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Oskarshamn site investigation

Sampling of precipitation at Äspö, 2003

Äspö sampling site

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August 2004

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Abstract

Sampling and analysis of precipitation was performed from September 2002 to the end of 2003 at an open field site at Äspö. The purpose of this activity was to measure chemical compounds in the precipitation within the site investigation area at Oskarshamn.

The precipitation was collected in samplers placed two to ten meters apart in an area with a diameter of approximately 25 meter. The samplers were emptied regularly each month and if the precipitation had been rich the water was sent for analysis at different laboratories. Samples were sent for analysis on seven occasions.

The concentrations of different ions varied much between the different measuring periods. Calculations of ion balances showed rather great imbalances in many of the samples (more than 10% relative error). In one of the samples the concentrations of the negative ions far exceeded the concentrations of the positive ions. This imbalance was so large that there must be an error either in the analysis or in the handling of the samples. A possible explanation for the different results is influx of sea water spray in to one or more of the sampling containers and that water for different analysis came from different bottles without proper mixing of the water prior to analysis. Also pH and conductivity varied much between the different measuring periods.

The weighted average concentration of some of the ions and of pH was compared with results from three national monitoring stations for depositions in south east Sweden. The comparison shows that the concentration of ions was generally higher at Äspö. Also pH was markedly higher at Äspö. The main reason for this is probably that the Äspö station is situated very close to the sea with a greater influx of sea salt. A corrected average of SO_4-S (which excludes the part of sulphur that originates from sea salt) at Äspö was also more similar to the other stations in south east Sweden.

The hydrogen isotope ratio of deuterium varied with the lowest ratio in spring 2003. As expected these ratios correlated well with the ratios of ^{18}O and the linear relation corresponds well with the “Global Meteoric Water Line”. The ratios of tritium varied with a small tendency for lower values in late autumn and in winter periods.

Three types of nonconformities have occurred. The first is that no record was kept on the starting date and of the volumes collected in the first measuring period. The second type was that not all parameters planned were analysed on every occasion. The third type of nonconformity that occurred was that sampling was not always performed with a maximum interval of one month between the sampling occasions.

Sammanfattning

Provtagning och analys av regnvatten från Äspö har utförts från september 2002 till slutet av 2003. Syftet med undersökningarna var att mäta regnvattnets kemiska sammansättning inom området för platsundersökningen i Oskarshamn.

Regnvatten samlades in i behållare som slumpmässigt placerats inom ett område med en diameter på ca 25 m. Behållarna tömdes regelbundet varje månad om nederbördsmängden var stor så skickades prover för analys. Prover skickades för analys vid sju tillfällen.

Koncentrationen av olika joner varierade mycket mellan olika provtagningsperioder. Beräkningar av jonbalanserna visade på relativt stora avvikelser (mer än 10 % relativt fel) i många av proverna. I ett av proverna var koncentrationen av negativa joner mycket större än koncentrationen av positiva joner. Skillnaden var så stor att ett fel måste föreligga, antingen vid analyserna eller vid hanteringen av proverna. En möjlig förklaring är att havsvatten blåst in i en eller flera av behållarna och att vatten för olika analyser tagits ut utan en ordentlig sammanblandning. Även regnvattnets pH värde och konduktivitet varierade en hel del mellan de olika provtagningsperioderna.

Viktade medelvärden av några av de undersökta jonerna samt av pH jämfördes med resultat från stationer i det nationella nederbördskemiska nätet som ligger i sydöstra Sverige. Jämförelsen visar att halten av joner generellt var högre vid Äspö. Även pH var högre vid Äspö. Den huvudsakliga orsaken till detta är sannolikt närheten till havet. Ett beräknat korrigerat värde för SO_4-S (som utesluter svavel som härrör från havet) var också mer likt resultaten från de andra stationerna i sydöstra Sverige.

Väteisotopen deuterium varierade mellan provtagningstillfällena med den lägsta kvoten under våren 2003. Som förväntat var kvoterna av deuterium väl korrelerade med kvoterna av ^{18}O. Även kvoterna av tritium varierade mellan provtillfällena med en svag tendens till lägre värden under senhösten och vintern.

Tre typer av avvikelser från vad som planerats har förekommit under perioden. Den första är att anteckningar om startdatum och insamlad volym inte gjorts under den första provtagningsperioden. Den andra är att inte alla planerade parametrar har analyserats vid varje provtillfälle. Den tredje typen av avvikelse var att provtagning inte alltid har gjorts med ett maximalt intervall på en månad.

Contents

1 Introduction

This document reports the results gained by the sampling and analysis of precipitation 2002–2003, which is one of the activities performed within the site investigation at Oskarshamn. The work was carried out in accordance with activity plan AP PS 400-02-031. In Table 1-1 controlling documents for performing this activity are listed. Both activity plan and method descriptions are SKB's internal controlling documents.

