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Precipitation Sampling Manual,
Barents Ecogeochemistry

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REPORT

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Precipitation Sampling, Barents Ecogeochemistry

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Summary:

Manual for precipitation sampling on a monthly base carried out to study the atmospheric input of elements to the Barents Project Survey area.
Description of; the precipitation sampler, set up of precipitation station, procedure for precipitation sampling summer and winter, procedure for taking the monthly sub sample from each station.

Keywords: Geochemistry	Precipitation	Sampling
Manual		

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FIGURES

1. BACKGROUND

Precipitation sampling on a monthly base is carried out to study the atmospheric input of elements to the Barents Ecogeochemistry Project Survey area. There are numerous existing meteorological stations measuring major elements on a regular base within the area. The trace elements are, however, rarely measured and have never been recorded over such a large area before. Thus our main aim in collecting these samples is to get an overview of the input of the trace elements for the same suite of elements that is determined in all other sample media. Concentrations of many of these elements in rain water are in the low ppb, ppt and even ppq level. These very low values pose severe problems in sampling and analyses. This is the reason why these elements are not monitored on a regular base. To obtain reliable values that can at least be compared over the sampled area, sampling must be carried out with exactly the same equipment and following exactly the same procedures over the whole area. This avoids at least contamination by using different equipment and artefacts of using slightly different procedures. It is thus of utmost importance that only the supplied materials are used throughout the whole project and that this equipment is not used for any other purpose during this time.

2. EQUIPMENT

The following is a list of equipment supplied by NGU for monthly precipitation sampling.

- Precipitation sampler according to enclosed drawing (Fig. 1).
- Tape for fixing the PE-bag to the pipe and for closing the full bags.
- PE bags– 1 new bag for each sampler for each sampling period (i.e. 5 bags per month = 60 bags per station for sampling). It is of absolute importance that only these bags are used for sampling and that the samples do not get in contact with any other material. A new bag must be mounted in each sampler when the old one is removed. NEVER use these bags for anything else prior to sampling.
- Scale to record the weight of each of the 5 bags when filled with precipitation.
- Automatic pipette (10 ml). ATTENTION: this pipette may not be used for any other purpose for the duration of the project!
- Pipette tips – 1 per month, sealed in plastic bag.
- Plastic strips for nearly closing the plastic bags mounted in the samplers during the summer months.
- 100 ml HDPE plastic bottle with top (supplied)
- Plastic gloves (supplied) – ATTENTION: use only these supplied gloves – no other brand is acceptable.
- Adhesive labels for the bottles marked with station number and month of sampling (supplied ready filled out).
-Sample protocol.

