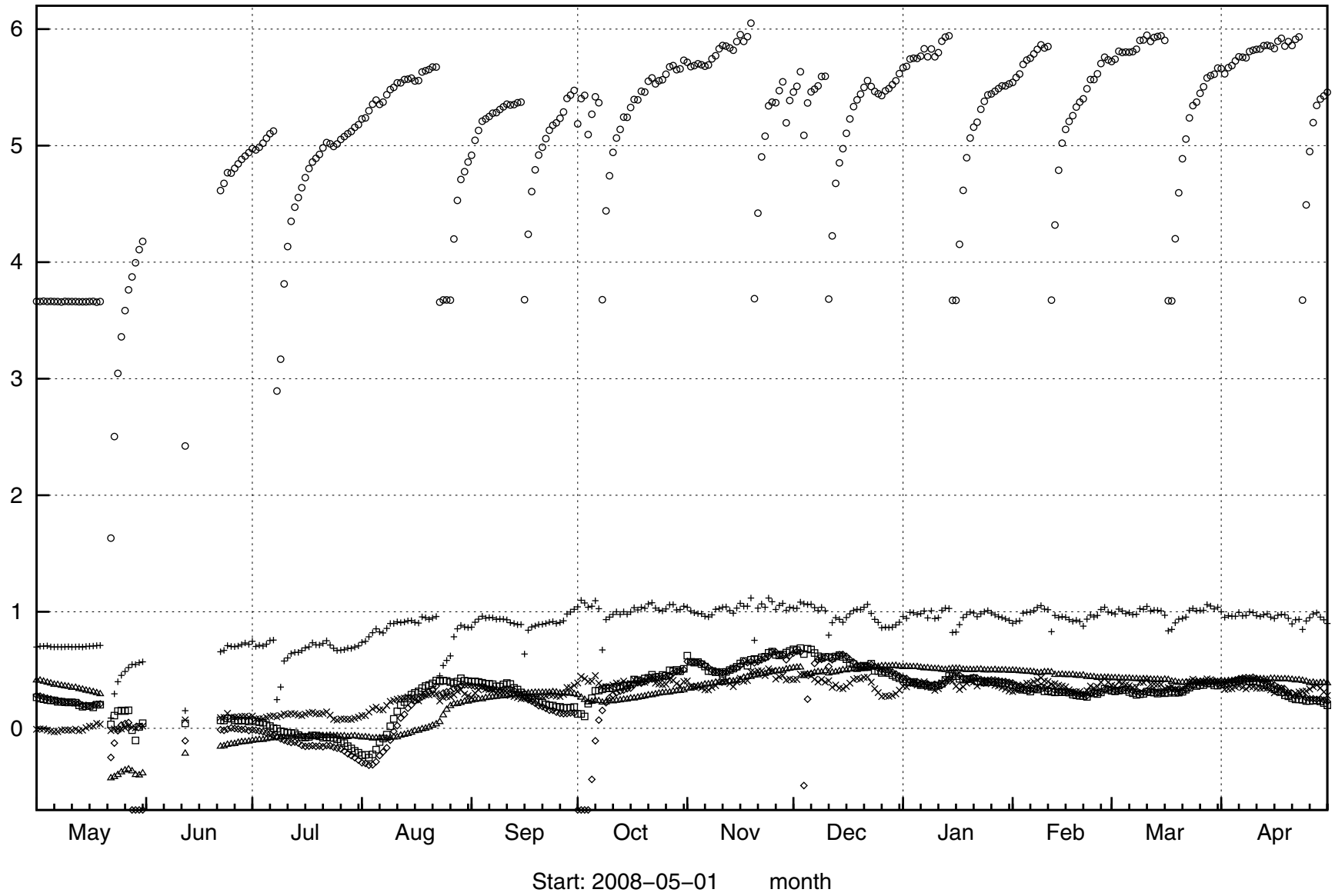
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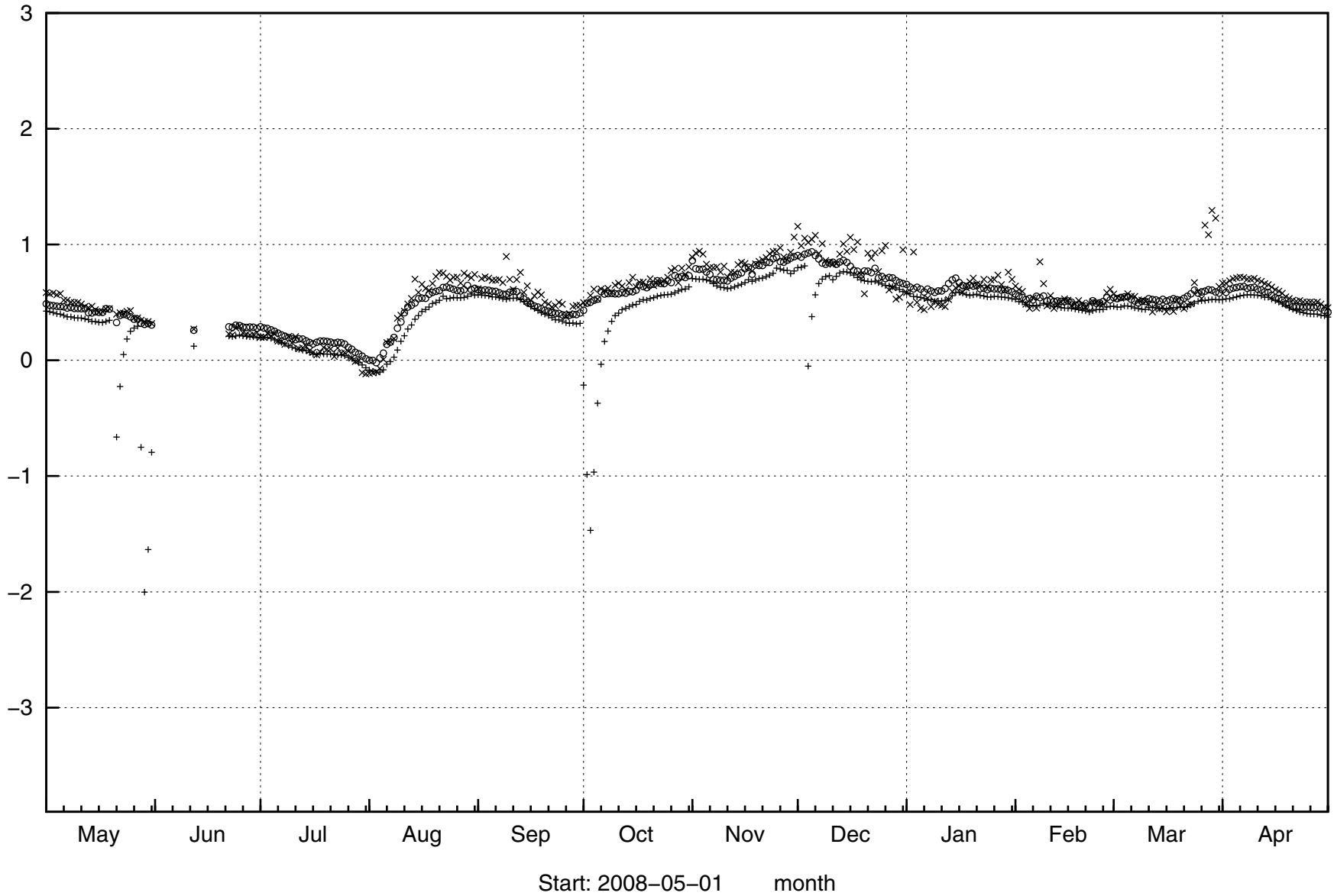
67

2008-06-09 15:59:16

KFM01A



KFM01B



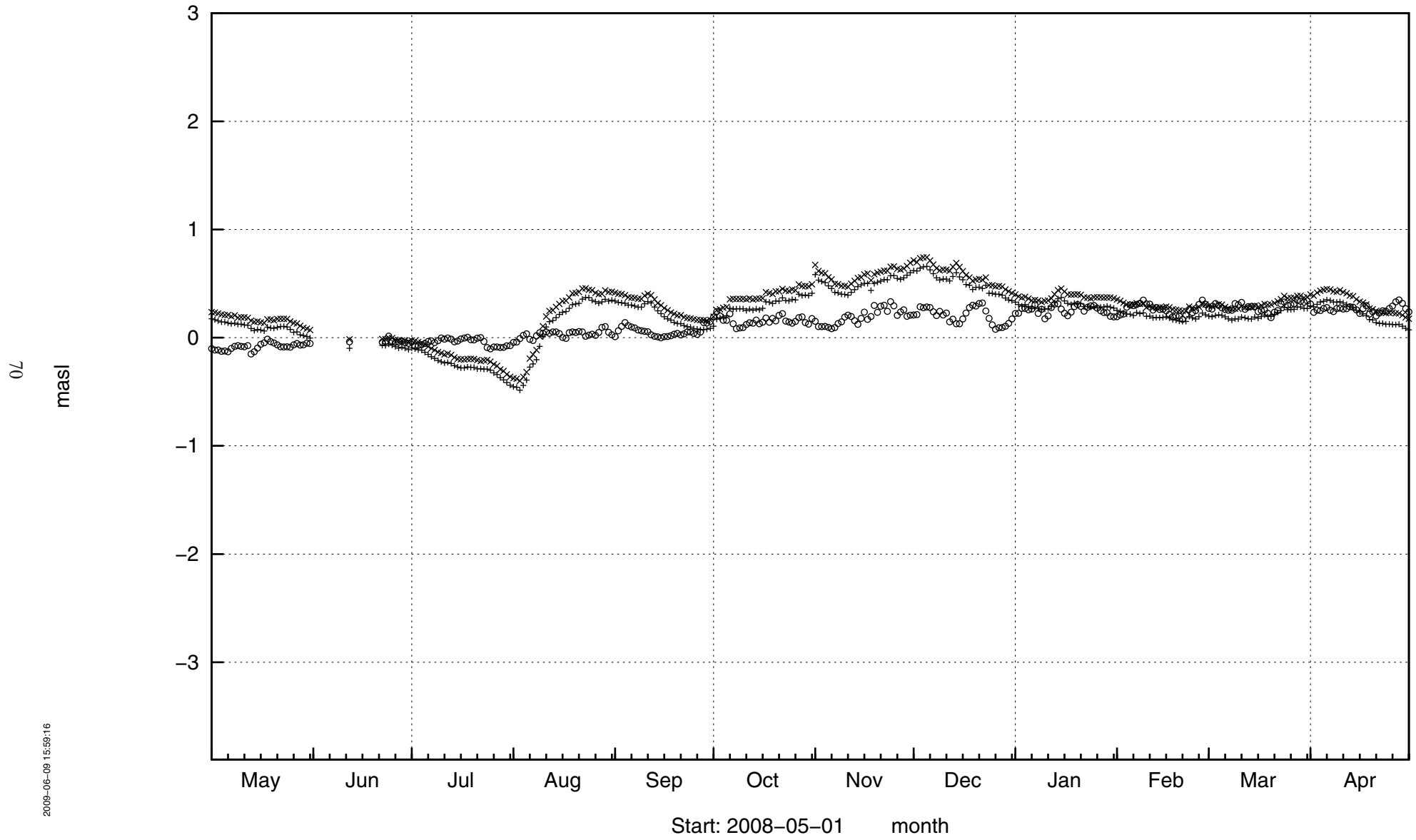
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2009-06-09 15:59:16

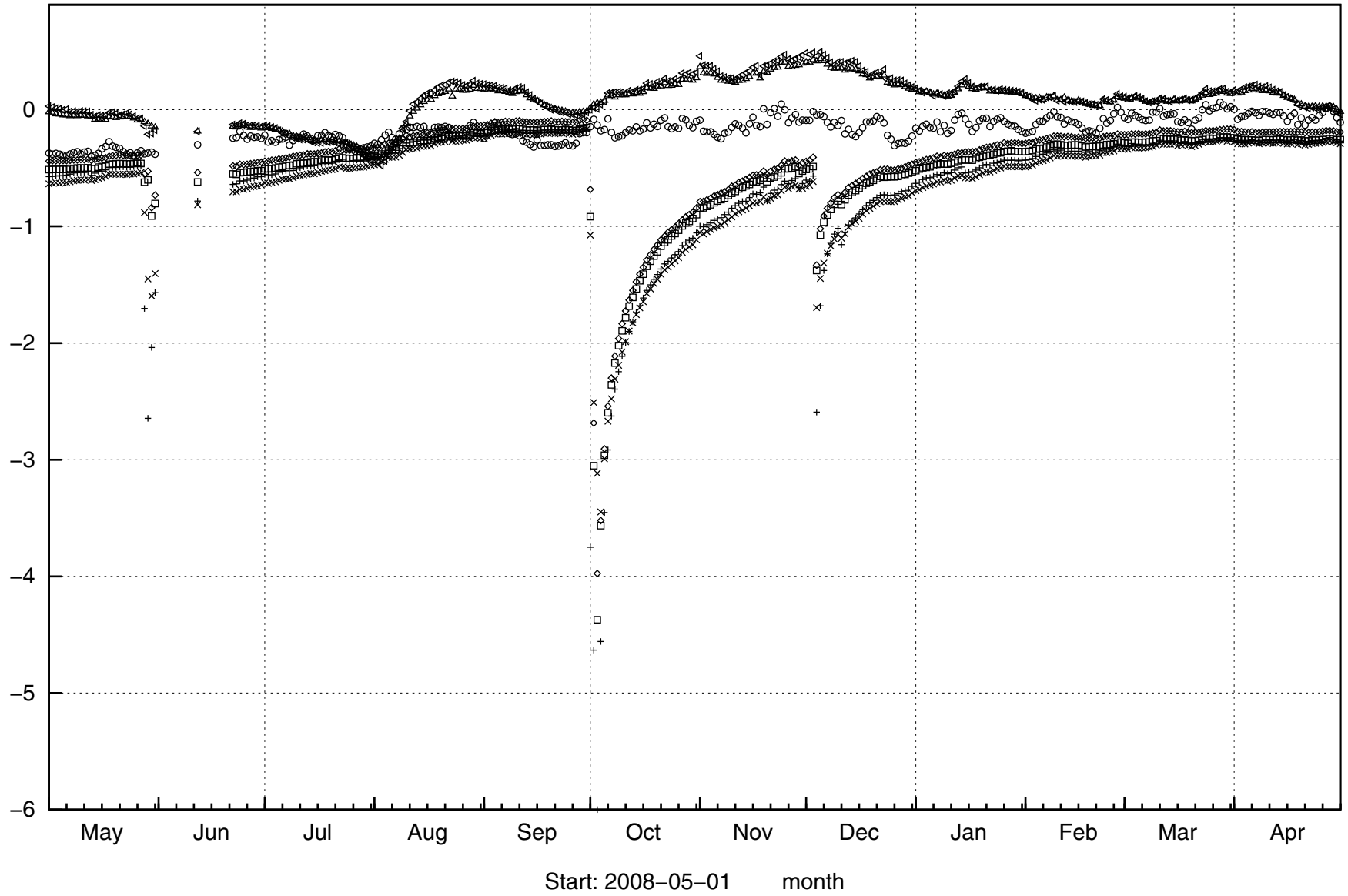


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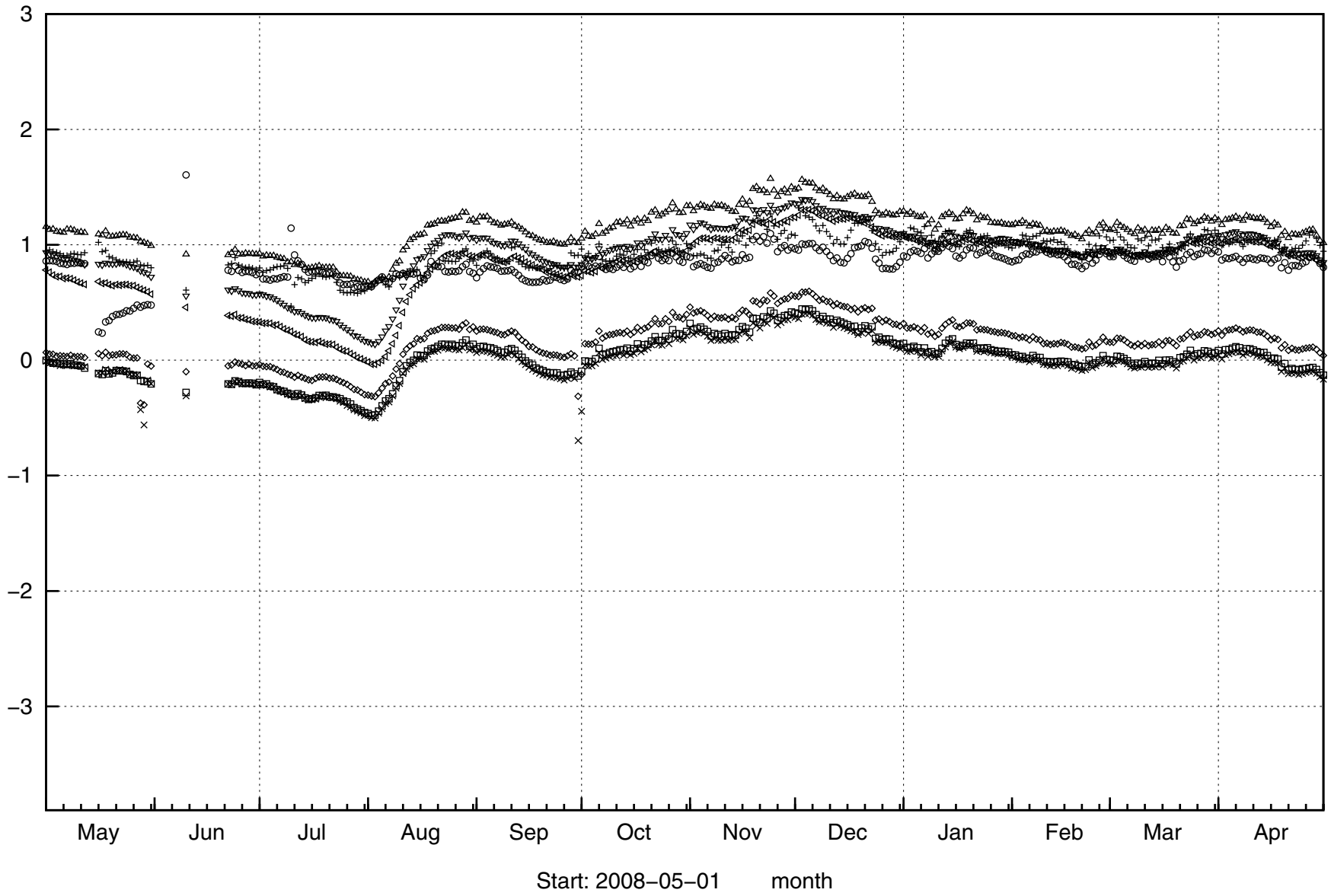


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KFM01D



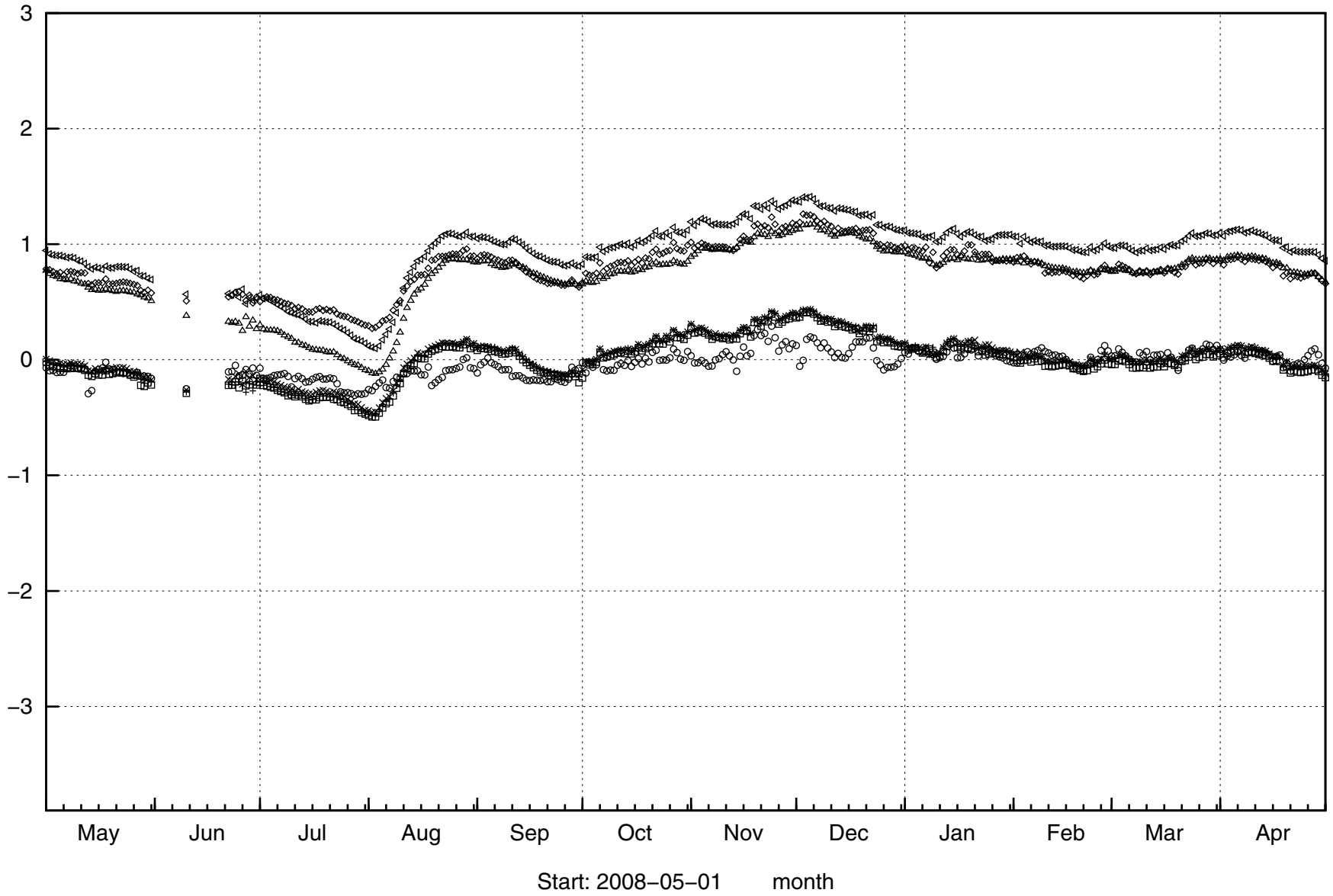
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72

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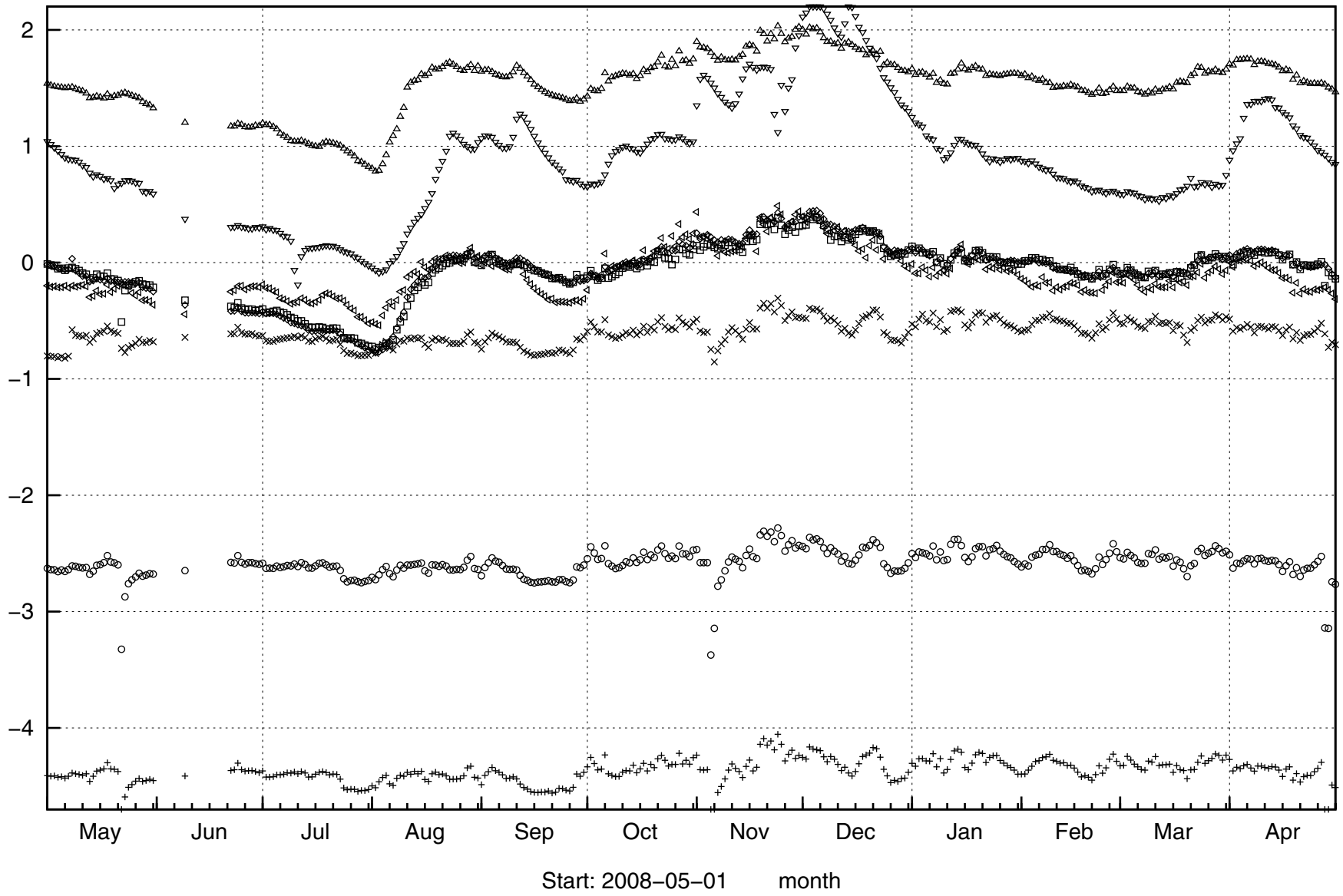
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73

2008-06-09 15:59:16

KFM03A



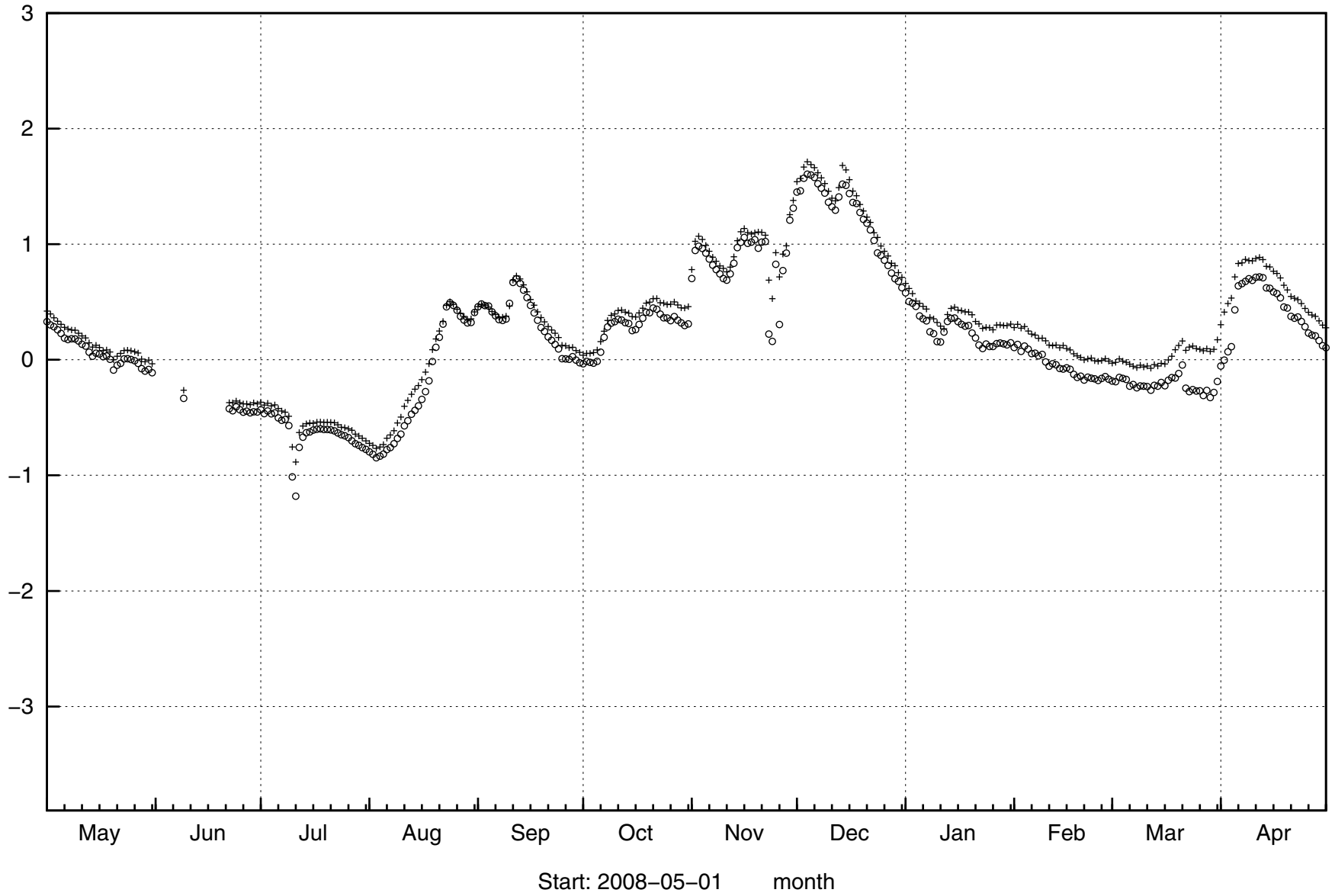
74

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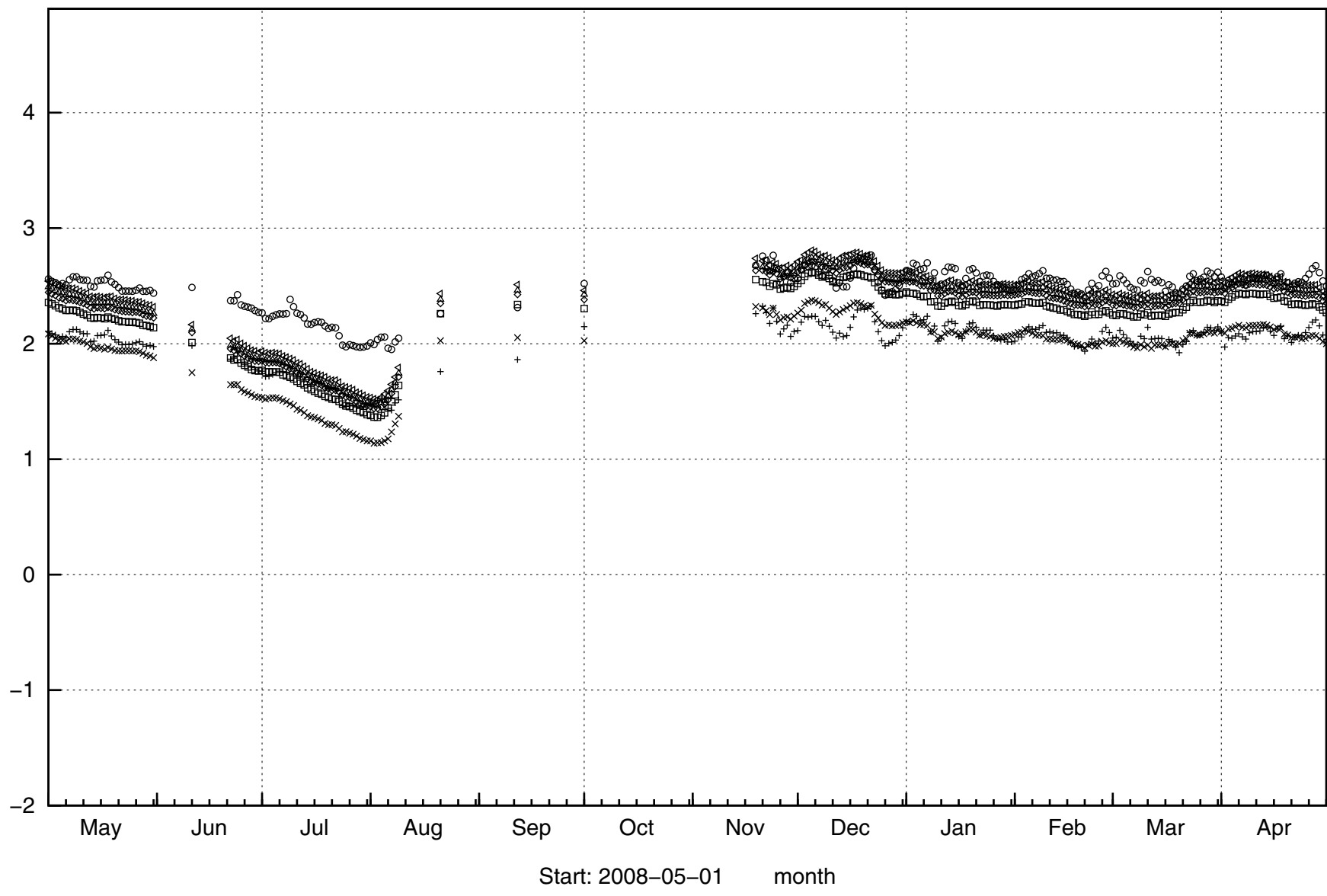
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75  
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KFM04A