The aim of the activity was to measure chemical substances in the precipitation (rain and snow). These data will be a part of the data needed to describe the circulation of water and water transported substances in the investigation area. The sampling was performed from September 2002 to the end of 2003 at the site PSM002170 at Äspö (Figure 1-1). All data generated was stored in the database SICADA.

Table 1-1. Controlling documents for the performance of the activity.

Activity plan	Number	Version
Undersökningar i Simpevarpsområdet: Nederbördsprovtagning 2002–2003	AP PS 400-02-031	1.0
Method descriptions	**Number**	**Version**
Metodbeskrivning för provtagning och analys av nederbörd	SKB MD 423.003	1.0

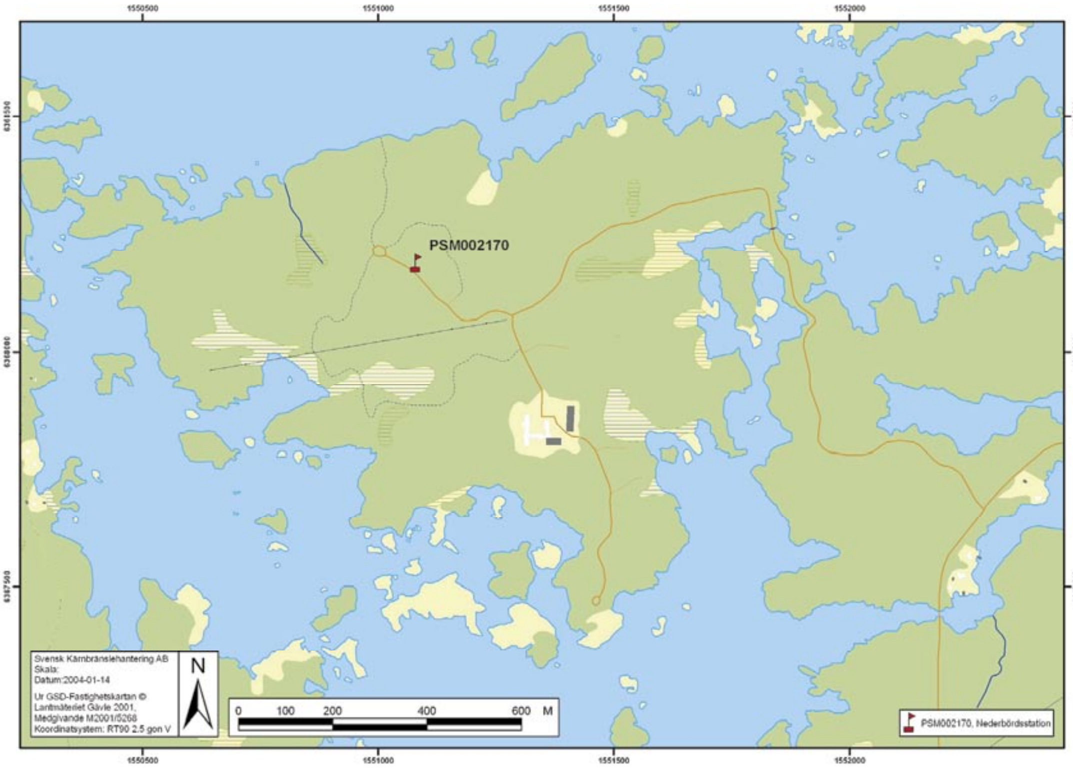

Figure 1-1. Site for sampling of precipitation at the island of Äspö. Coordinates for the site is N 6368188.887; E 1551081.634 (RT90/RHB70). The elevation is 6.165 m.

2 Objective and scope

The purpose of this activity was to measure chemical compounds in the precipitation within the site investigation area. The method used was designed to measure precipitation in an open field and in undisturbed conditions. Samples for analysis were to be taken on approximately six occasions every year. In the end of each month when samples were not taken the samplers were emptied.

The measurements and analysis performed aimed also to give results of high quality from an undisturbed site. To ensure high quality the sample was transported to the laboratories as fast as possible. Sampling was also performed during or immediately after a period of heavy rain. Calculations of the ion balance in each sample were later a mean to prove high quality of the samples. According to the method description (SKB MD 423.003, internal document) the relative error in the ion balance should be less than 10%.

The parameters measured in the samples are presented in Table 4-1.

3 Equipment

Fourteen samplers were placed in an open field approximately half a meter above the ground (Figure 3-1). Exact locations with coordinates are given in Table 3-1. The samplers were placed two to ten meters apart in an area with a diameter of approximately 25 meter. The total volume caught in the samplers at each sampling period was treated as one sample to ensure that enough water was caught for all analysis planned.

