Citizen science project “Cave drip water”

WHAT IS CITIZEN SCIENCE?

Natural science projects often rely on the support of citizens, such as the collection of weather data for climatology. Citizen science projects are based on close cooperation between research institutions and people from the interested population.

OBJECTIVES OF THE “CAVE DRIP WATER” CITIZEN PROJECT

To produce a swiss national map of cave drip water isotopic values (hydrogen and oxygen) and monitor cave water isotopes over a long-time interval. This map can be integrated in the international data network. The data will give insights to the spatial distribution of the water isotopes in the swiss karst systems and the evolution of water reservoir in the host rock. An overview map will be made available to the community on our web site.

Why is cave drip water important?

The cave drip water originates from precipitation falling in the cave region. Therefore, its isotopic signature reflects the local or regional environmental and hydrological conditions.

Why the “Cave drip water” project?

To produce a Swiss national map of cave drip water isotopic values (hydrogen and oxygen) and monitor cave water isotopes over a short and long-time interval.

Who can participate?

Every caver can participate. Order the sampling kit and follow the simple sampling and sending protocol. All free of costs for the participants.

Which caves are of interest?

Drip water samples from all the Swiss caves and its neighboring regions are of interest for this project. There is also no limit on sampling sites within a cave.

How often should be sampled?

Individual samples are also of great interest for our project. To have a good overview, it is important to analyse water samples from as many caves as possible.

It is optimal if:

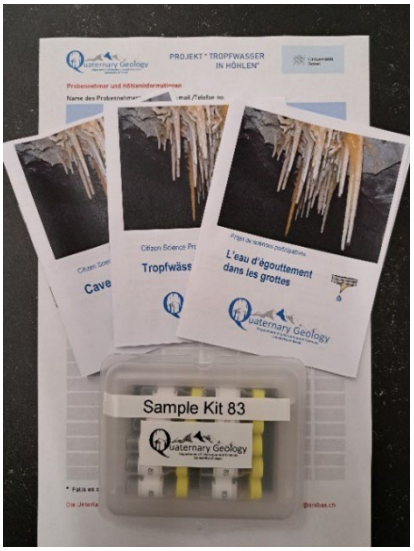
- at least 10 drip sites in the same cave are sampled regularly
- the samples are taken regularly (seasonally) at the same dripping point

Communication

- Website - "Citizen Science Project: Cave Drip Water"
https://duw.unibas.ch/de/quartaergeologie/citizen-science/
- Information about the project will be shared during our regular open lab-days, cave meetings, via e-mail lists and personal media channels.

SAMPLING STRATEGY

Sampling-Kits can be **ordered and sent back** to the Quaternary Geology Group of the Basel University, or directly from/to the group members at different caving reunions. The sampling kits are provided free of charge to the participants.



SAMPLING-KIT

- Plastic box 10 x 11 x 2 cm
- Sampling documentation list
- 10 x 1.5 ml l glass vials with rubber caps and a sampling number
- Parafilm and small zip-bags
- Optional: small funnel, phosphorescent sticker
- Ready-to-send envelopes

INSTRUCTIONS AND SAMPLING DOCUMENTATION

Order sampling kit

Sampling Kits can be ordered at: **Pascal Tschudin, pascal.tschudin@unibas.ch, +41 61 207 36 38**

Sampling

All caves and mines in limestone, sandstone and conglomerate from Switzerland and neighboring regions are of interest for this project.

Dripping sites

- the number of dripping sites in a cave is unlimited
- should not be located in the cave entrance area
- the water should drip from the ceiling, and not flow
- optimal: several dripping points will be sampled in the same cave gallery regularly, over a long-time interval
- for the very slow dripping sites, the vials can be fixed with natural materials on the cave floor and recovered on the way out from the cave. For this case and/or if the dripping point is high on the ceiling, a small funnel is available in the kit.