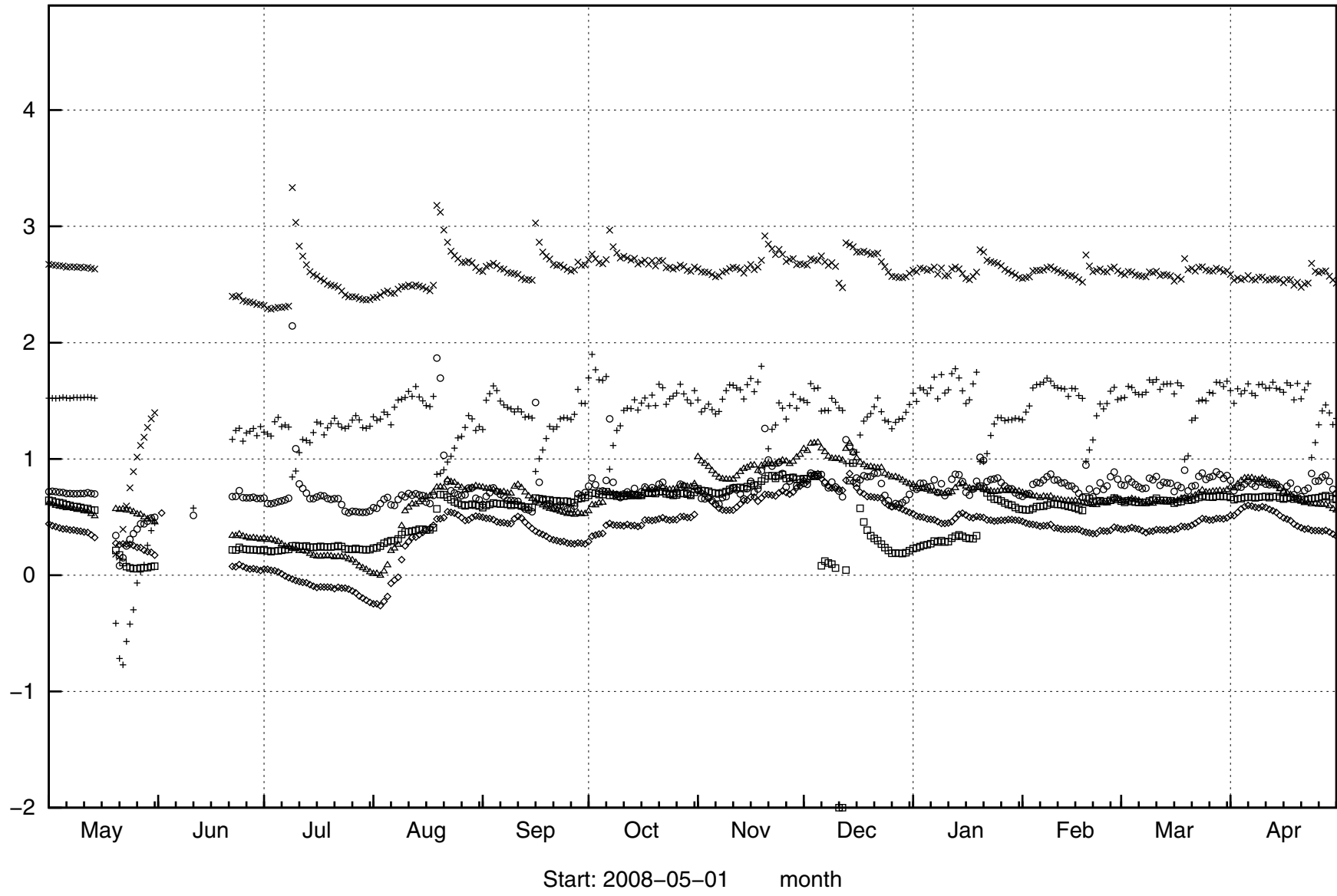


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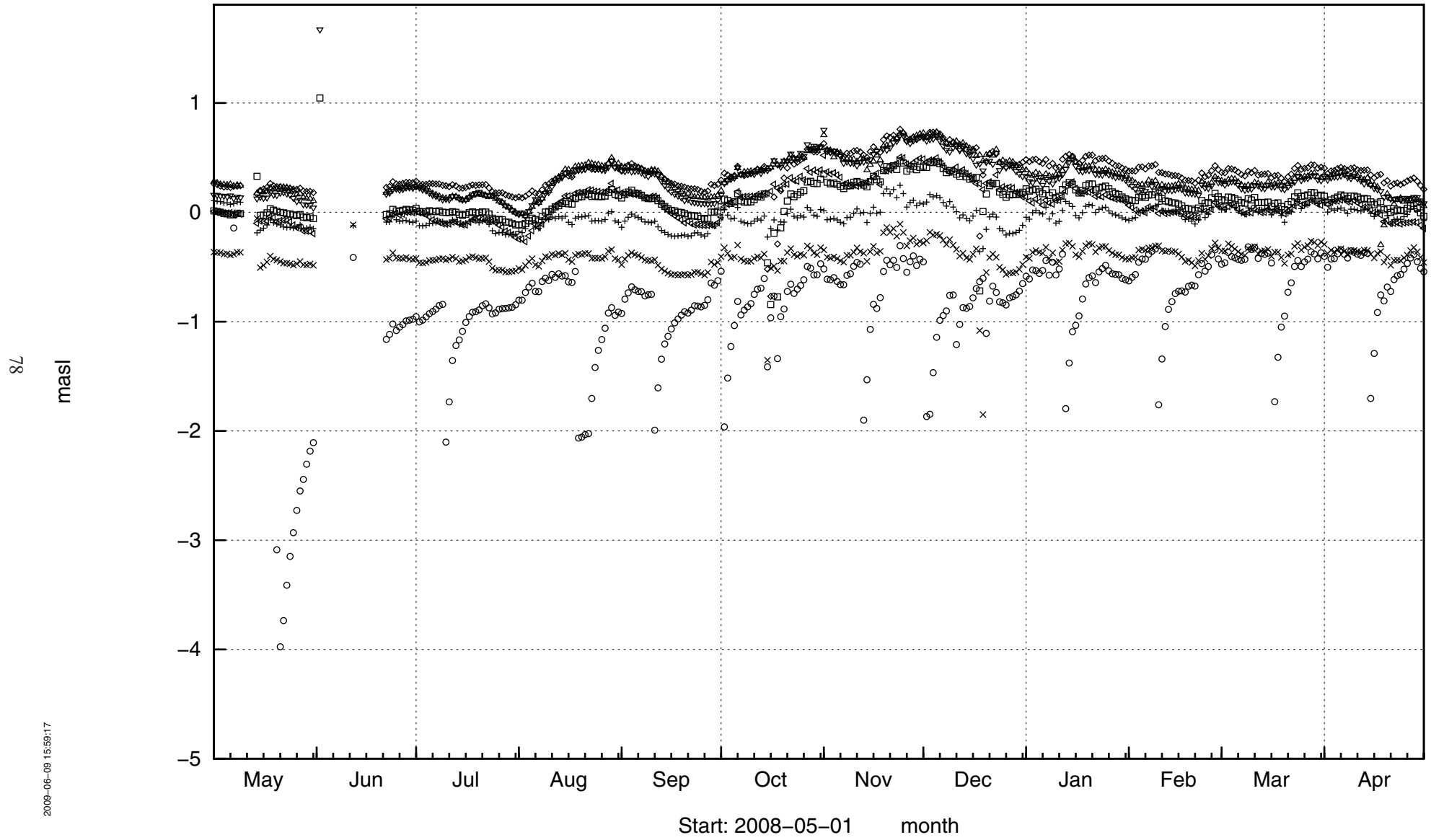
LL  
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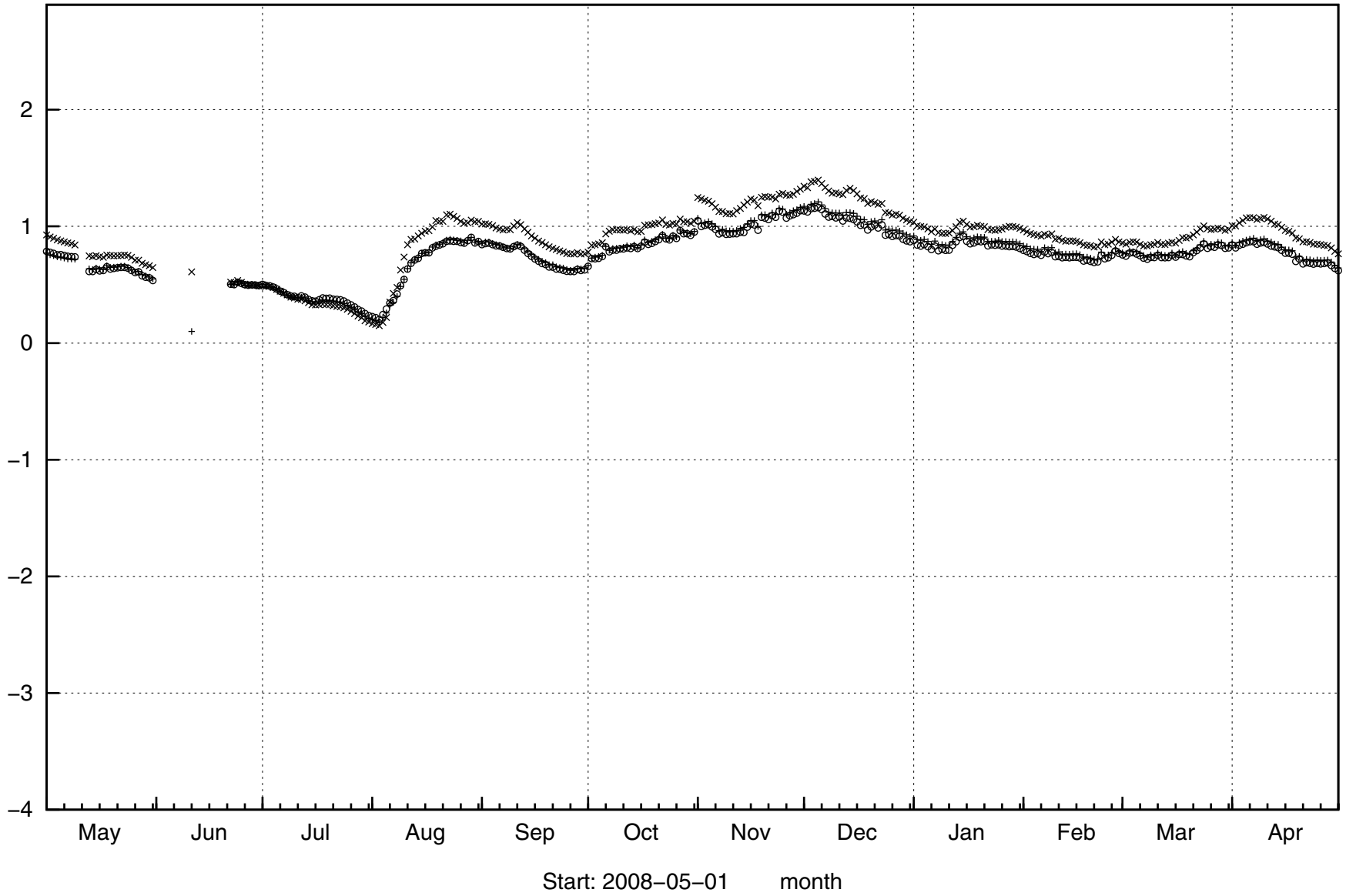


KFM06A



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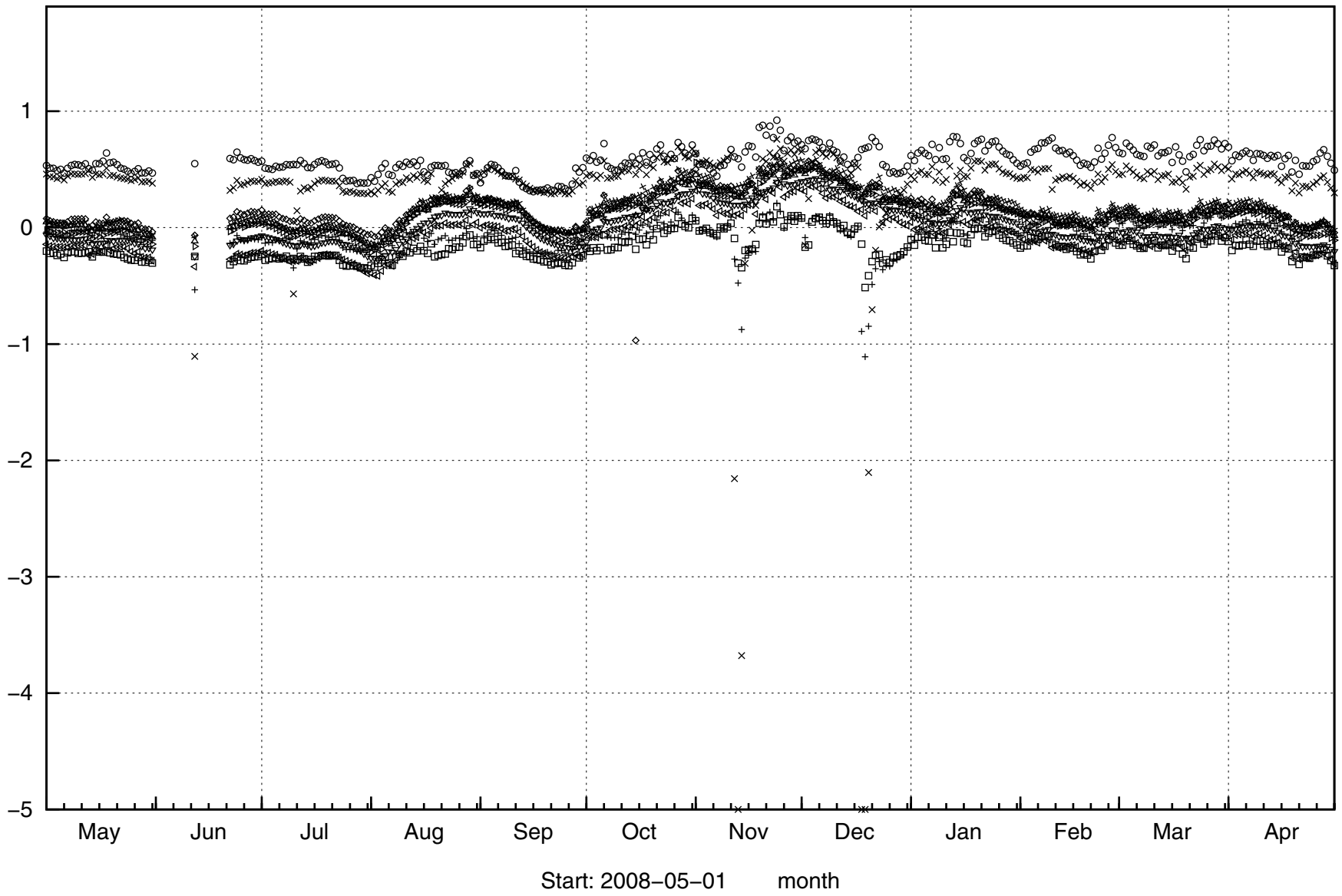
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79

2009-06-09 15:59:17

KFM06C



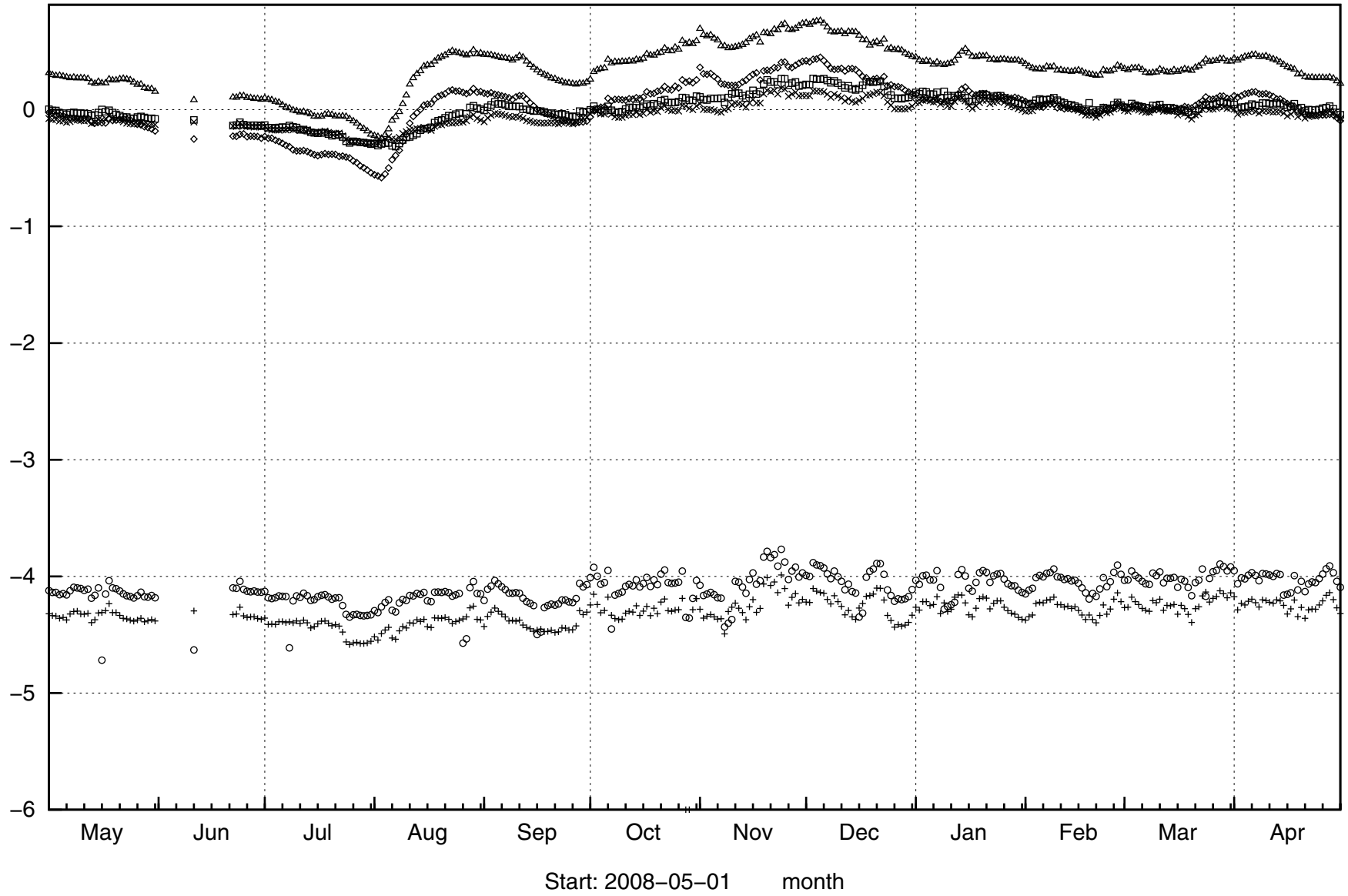
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Start: 2008-05-01 month

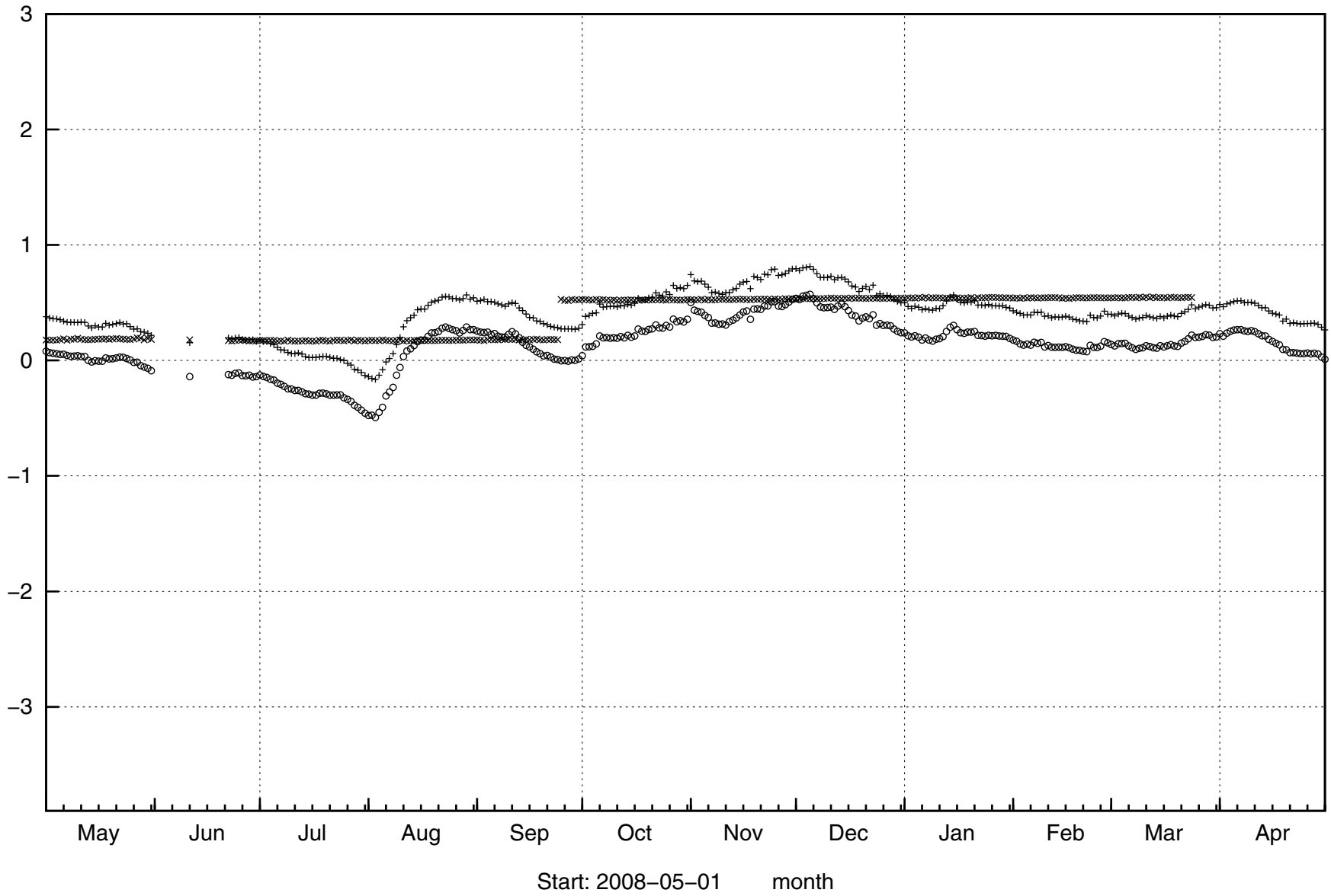
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18  
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KFM07B

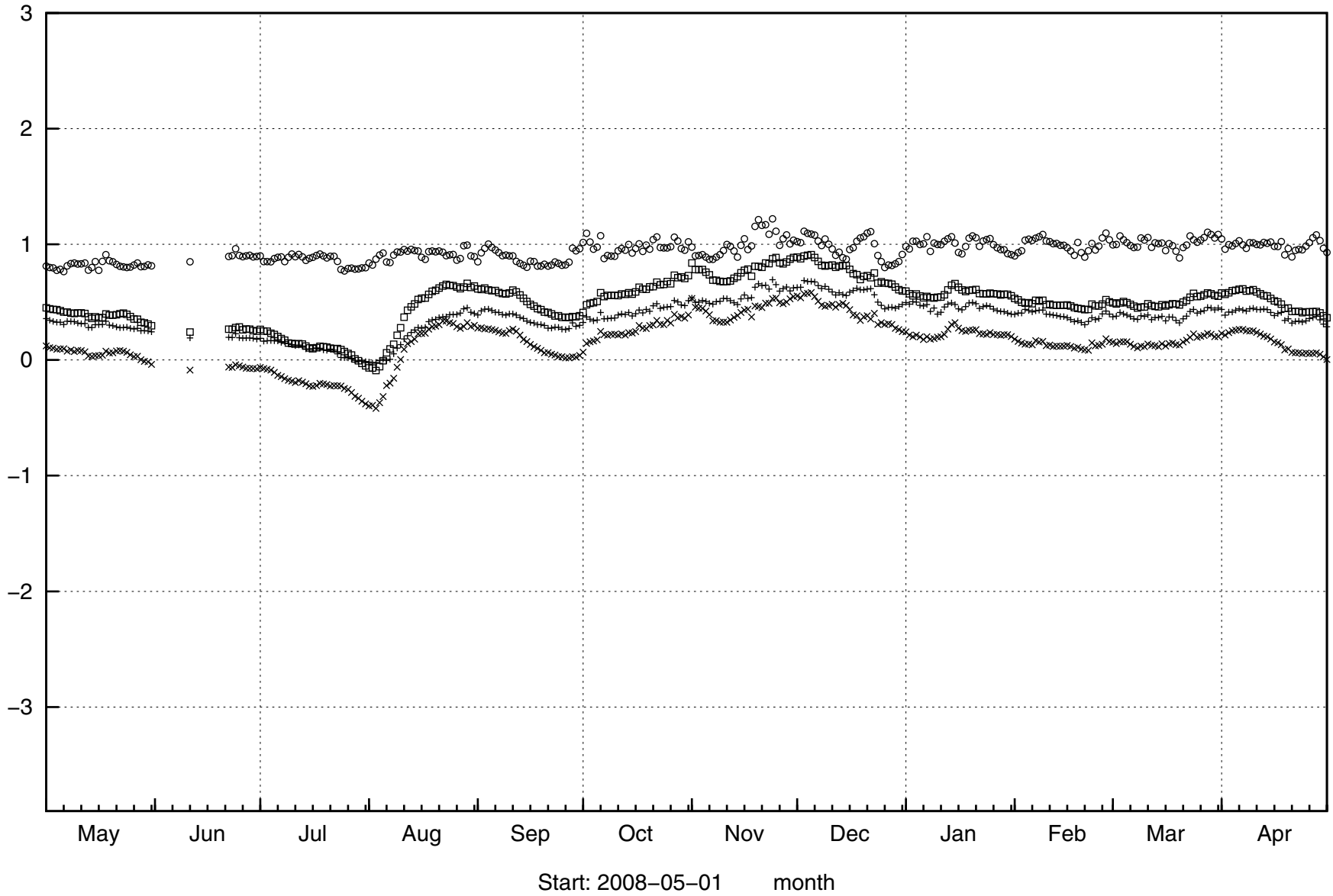


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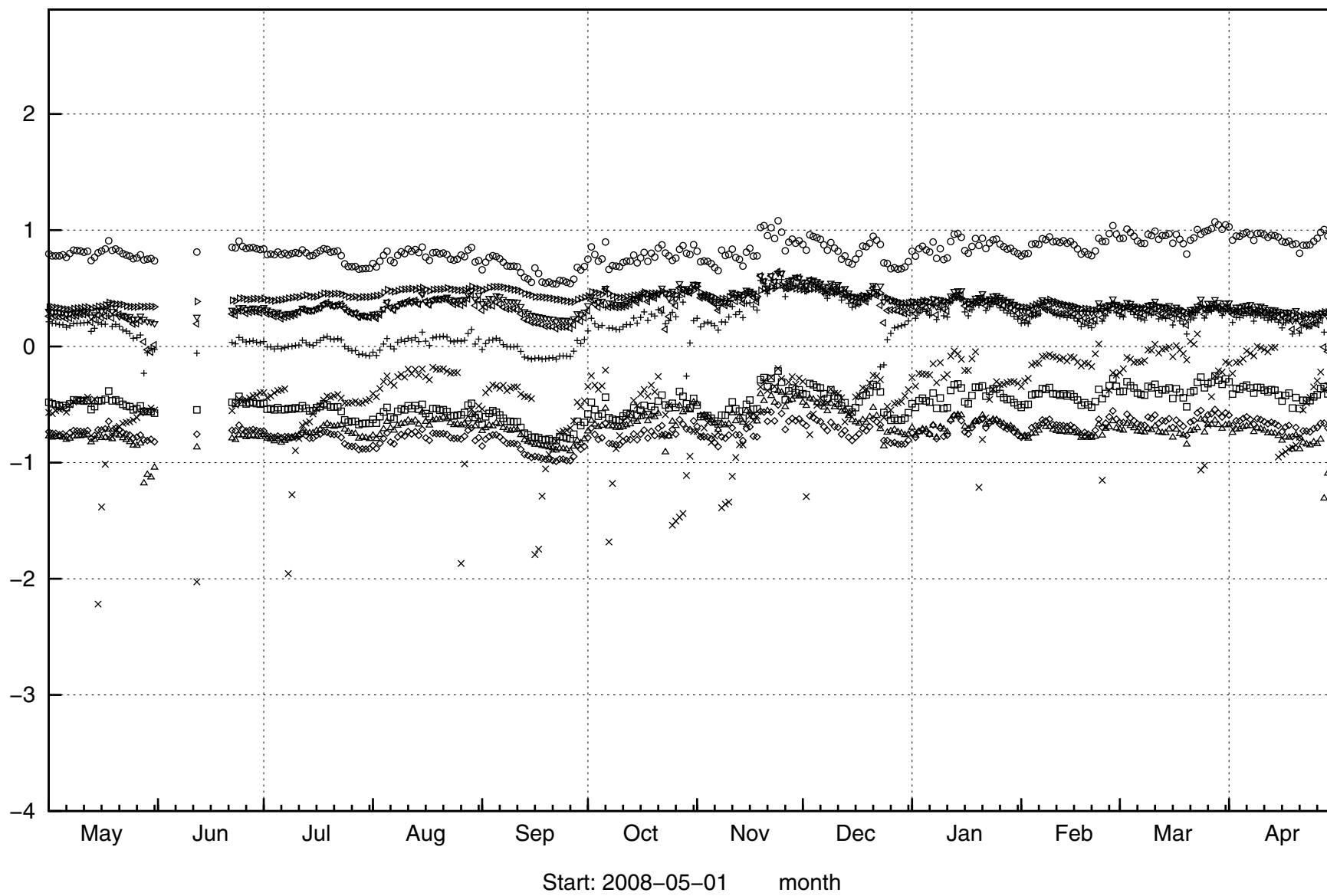
KFM07C



KFM08A

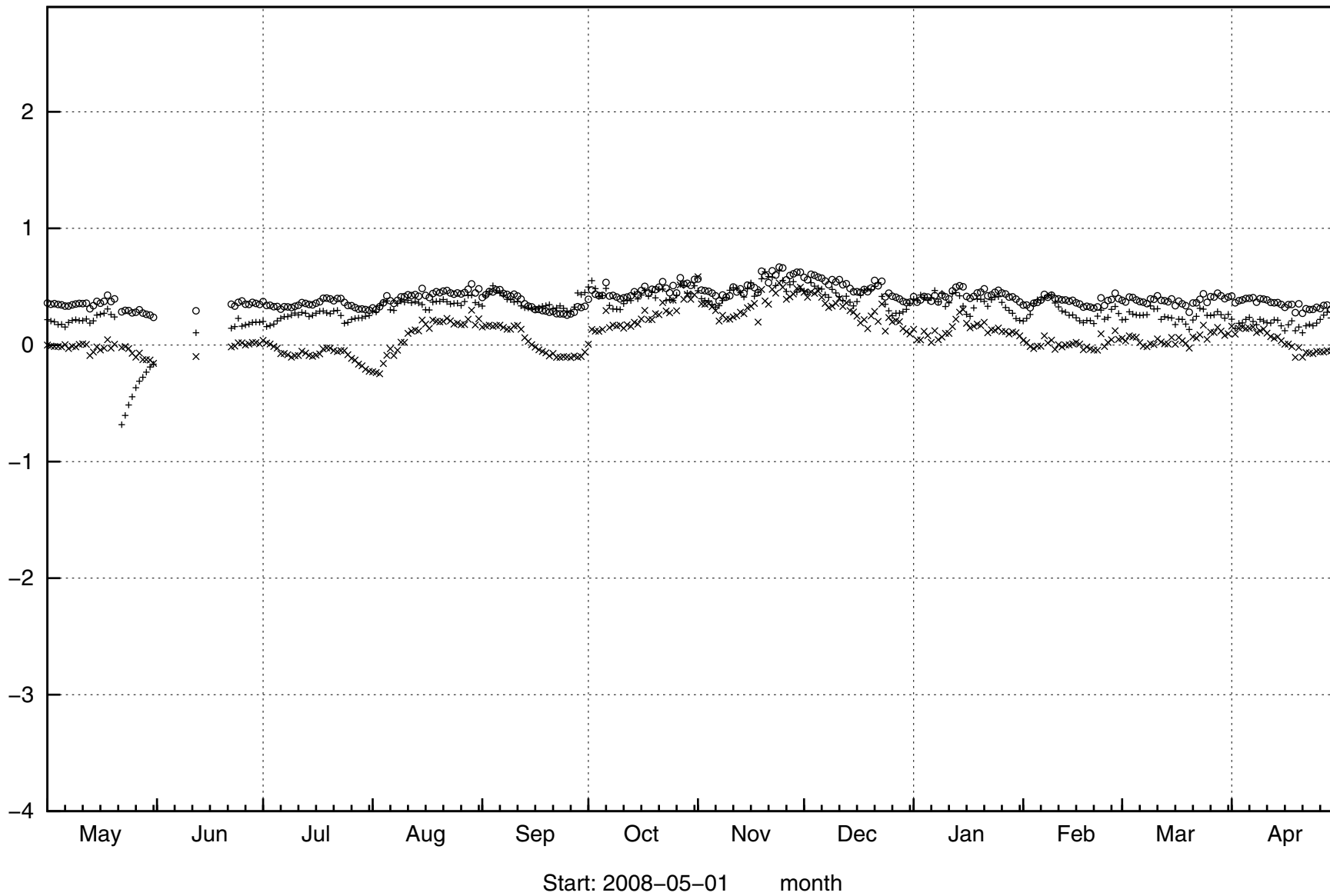
84

masl



2009-06-09 15:59:17

KFM08B



58

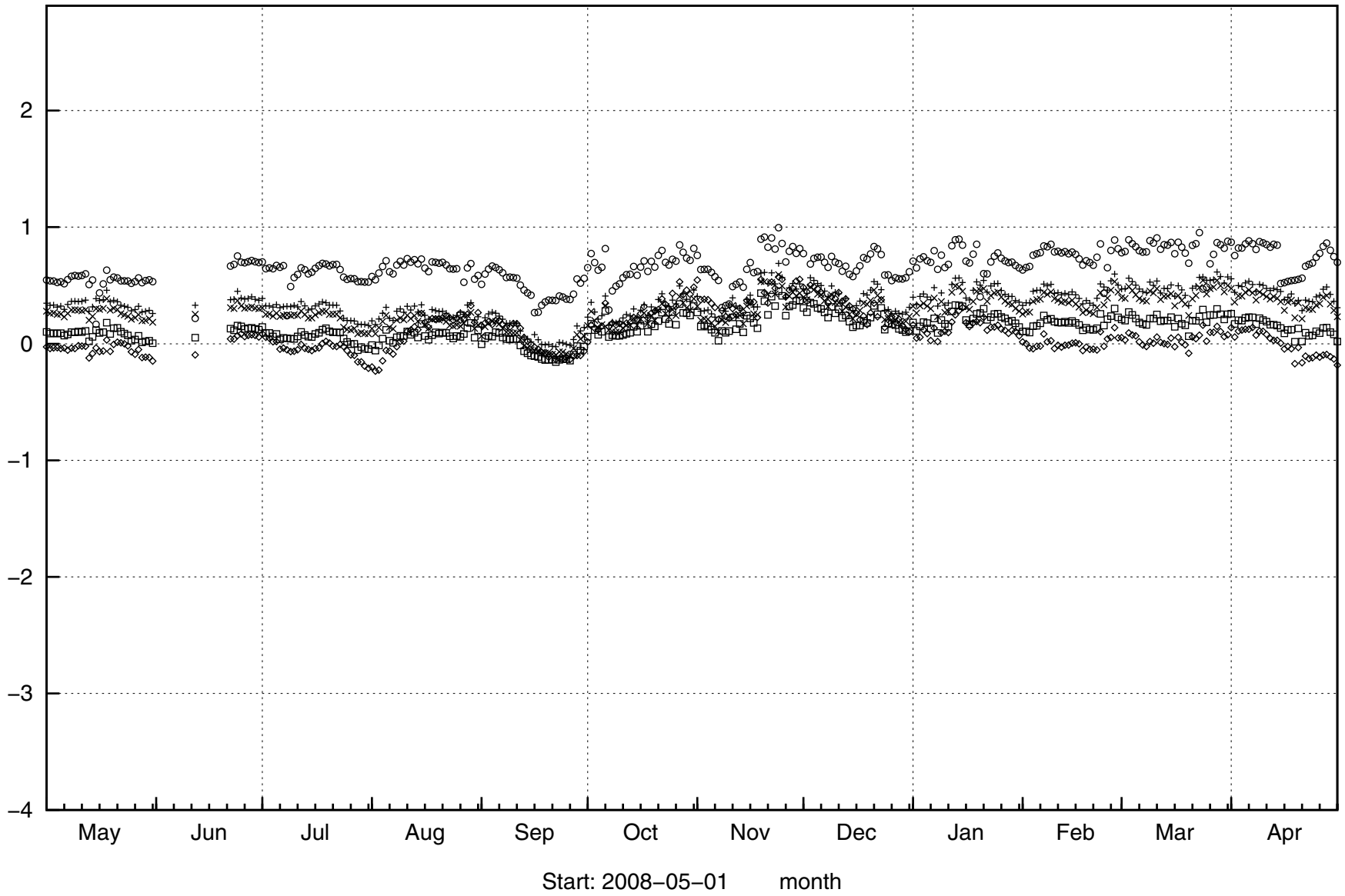
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2008-06-09 15:59:17

Start: 2008-05-01 month



KFM08C

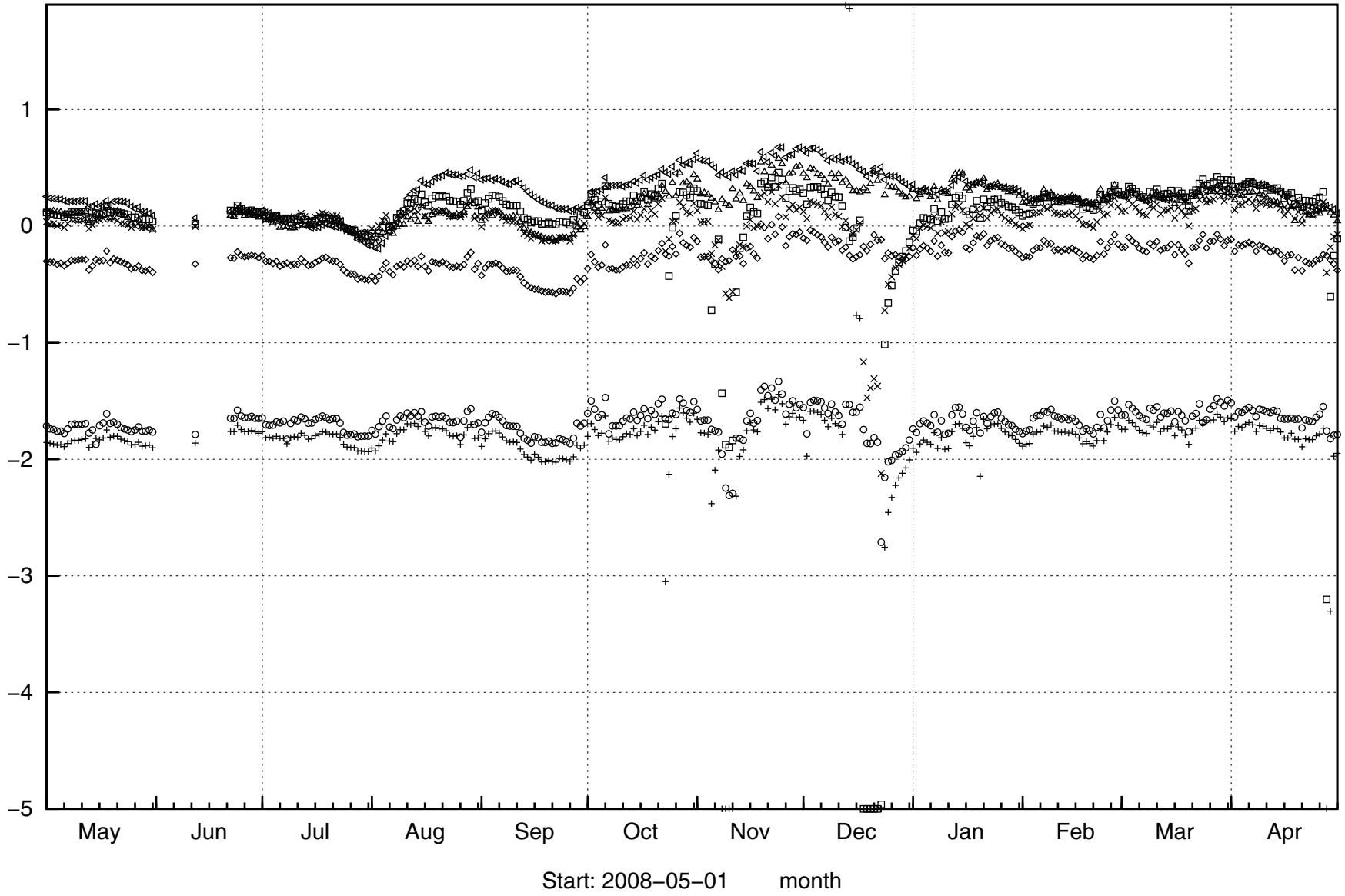


98

masl

2009-06-09 15:59:17

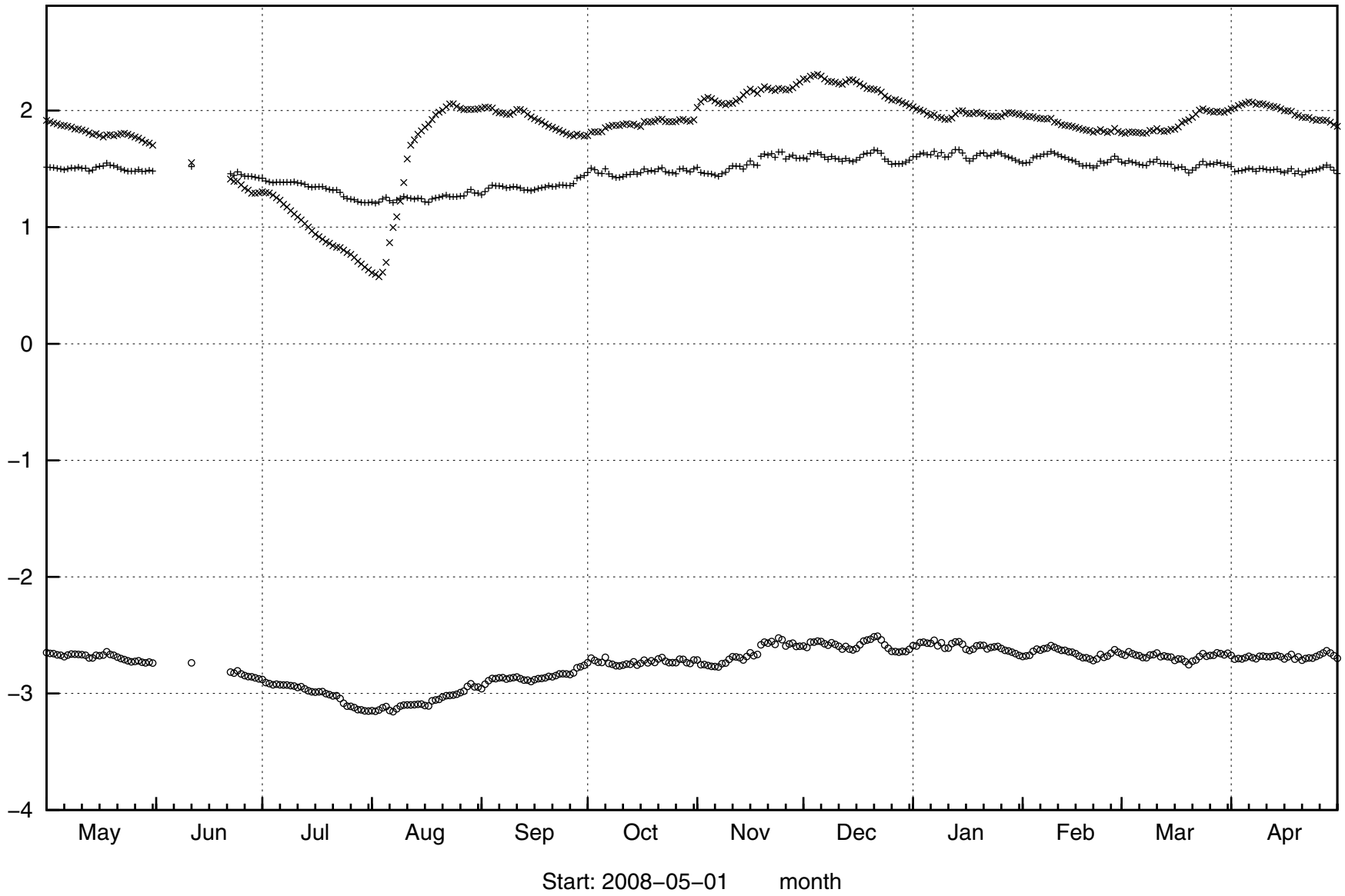
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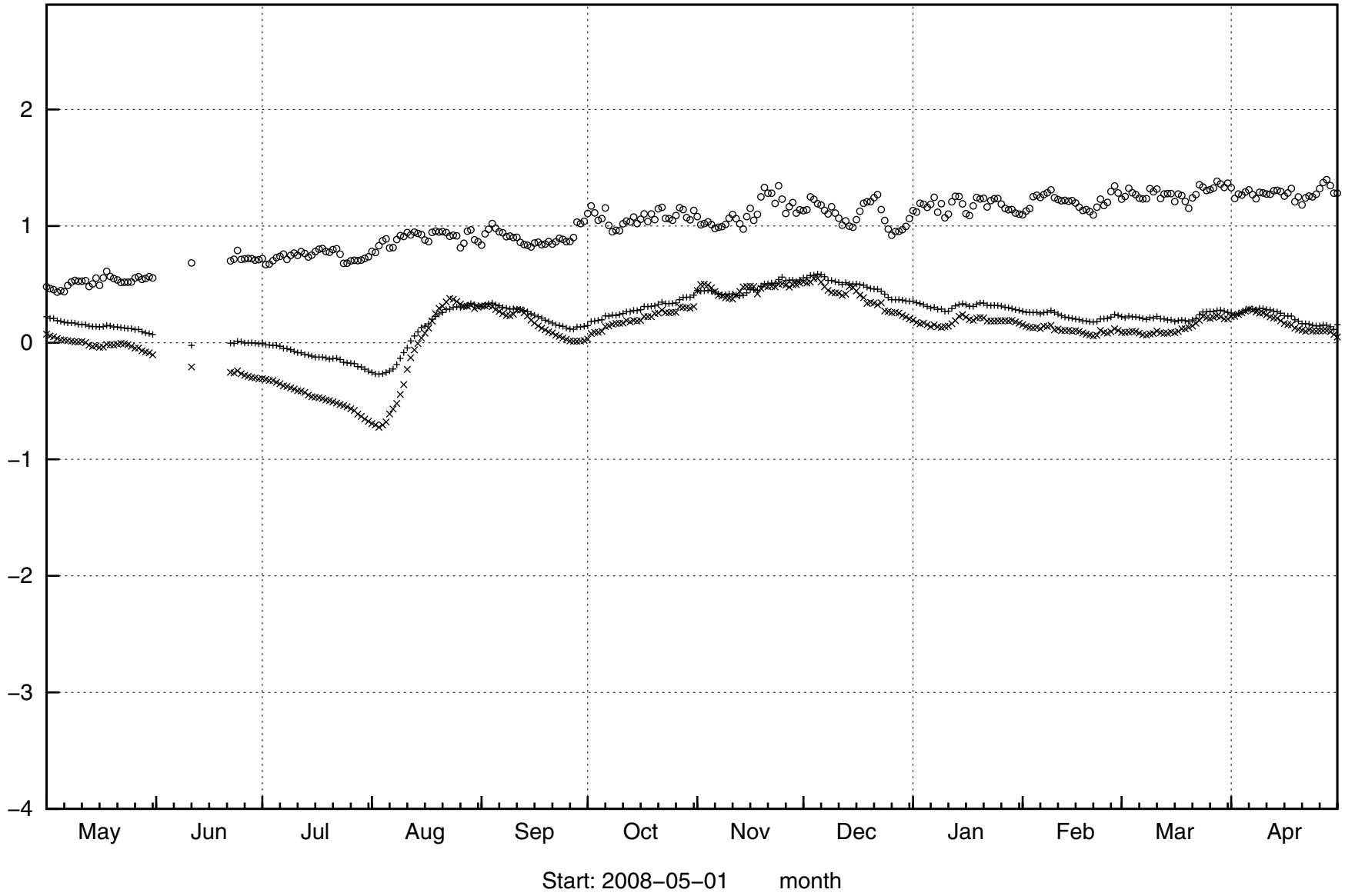
87