In summer the samplers were cans with funnels with a diameter of 15.5 cm. In winter buckets with a diameter of 21 cm were used. The cans and the bucket could hold a maximum volume of five litres. Plastic bags made of polyethene were used inside the cans or buckets to prevent contamination. A new plastic bag was used for every measuring period. When emptying the samplers a graduated glass was used to measure the volumes in the samplers. One or two five litres plastic container was then used to transport the sample to the laboratory were the sample was divided into smaller bottles before they were delivered to the different analysing laboratories. When the sample was divided into smaller bottles the water for some analysis were filtrated with a syringe through a 0.45 µm sterile-R single use filter. All handling of the samples was performed with protective plastic gloves.

***Figure 3-1.** The samplers used in summer at the site for sampling of precipitation at the island of Äspö.*

Table 3-1. Locations with coordinates for the individual samplers (RT90/RHB70).

ID-code	Northing (m)	Easting (m)
PSM002164	6368190.379	1551095.219
PSM002165	6368190.772	1551092.651
PSM002166	6368191.406	1551089.403
PSM002167	6368189.112	1551087.298
PSM002168	6368186.288	1551085.978
PSM002169	6368186.333	1551083.621
PSM002170	6368188.887	1551081.634
PSM002171	6368191.387	1551082.044
PSM002172	6368192.608	1551081.786
PSM002173	6368194.691	1551080.047
PSM002174	6368197.498	1551078.972
PSM002175	6368198.224	1551081.681
PSM002176	6368198.204	1551086.452
PSM002177	Not measured	Not measured

4 Execution

4.1 Preparations

To prevent contamination and avoid extensive algal growth plastic bags made of polyethene were used inside the samplers. New plastic bags were used for each measuring period.

4.2 Execution of field work

The precipitation was collected in samplers placed in an open field at Äspö (Figure 1-1, 3-1). The samplers were emptied regularly each month and if the precipitation had been rich the water was sent for analysis at different laboratories (Table 4-1). The analysis performed follow chemistry class 3 (MD 450.001 SKB's internal controlling document). In months with low precipitation the water was discarded and no analysis and no measurements of volume were performed (Table 5-1). The method used is described in detail in MD 423.003, SKB internal document.

The samplers were emptied each month and the volume of water in every sampler was measured with a graduated glass. In months with rich precipitation a part of the water (the same amount from each sampler) from each sampler was gathered in a five litres plastic container. Later in the laboratory the sample was divided into different bottles before they were distributed to the analysing laboratories. The handling of these samples with type of bottles, filtration, acidification, filling instructions and the laboratories used are shown in Table 4-1 (MD 423.003, SKB internal document).

In winter the samples were handled in a similar way except that the plastic bags from the buckets were taken to the laboratory where the weight of the ice and snow was measured on a scale.

Table 4-1. Analysed components, treatments of samples and analysing laboratory.

Components	Bottle/volume	Preparation of sample	Laboratory
pH, Conductivity, HCO_3	150 ml	–	Äspö laboratory
Ca, Fe, K, Mg, Na, S, Si, Li, Mn, Sr	50 ml, acid rinsed	filtration 0.45 µm acidification 1% HNO_3	Analytica
Cl, Br, SO_4, F, Si	100 ml	filtration 0.45 µm	Äspö laboratory
DOC	100 ml	filtration 0.45 µm	Department of Systems Ecology at Stockholm University
^3H, ^{37}Cl	1000 ml	dried bottle, flow over twice	Environmental Isotope Lab at the University of Waterloo, Canada
^2H, ^{18}O	100 ml	flow over twice	Institutute for Energy Technology, Norway

Three different ways of delivery to the laboratories were chosen. The samples for Äspö laboratory were delivered directly after each sampling day. To the department of Systems Ecology in Stockholm and to Analytica the samples were immediately sent by postal service. This means that the samples arrived to the laboratories the following day, after sampling. The samples for IFE in Norway and EIL in Canada were sent by DHL delivery service.

4.3 Data handling and calculations

After analysis data has continuously been reported from the laboratories. As a routine a first preliminary control of the data quality was performed before storing them in the database SICADA. The data was reported to SICADA in field note numbers (Table 4-2). Data for this evaluation was delivered from SICADA 2004-07-07.

The precipitation (P) during the sampling periods was calculated from the collected volume (V) and the area of the sampler (A). P (mm) = 10 * V (ml)/A (cm^2).

The concentration of SO_4-S in the precipitation was calculated as the atomic proportion of SO_4 ([SO_4-S] = [SO_4]/96 *32).

A part of the SO_4-S originates from sea salt which makes it difficult to compare the concentrations of SO_4-S from different sites at different distances from the sea. A corrected value which excludes the part that originate from sea salt was calculated from the concentration of Na ([SO_4-S_{korr}] = [SO_4-S] – 0.0837 * [Na]).