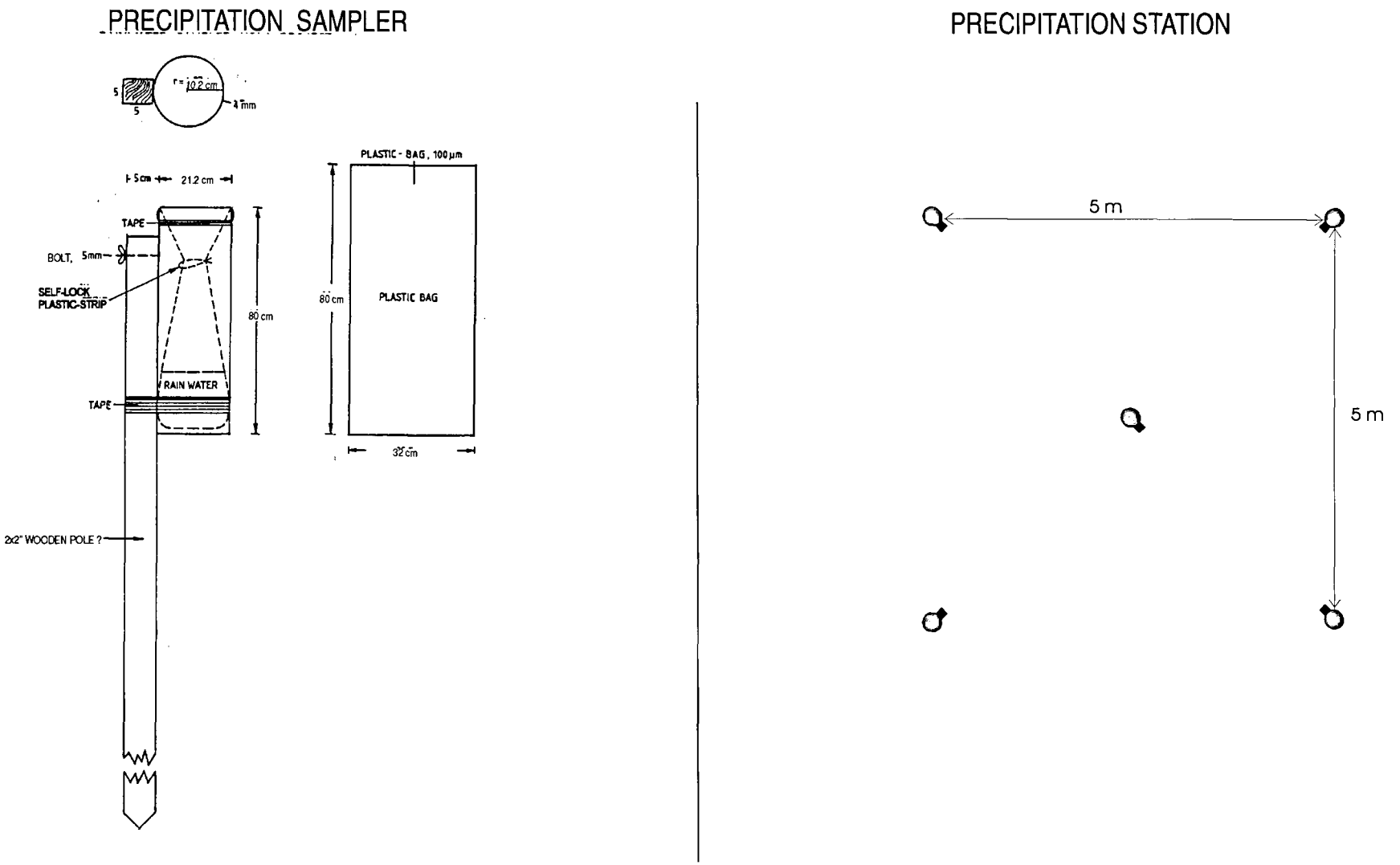

Fig. 1. Construction drawing of the precipitation sampler for the Barents Project and the configuration of the five samplers at the precipitation station.

3. SAMPLING

3.1 Set-up of station

5 samplers per site form one station (Figure 1 and 2). A monthly composite sample of these 5 samplers is the required sample. The sampler consists of a wooden pole (free material – the height of mounting is most important), a piece of pipe (supplied) mounted to the wooden pole and a PE-bag (supplied) which is mounted inside the pipe (Fig. 3). The samplers should be mounted such that the lower end of the pipe is as exactly as possible 1.0 m over ground. If the snow cover reach the bottom of the pipe the wooden pole must be extended and the pipe reinstalled in a higher position. The samplers should be set up such (ground conditions permitting) that 4 samplers are forming a square with a side length of 5 m while the fifth sampler is positioned in the middle of this square. The samplers MUST be set up in a free space where the collected precipitation is not
affected by throughfall from trees or bushes. At the end of the project one photo (at least) of each station should be supplied, showing the set up and the local conditions.

Fig. 2. A typical precipitation sampling station as used during the Kola Project. Note that the Kola sampler had different dimensions than the one used for the Barents Project. The station is set up in an open place so that no throughfall from trees or bushes can influence the results.

Fig. 3. Procedure for installation of plastic bag in the card board container.

3.2 Winter sampling – field procedure

The samplers should be installed such that sampling can start with the 1st (2nd is acceptable, but not later) of one month. If absolutely necessary changing of the bags can also take place on the 30th or 31st of the previous month. On this day the PE bags are mounted into the pipes:
- Put on plastic gloves before touching the bags. Take one bag and put it into the pipe. Fold a 2 cm (approximately, not less!) lip over the top of the pipe and fix it to the pipe using the supplied tape (½ over the plastic bag, ½ on the pipe). (*Note: The top of the plastic bag may have to be stretched to fit the pipe*). Make sure the bag is fully opened within the pipe. Attention, make sure nothing falls into the bag and that you do not touch the inside of the bag with your naked fingers or any part of your clothing. If necessary take a supplied plastic bag over your arm and clothing (inside out!) and then open the bag inside the pipe by sticking your plastic covered arm into the sampler bag. The plastic bag used for opening the sampler bag has been in contact with clothing and MUST be discarded afterwards.

