Affordable event and monthly rain samplers: Improving isotopic datasets to understand meteorological processes

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Abstract

Stable isotopes of the water molecule have emerged as powerful tracers of the sources and trajectories of water leading to precipitation, at different spatial and temporal scales. However, the high cost of commercially available rain samplers for isotopic analysis, have made using them for high spatial resolution networks and for studies being conducted in developing countries prohibitively expensive. We have designed a low-cost, simple, and robust rain sampler capable of sampling precipitation for isotopic analysis on the event and monthly scale, based on the existing designs provided in the literature. The event rain samplers were tested to determine the minimum amount of rainfall to minimize isotopic fractionation, both from post-sampling evaporation and equilibration. These new rain samplers will enable isotopic sampling of precipitation at high spatial resolutions. All the instructions for constructing and using these samplers are made openly accessible to the scientific community so they can easily be repeated and adapted to the needs of each project. This open access and low-cost methodology will help democratize the use of isotopes for hydrological studies in developing countries.

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