Sampling

- please fill the 1.5 ml vials with water
- avoid contamination of the water (for example with sediment)
- to avoid evaporation, close well the cap and seal it with Parafilm: stretch the thermoplastic and place it around and on the cap of the vial with several a circular move

ADDITIONAL: fresh precipitated calcite from the same water dripping site can be also sampled and sent for isotopic analysis. At some sites of interest, drip and temperature loggers or a glass watch for fresh calcite precipitation can be placed at a later time.

DRIP SITE DOCUMENTATION

Instructions for sampling, storage and sending of the samples are available in French, German, Italian, and English.

Sampling documentation forms (sampler contact information, cave location, subsurface gallery depth and temperature, drip rate, sampling date, etc.) are available in electronic (pdf. and Excel) and paper formats in German, French, Italian and English.

- fill the sampling form and, if possible, indicate the sampling locations on the cave map.
- if possible, take a photo of the sampling site and mark it with a phosphorescent sticker for a later sampling campaign.
- in the 'Observations' field, record information about the host rock (limestone, sandstone, conglomerate), soil (bare karst, thin soil, peat), and vegetation cover (grass, forest, agricultural) at the surface.
- specify if fresh calcite is forming under the dripping point.

STORE the filled vials at a temperature between 5° and 20°C, away from sources of light and heat. We recommend sending the water samples within 2 - 4 weeks after the sampling.

SEND the plastic box with the drip water samples, the documentation form and the cave map with the location of the sampling sites to: **Pascal Tschudin, Dep. of Environmental Sciences, University of Basel Bernoullistrasse 30, CH - 4056 Basel** or give the samples directly to members of the Quaternary Geology Group of the University of Basel.

The documentation forms and the cave maps can be also sent to **pascal.tschudin@unibas.ch**.

ISOTOPIC ANALYSIS, SAMPLES AND DATA STORAGE

The storage and the isotopic analysis of the water samples will be done in the laboratory of the Quaternary Geology Group, under the supervision of Prof. Dr. Dominik Fleitmann and Dr. Stéphane Affolter.

The results are communicated on a regular basis to the samplers and events on this topic will be organized. The data may be later subject of scientific publications. Cave maps and information will be used and published only in the purpose of this project and its publications.

A results summary and a map of the sampled caves will be available online on our internet site:
https://duw.unibas.ch/de/quartaergeologie/citizen-science/

CONTACT US

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WEBSITE

https://duw.unibas.ch/de/quartaergeologie/ citizen-science/

ADDITIONAL INFORMATIONS

In-situ recent calcite samples

In-situ precipitated calcite under the sampled drip sites is of scientific interest. Different chemical elements of the calcite (stable isotopes, trace elements) and its fluid inclusions (hydrogen and oxygen isotopes) could be analyzed using different laboratory methods. For calcite stable isotopes analysis, a crust of several millimeters is needed, for calcite fluid inclusions and trace elements analysis at least 0.5 centimeter in thickness. After in situ calcite was collected, a glass-watch can be placed under the dripping point. The glass-watch can be provided free of charge by the Quaternary Geology Group of Basel University.

For calcite crusts that can be easily detached, the small zip-plastic bags are available in the Sampling Kit. Write the calcite sample number (the same number as the drip site) on the bag with a water-proof marker. Avoid contamination with other materials if possible. Document the sampling place and take a photo, if possible.

Stalagmites (of any size) actively growing (fresh calcite forms on their top): should not be sampled without a previous consolation with the scientists at Uni Basel, as cave protection protocols have to be followed.

Soda straws/ spaghetti formed by the sampled water: should be sampled only after the consultation with the scientists from the Uni Basel.

Glass-watches for future calcite precipitation

Glass-watches are widely used in caves as surrogate surfaces for the fresh calcite to precipitate. Depending on the drip rate, water saturation and other factors, the calcite precipitation rate is several micrometers per year. Usually, in the fast precipitating sites, it will take years until the calcite can be then sent directly on the glass watch in the laboratory for analysis.

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