To compare with results from other sites in south east Sweden weighted averages was calculated on some of the ions and pH. The calculations were made from the formula $X_m = \sum(c_i * m_i)/ \sum(m_i)$ were c is the concentration during a period and m is the precipitation during the same period.

Table 4-2. Reported field note numbers in SICADA.

Activity	Start Date	Stop Date	Idcode	Field Notes ID
Water sampling, class 3	2002-09-09 09:00	2002-09-09 10:15	PSM002170	Simpevarp 63
Water sampling, class 3	2002-12-18 08:30	2002-12-18 09:30	PSM002170	Simpevarp 63
Water sampling, class 3	2003-02-24 10:00	2003-02-24 11:00	PSM002170	Simpevarp 63
Water sampling, class 3	2003-04-14 09:00	2003-04-14 10:05	PSM002170	Simpevarp 63
Water sampling, class 3	2003-06-24 12:30	2003-06-24 13:30	PSM002170	Simpevarp 114
Water sampling, class 3	2003-09-22 09:20	2003-09-22 09:55	PSM002170	Simpevarp 136
Water sampling, class 3	2003-11-27 09:00	2003-11-27 10:00	PSM002170	Simpevarp 187

4.4 Nonconformities

Three types of nonconformities have occurred. The first is that no record was kept on the starting date of the first measuring period. Similar there were no record of the volumes collected in the samplers for the first period.

The second type of nonconformity was that some analysis was not performed on every occasion. Tritium was not analysed in September 2003. The reason for this was probably that not enough water was obtained during that period. HCO_3 was not analysed on two occasions (December 2002 to February 2003 and October 2003 to November 2003) because of very low pH. DOC was only analysed once, during the first period.

The third type of nonconformity that occurred was that sampling was not always performed with a maximum interval of one month between the sampling occasions. On one occasion (December 2002 to February 2003) the interval was approximately two month.

5 Results and discussion

All data gained are stored in the primary data base SICADA. These data will later be used for further interpretation and modelling. Here the results are presented in a more general way.

Samples were sent for analysis on seven occasions. During the total sample period the average volume collected was 657 ml per sampler (Table 5-1). The mean calculated precipitation during this period was 26.7 mm.

The concentrations of different ions varied much between the different measuring periods (Table 5-2). On one occasion (2002-12-18 to 2003-02-24) the concentrations of the negative ions far exceeded the concentrations of the positive ions. This imbalance is large and there must be an error either in the analysis or in the handling of the samples. To test the quality of the samples the relative error in the ion balance was calculated (Table 5-3). These calculations show rather great imbalances (more than 10% relative error) in many of the samples). The reason for this is hard to interpret, partly because two major ions (NO_3 and NH_4) hasn't been analysed. In a nearby station for measurement of precipitation (Norra Kvill in the municipality of Vimmerby) the average concentrations of NO_3 and NH_4 was 0.35 mg/l and 0.38 mg/l in 2002 /Karlsson et al. 2003/.

Also pH and conductivity varied much between the different measuring periods (Table 5-4). The results obtained during the period 2002-12-18 to 2003-02-24 differ with higher pH and an extremely high conductivity. A possible explanation for the different result in this period is influx of sea water spray in to one or more of the sampling containers and that water for different analysis came from different bottles without proper mixing of the water prior to analysis. The single measurement of DOC (dissolved organic carbon) from the first sampling period was 13 mg/l (Table 5-4). This seems to be a rather high value for rain water.

Table 5-1. Sampling periods and average volume of water in the samplers and calculated precipitation during the periods when analysis were performed.

Sample period		Sample number	Average volume (ml)	Sampler diameter (cm)	Sampler area (cm²)	Pricipitation (mm)
? – 2002-09-09	A	3762	–	21.0	346.4	–
2002-11-21 – 2002-12-18	A	3881	791.8	21.0	346.4	22.9
2002-12-18 – 2003-02-24	A	3894	210.1	15.5	188.7	11.1
2003-02-24 – 2003-04-08	N			15.5	188.7	
2003-04-08 – 2003-05-14	A	6005	475.7	15.5	188.7	25.2
2003-04-14 – 2003-05-27	N			15.5	188.7	
2003-05-27 – 2003-06-24	A	5671	1078.6	15.5	188.7	57.2
2003-06-24 – 2003-07-15	N			15.5	188.7	
2003-07-15 – 2003-09-10	N			15.5	188.7	
2003-09-10 – 2003-09-22	A	5861	144.3	15.5	188.7	7.6
2003-09-22 – 2003-10-14	N			15.5	188.7	
2003-10-14 – 2003-10-28	N			15.5	188.7	
2003-10-28 – 2003-11-27	A	7013	1243.1	21.0	346.4	35.9
2003-11-27 –	N			21.0	346.4	
Average						26.7
Standard deviation						18.1