At the end of the month (preferably last day of the month) the bags are detached from the samplers by cutting them off at the outside just above the taped portion along the pipe (hold the bag from below!) or, better if possible, by removing the tape.
Tightly shut the bag by rolling it up from the upper end after having removed the air.
Tape the bag shut. Mount a new bag for the next month into the sampler.
For months where no snow is expected follow the "*summer sampling*" instructions.
For months where there it is likely that a high amount of precipitation will appear as snow follow above "*winter sampling*" instructions.

During wintertime the bags have to be taken to the base for melting of the snow. Avoid outside contamination of the bags under transport, if necessary put them into a spare plastic bag for transport. Record the weight of each bag on the field sheet. At the base the bags are taken inside to allow the snow to melt. As soon as possible after the complete content is molten the subsample for analysis should be taken following the instructions *"Taking the subsamples for analysis"* below.
At the same time as the monthly change of plastic bags in the precipitation samplers the depth of the snow cover at each of the five sampler must be measured and noted in the field sheet. To simplify the measurements mark the precipitationsamplers wooden pole after installation with 5 cm intervals from ground level to bottom of the pipe.

3.3 Summer sampling – field procedure

For the summer months, when no more snow fall is expected, the bags are closed at about 2/3 of their height with the supplied plastic strip before mounting so that just a little opening remains, through which the rain can enter the bag. Then they are taped to the pipe of the sampler as described above. It is not necessary to open the bags as it is during wintertime. Avoid completely touching the inside of the bag. At the end of the month the bag is again removed from the sampler by cutting it off at the upper end with the supplied knife. Be aware that this bag is full of water now and remove it carefully through the lower end of the pipe. Use the self lock plastic strip to close the bag completely. If this is not possible tape it shut.
Discard single bags that contain a completely different amount of water (e.g. less than half of the amount collected in all other bags) or that are visibly contaminated.
Do not forget to note this in the field sheet.
Mount a new bag into the pipe – for months where no snow is expected following the "*summer sampling*" instructions, for months where there it is likely that a high amount of precipitation will appear as snow following the "*winter sampling*" instructions.

3.4 Taking the sub sample for analysis

Record the weight of each bag and note it on the field sheet. Shake the bags thoroughly so that the contents are well mixed. Figure 4 illustrates the procedure.
Prepare plastic gloves, pipette, 1 pipette tip and two HDPE-bottles with tops. Put on plastic gloves. Take the pipette tip out of the plastic bag and mount it to the automatic pipette. Open the first sample 100 ml sample bottle. Press the top of the pipette so that it is ready to suck up the first 10 ml of water. Stick the pipette tip carefully through the plastic bag into the water and release the top of the pipette so that 10 ml of water are sucked into the tip. ATTENTION: do not stick the pipette too far into the bag to avoid any big holes in the bag. Remove the tip from the plastic bag and release the water into the first bottle. Close the bottle and shake it well. Open the bottle and discard the water. Repeat this procedure two times more, then start to sample. Suck up 2 x 10 ml from each bag to completely fill the first 100 ml sampling bottle. Close the bottle tightly. Repeat the cleaning procedure for the second bottle. Then fill the second bottle with 2 x 10 ml form each bag and close the bottle tightly. In case you had to

discard one of the five bags due to a too low amount of precipitation or to apparent contamination, take more water out of the other bags. The 100 ml HDPE sample bottles must always be filled to the very top with water. Dry the bottles from the outside with a clean cloth. Put the correct pre-printed self-adhesive label on the bottle (station number, followed by the month of sampling – the month that is represented by this sample e.g., the January label has to be used at the end of January or beginning of February). The filled bottles should be stored cool and dark and forwarded at the first suitable opportunity to:

For the Russian part: SC «Mineral»
Veselnaya 6
199106 St. Petersburg

For the Norwegian part: Norges geologiske undersøkelse
Kjemisk laboratorie
7491 Trondheim

For the Finnish part: Geologian tutkimuskeskus
PL/PB/P.O. Box 1237
FIN-70211 KUOPIO

Fig. 4. Sticking the pipette tip into the bag. Take care, doing this with too much force results in a big hole and spilling of sample. Do not touch the place where you want to enter the bag with the pipette with your naked finger. If for any reason the outside of the bag is very dirty clean it prior to taking the sample.