2009-06-09 15:59:18

KFM09A



KFM09B



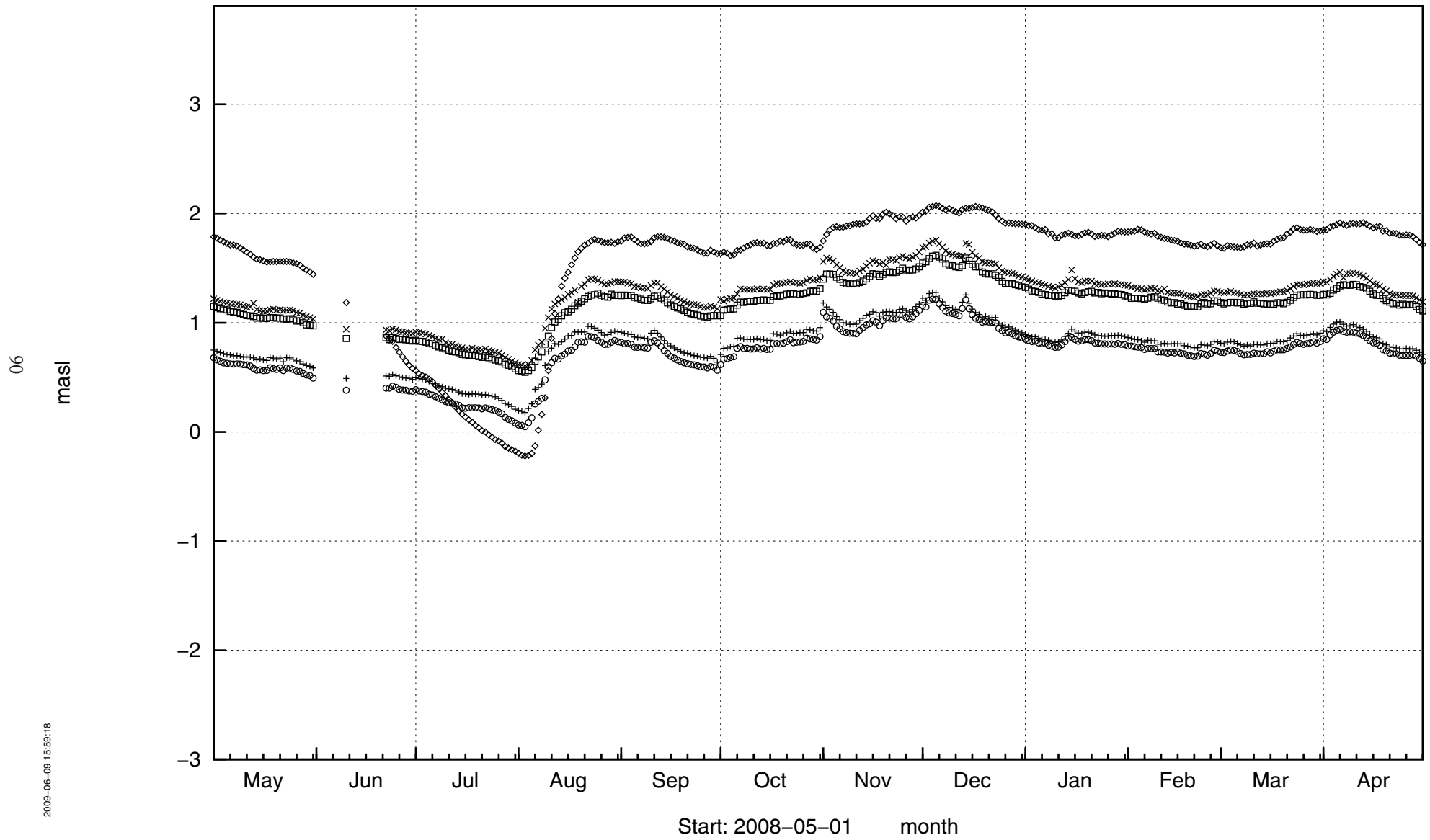
68

masl

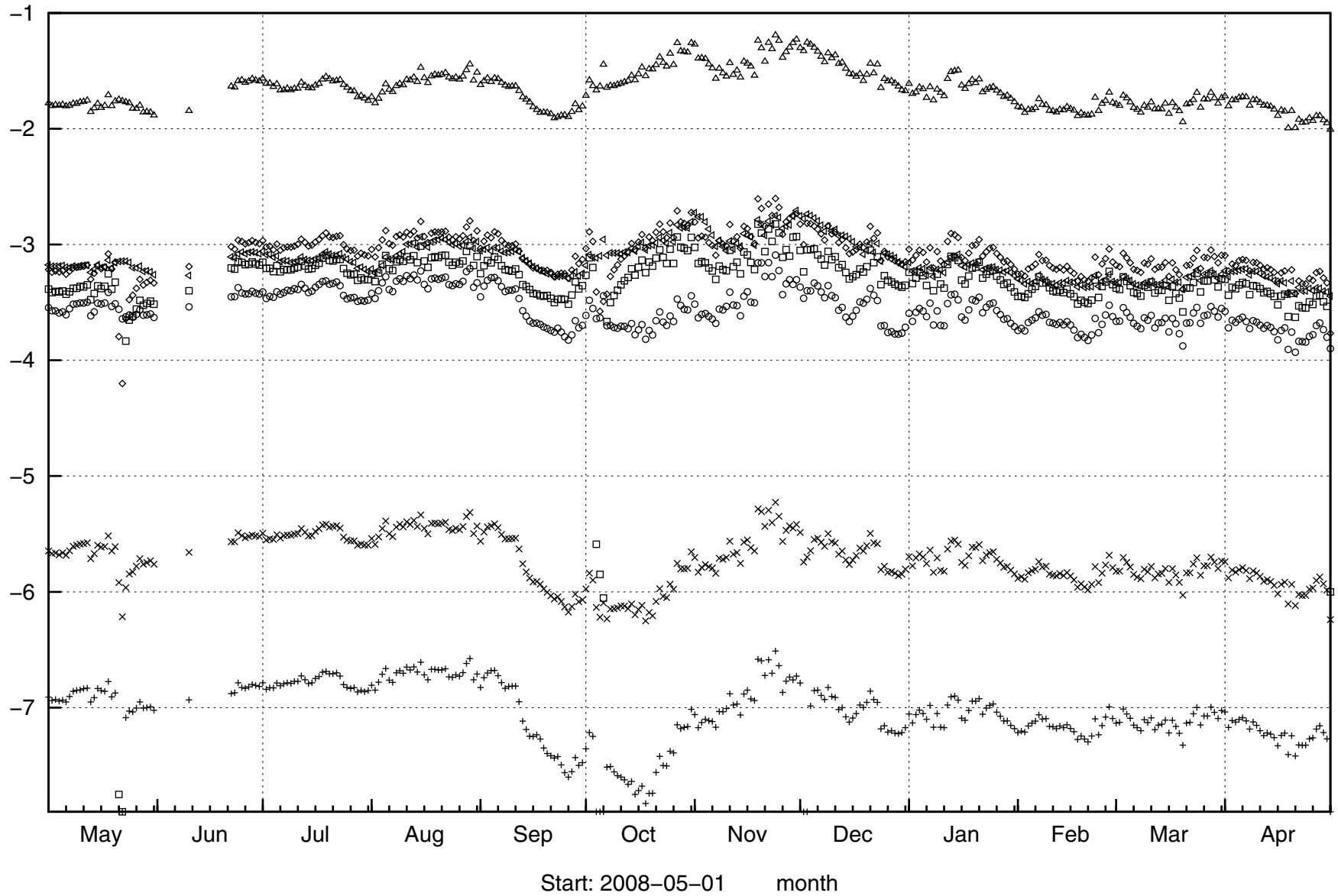
2009-06-09 15:59:18

Start: 2008-05-01 month

KFM10A



KFM11A

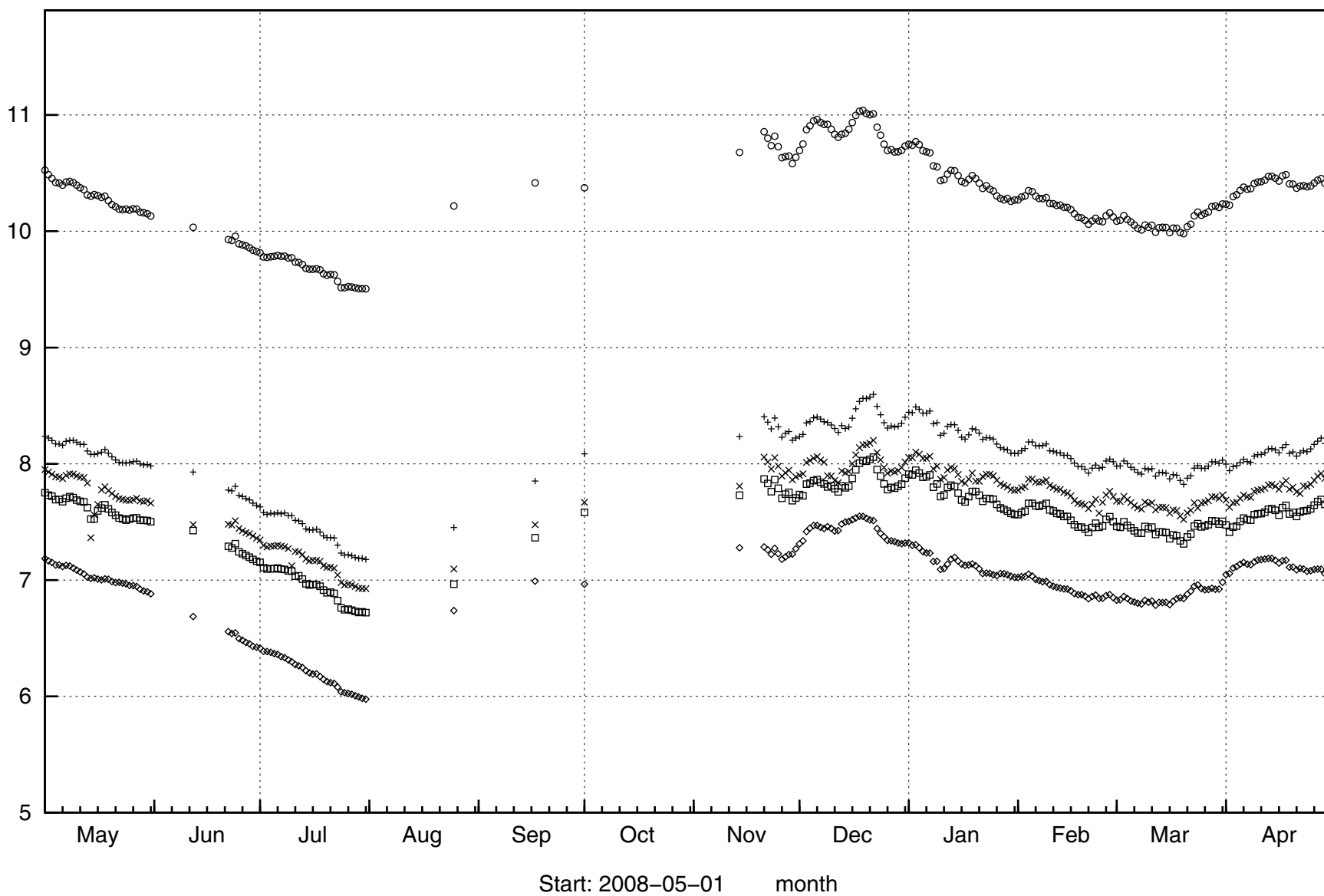


I6

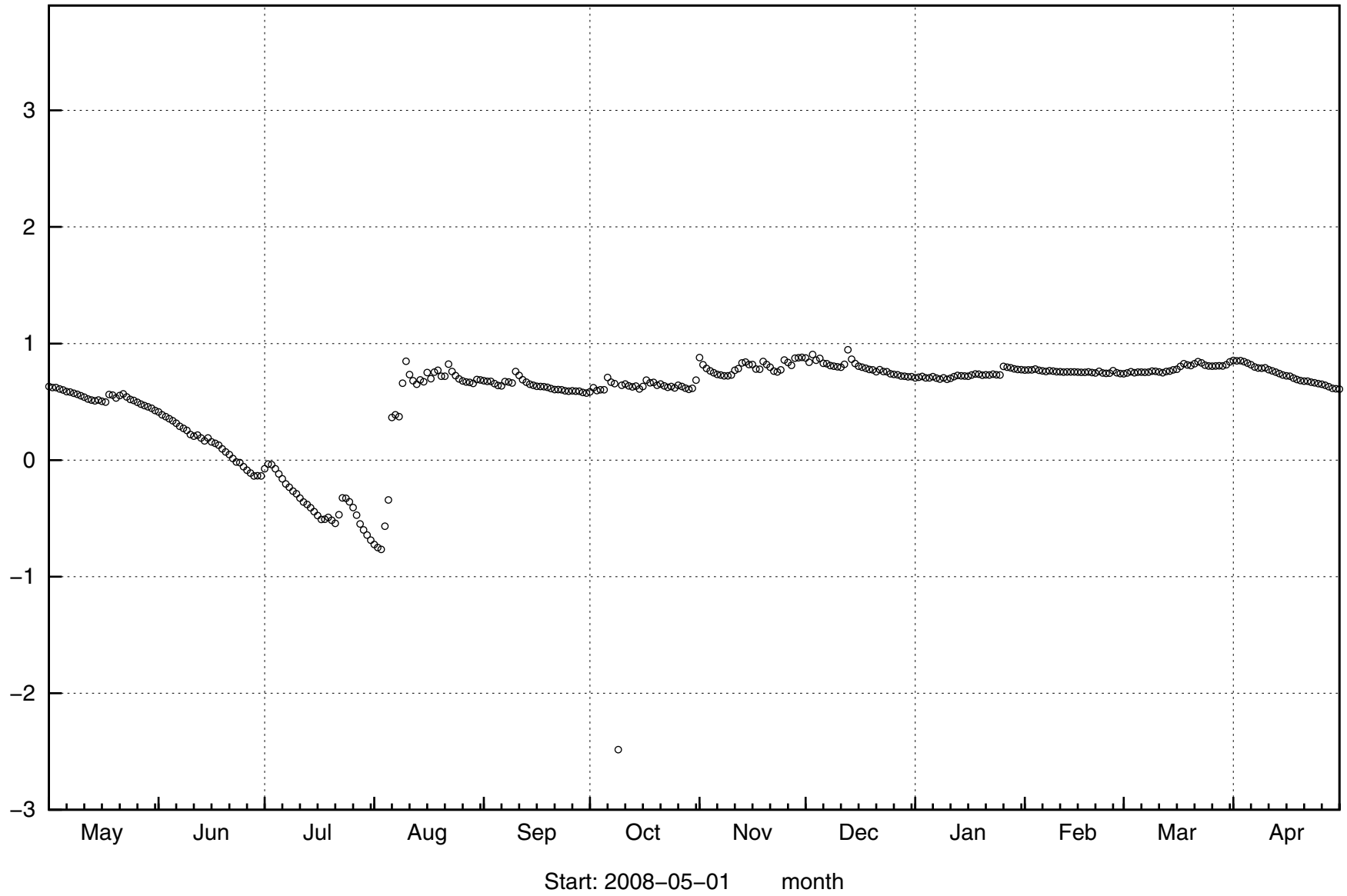
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2009-06-09 15:59:18

KFM12A



SFM0001

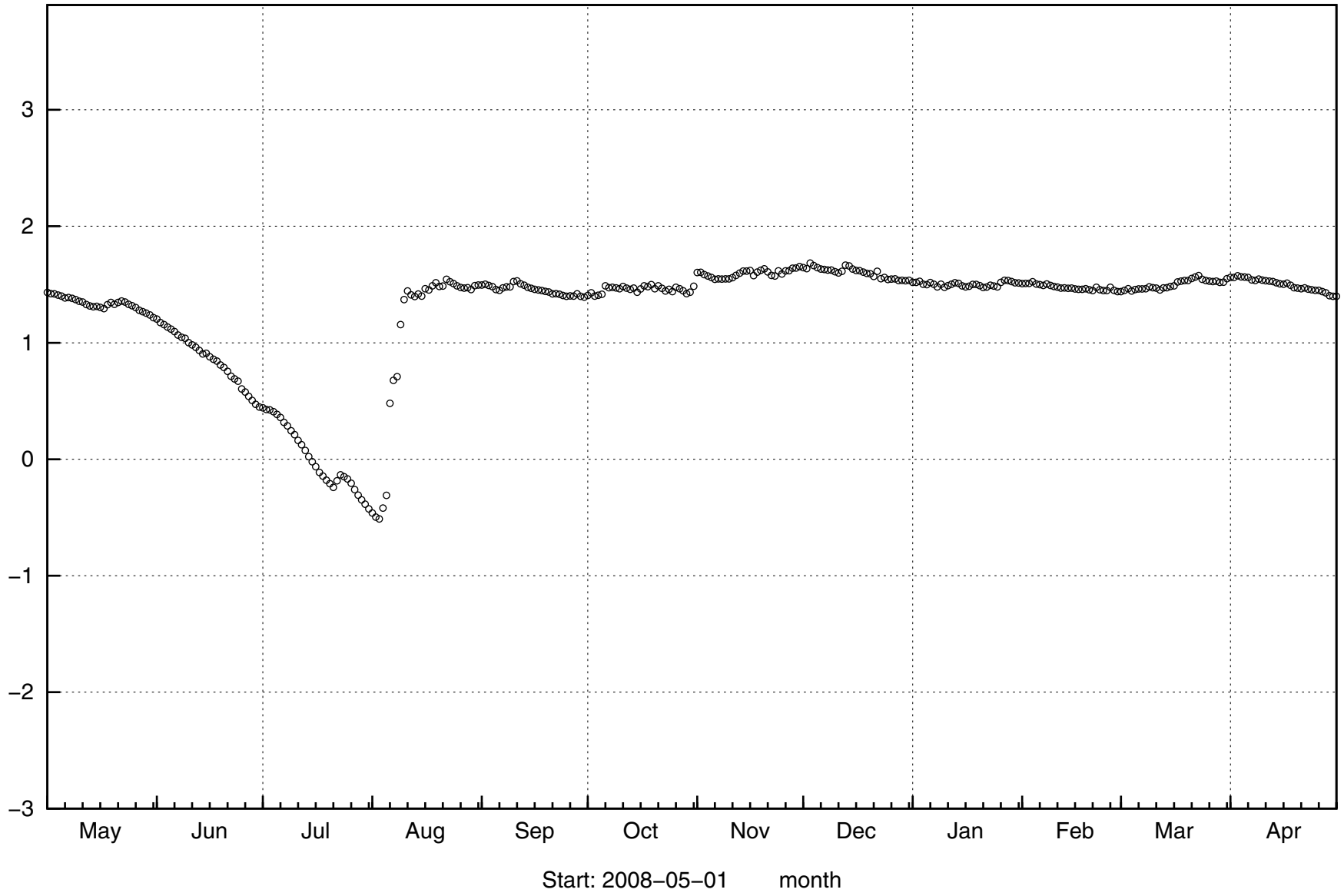


93

2009-06-09 15:59:18



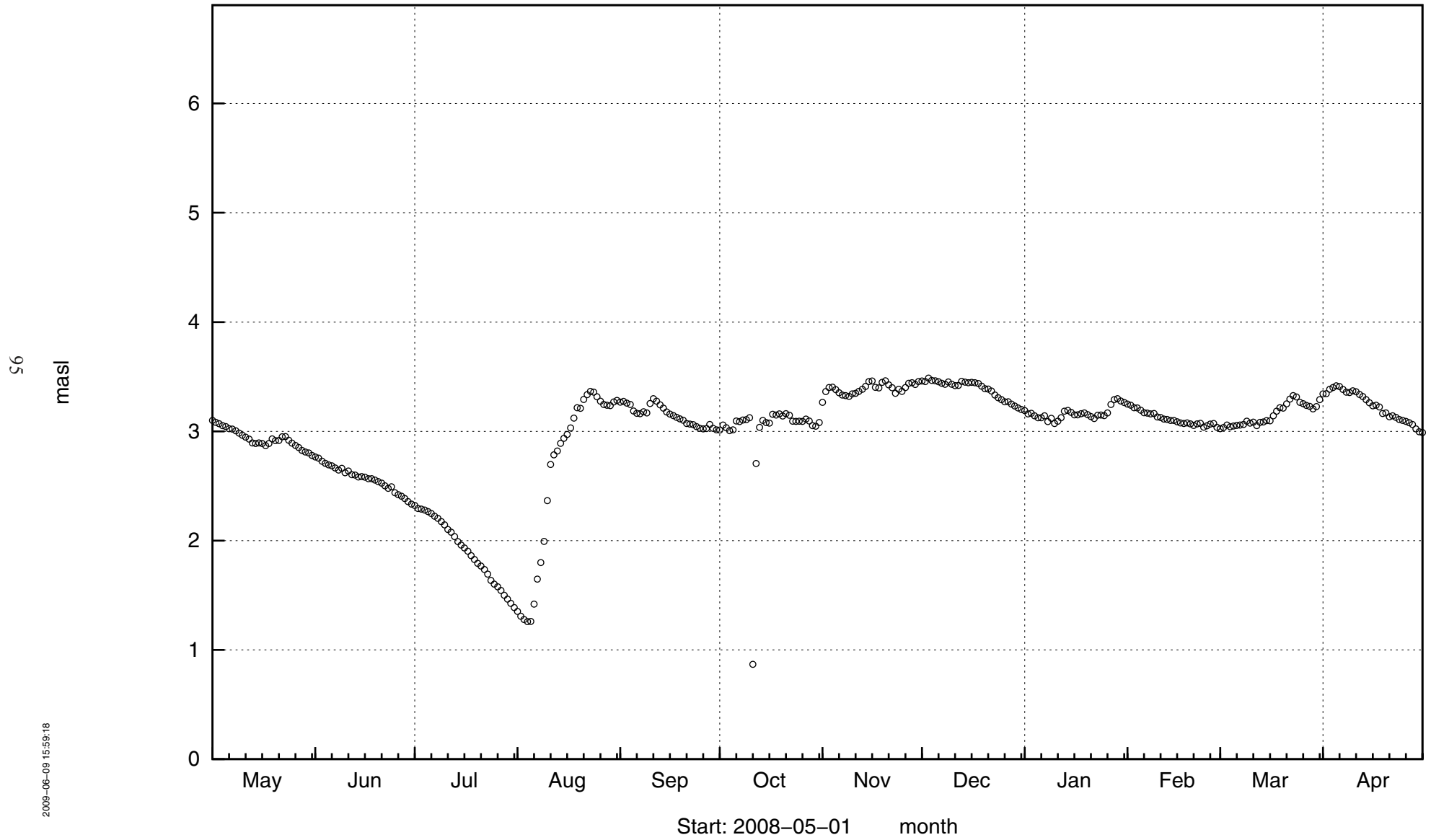
SFM0003



94

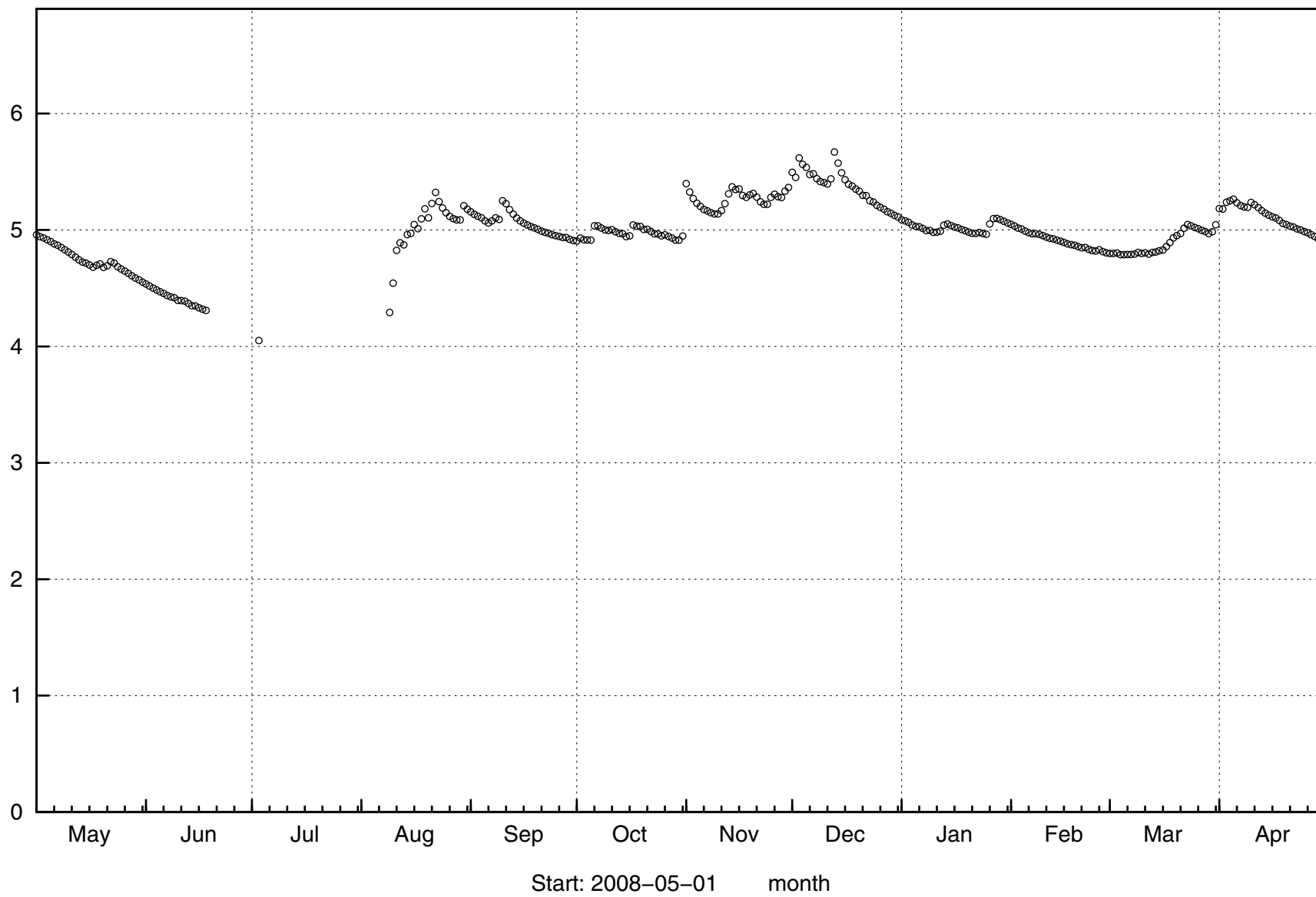
2009-06-09 15:59:18

SFM0004



2009-06-09 15:59:18

SFM0005



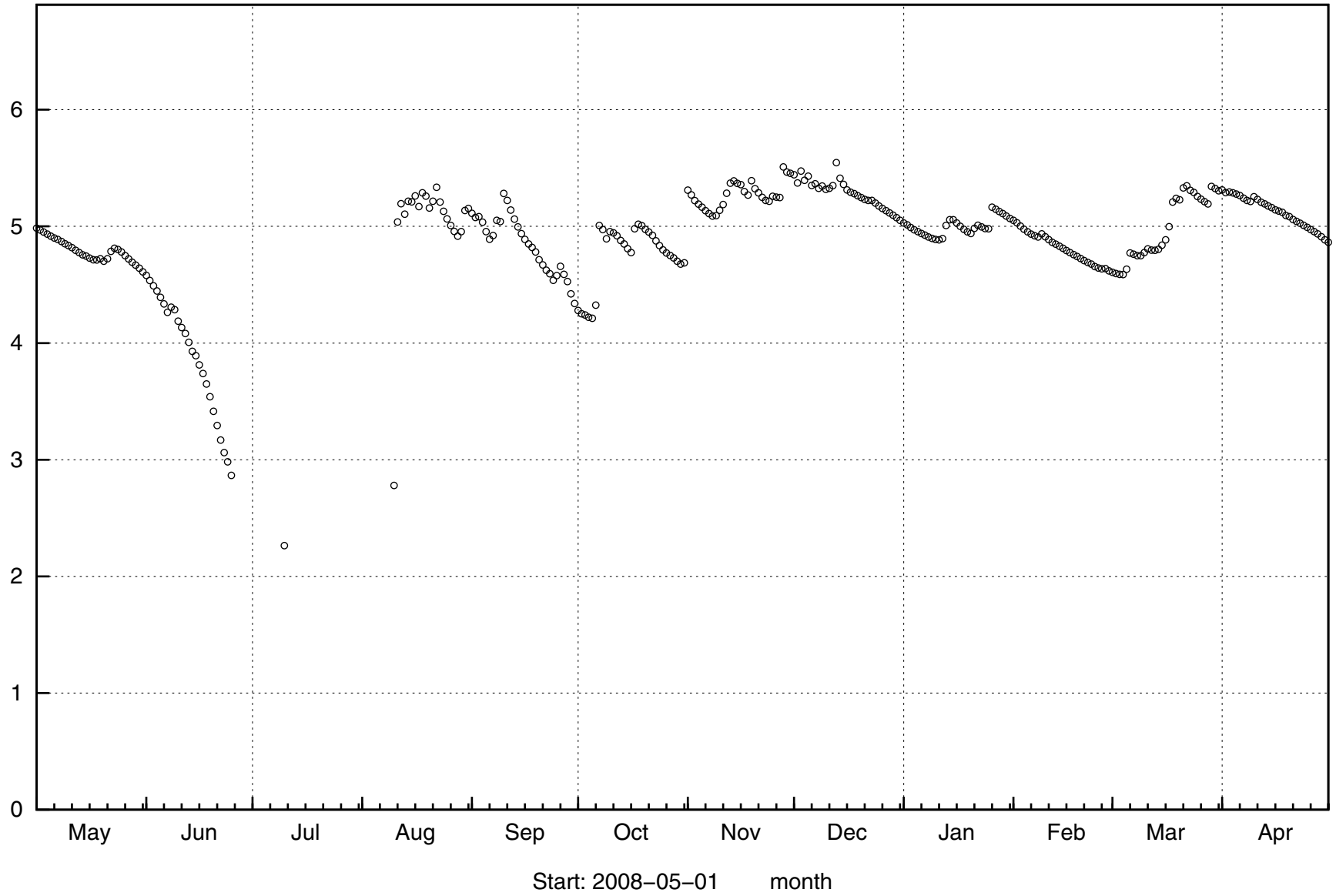
96

masl

2009-06-09 15:59:18

Start: 2008-05-01 month

SFM0006

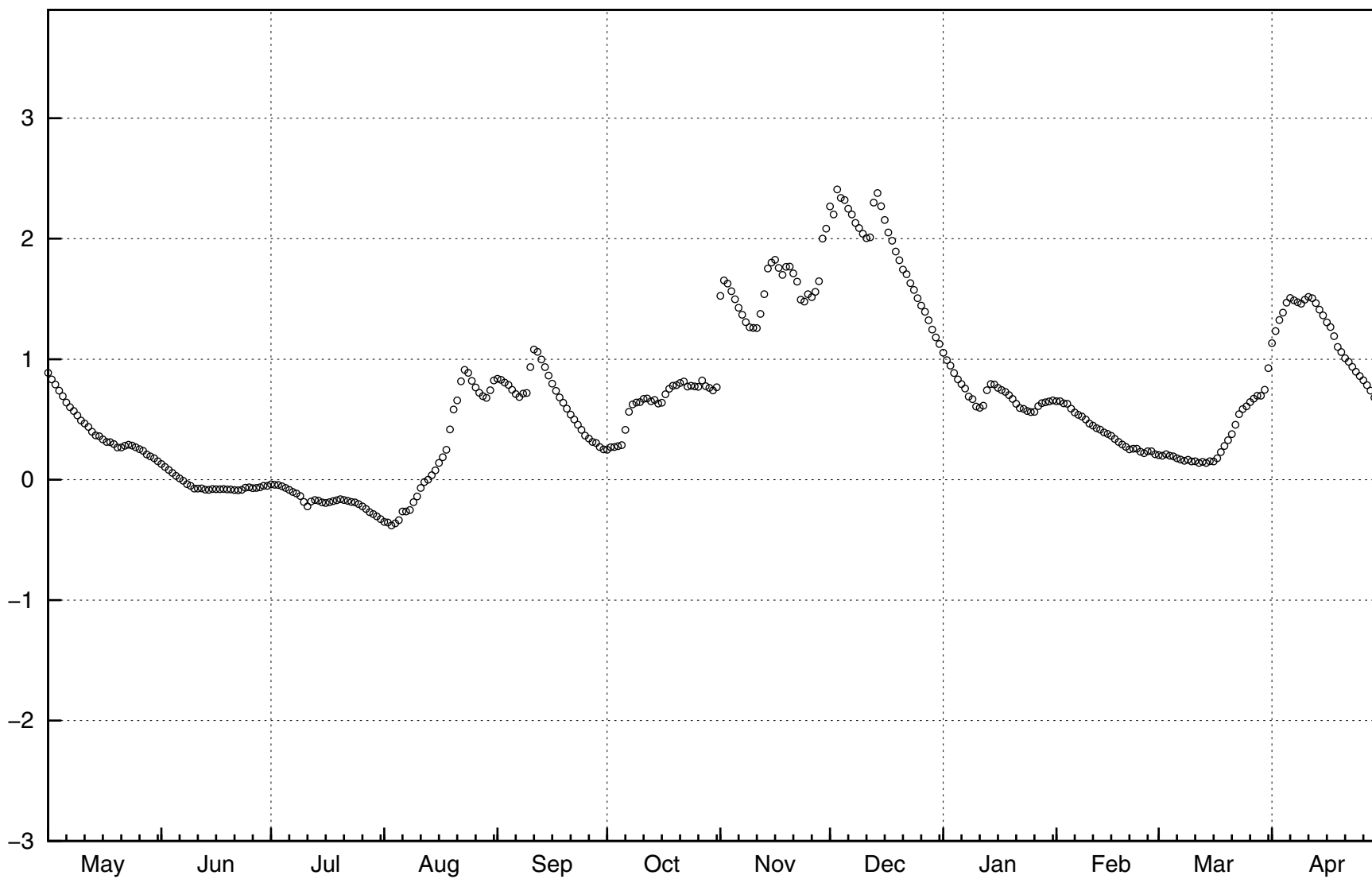


97

2009-06-09 15:59:18

SFM0008

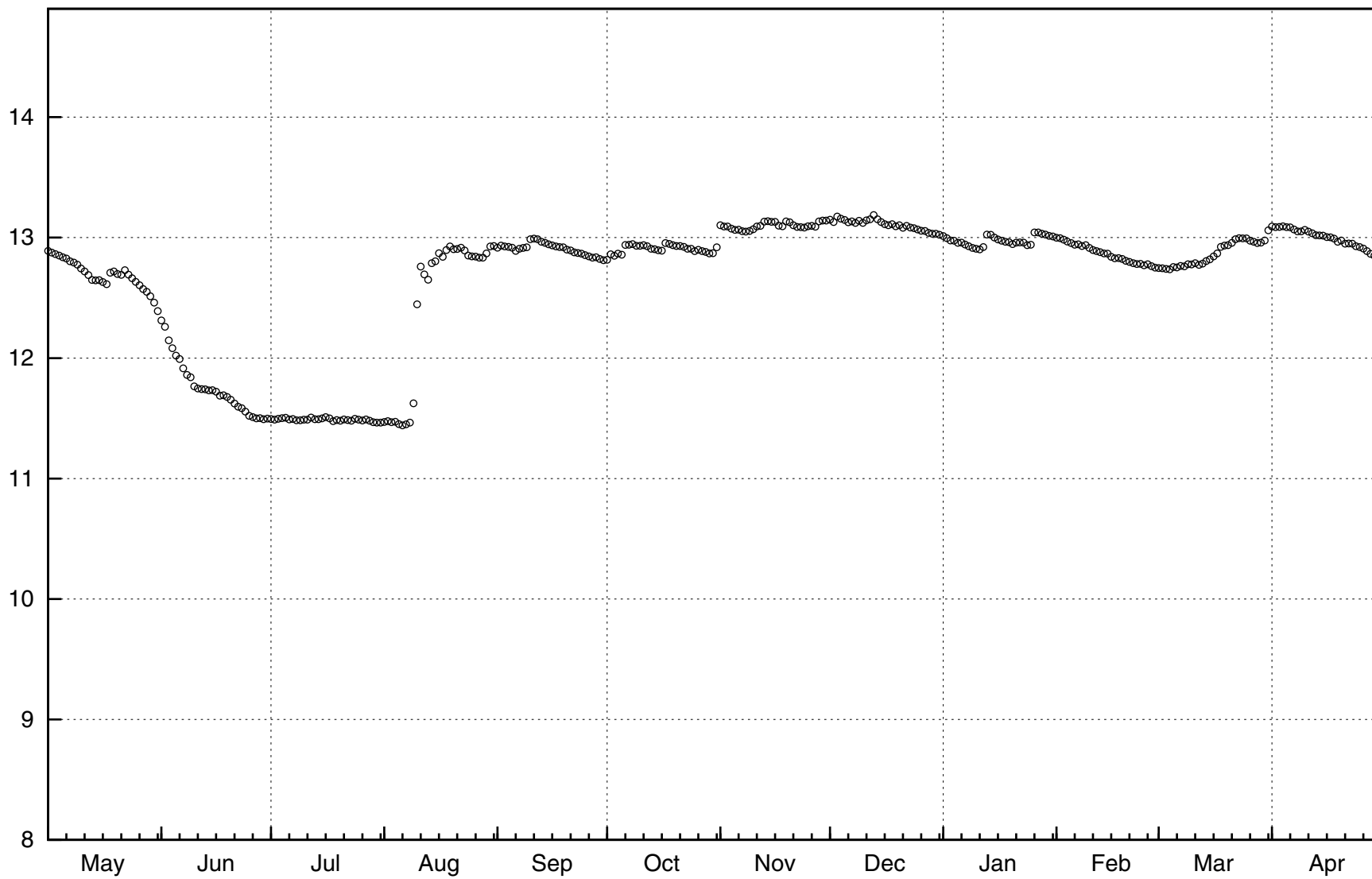
86  
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SFM0010