A = analysis was performed, N = alaysis was not performed

Table 5-2. Measured concentrations of ions and some other components during the measuring periods

Sample period	Sample number	Na (mg/l)	K (mg/l)	Ca (mg/l)	Mg (mg/l)	Fe (mg/l)	Mn (mg/l)	Li (mg/l)	Si (mg/l)	Sr (mg/l)
? – 2002-09-09	3762	0.5	1.65	0.9	0.3	0.010	0.05	<0.004	0.1	0.00
2002-11-21 – 2002-12-18	3881	1.9	<0.4	1.0	0.2	0.023	0.01	<0.004	<0.03	0.01
2002-12-18 – 2003-02-24	3894	0.5	<0.4	0.6	<0.1	0.022	0.01	<0.004	<0.03	0.01
2003-04-08 – 2003-04-14	6005	0.8	<0.4	0.2	<0.1	<0.020	0.00495	<0.004	<0.03	0.0026
2003-05-27 – 2003-06-24	5671	1.2	1.36	0.5	0.2	<0.030	0.02	<0.004	<0.03	0.0048
2003-09-10 – 2003-09-22	5861	6.3	0.45	5.2	0.3	0.100	0.07	<0.004	<0.03	0.07
2003-10-28 – 2003-11-27	7013	0.6	0.42	0.4	0.1	<0.030	0.04	<0.004	<0.03	0.0027

Sample period	Sample number	S (mg/l)	Cl (mg/l)	SO_4 (mg/l)	SO_4-S (mg/l)	SO_4-S_{korr} (mg/l)	Br (mg/l)	F (mg/l)	HCO_3 (mg/l)
? – 2002-09-09	3762	0.72	1.0	1.70	0.567	0.525	0.09	0.08	<1
2002-11-21 – 2002-12-18	3881	1.29	1.3	3.63	1.210	1.051	<0.2	0.53	–
2002-12-18 – 2003-02-24	3894	0.51	435	24.6	8.200	8.158	3.41	<0.2	1
2003-04-08 – 2003-04-14	6005	0.35	1.2	0.87	0.290	0.223	<0.2	0.05	<1
2003-05-27 – 2003-06-24	5671	0.52	0.7	1.26	0.420	0.320	<0.2	<0.2	<1
2003-09-10 – 2003-09-22	5861	1.29	15.6	4.15	1.383	0.856	0.86	<0.2	<1
2003-10-28 – 2003-11-27	7013	0.67	0.7	1.83	0.610	0.560	<0.2	<0.2	–

Table 5-3. Calculated errors of the ion balance in the samples from the different measuring periods.

Sample period	Sample number	Ion balance, relative error (%)
? – 2002-09-09	3762	23.3
2002-11-21 – 2002-12-18	3881	13.5
2002-12-18 – 2003-02-24	3894	–98.9
2003-04-08 – 2003-04-14	6005	–1.6
2003-05-27 – 2003-06-24	5671	26.9
2003-09-10 – 2003-09-22	5861	1.1
2003-10-28 – 2003-11-27	7013	10.4

Table 5-4. Measured values of pH, Conductivity and the concentration of DOC (dissolved organic carbon) during the measuring periods.

Sample period	Sample number	pH	Conductivity (mS/m)	DOC (mg/l)
? – 2002-09-09	3762	5.45	2.2	13
2002-11-21 – 2002-12-18	3881	4.55	3.5	–
2002-12-18 – 2003-02-24	3894	6.17	115	–
2003-04-08 – 2003-04-14	6005	5.10	3	–
2003-05-27 – 2003-06-24	5671	5.58	1.9	–
2003-09-10 – 2003-09-22	5861	5.17	9.7	–
2003-10-28 – 2003-11-27	7013	4.65	3.2	–

To compare some of the results with national monitoring stations for depositions in south east Sweden weighted averages were calculated of some of the ions and of pH (see chapter 4.3). Due to the deviating results during the period 2002-12-18 to 2003-02-24 these data was omitted from the calculations. Three stations situated in the counties of Kalmar, Kronoberg and Blekinge were chosen and the results as weighted averages from 2002 were taken from /Karlsson et al. 2003/. The comparison shows that the concentration of ions was generally higher at Äspö (Table 5-5). Also pH was markedly higher at Äspö. The main reason for this is probably that the Äspö station is situated very close to the sea with a greater influx of sea salt. The corrected average of SO_4-S_{korr} (which excludes the part of sulphur that originates from sea salt) at Äspö was also more similar to the other stations in south east Sweden (Table 5-5).

