

BSc./MSc. thesis topic

Setup and test of an automated precipitation sampler for water stable isotope analysis

In hydrology and many other related disciplines water stable isotopes ($\delta^{18}\text{O}$, $\delta^2\text{H}$) are used as powerful tracers to understand how catchments convert rainfall into runoff, to estimate plant water resource or to examine long-term changes in climatic conditions and atmospheric processes. Data on the oxygen and hydrogen stable isotope composition of precipitation are thus a prerequisite for many hydrologic studies. Many different collector designs exist to obtain water isotope samples of precipitation. Automatic precipitation sampling enables the collecting of high-frequency data to e.g., analyze within and between storm characteristics. However, the majority of commercial collectors are costly and often do not adequately minimize the post-sampling isotope fractionation effects leading to erroneous isotope data. Here, a micro-controller based automatic precipitation sampler should be designed and tested. Testing should involve sampling at varying temperature regimes and precipitation amounts to ensure an unfractionated sample collection. In the near future, this sampler will be setup and used in various research projects of the Chair.

Requirements

- Interest in lab and field work, “MacGyver” skills
- Statistical analysis of the results

Supervision

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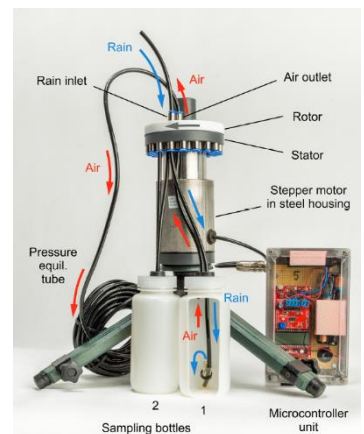
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Literature

- Fischer, Benjamin M. C., Franziska Aemisegger, Pascal Graf, Harald Sodemann, und Jan Seibert. 2019. „Assessing the Sampling Quality of a Low-Tech Low-Budget Volume-Based Rainfall Sampler for Stable Isotope Analysis“. *Frontiers in Earth Science* 7. <https://doi.org/10.3389/feart.2019.00244>.
- Herbstritt, Barbara, Benjamin Gralher, und Markus Weiler. 2018. „Real-Time Observations of Stable Isotope Dynamics during Rainfall and Throughfall Events“. *Hydrology and Earth System Sciences Discussions*, Juni, 1–16. <https://doi.org/10.5194/hess-2018-301>.
- Michelsen, Nils, Robert van Geldern, Yasmin Roßmann, Ingo Bauer, Stephan Schulz, Johannes A. C. Barth, und Christoph Schüth. 2018. „Comparison of precipitation collectors used in isotope hydrology“. *Chemical Geology* 488 (Juni): 171–79. <https://doi.org/10.1016/j.chemgeo.2018.04.032>.
- Michelsen, Nils, Gerrit Laube, Jan Friesen, Stephan M. Weise, Ali Bakhit Ali Bait Said, und Thomas Müller. 2019. „Technical Note: A Microcontroller-Based Automatic Rain Sampler for Stable Isotope Studies“. *Hydrology and Earth System Sciences* 23 (6): 2637–45. <https://doi.org/10.5194/hess-23-2637-2019>.



Overview of the automatic sampler principle (photo by André Künzelmann, UFZ). Michelsen et al., 2019