66

masl

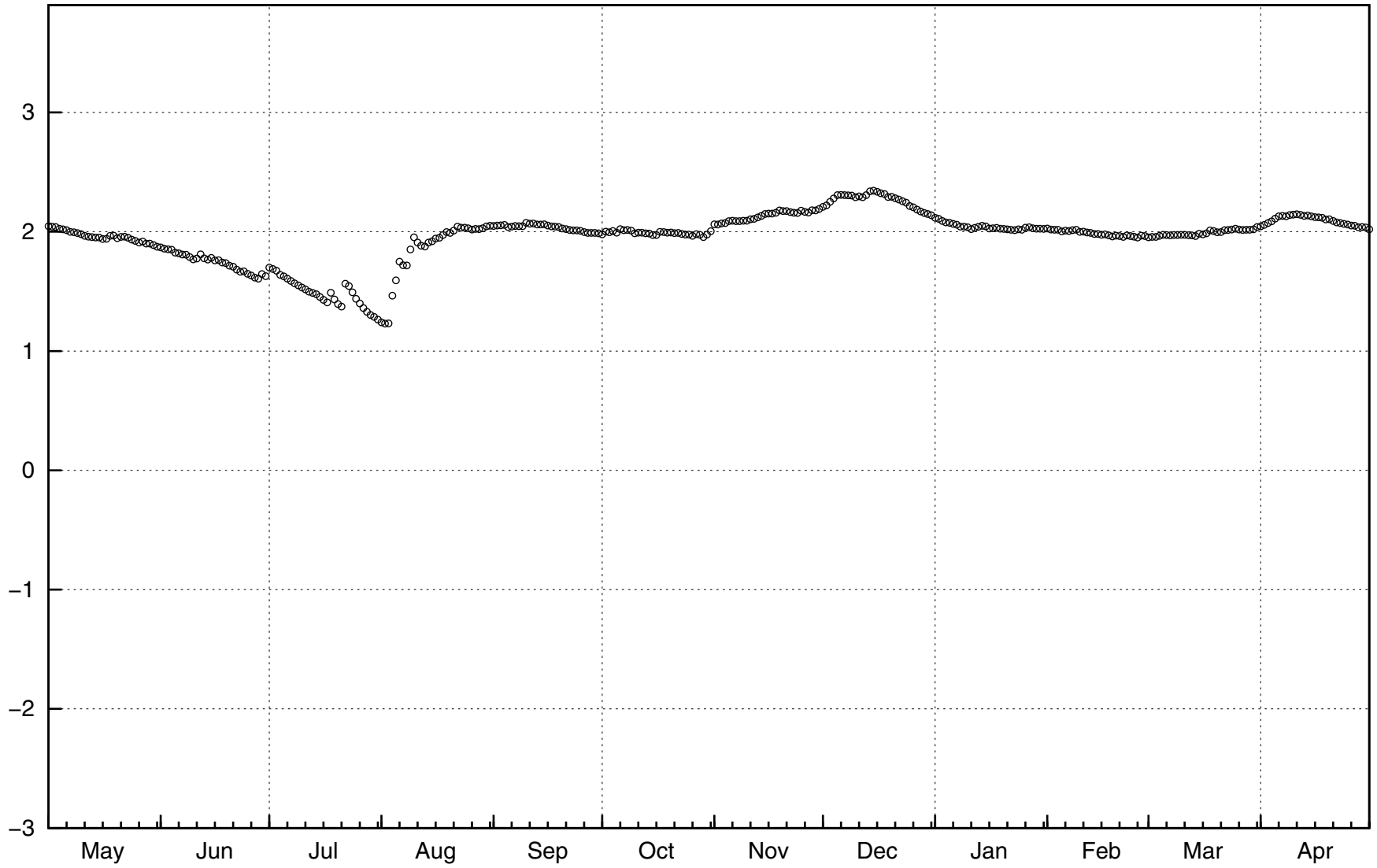


2009-06-09 15:59:19

Start: 2008-05-01 month

SFM0011

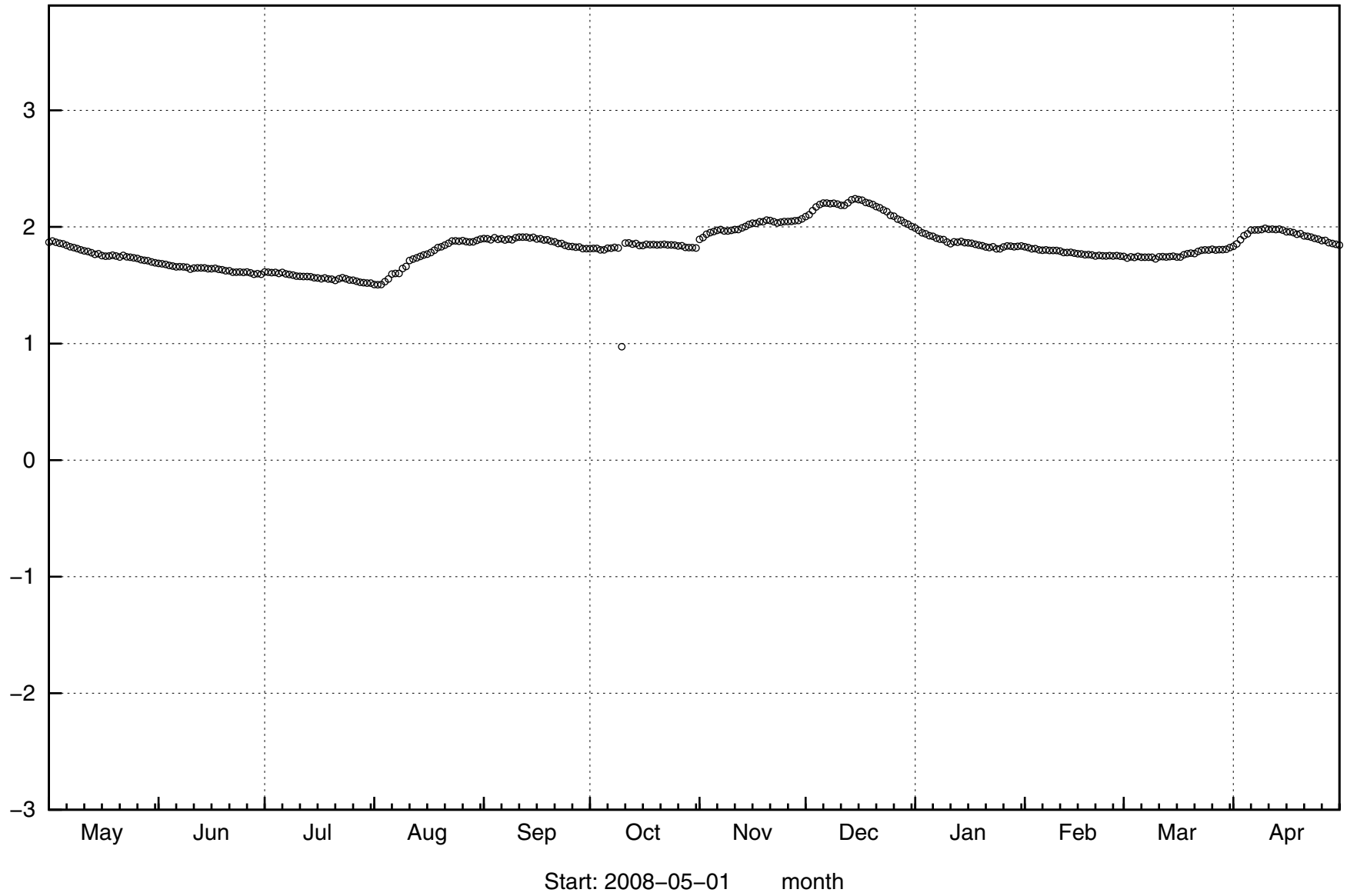
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2009-06-09 15:59:19

Start: 2008-05-01 month

SFM0012



101

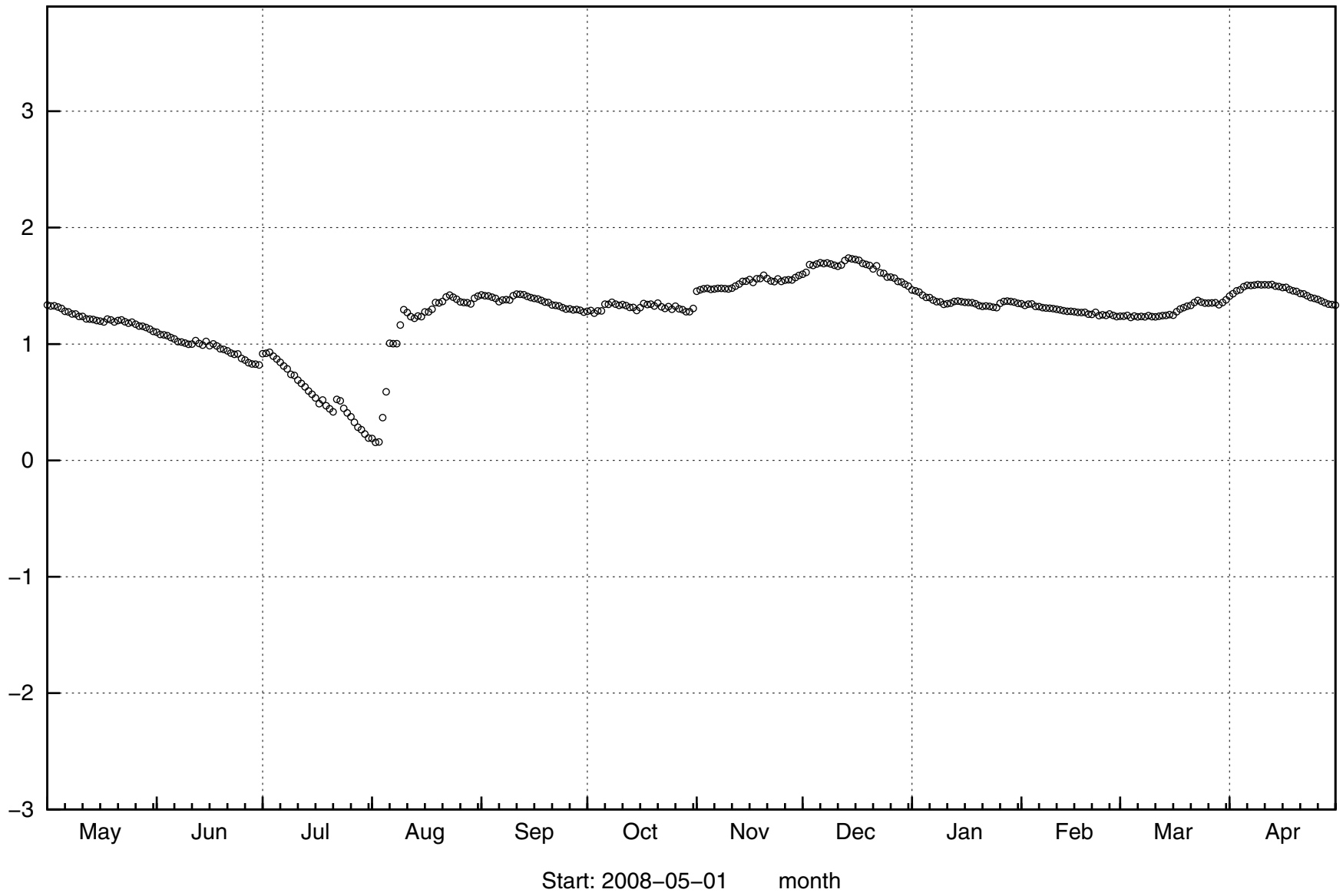
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2009-06-09 15:59:19

Start: 2008-05-01 month



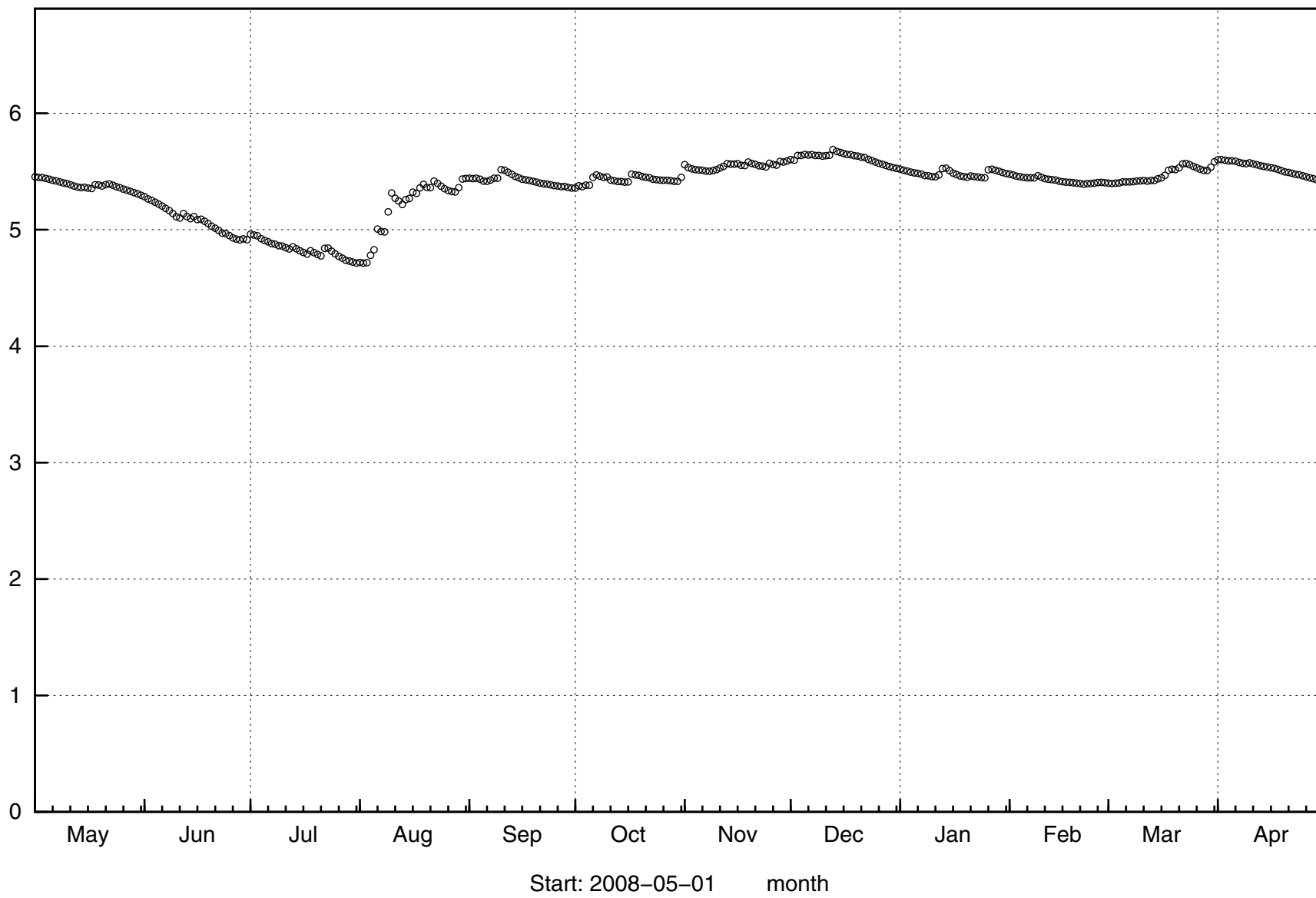
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102

6:16:51.60-90-6002

SFM0014



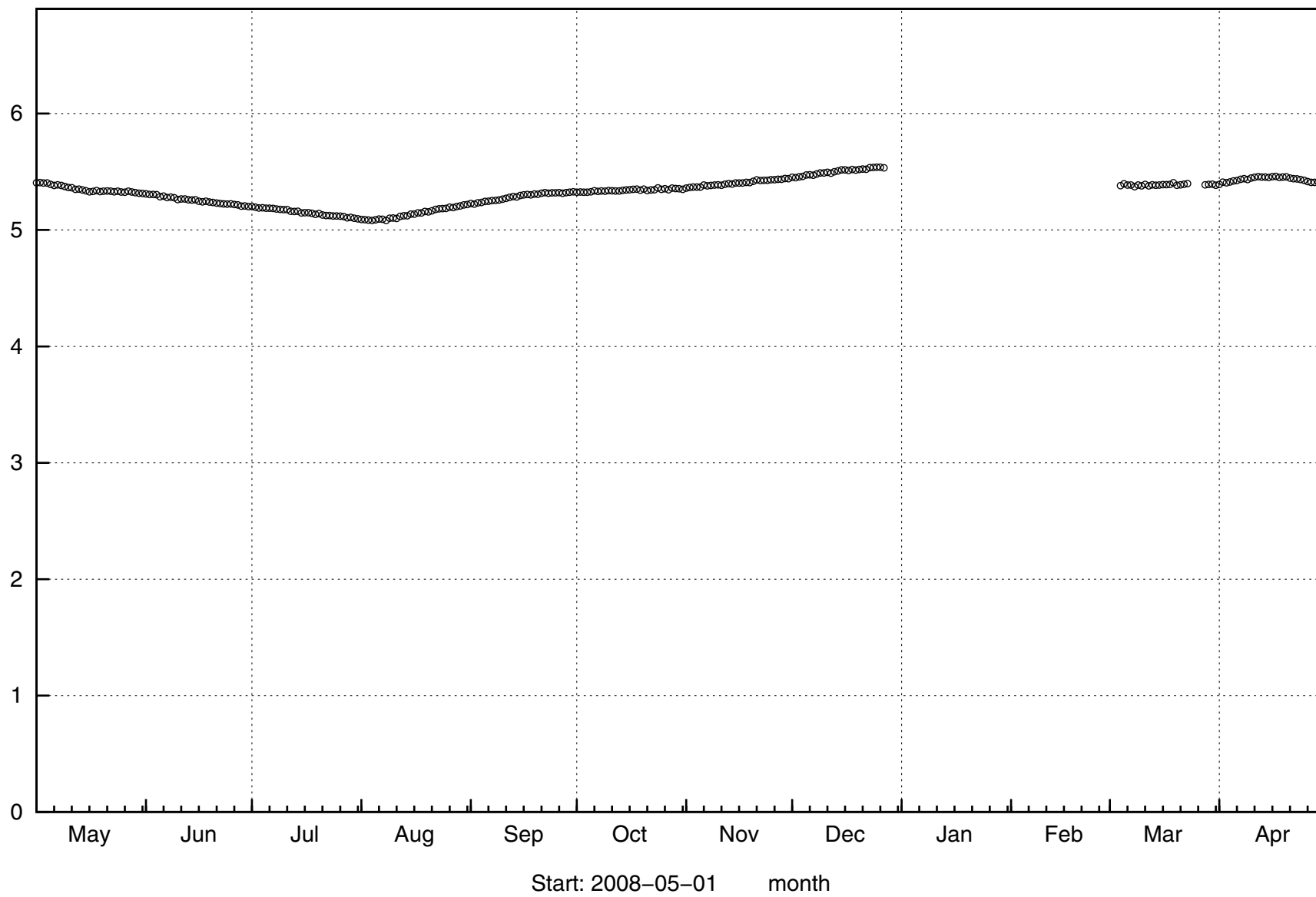
103

masl

2008-06-06 15:59:19

Start: 2008-05-01 month

SFM0015



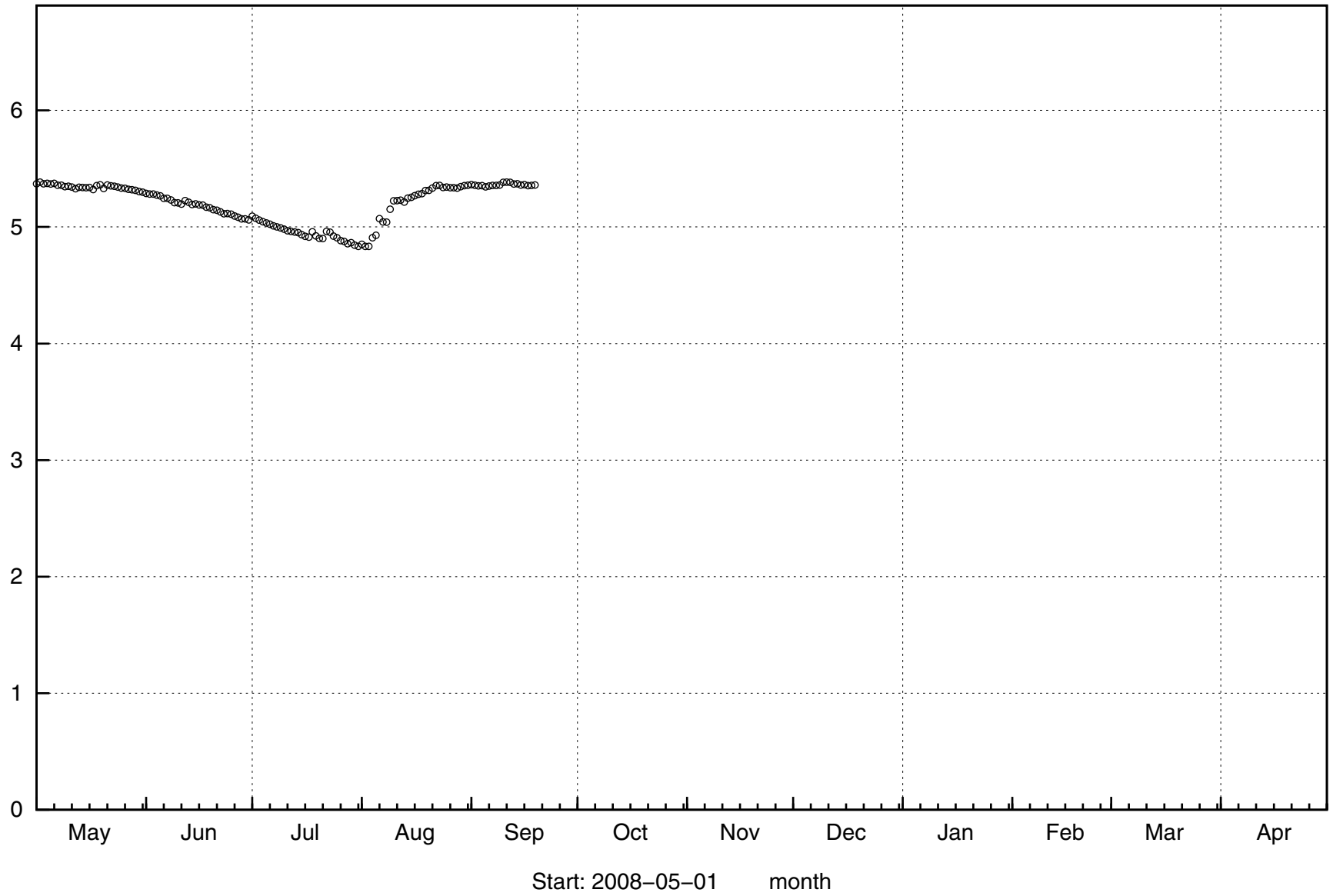
104

masl

2009-06-09 15:59:19

Start: 2008-05-01 month

SFM0017



105

masl

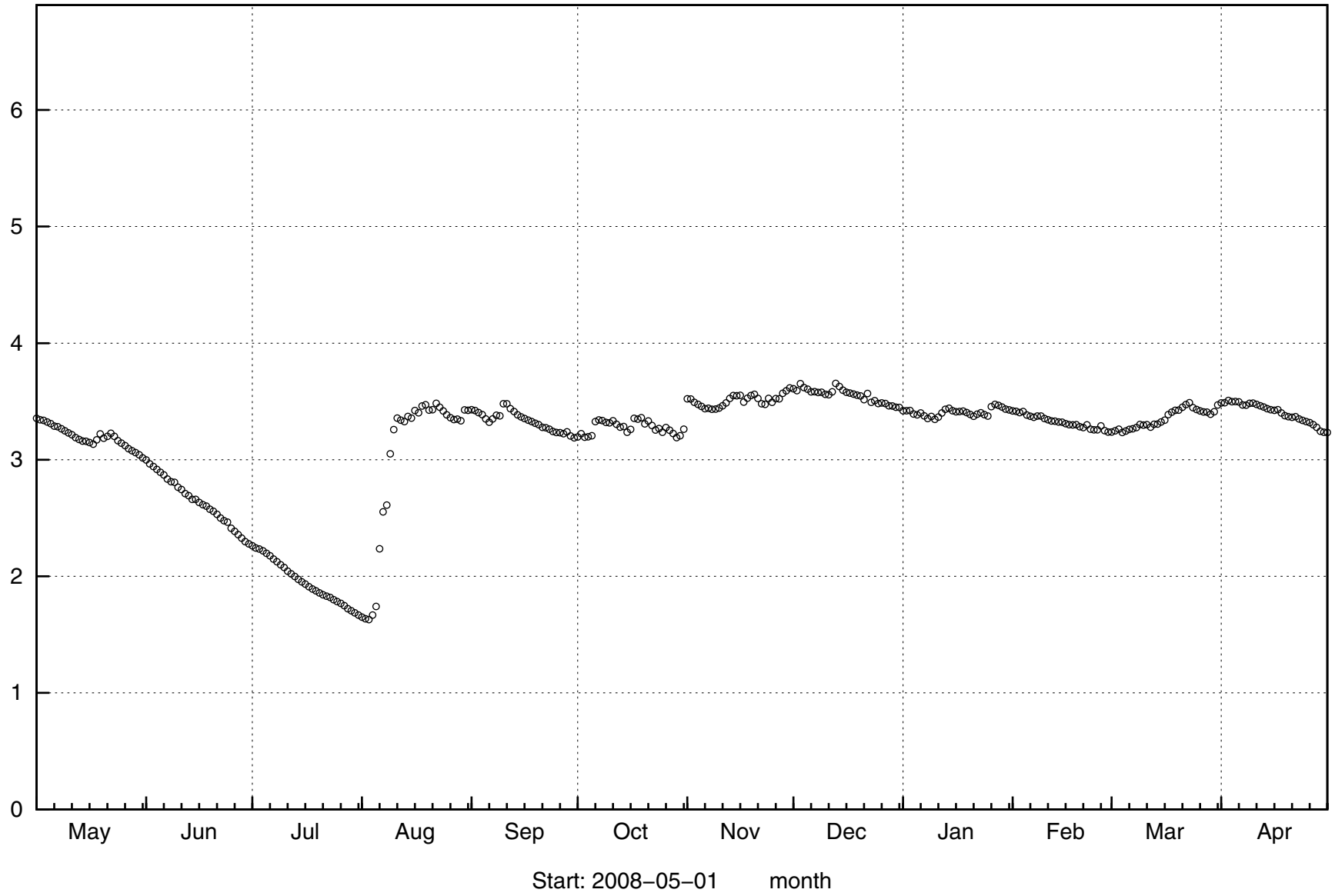
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Start: 2008-05-01 month

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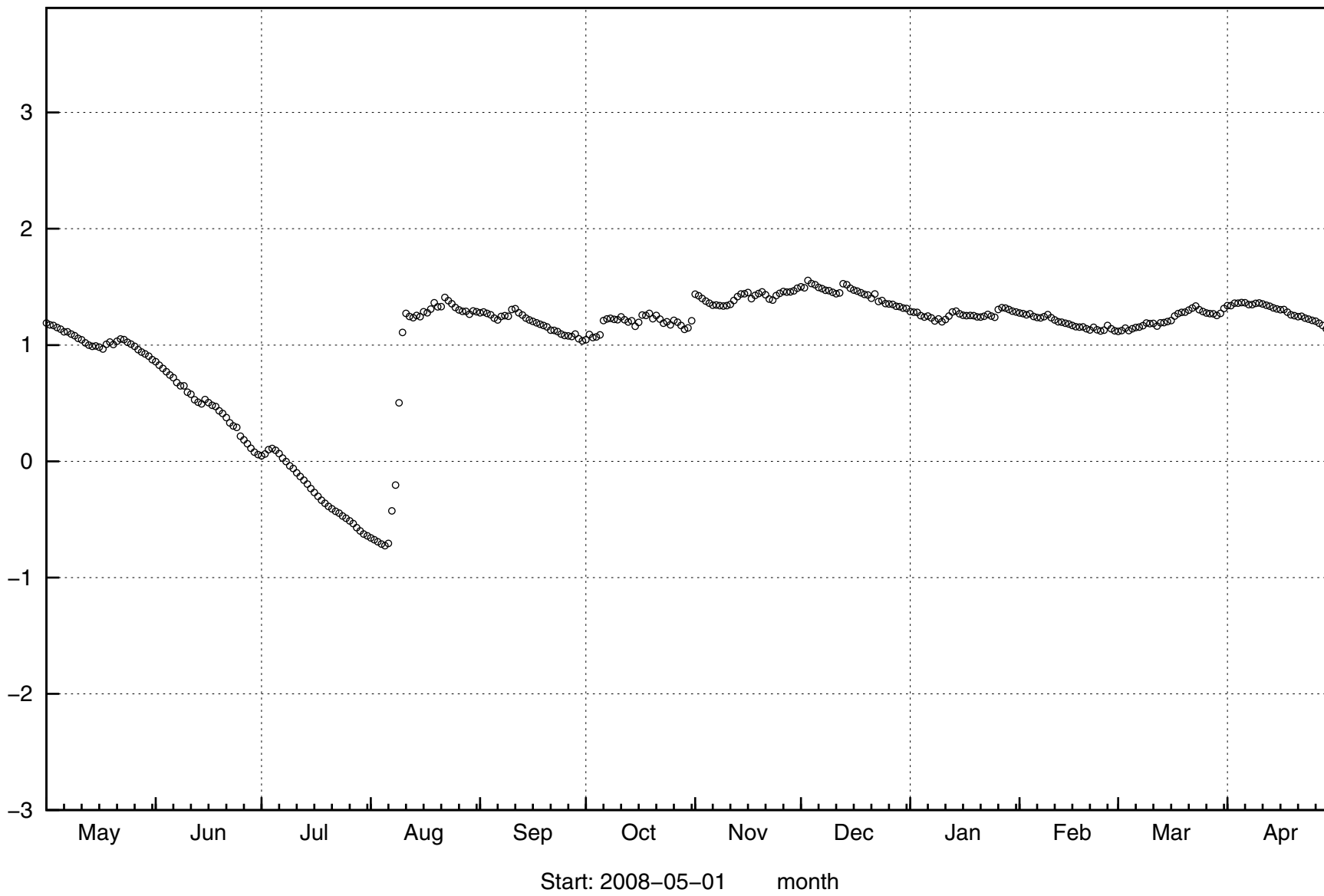
190

masl



2009-06-09 15:58:19

SFM0021



107

masl

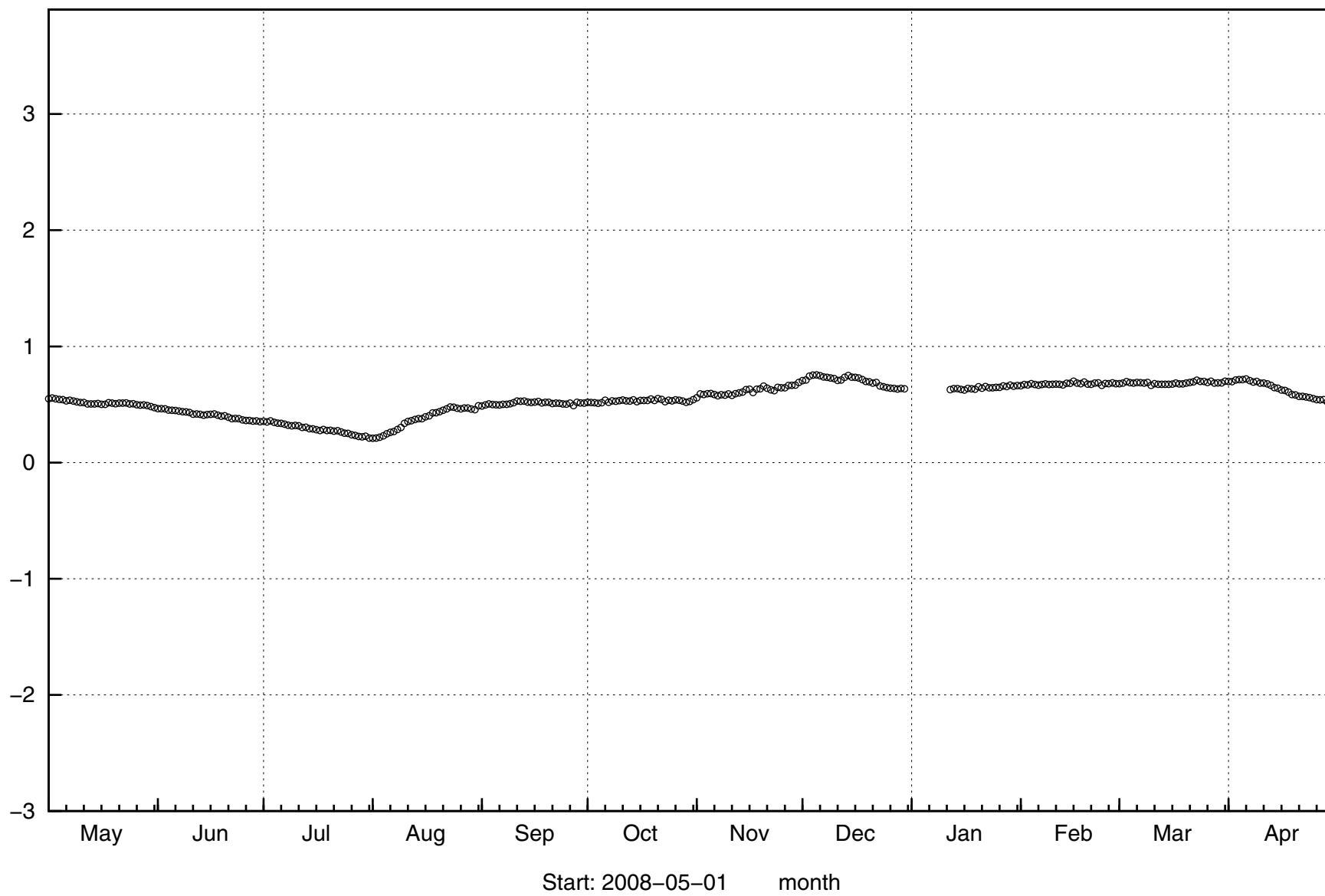
2008-06-09 15:59:19

Start: 2008-05-01 month

SFM0022

801

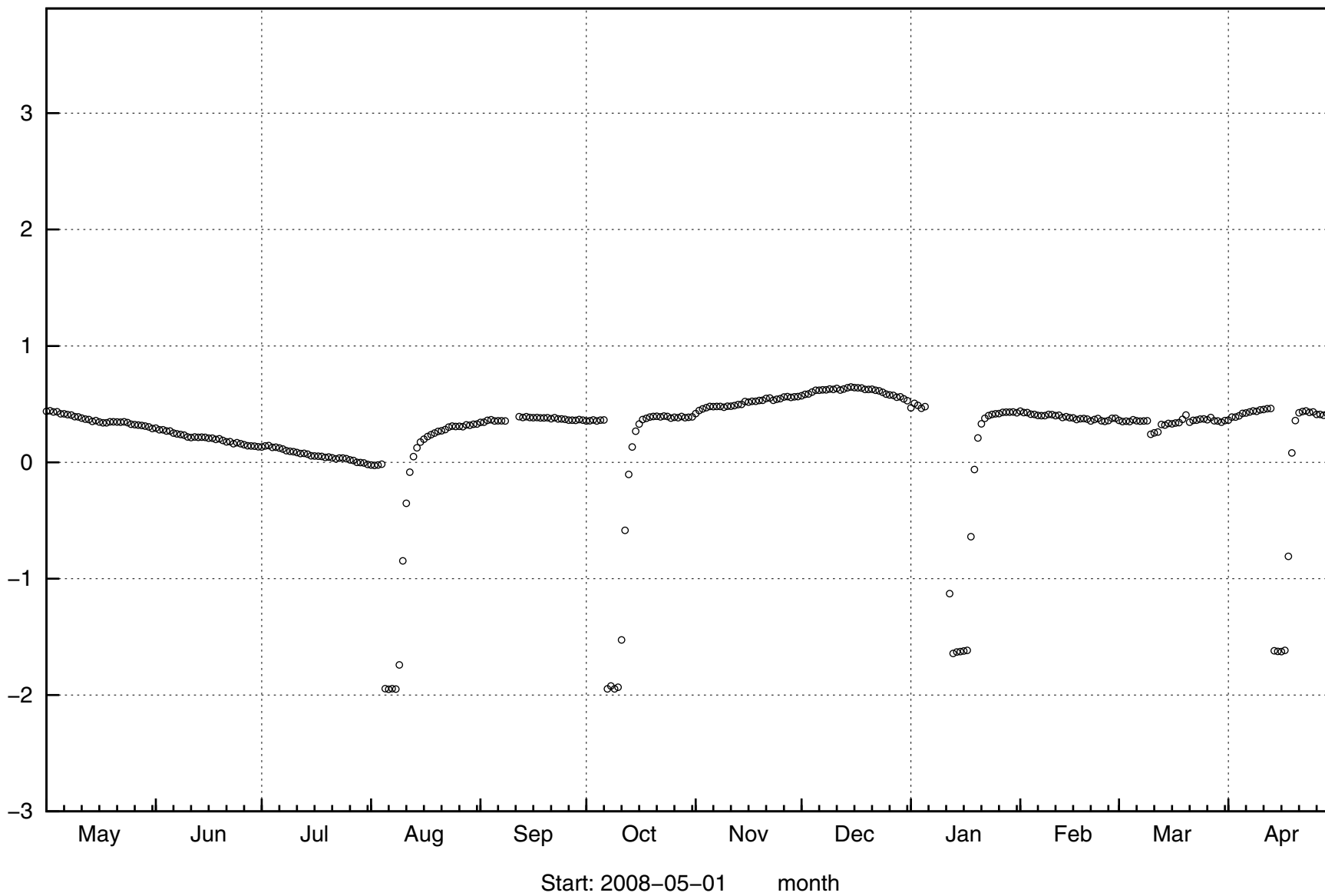
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SFM0023