The hydrogen isotope ratio of deuterium (dD) varied with the lowest ratio in spring 2003 (Table 5-6). These ratios correlated well with the ratios of ^{18}O (Figure 5-1). The linear relation corresponds well with the “Global Meteoric Water Line” (dD = $8*^{18}O + 10$) which is based on precipitation data from locations around the globe /Craig, 1961/. The ratios of tritium (^3H) varied with a small tendency for lower values in late autumn and in winter periods.

Table 5-5. Weighted averages of some major ions and pH in Äspö and in some other stations in south east Sweden. Data from the other stations is taken from /Karlsson et al. 2003/.

Station	Cl (mg/l)	SO_4-S_{korr} (mg/l)	Na (mg/l)	Ca (mg/l)	K (mg/l)	Mg (mg/l)	pH (mg/l)
Äspö	1.64	0.50	2.05	0.74	0.78	0.16	5.09
N Kvill	0.46	0.38	0.30	0.18	0.13	0.06	4.79
Aneboda	1.86	0.48	1.03	0.19	0.09	0.13	4.65
Sännen	0.68	0.45	0.41	0.21	0.21	0.08	4.78

Table 5-6. Isotope data obtained during the measuring periods.

Sample period	Sample number	Average volume (ml)	dD (‰ VSMOW)	^{3}H (TU)	^{18}O (‰ VSMOW)	^{37}Cl (‰ CDT)
? – 2002-09-09	3762	–	–80.6	15.3	–10.9	–
2002-11-21 – 2002-12-18	3881	791.8	–76.7	12.7	–11.3	0.07
2002-12-18 – 2003-02-24	3894	210.1	–97.2	9.0	–12.8	–
2003-04-08 – 2003-04-14	6005	475.7	–116.9	14.8	–15.5	–
2003-05-27 – 2003-06-24	5671	1078.6	–64.8	10.6	–8.5	–
2003-09-10 – 2003-09-22	5861	144.3	–44.4	–	–6.9	–
2003-10-28 – 2003-11-27	7013	1243.1	–65.5	9.2	–9.9	–
Average		657.3	–78.0	11.9	–10.8	0.07
Standard deviation		454.9	23.6	2.8	2.8	–

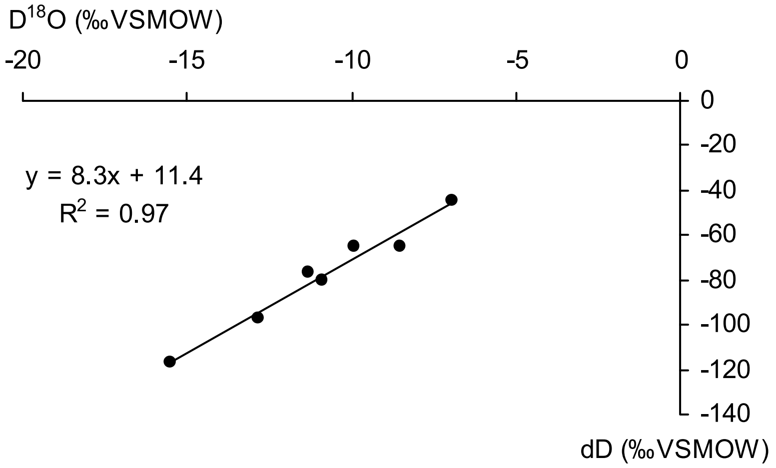

Figure 5-1. The relationship between the ratios of Deuterium (dD) and ^{18}O.

6 References

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Appendix 1

Field notes and measured volumes of precipitation

PSM002164

Date	Volume (ml)	Time	Note
2002-11-21 – 2002-12-18	864,51	08:30	
2002-12-18 – 2003-02-24	222	10:00	
2003-02-24 – 2003-04-08	Emptied	11:00	
2003-04-08 – 2003-05-27	Emptied	13:15	
2003-05-27 – 2003-06-24	1060	12:30–13:30	
2003-06-24 – 2003-07-15	Emptied		
2003-07-15 – 2003-09-10	Emptied	11:00–11:30	
2003-09-10 – 2003-09-22	150	09:20	
2003-09-22 – 2003-10-14	Emptied	11:00	
2003-10-14 – 2003-10-28	Emptied	12:45	Emptied and changed to a bucket.
2003-10-28 – 2003-11-27	1280	09:00	

PSM002165

Date	Volume (ml)	Time	Note
2002-11-21 – 2002-12-18	925,08	08:30	
2002-12-18 – 2003-02-24	226	10:00	
2003-02-24 – 2003-04-08	Emptied	11:00	
2003-04-08 – 2003-05-27	Emptied	13:15	
2003-05-27 – 2003-06-24	1110	12:30–13:30	
2003-06-24 – 2003-07-15	Emptied		
2003-07-15 – 2003-09-10	Emptied	11:00–11:30	
2003-09-10 – 2003-09-22	150	09:22	
2003-09-22 – 2003-10-14	Emptied	11:03	
2003-10-14 – 2003-10-28	Emptied	12:50	Emptied and changed to a bucket.
2003-10-28 – 2003-11-27	1280	09:05	