601

masl

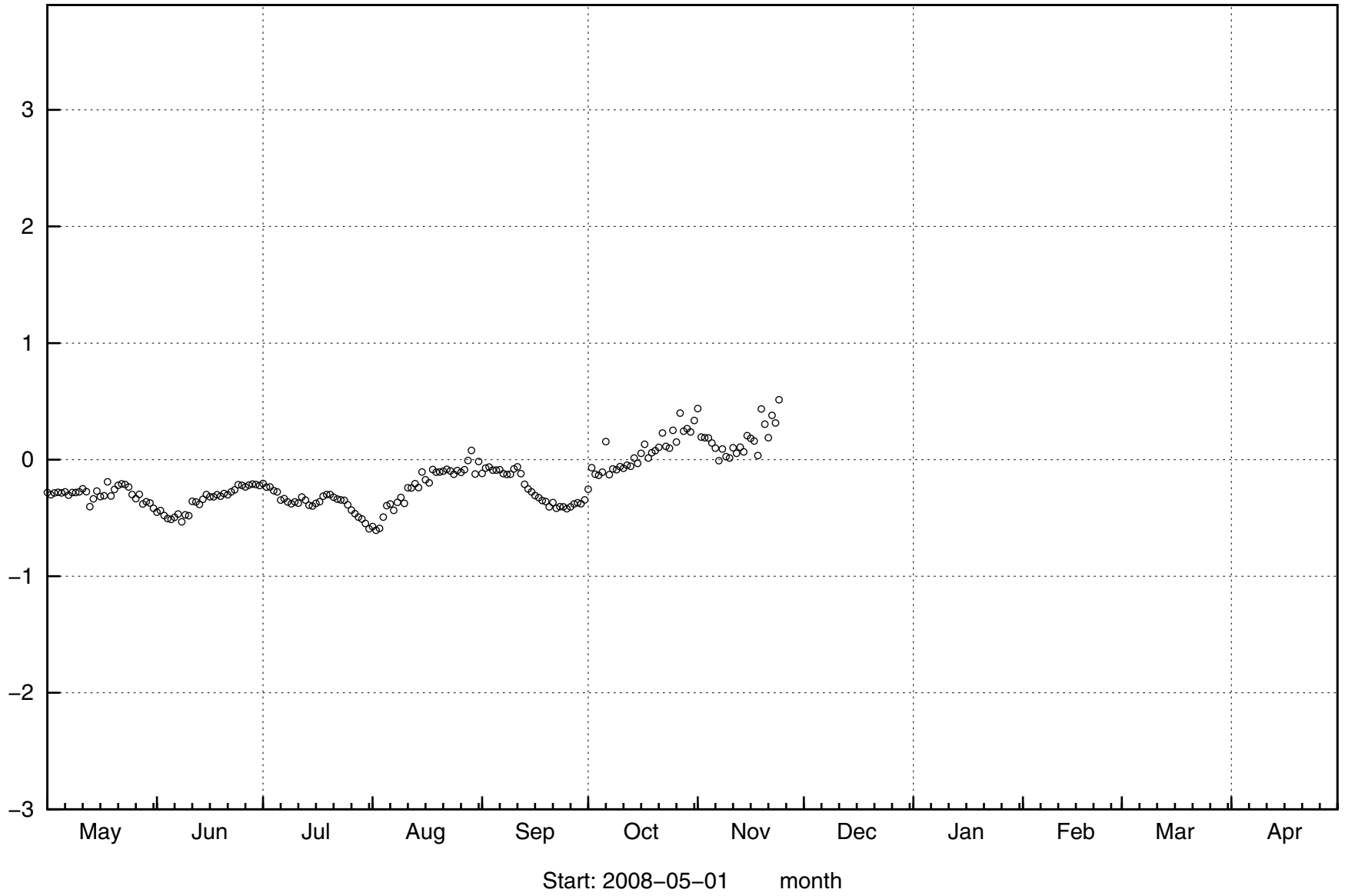


2009-06-09 15:59:20



SFM0025

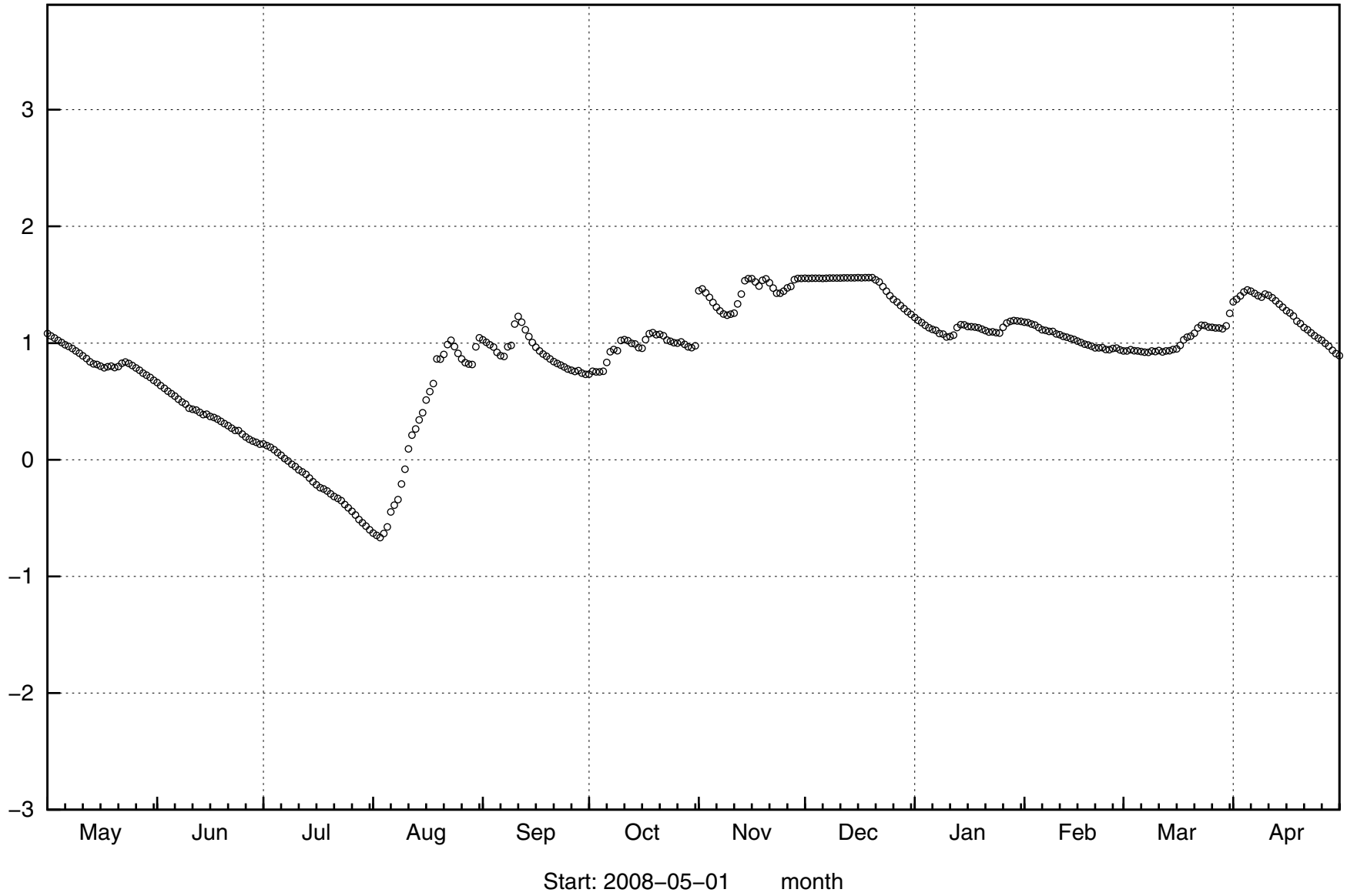
011  
masl



2009-06-09 15:59:20

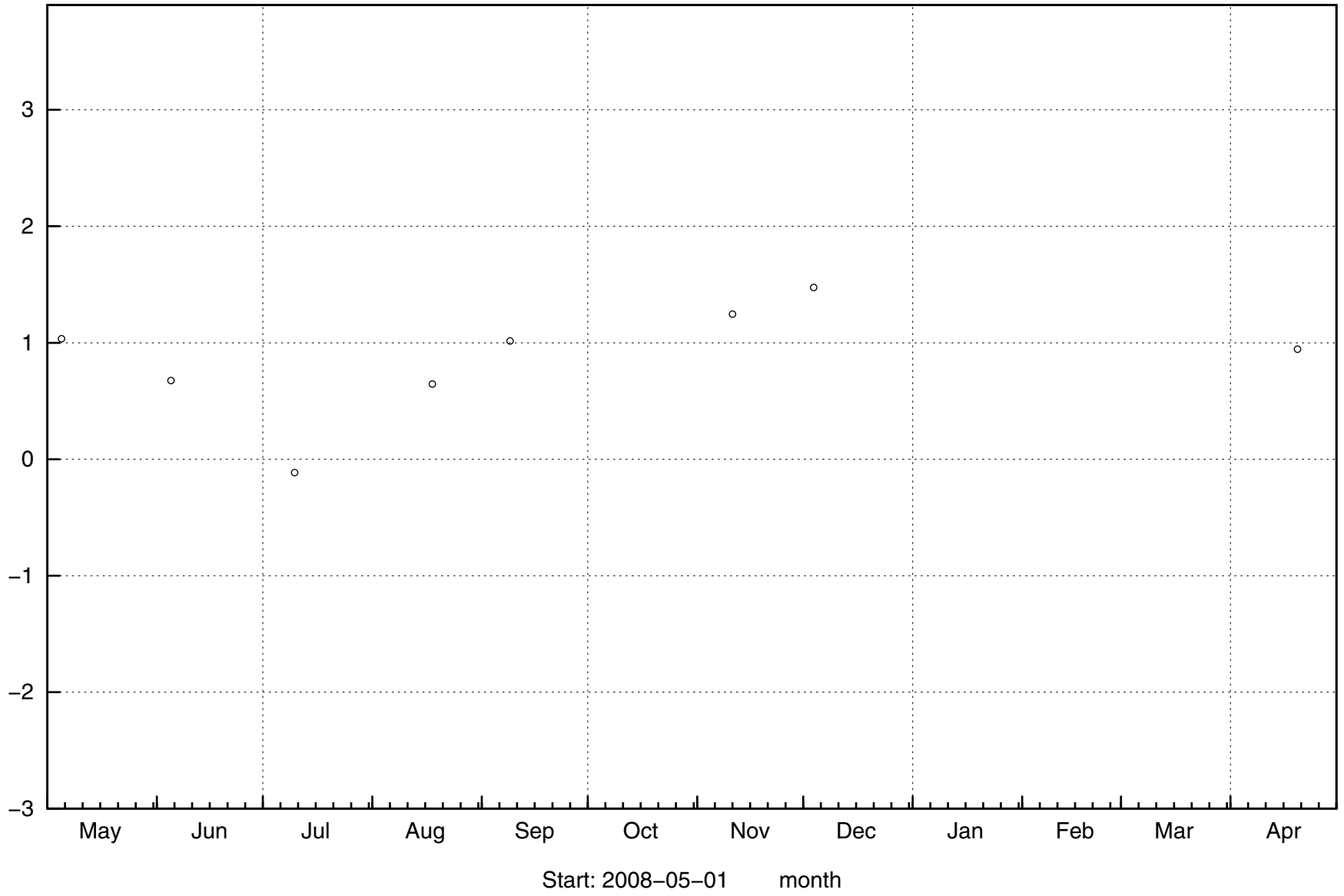
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III  
masl



2009-06-09 15:59:20

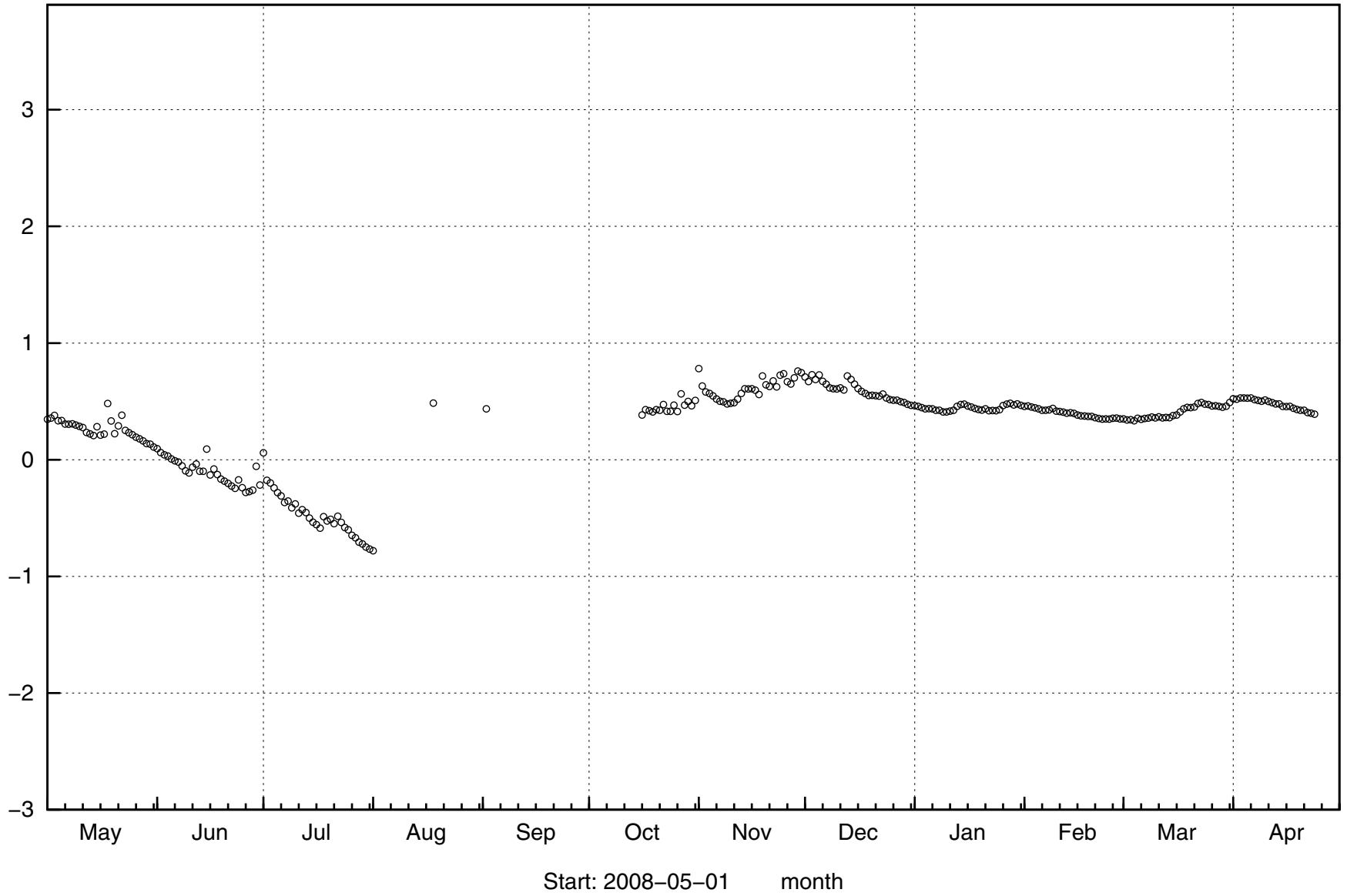
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112

02:56:15.60-90-6002

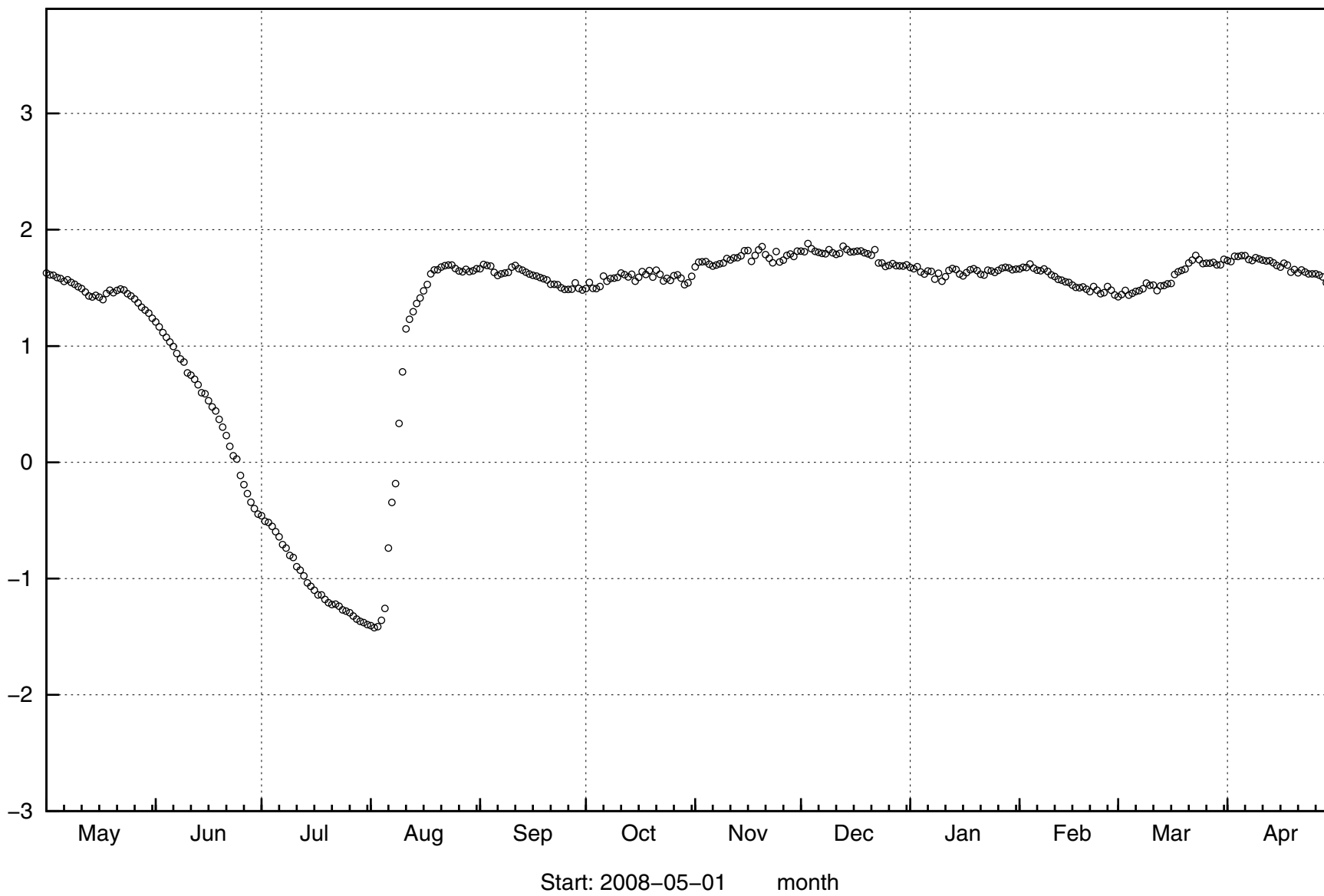
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113

2009-06-09 15:59:20

SFM0030



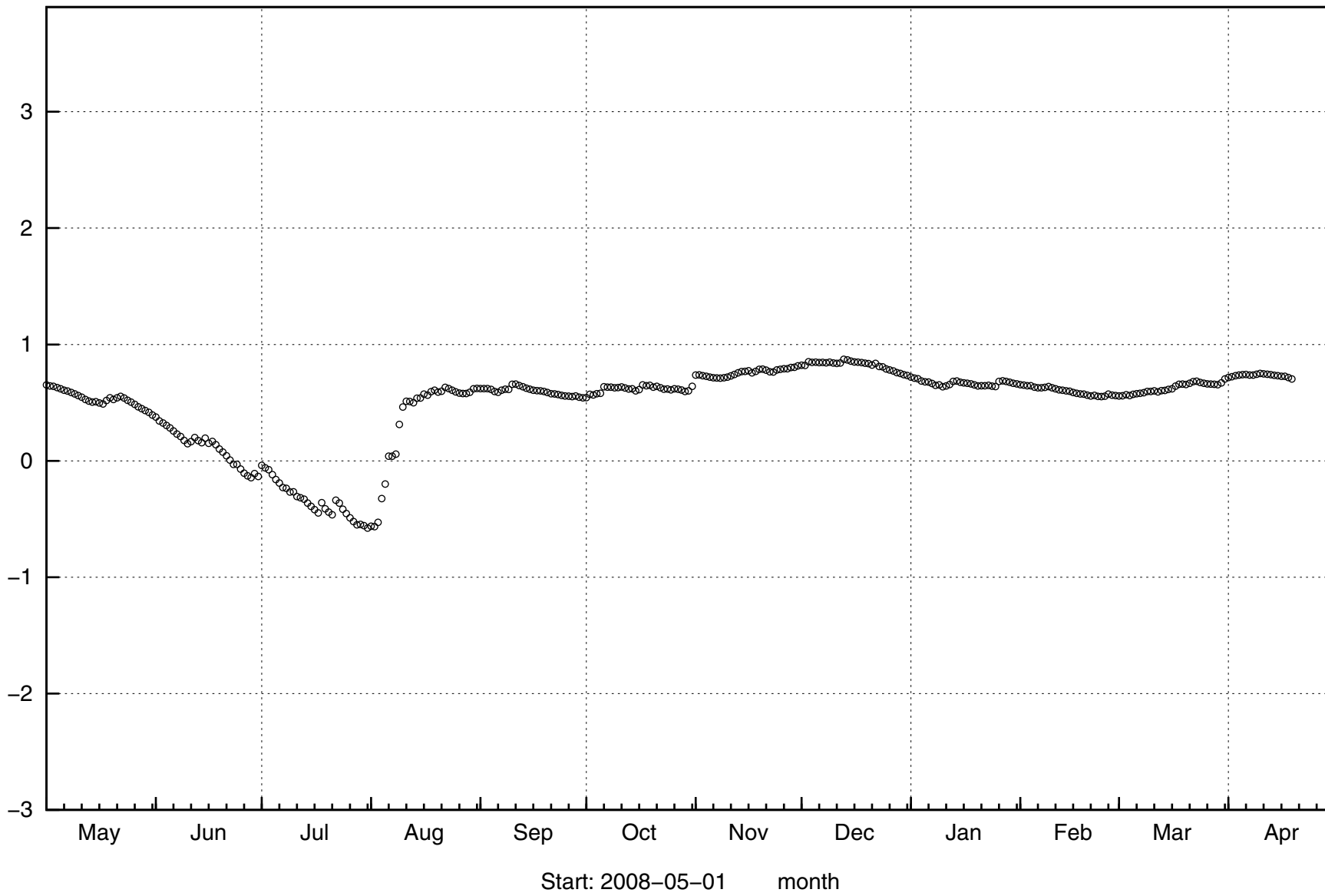
114

2009-06-09 15:59:20

SFM0033

115

masl

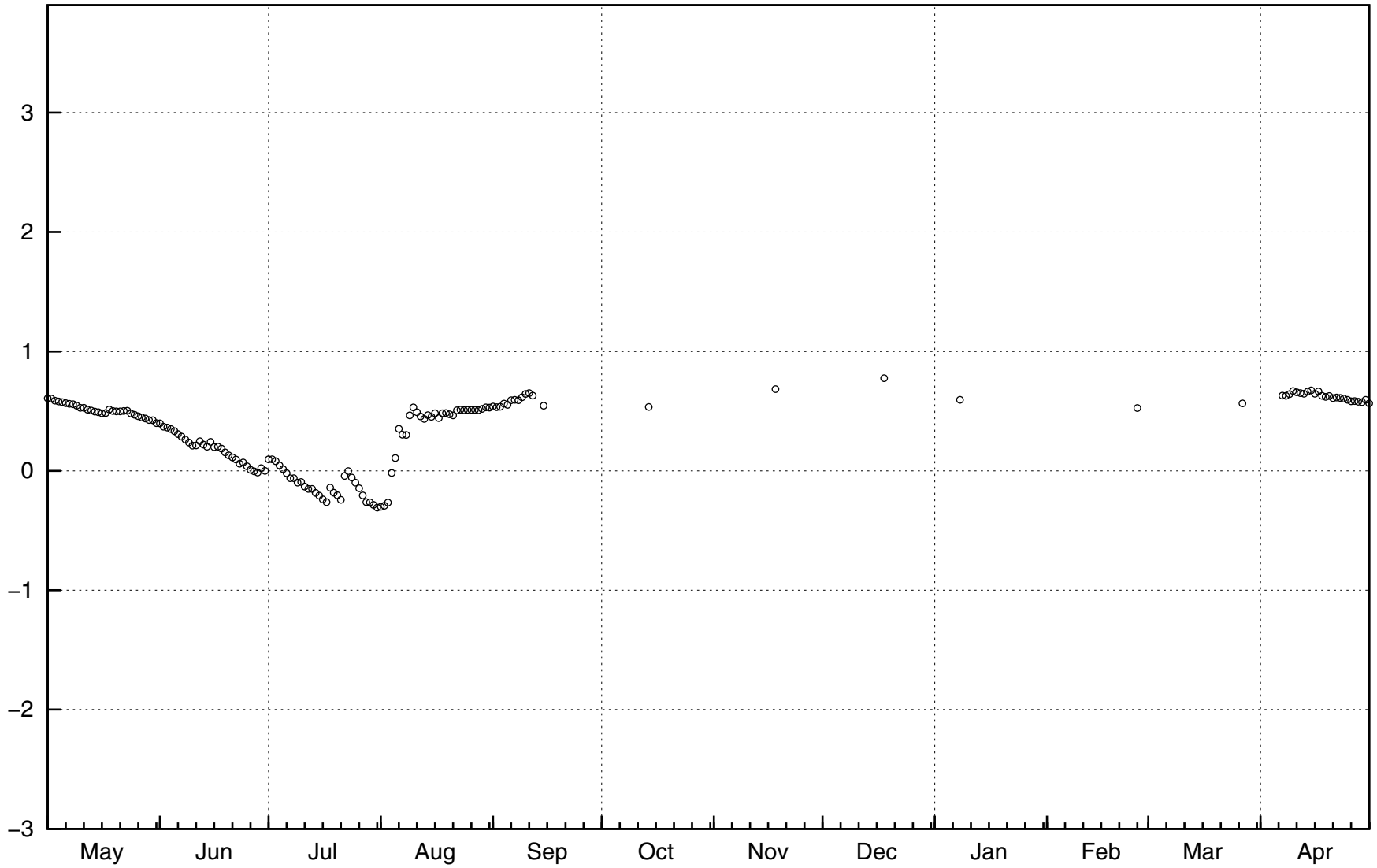


2009-06-09 15:59:20

SFM0034

911

masl



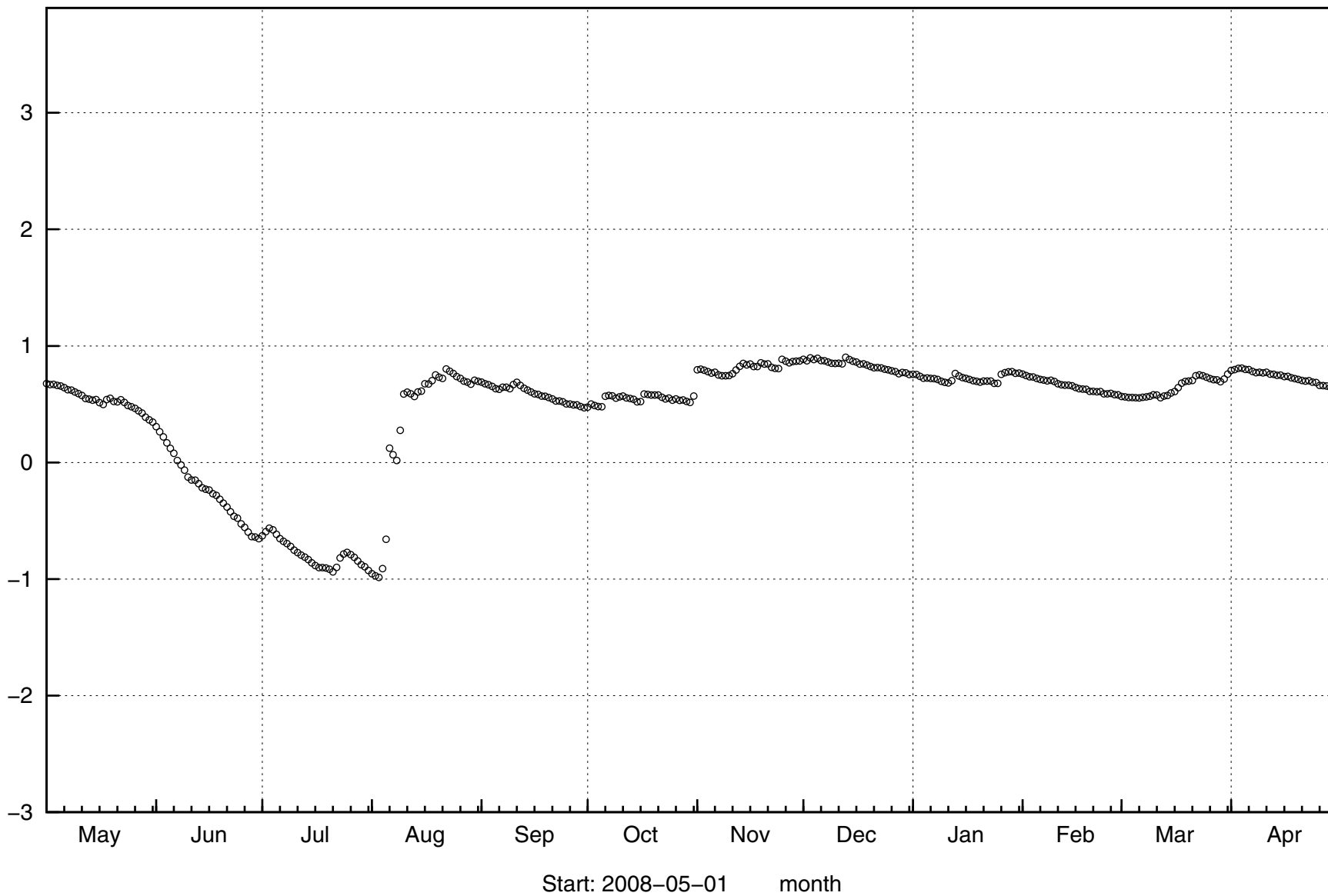
Start: 2008-05-01 month

2009-06-09 15:58:20

SFM0036

117

masl



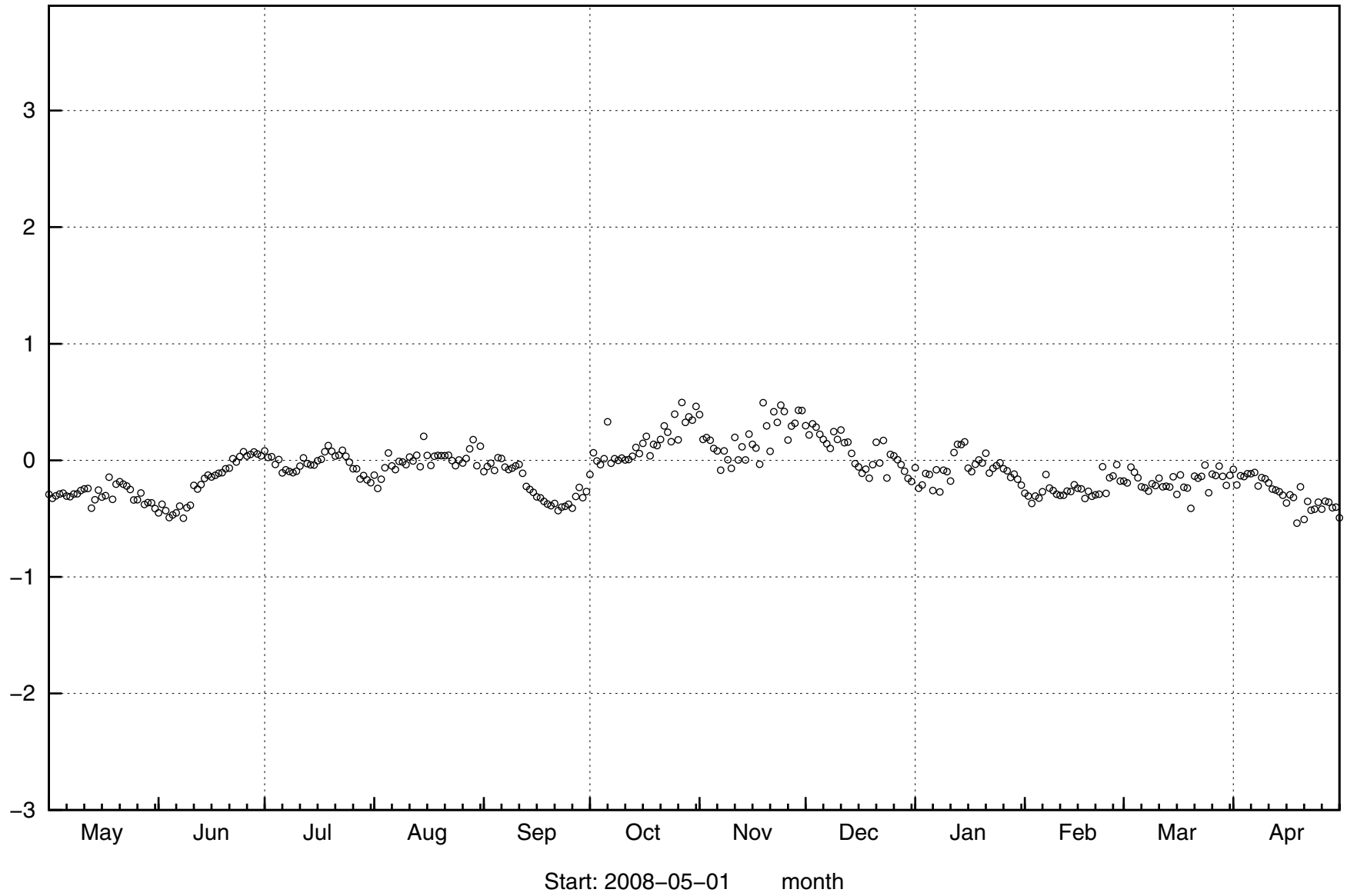
2008-06-09 15:59:20



SFM0038 (= PFM010038)

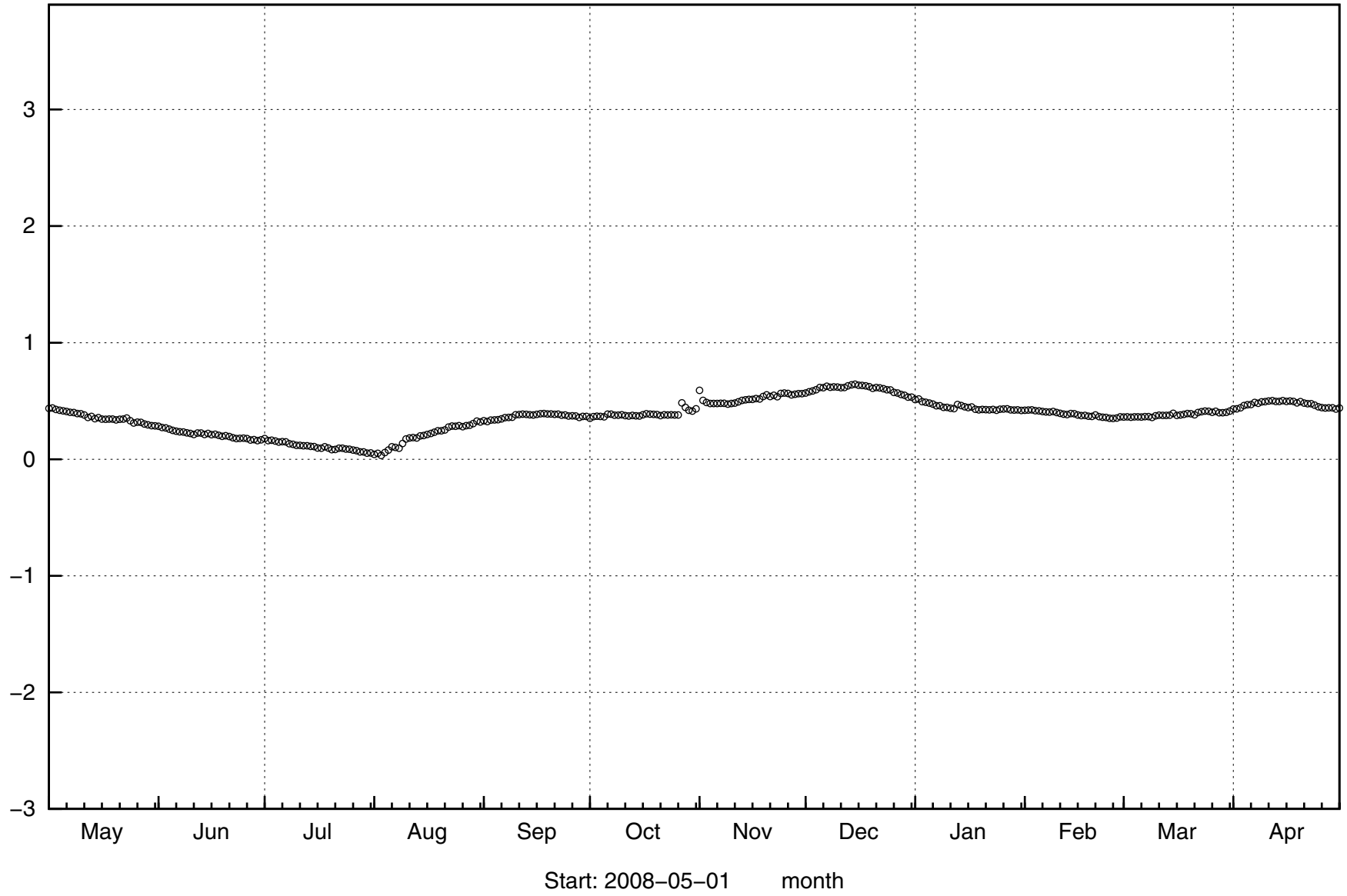
811

masl



2009-06-09 15:59:20

SFM0039



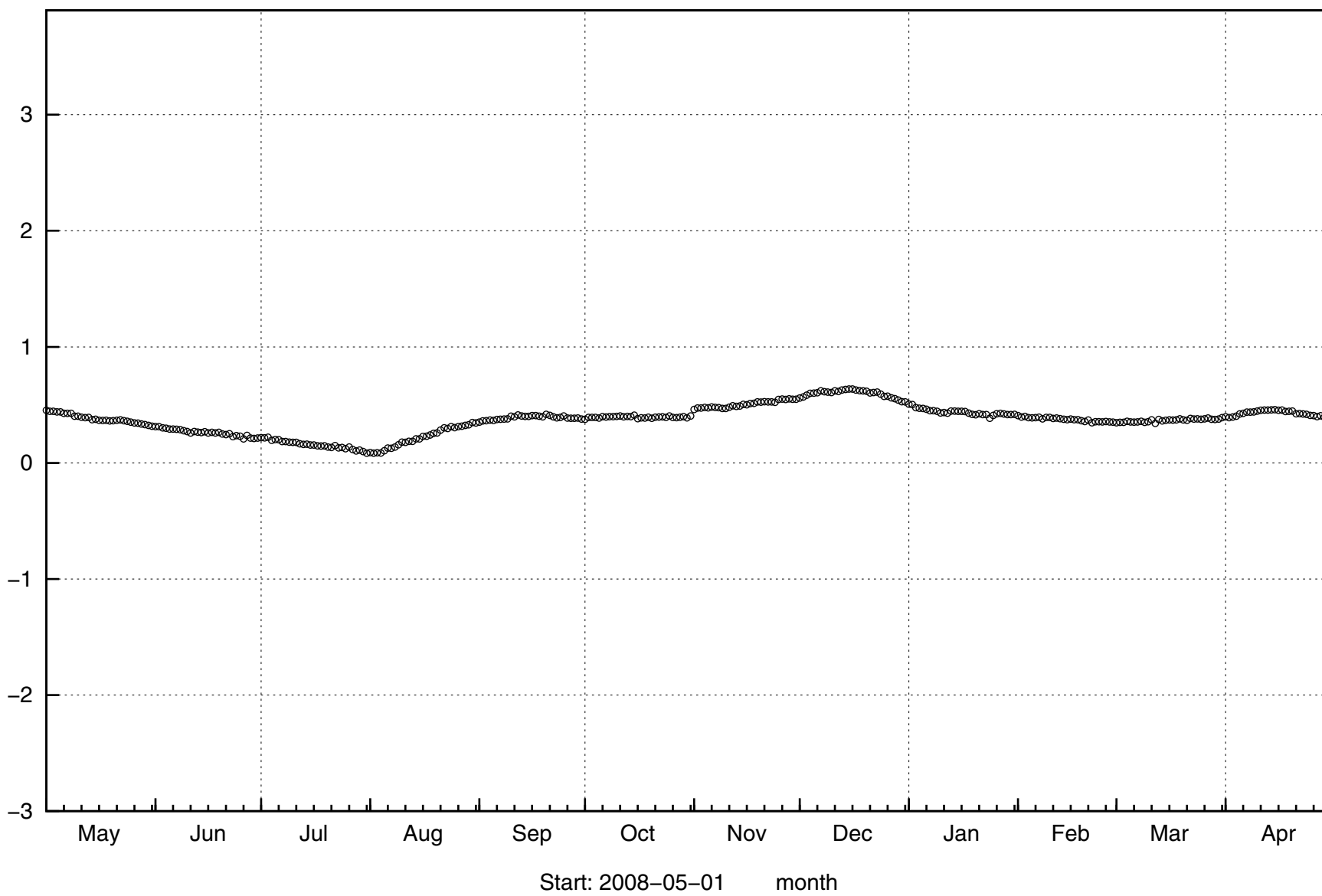
111

masl

2008-06-09 15:59:21

Start: 2008-05-01 month

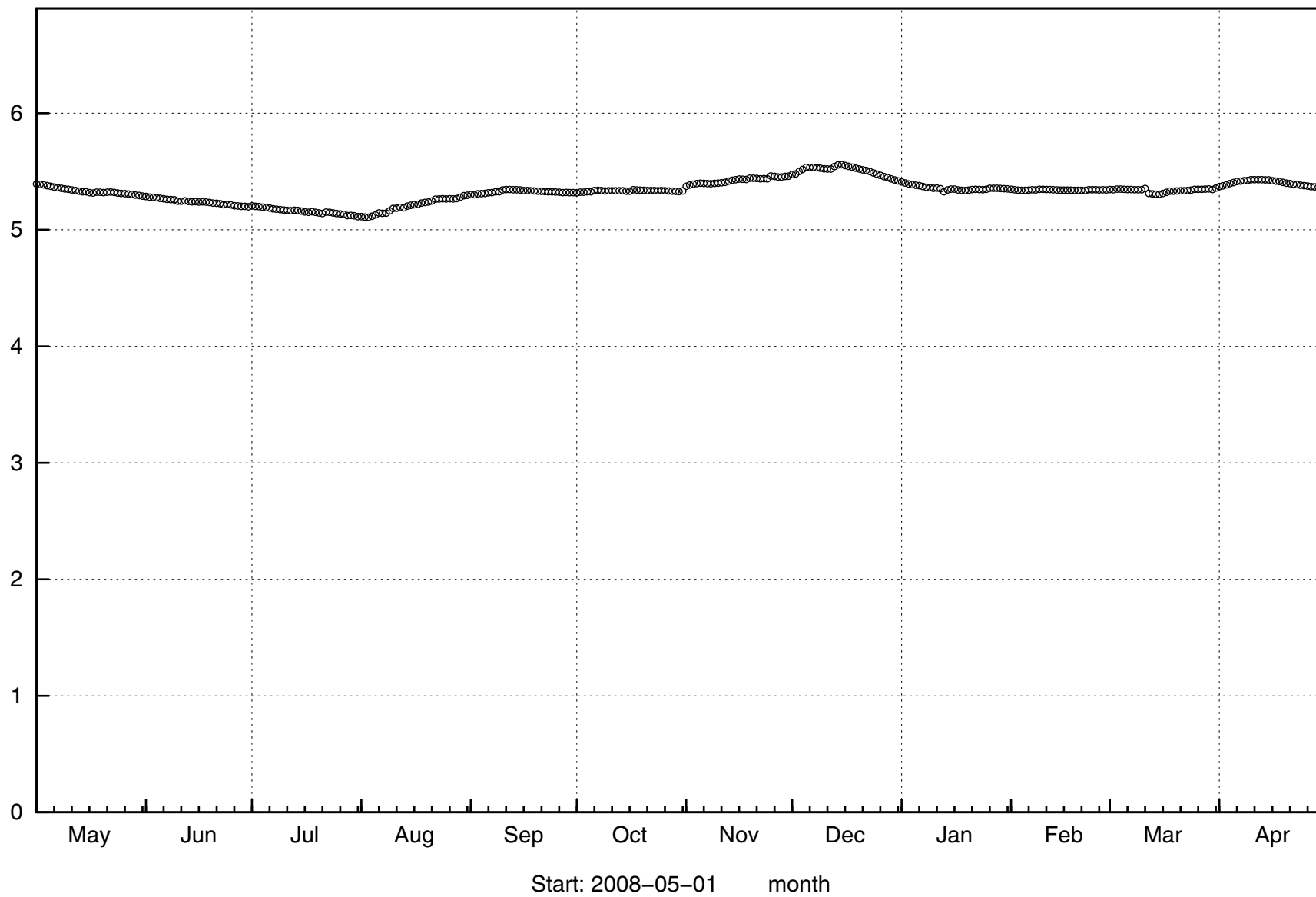
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120

127.66:51.60-90-6002

SFM0041

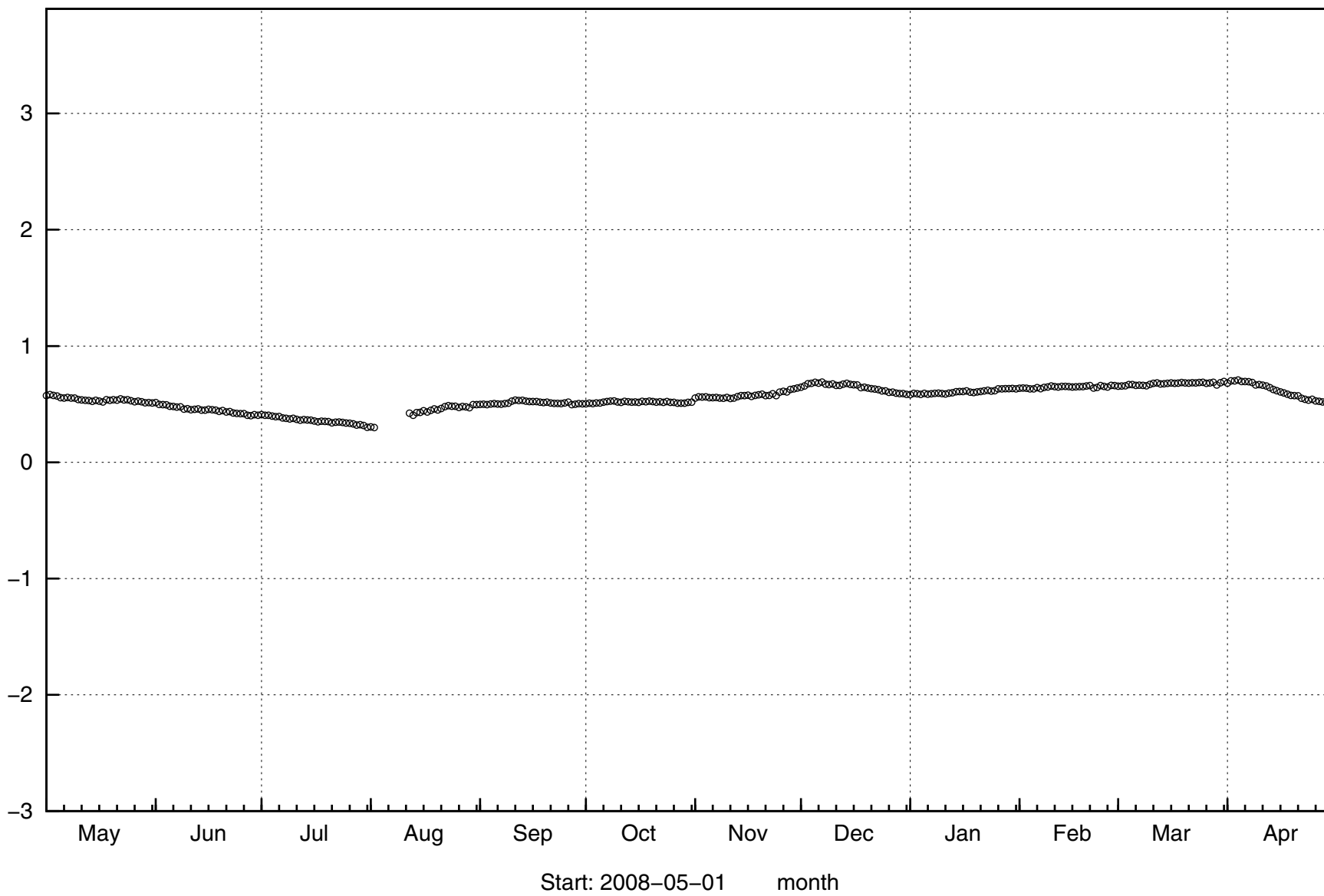


121

mas

1:36:51.60-90-6002

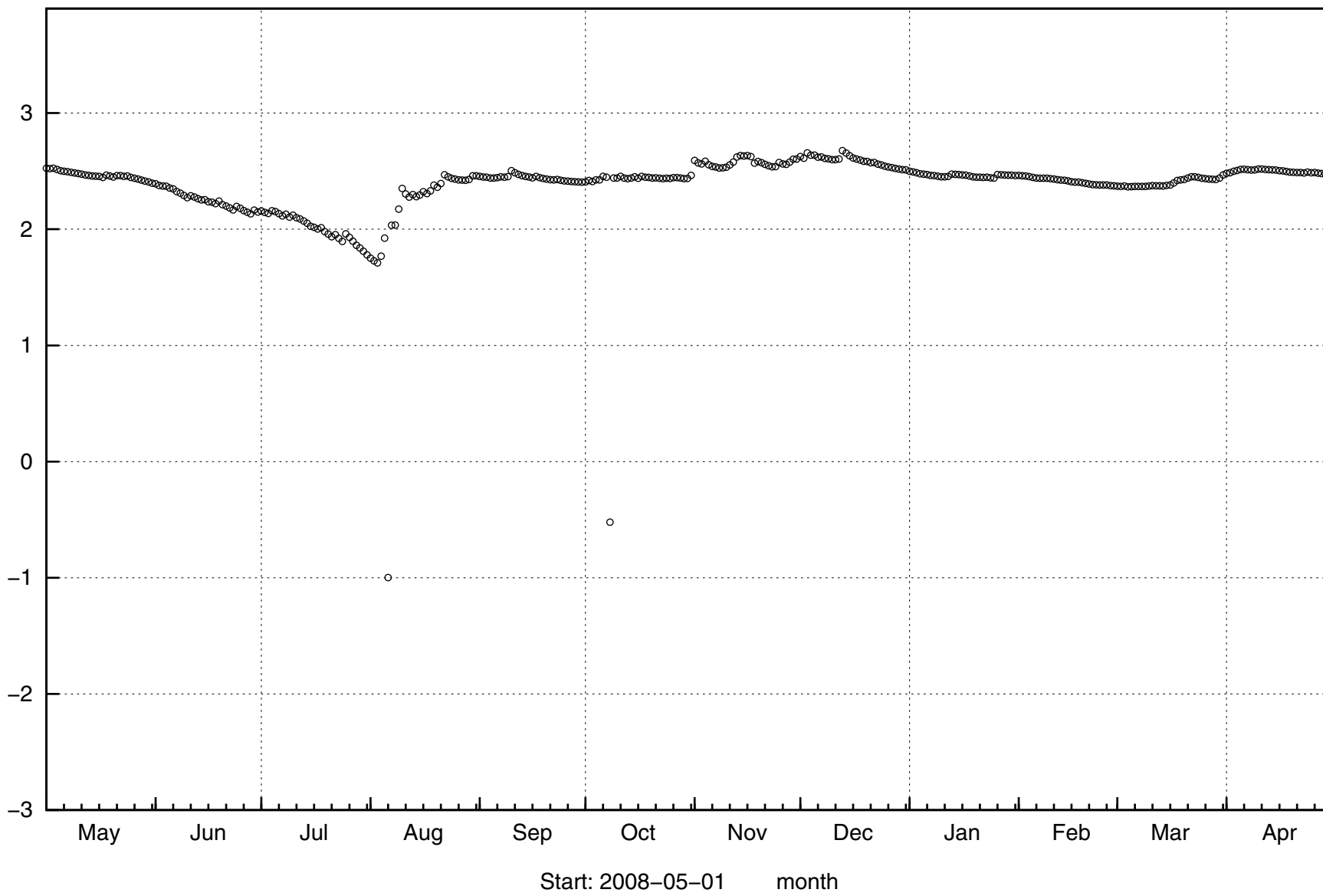
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122