PSM002166

Date	Volume (ml)	Time	Note
2002-11-21 – 2002-12-18	891,56	08:30	
2002-12-18 – 2003-02-24	214	10:00	
2003-02-24 – 2003-04-08	Emptied	11:00	
2003-04-08 – 2003-05-27	Emptied	13:15	
2003-05-27 – 2003-06-24	1100	12:30–13:30	
2003-06-24 – 2003-07-15	Emptied		
2003-07-15 – 2003-09-10	Emptied	11:00–11:30	
2003-09-10 – 2003-09-22	150	09:25	
2003-09-22 – 2003-10-14	Emptied	11:05	
2003-10-14 – 2003-10-28	Emptied	12:55	Emptied and changed to a bucket.
2003-10-28 – 2003-11-27	1260	09:10	

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Date	Volume (ml)	Time	Note
2002-11-21 – 2002-12-18	803,75	08:30	
2002-12-18 – 2003-02-24	198	10:00	
2003-02-24 – 2003-04-08	Emptied	11:00	
2003-04-08 – 2003-05-27	Emptied	13:15	
2003-05-27 – 2003-06-24	1000	12:30–13:30	
2003-06-24 – 2003-07-15	Emptied		
2003-07-15 – 2003-09-10	Emptied	11:00–11:30	
2003-09-10 – 2003-09-22	150	09:27	
2003-09-22 – 2003-10-14	Emptied	11:08	
2003-10-14 – 2003-10-28	Emptied	13:00	Emptied and changed to a bucket.
2003-10-28 – 2003-11-27	1260	09:15	

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Date	Volume (ml)	Time	Note
2002-11-21 – 2002-12-18	668,45	08:30	
2002-12-18 – 2003-02-24	181	10:00	
2003-02-24 – 2003-04-08	Emptied	11:00	
2003-04-08 – 2003-05-27	Emptied	13:15	
2003-05-27 – 2003-06-24	1000	12:30–13:30	
2003-06-24 – 2003-07-15	Emptied		
2003-07-15 – 2003-09-10	Emptied	11:00–11:30	
2003-09-10 – 2003-09-22	100	09:30	
2003-09-22 – 2003-10-14	Emptied	11:10	
2003-10-14 – 2003-10-28	Emptied	13:05	Emptied and changed to a bucket.
2003-10-28 – 2003-11-27	1120	09:20	

PSM002169

Date	Volume (ml)	Time	Note
2002-11-21 – 2002-12-18	787,1	08:30	
2002-12-18 – 2003-02-24	253	10:00	
2003-02-24 – 2003-04-08	Emptied	11:00	
2003-04-08 – 2003-05-27	Emptied	13:15	
2003-05-27 – 2003-06-24	1180	12:30–13:30	
2003-06-24 – 2003-07-15	Emptied		
2003-07-15 – 2003-09-10	Emptied	11:00–11:30	
2003-09-10 – 2003-09-22	160	09:32	
2003-09-22 – 2003-10-14	Emptied	11:13	
2003-10-14 – 2003-10-28	Emptied	13:10	Emptied and changed to a bucket.
2003-10-28 – 2003-11-27	1400	09:25	

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Date	Volume (ml)	Time	Note
2002-11-21 – 2002-12-18	791,4	08:30	
2002-12-18 – 2003-02-24	250	10:00	
2003-02-24 – 2003-04-08	Emptied	11:00	
2003-04-08 – 2003-05-27	Emptied	13:15	
2003-05-27 – 2003-06-24	1200	12:30–13:30	
2003-06-24 – 2003-07-15	Emptied		
2003-07-15 – 2003-09-10	Emptied	11:00–11:30	
2003-09-10 – 2003-09-22	160	09:35	
2003-09-22 – 2003-10-14	Emptied	11:15	
2003-10-14 – 2003-10-28	Emptied	13:20	Emptied and changed to a bucket.
2003-10-28 – 2003-11-27	1360	09:30	

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Date	Volume (ml)	Time	Note
2002-11-21 – 2002-12-18	799,54	08:30	
2002-12-18 – 2003-02-24	197	10:00	
2003-02-24 – 2003-04-08	Emptied	11:00	
2003-04-08 – 2003-05-27	Emptied	13:15	
2003-05-27 – 2003-06-24	1040	12:30–13:30	
2003-06-24 – 2003-07-15	Emptied		
2003-07-15 – 2003-09-10	Emptied	11:00–11:30	
2003-09-10 – 2003-09-22	150	09:37	
2003-09-22 – 2003-10-14	Emptied	11:18	
2003-10-14 – 2003-10-28	Emptied	13:25	Emptied and changed to a bucket.
2003-10-28 – 2003-11-27	1320	09:35	