2008-06-15 09:21

SFM0049

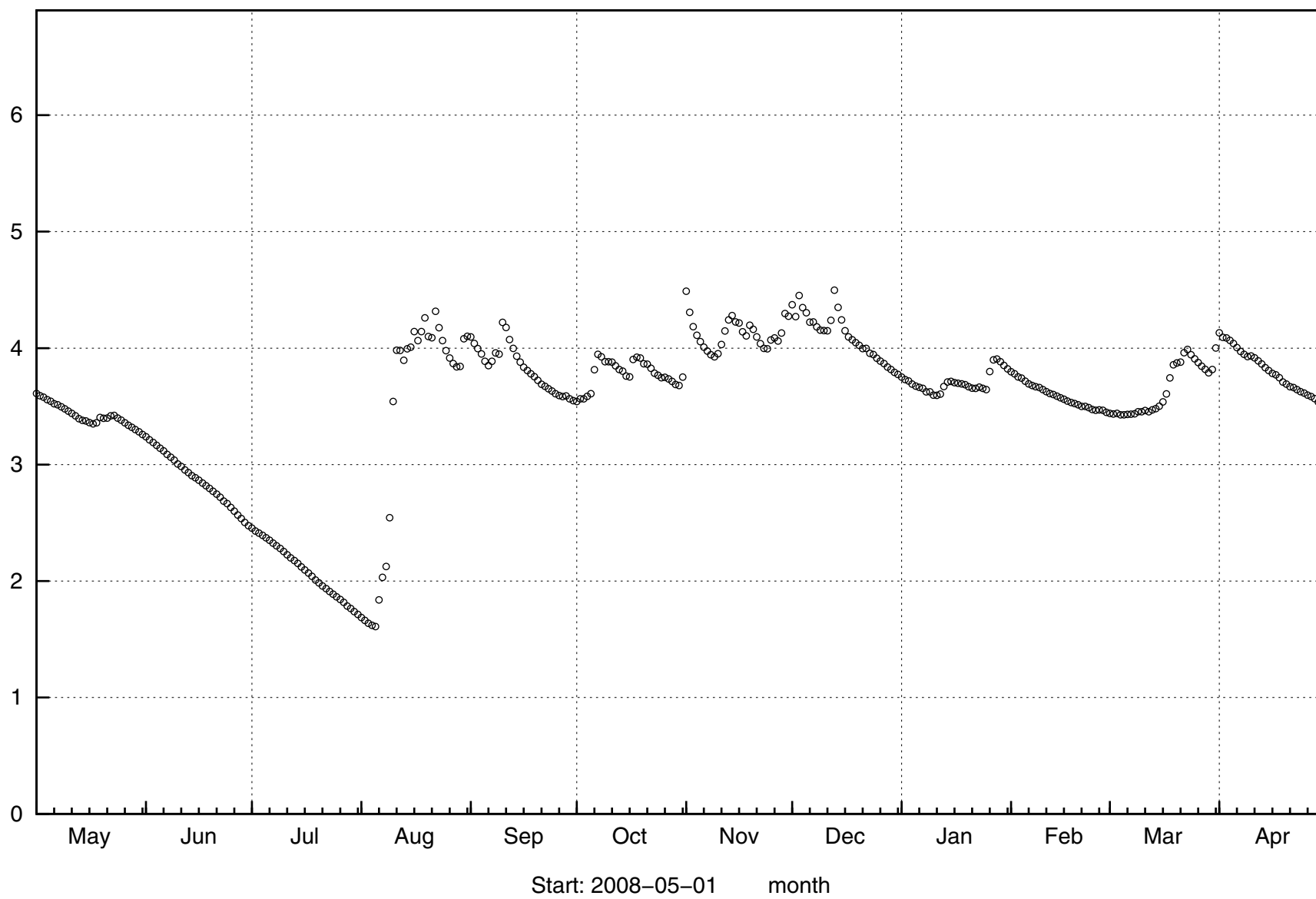


123

msu

1995:51:60-90-0002

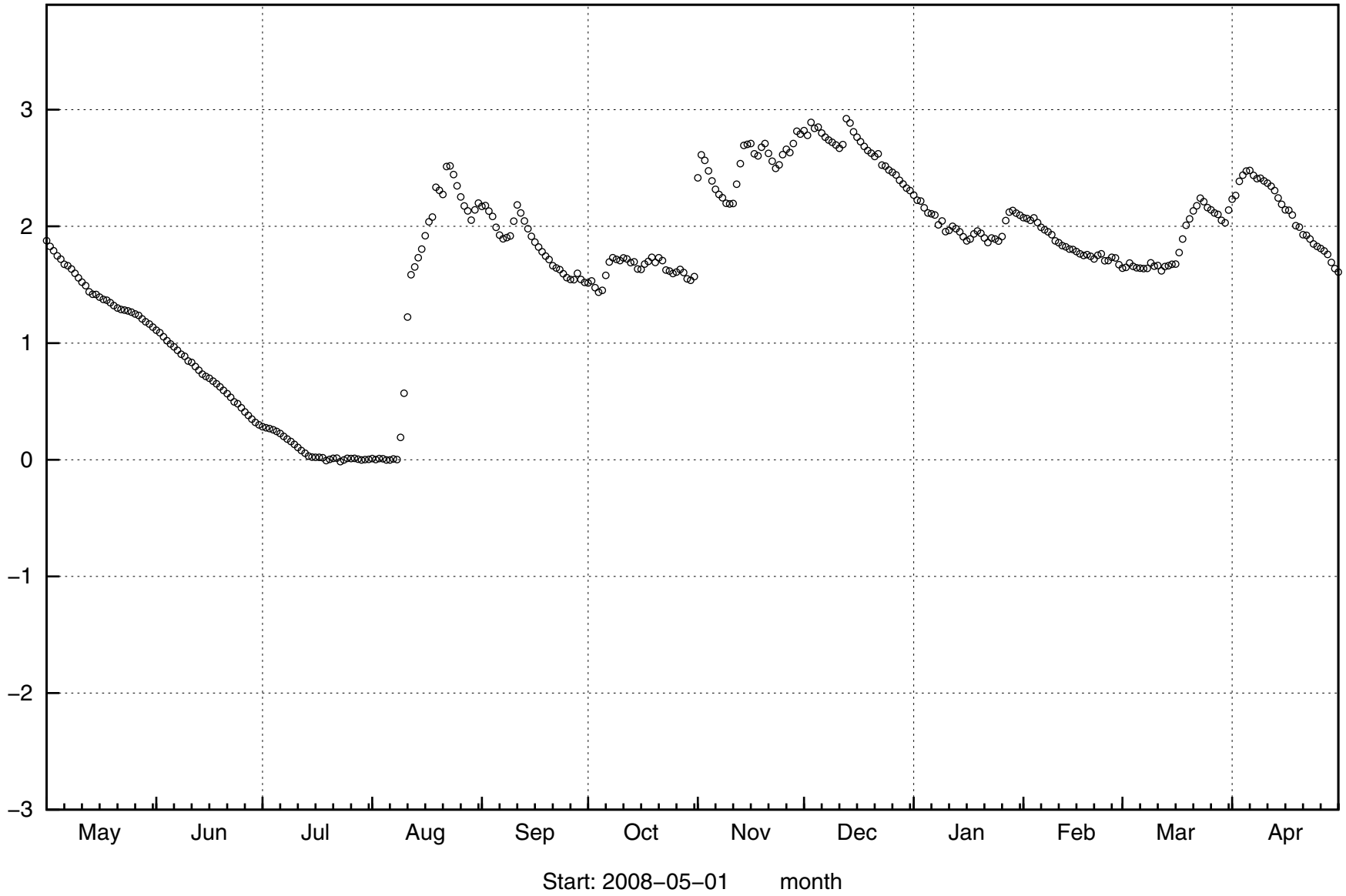
SFM0057



124

2008-08-08 15:59:21

SFM0058



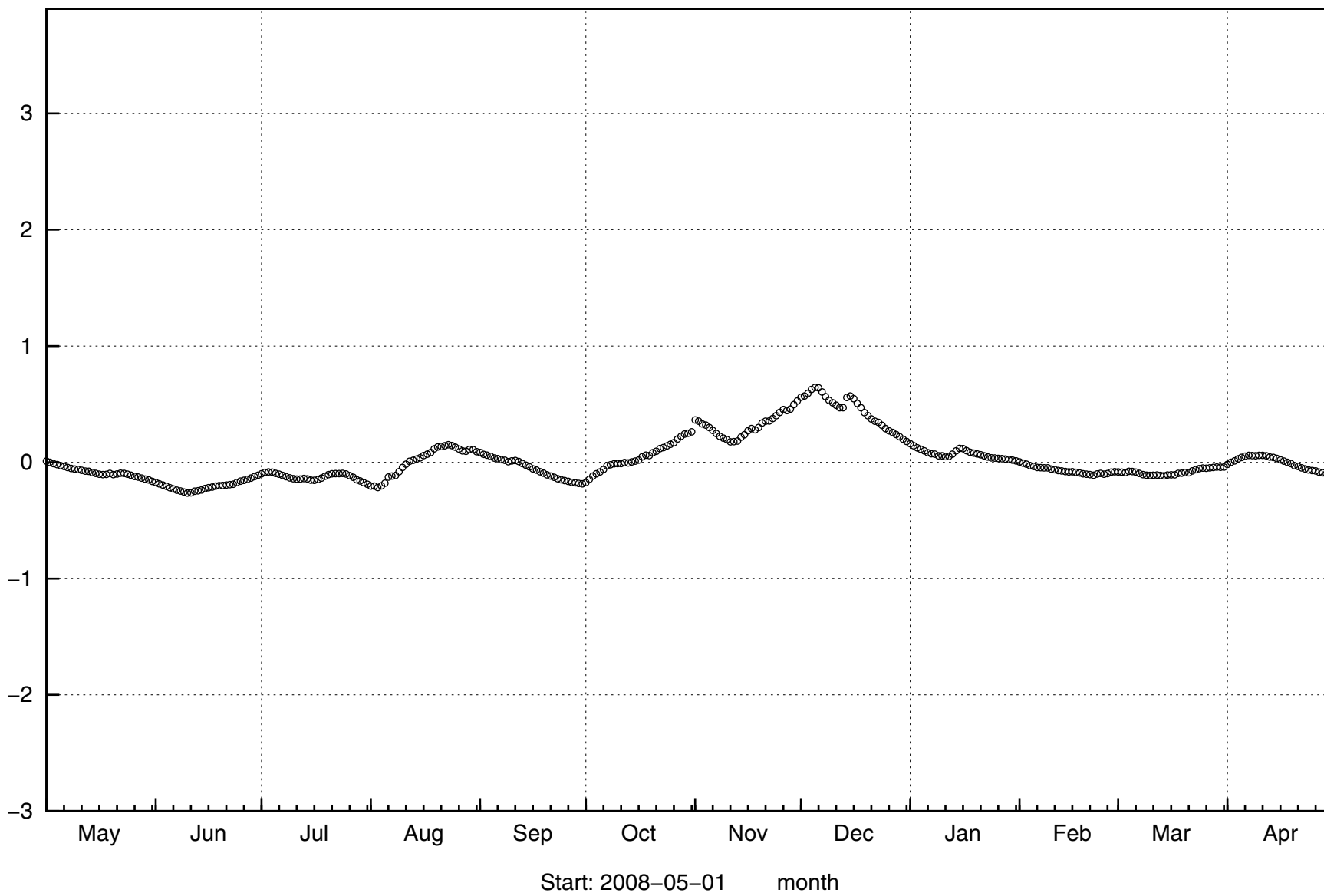
125

mas

2008-06-09 15:59:21



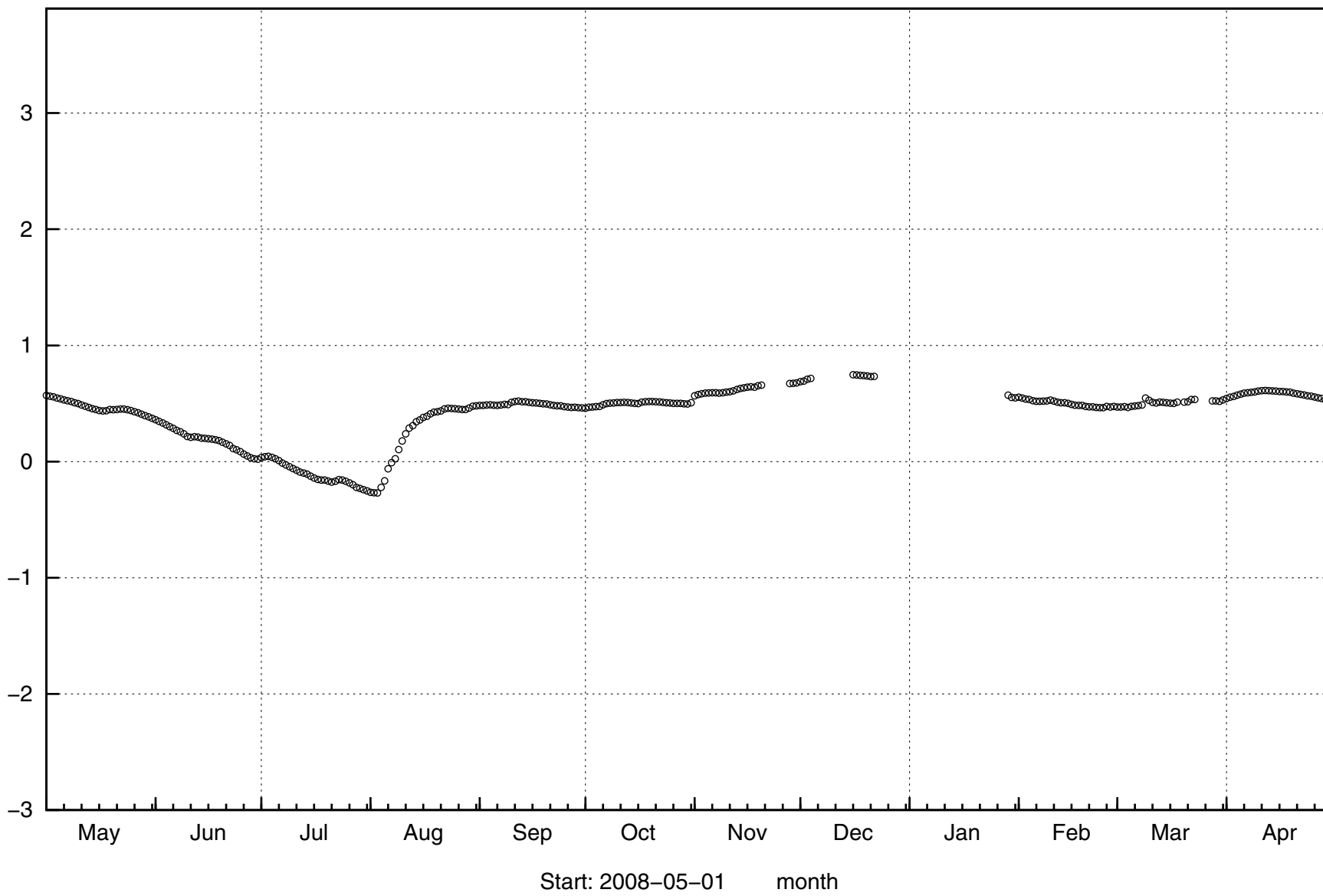
SFM0061



126

2008-06-15:09:21

SFM0062

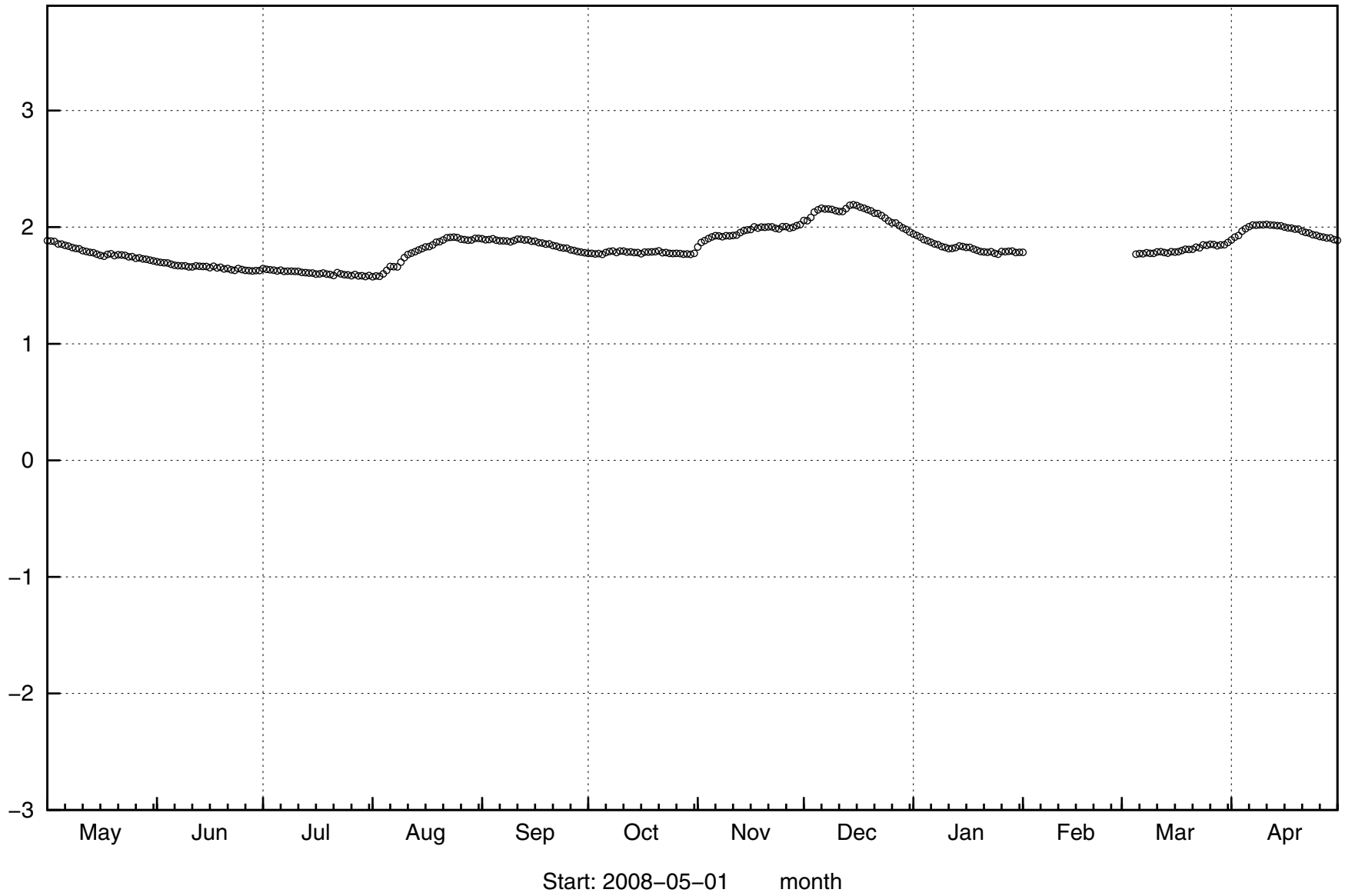


127

msl

1995:51:60-90-0002

SFM0064

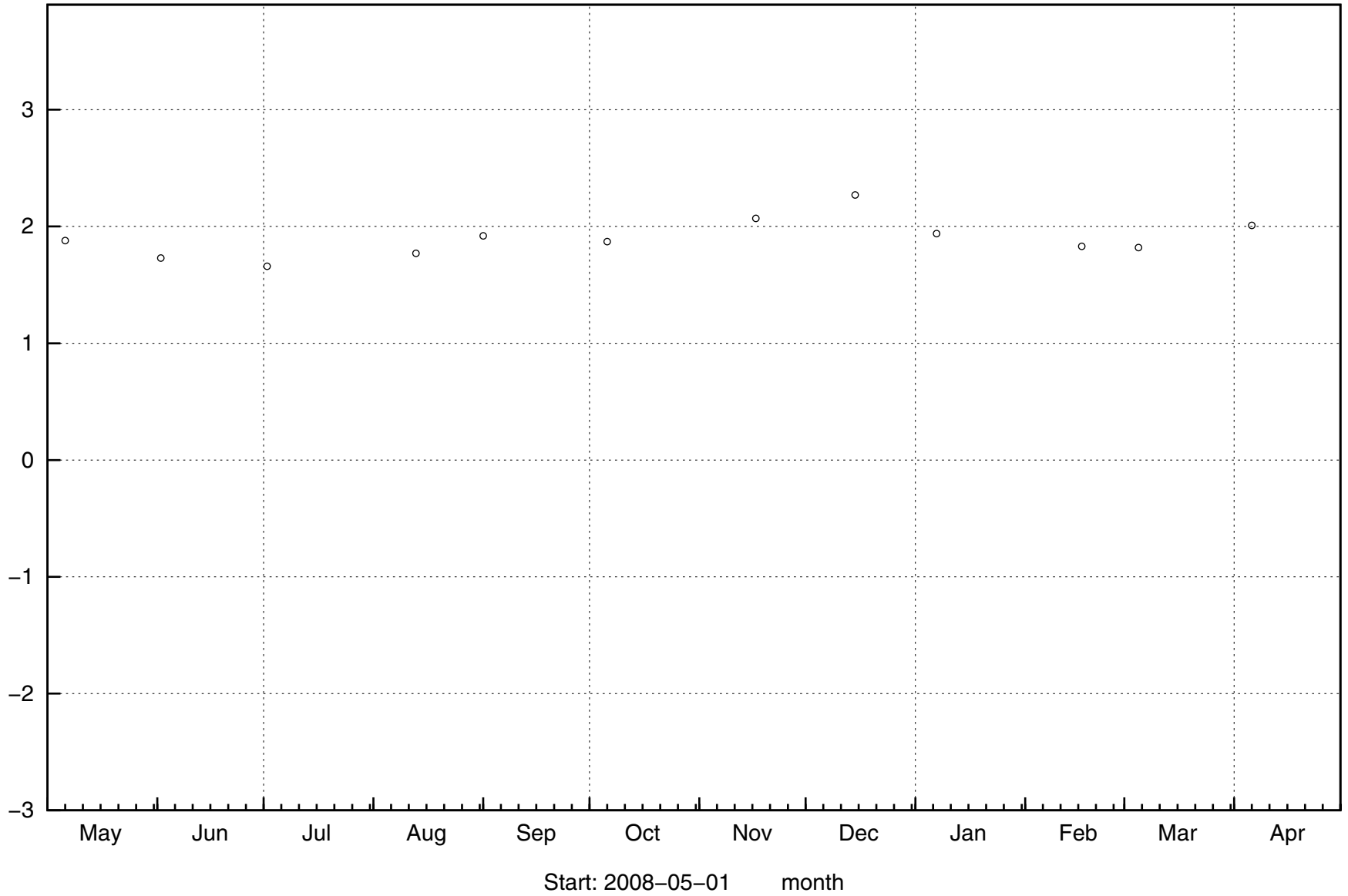


128

masl

1276951:60-90-6002

SFM0067



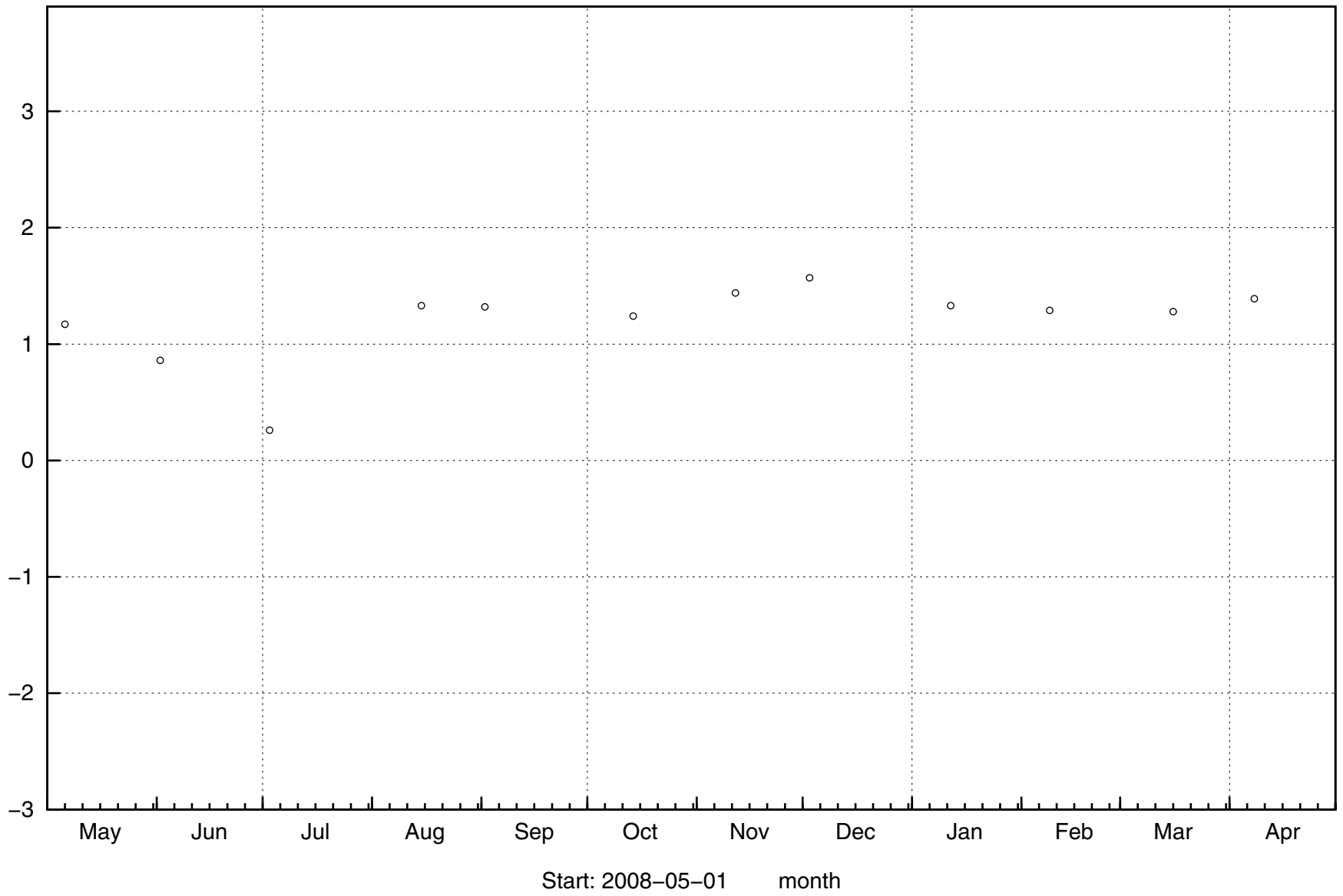
129

masl

12:55:51 60-90-6002

Start: 2008-05-01 month

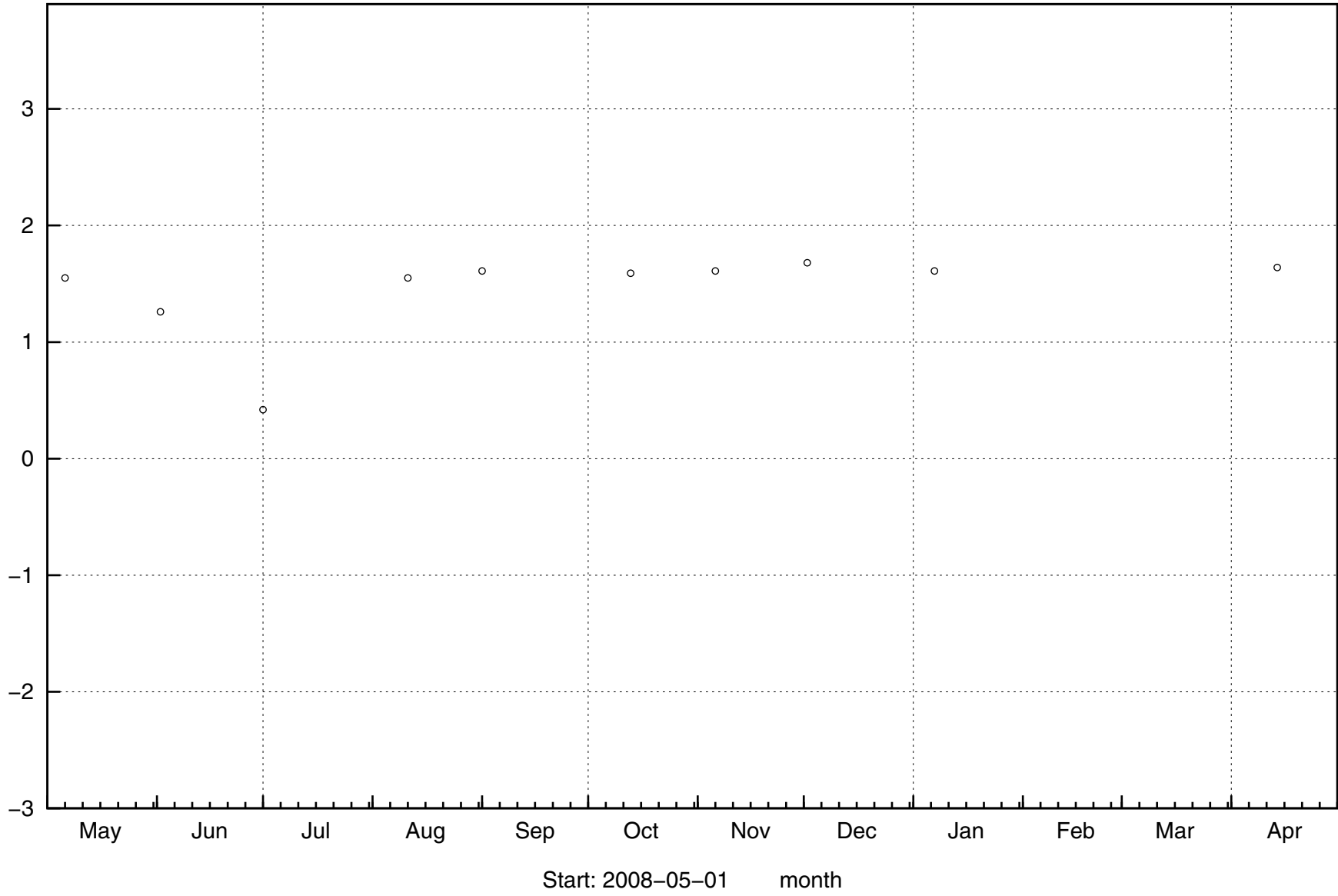
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130

2008-06-09 15:59:21

SFM0069



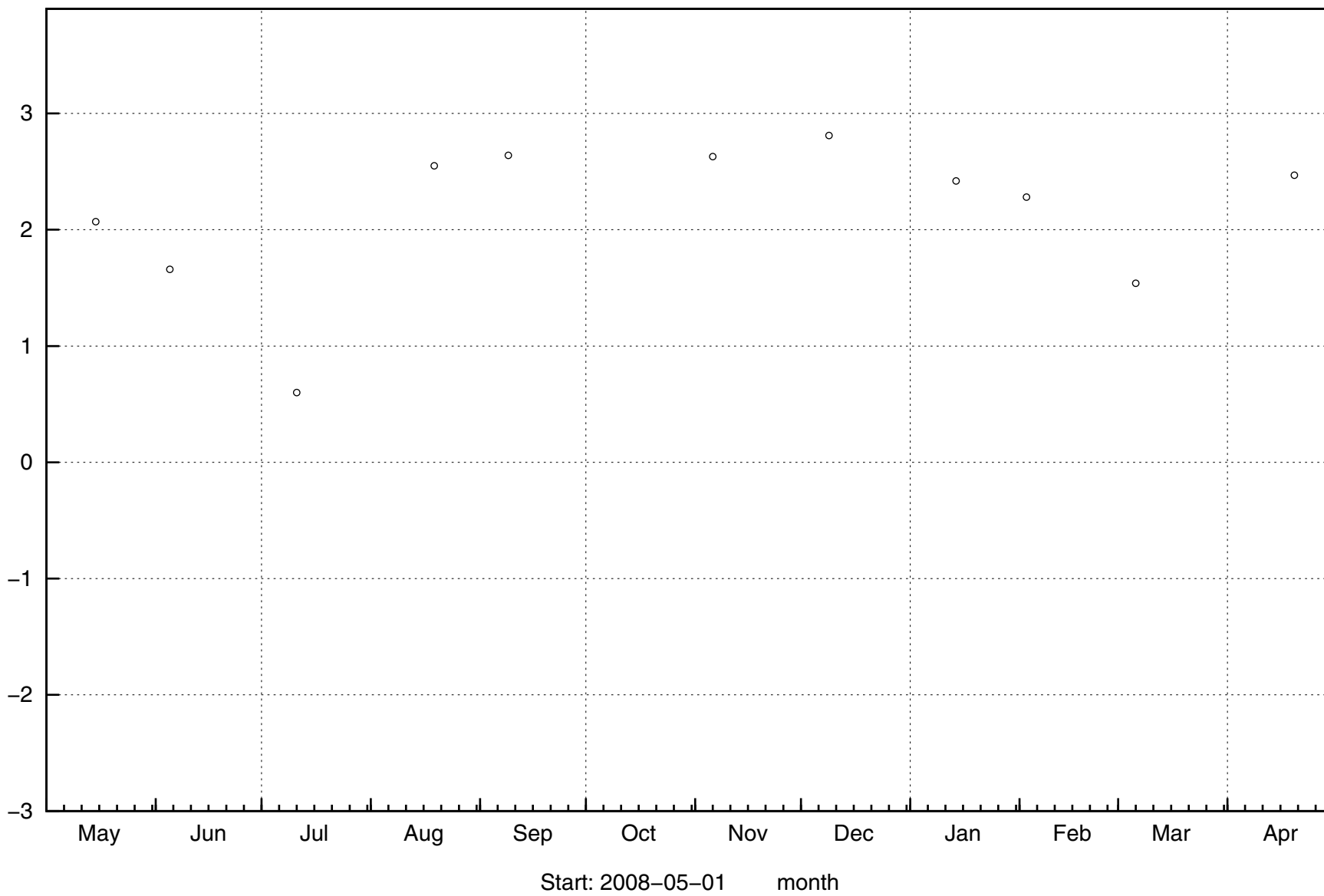
131

masl

2008-06-09 15:59:21

Start: 2008-05-01 month

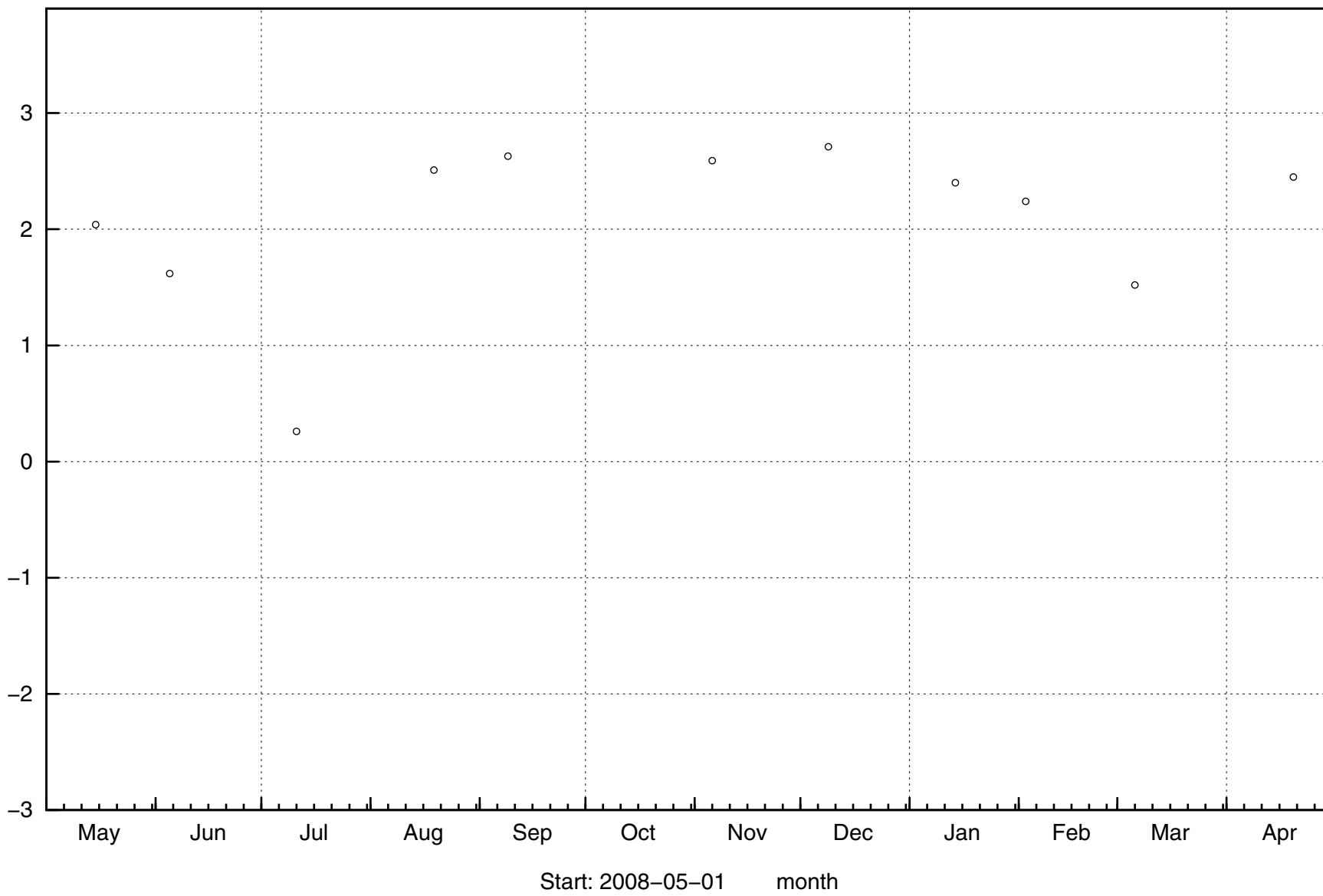
SFM0070



132

2008-08-15:09:21  
1.76951160-90-6002

SFM0071



133

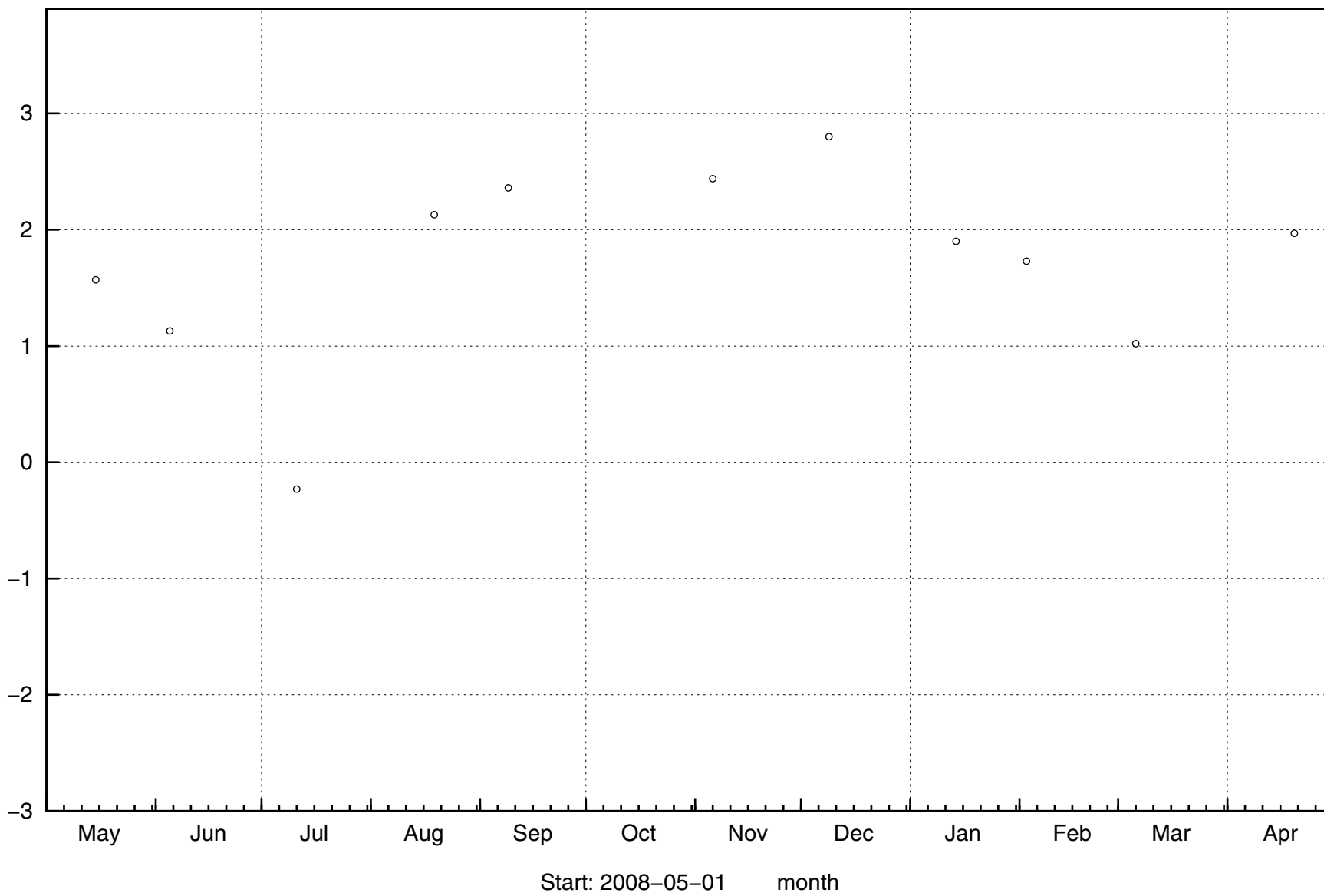
masl

2008-06-06 15:58:22

Start: 2008-05-01 month



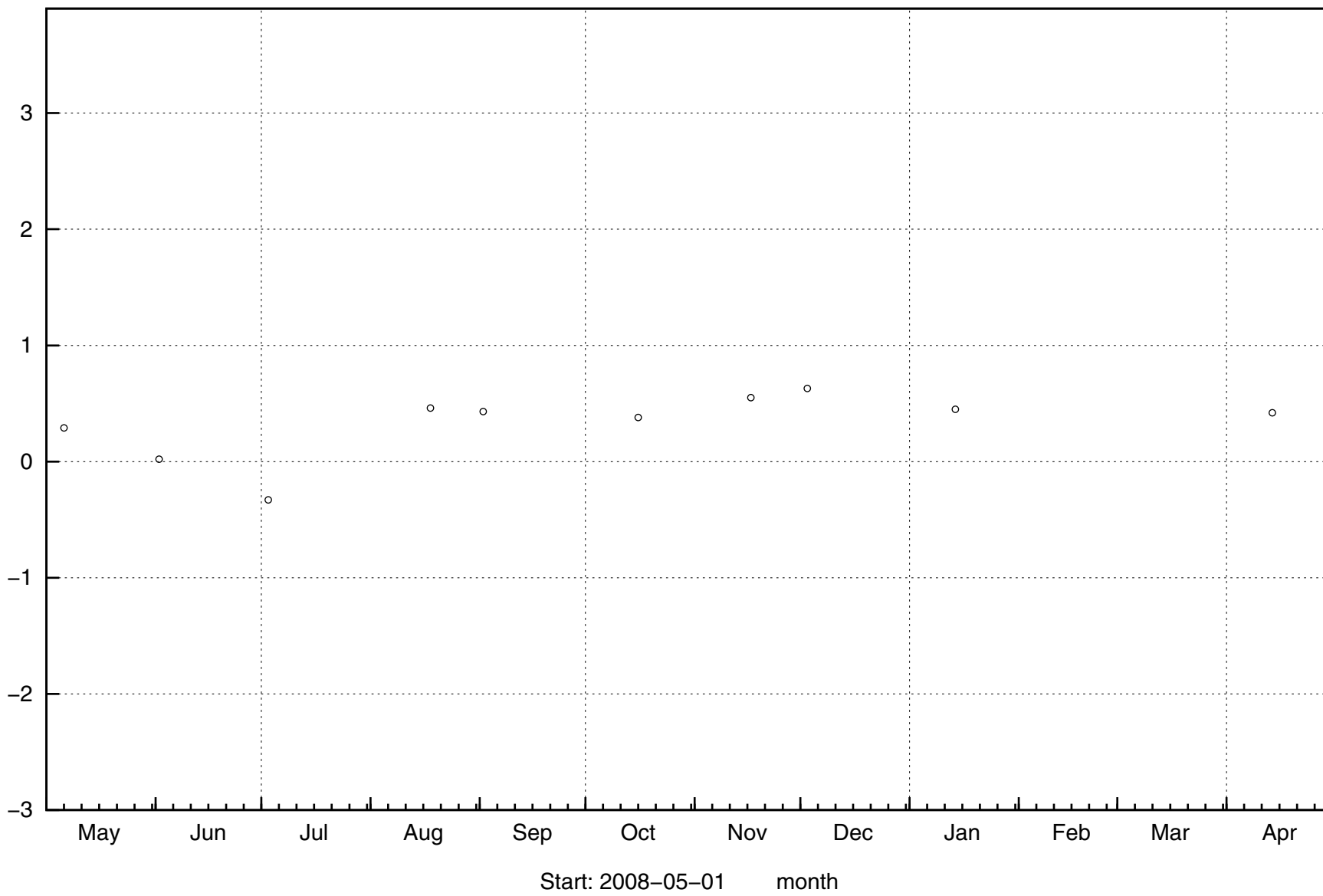
SFM0072



134

2009-06-09 15:59:22

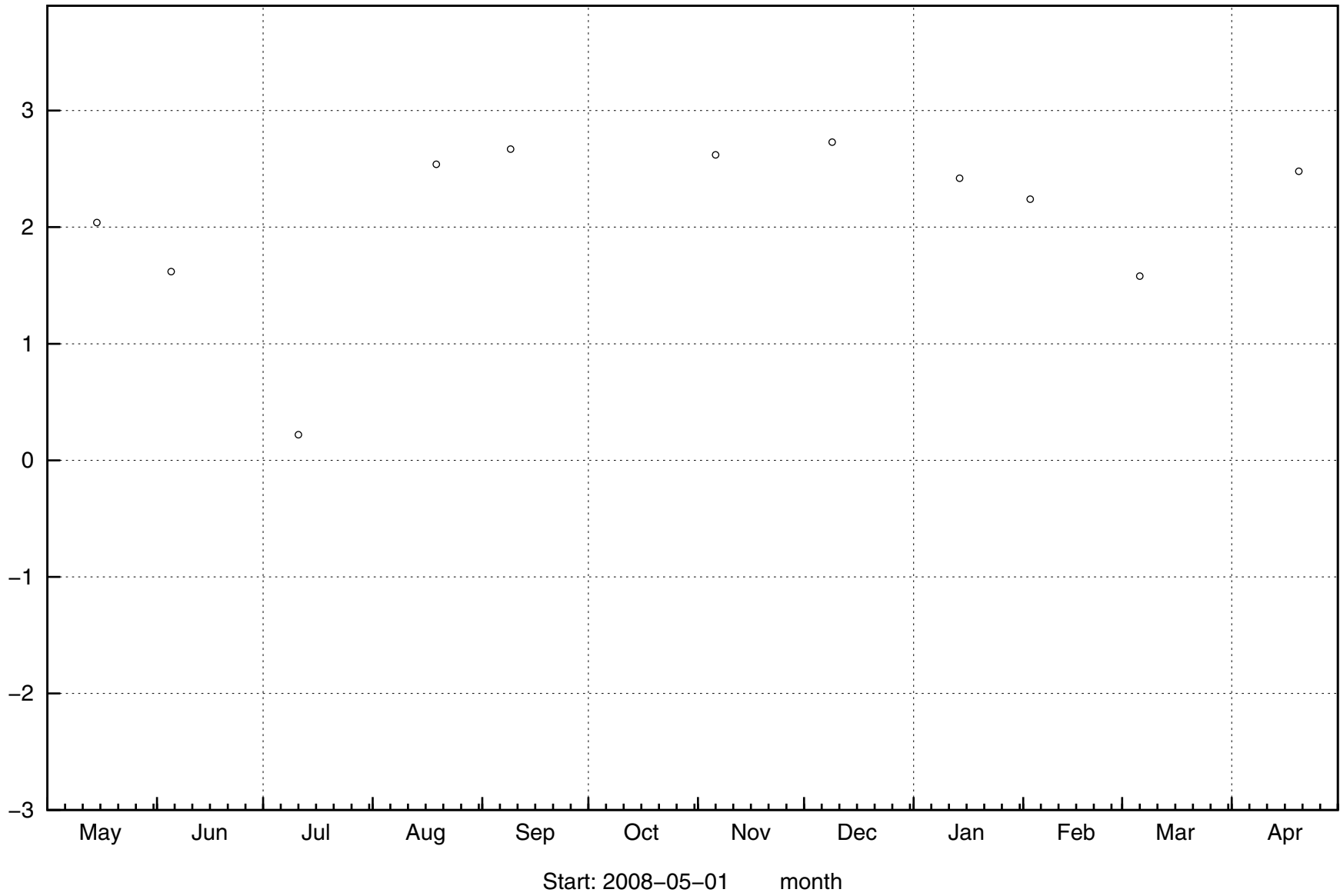
SFM0073



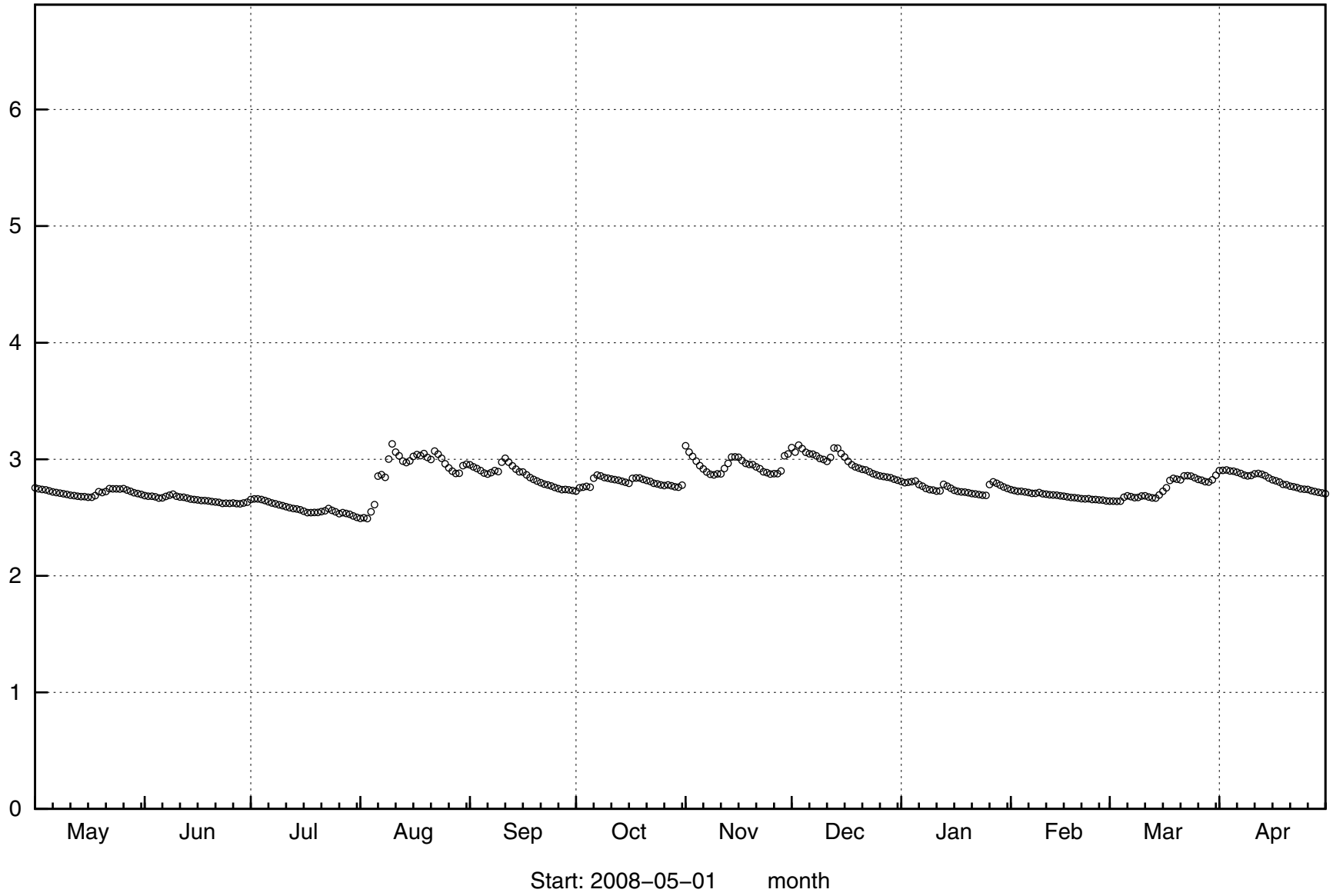
135

2008-06-09 15:58:22

SFM0075



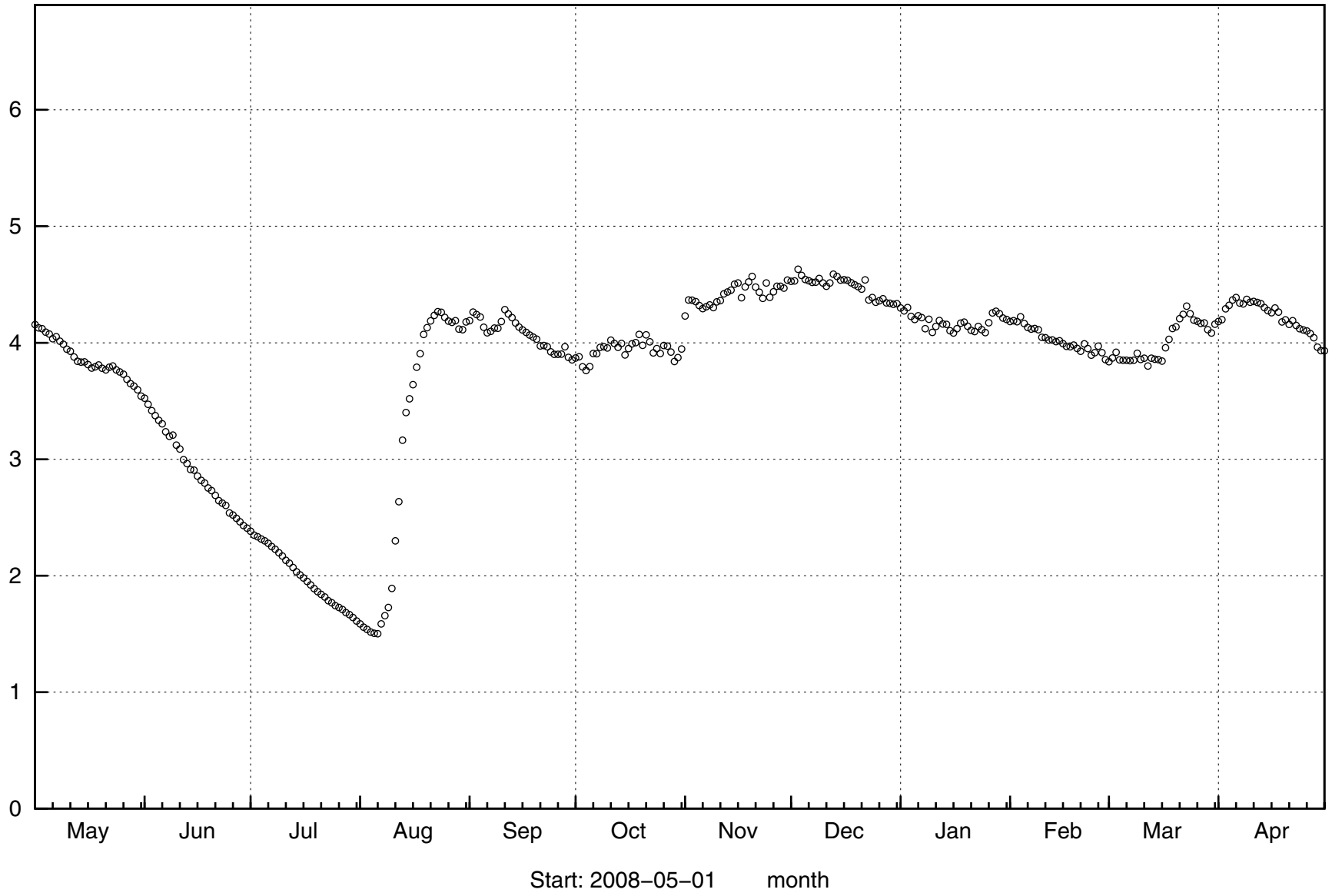
SFM0077



137

2008-05-01 15:59:22

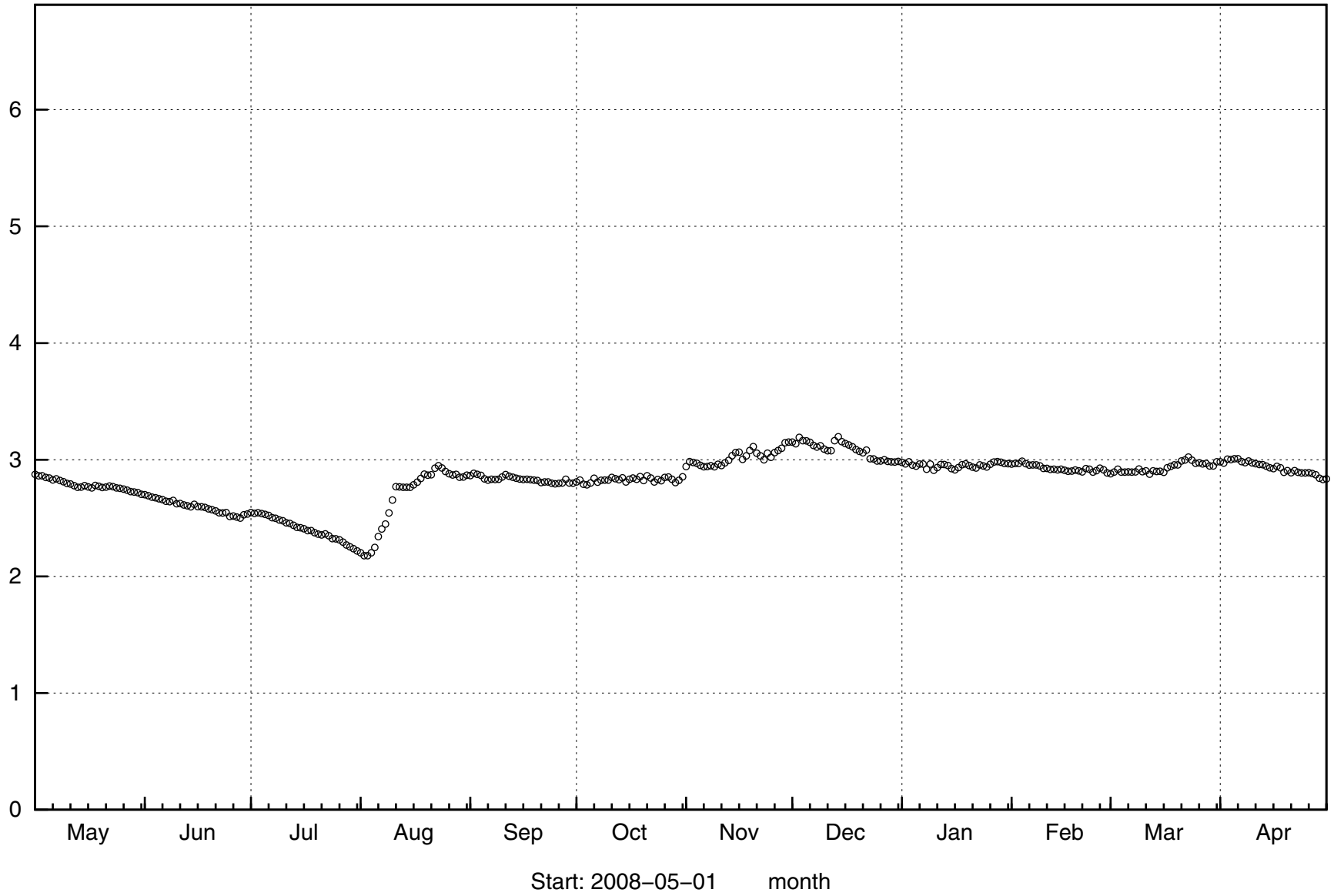
SFM0078



138

2009-06-09 15:59:22

SFM0079



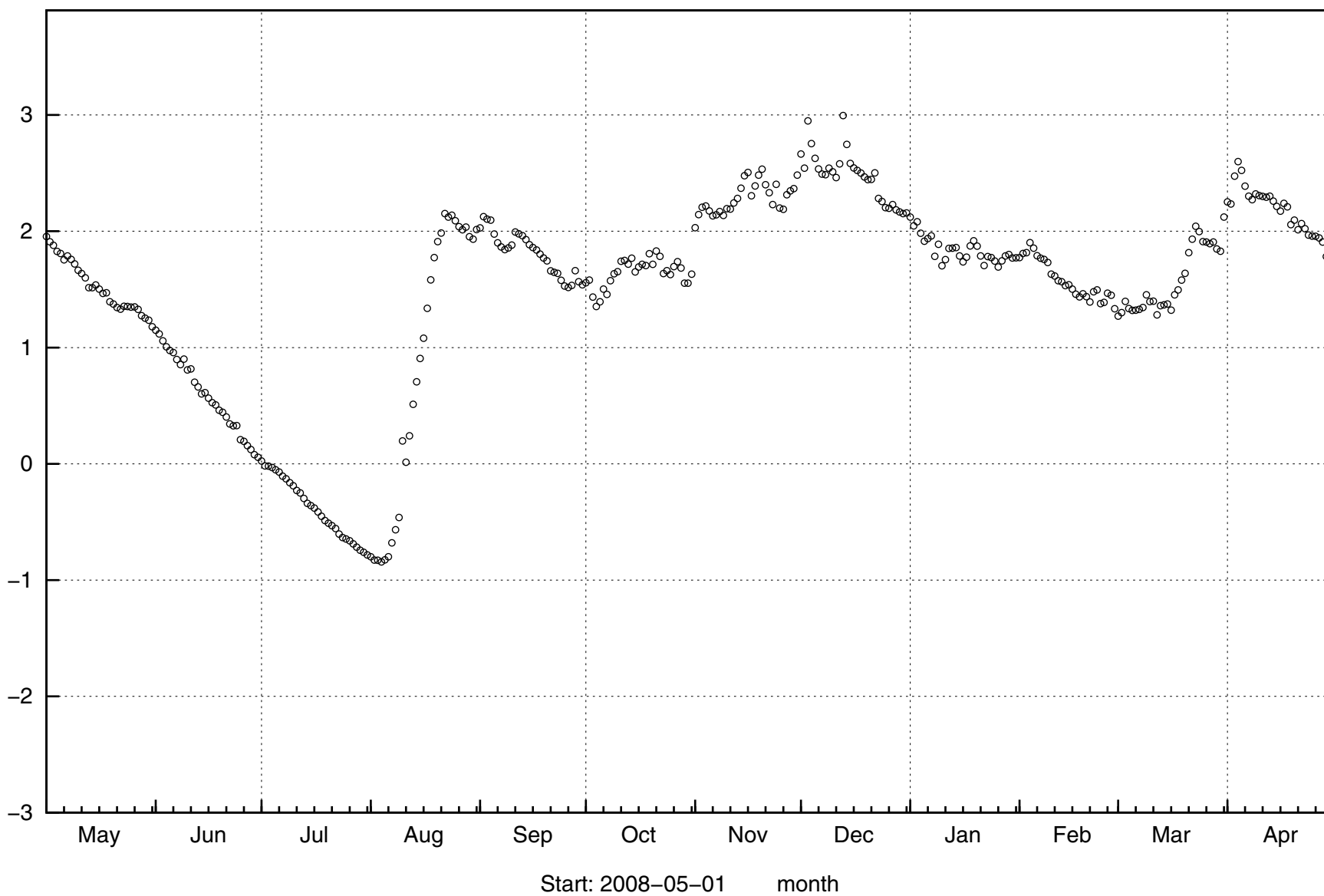
139

masl

2009-06-06 15:59:22

Start: 2008-05-01 month

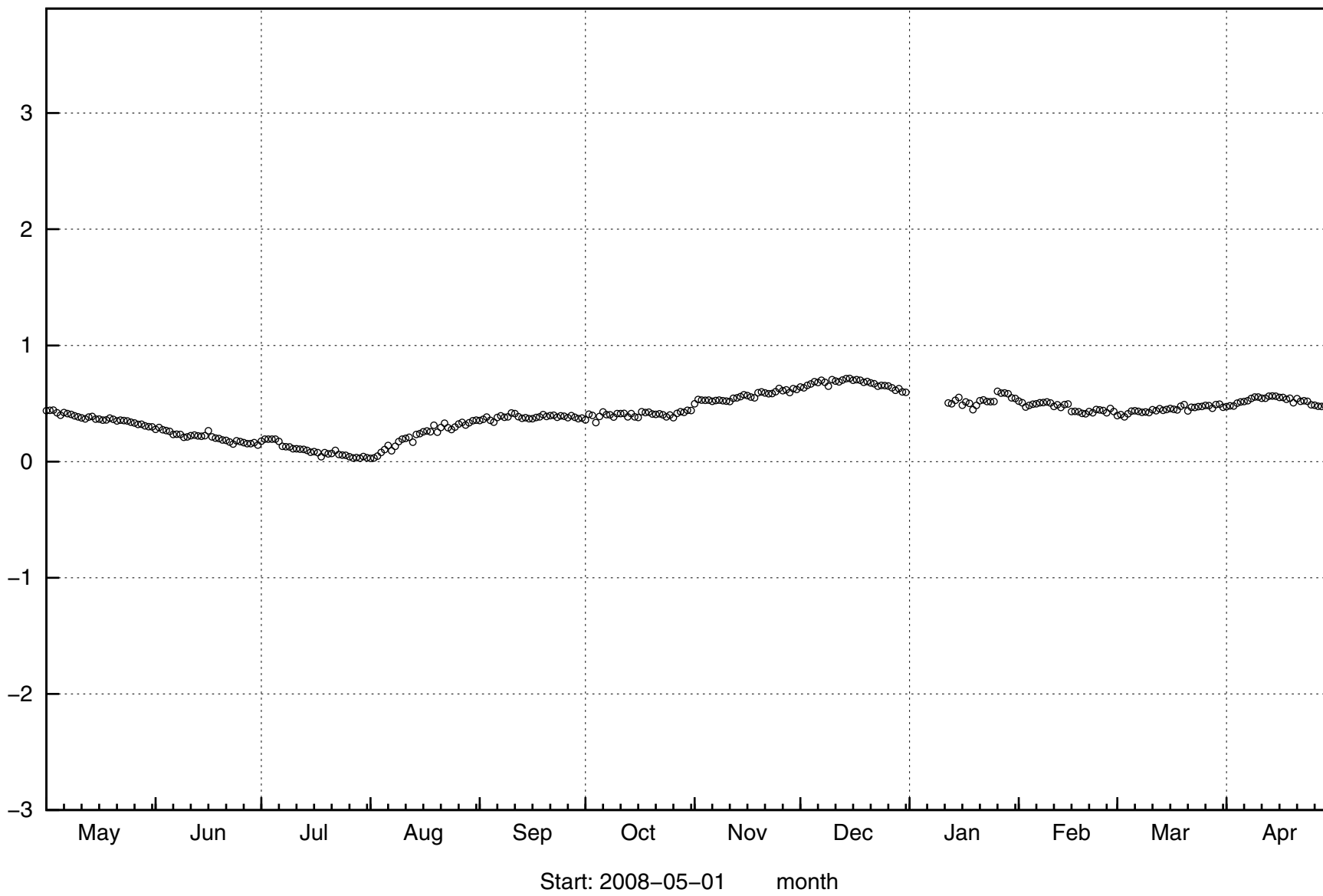
SFM0080



140

2009-06-09 15:59:22

SFM0081



141

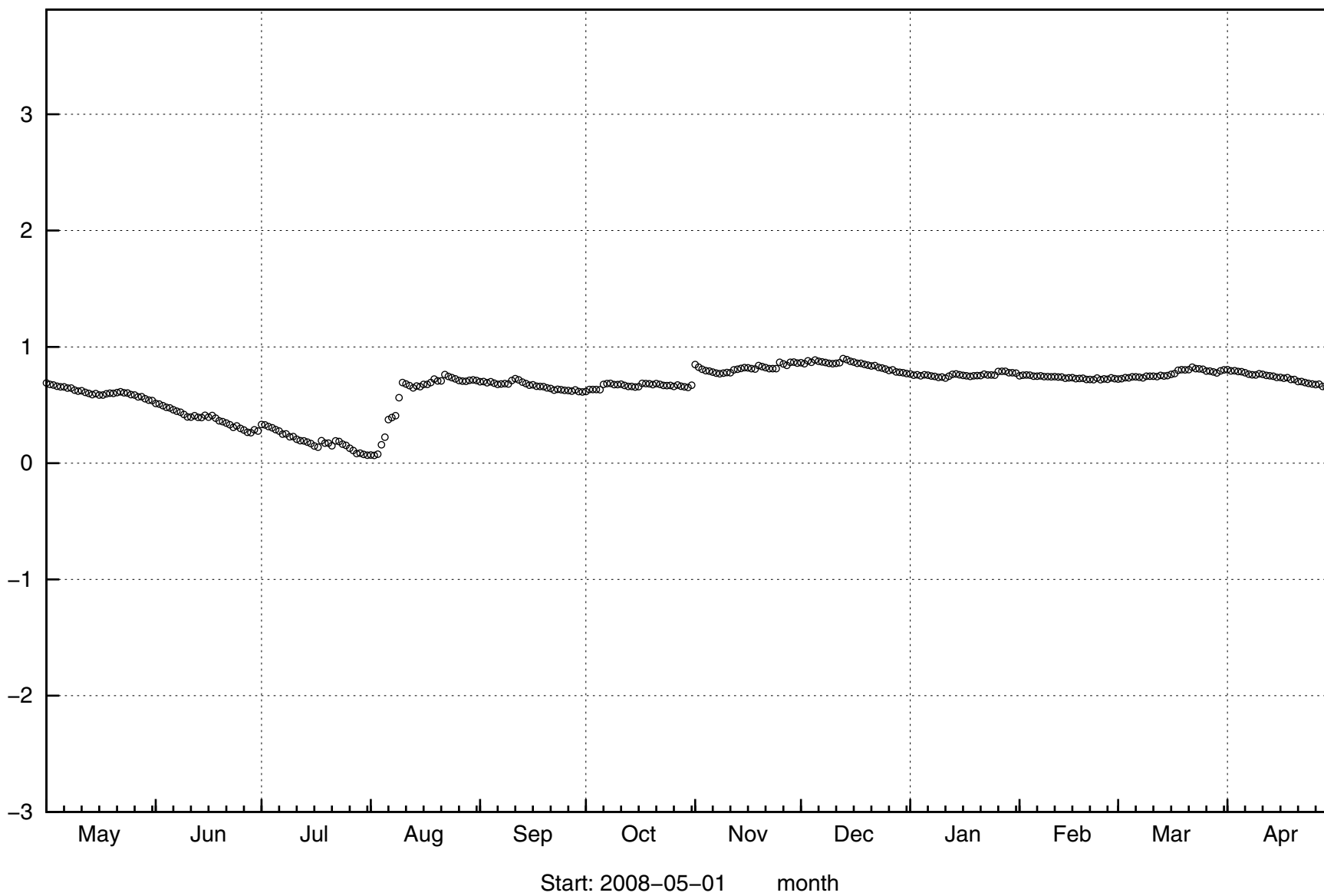
2009-06-09 15:59:22



SFM0084

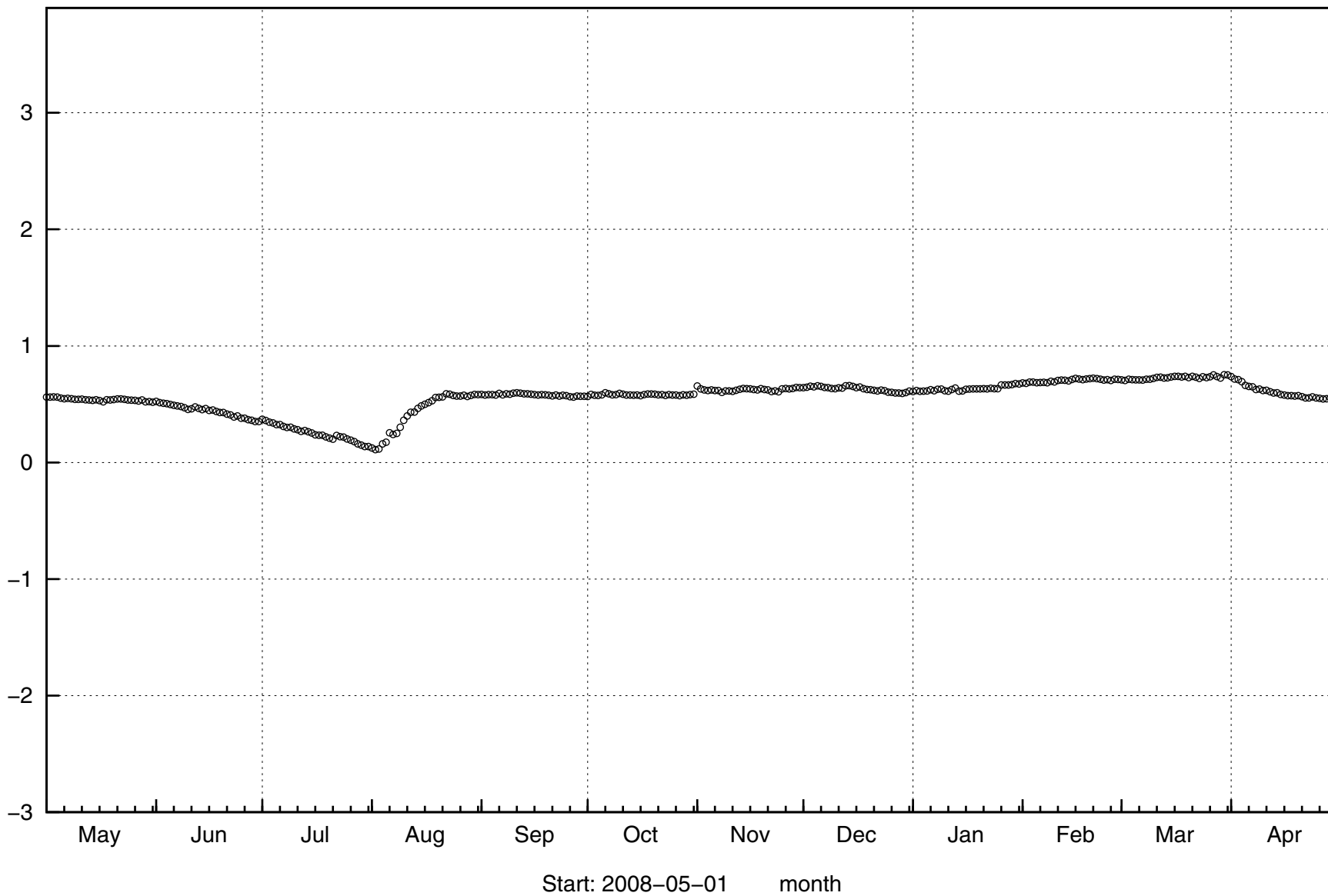
142

mas



2008-06-09 15:58:22

SFM0091



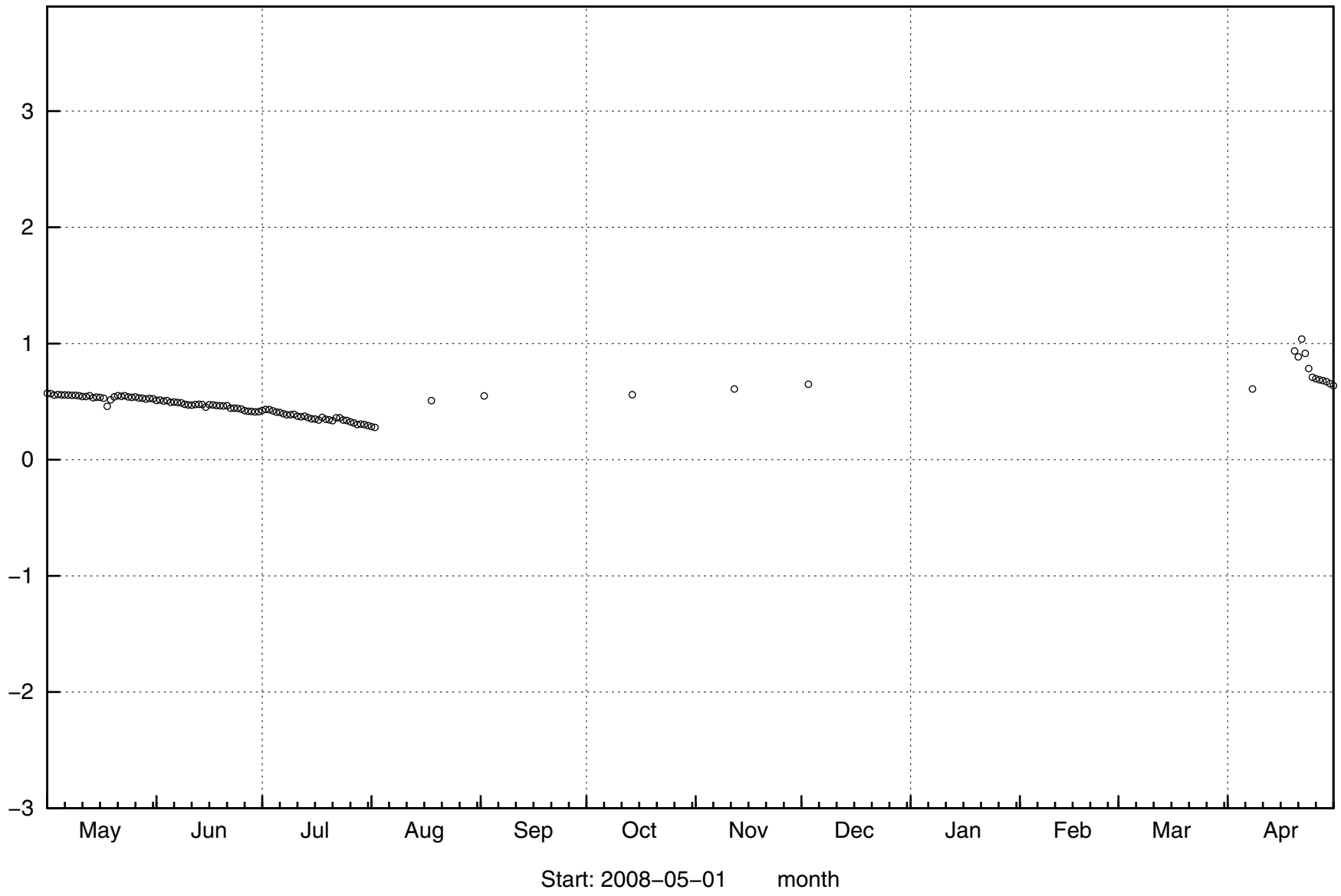
143

msa

2008-06-09 15:59:22

Start: 2008-05-01 month

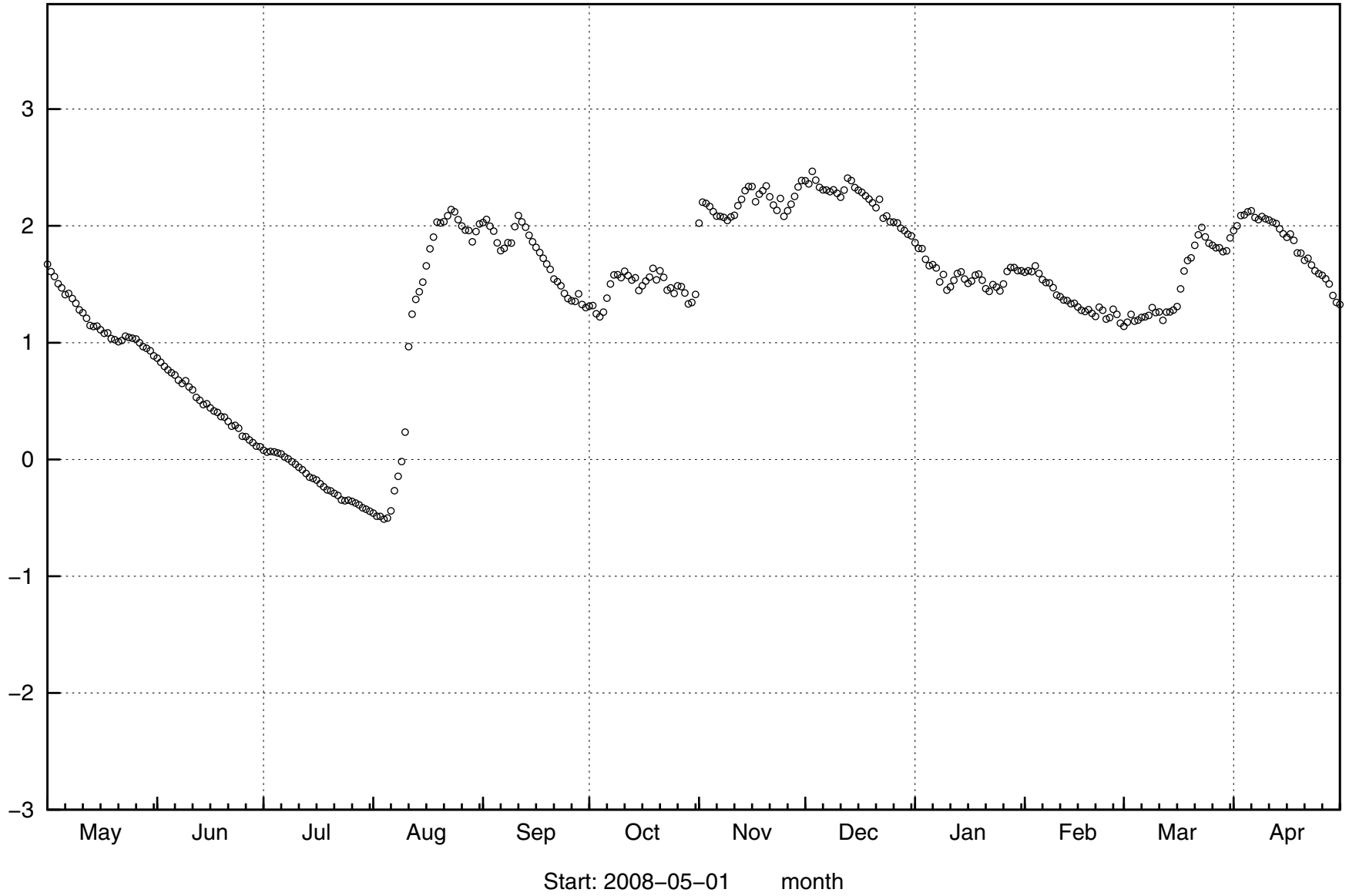
SFM0087



144

2008-06-09 15:59:22

SFM0104



145

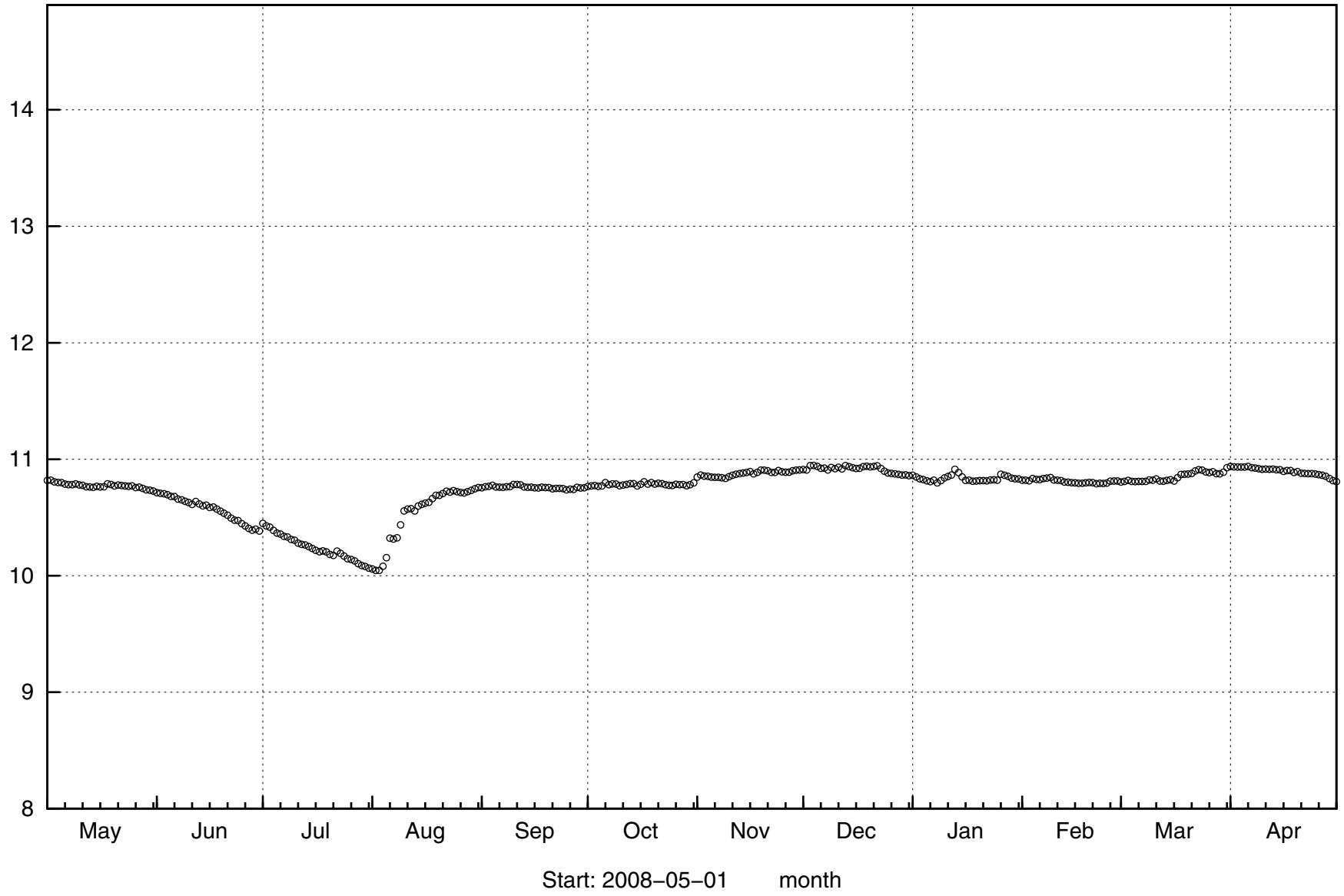
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2008-05-01 09:55:22

SFM0095

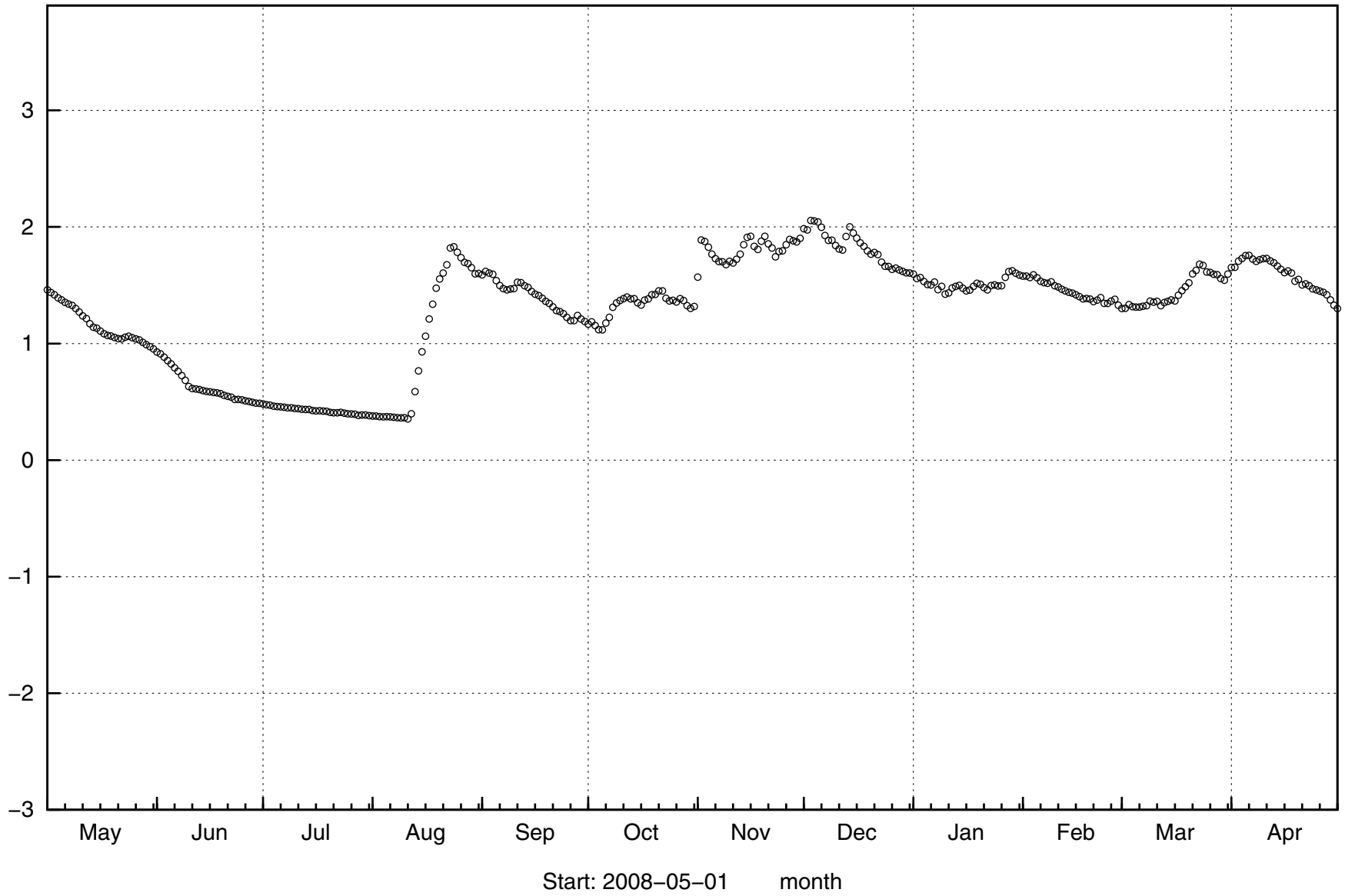
146

masl



2009-06-09 15:59:22

SFM0105



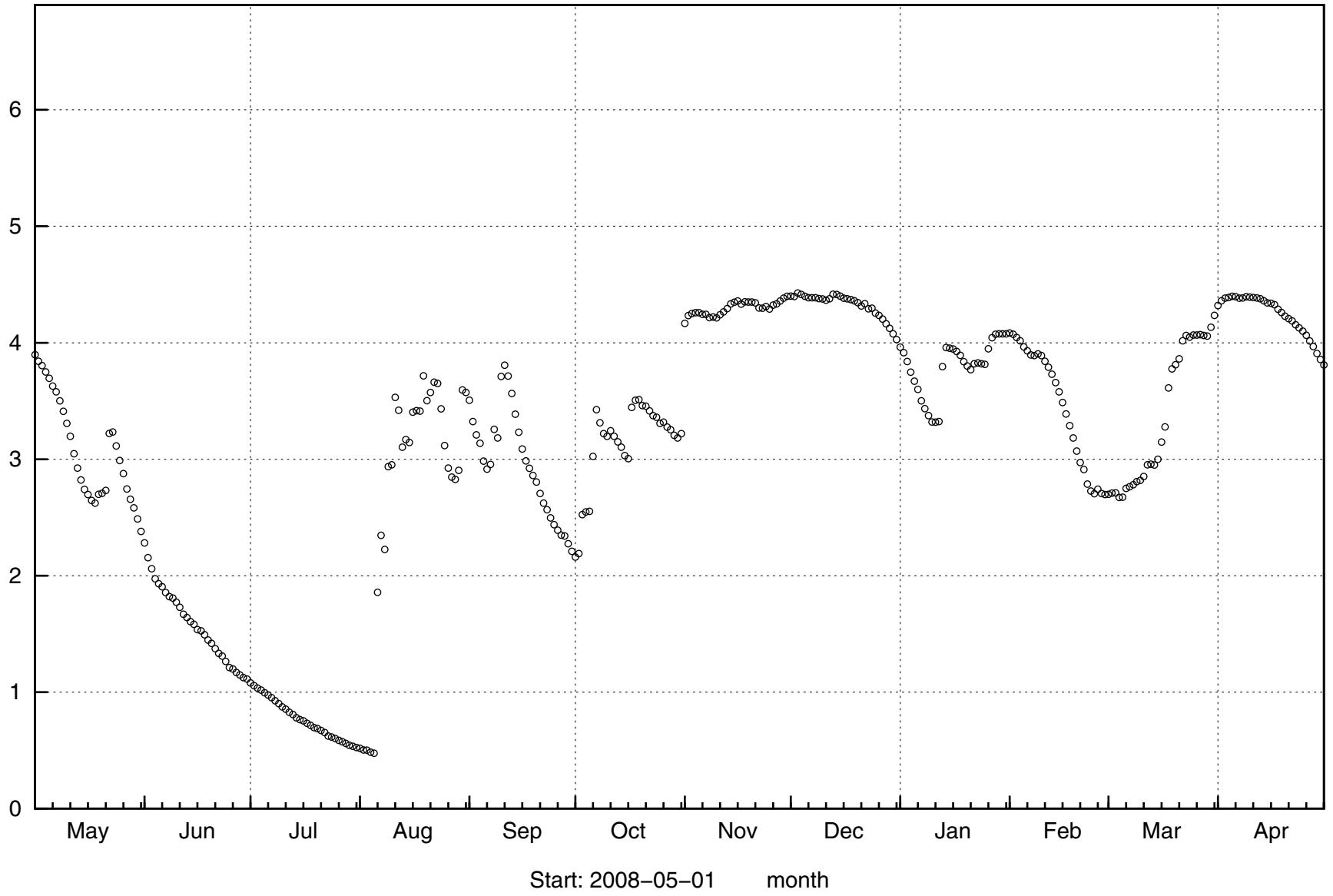
147

masl

2008-06-09 15:59:22

Start: 2008-05-01 month

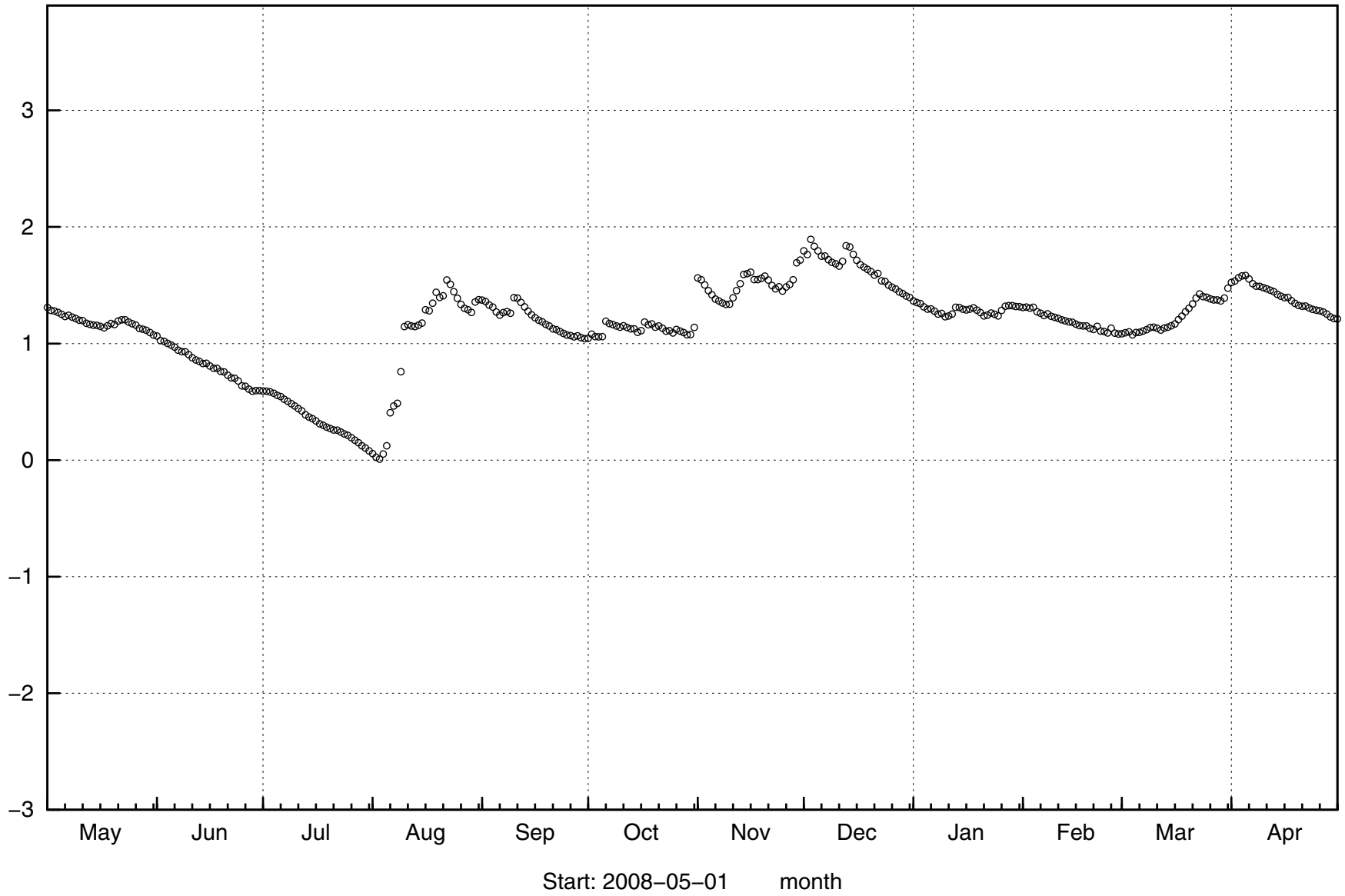
SFM0106



148

2009-06-09 15:59:22

SFM0107



149

masl

2009-06-09 15:59:22

Start: 2008-05-01 month