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Date	Volume (ml)	Time	Note
2002-11-21 – 2002-12-18	779,65	08:30	
2002-12-18 – 2003-02-24	196	10:00	
2003-02-24 – 2003-04-08	Emptied	11:00	
2003-04-08 – 2003-05-27	Emptied	13:15	
2003-05-27 – 2003-06-24	1040	12:30–13:30	
2003-06-24 – 2003-07-15	Emptied		
2003-07-15 – 2003-09-10	Emptied	11:00–11:30	
2003-09-10 – 2003-09-22	130	09:40	
2003-09-22 – 2003-10-14	Emptied	11:20	
2003-10-14 – 2003-10-28	Emptied	13:30	Emptied and changed to a bucket.
2003-10-28 – 2003-11-27	1240	09:40	

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Date	Volume (ml)	Time	Note
2002-11-21 – 2002-12-18	736,3	08:30	
2002-12-18 – 2003-02-24	188	10:00	
2003-02-24 – 2003-04-08	Emptied	11:00	
2003-04-08 – 2003-05-27	Emptied	13:15	
2003-05-27 – 2003-06-24	1040	12:30–13:30	
2003-06-24 – 2003-07-15	Emptied		
2003-07-15 – 2003-09-10	Emptied	11:00–11:30	
2003-09-10 – 2003-09-22	120	09:42	
2003-09-22 – 2003-10-14	Emptied	11:23	
2003-10-14 – 2003-10-28	Emptied	13:35	Emptied and changed to a bucket.
2003-10-28 – 2003-11-27	1120	09:45	

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Date	Volume (ml)	Time	Note
2002-11-21 – 2002-12-18	806,39	08:30	
2002-12-18 – 2003-02-24	194	10:00	
2003-02-24 – 2003-04-08	Emptied	11:00	
2003-04-08 – 2003-05-27	Emptied	13:15	
2003-05-27 – 2003-06-24	1140	12:30–13:30	
2003-06-24 – 2003-07-15	Emptied		
2003-07-15 – 2003-09-10	Emptied	11:00–11:30	
2003-09-10 – 2003-09-22	150	09:45	
2003-09-22 – 2003-10-14	Emptied	11:25	
2003-10-14 – 2003-10-28	Emptied	13:40	Emptied and changed to a bucket.
2003-10-28 – 2003-11-27	1180	09:50	

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Date	Volume (ml)	Time	Note
2002-11-21 – 2002-12-18	750,8	08:30	
2002-12-18 – 2003-02-24	227	10:00	
2003-02-24 – 2003-04-08	Emptied	11:00	
2003-04-08 – 2003-05-27	Emptied	13:15	
2003-05-27 – 2003-06-24	1080	12:30–13:30	
2003-06-24 – 2003-07-15	Emptied		
2003-07-15 – 2003-09-10	Emptied	11:00–11:30	
2003-09-10 – 2003-09-22	160	09:47	
2003-09-22 – 2003-10-14	Emptied	11:28	
2003-10-14 – 2003-10-28	Emptied	13:45	Emptied and changed to a bucket.
2003-10-28 – 2003-11-27	1200	09:55	

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Date	Volume (ml)	Time	Note
2002-11-21 – 2002-12-18	No bucket	08:30	
2002-12-18 – 2003-02-24	No bucket	10:00	
2003-02-24 – 2003-04-08	Emptied	11:00	
2003-04-08 – 2003-05-27	Emptied	13:15	
2003-05-27 – 2003-06-24	1010	12:30–13:30	
2003-06-24 – 2003-07-15	Emptied		
2003-07-15 – 2003-09-10	Emptied	11:00–11:30	
2003-09-10 – 2003-09-22	140	09:50	
2003-09-22 – 2003-10-14	Emptied	11:30	
2003-10-14 – 2003-10-28	Emptied	13:45	
2003-10-28 – 2003-11-27		09:55	

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Date	Volume (ml)	Time	Note
2002-11-21 – 2002-12-18	688,78	08:30	
2002-12-18 – 2003-02-24	184	10:00	
2003-02-24 – 2003-04-08	Emptied	11:00	
2003-04-08 – 2003-05-27	Emptied	13:15	
2003-05-27 – 2003-06-24	1100	12:30–13:30	
2003-06-24 – 2003-07-15	Emptied		
2003-07-15 – 2003-09-10	Emptied	11:00–11:30	
2003-09-10 – 2003-09-22	150	09:55	
2003-09-22 – 2003-10-14	Emptied	11:33	
2003-10-14 – 2003-10-28	Emptied	13:50	Emptied and changed to a bucket.
2003-10-28 – 2003-11-27	1140	10:00	