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It's getting hot in here…and dry: Intercomparison of cumulative rain collectors used in stable isotope studies

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Many isotope studies require data on the stable isotope signature (δ2H, δ18O) of precipitation. Although isotope analyzers recently became field-deployable, allowing near-real time measurements, it is still common to collect cumulative rain samples on a monthly basis. For this purpose, various rain collectors are available (IAEA 2014), but a comprehensive intercomparison of these samplers and their capacity to reduce evaporation is missing in the published literature.
In this study, we tested selected established (IAEA 2014) and new samplers (floating ball-based, float-based). They were partially filled with water of known isotopic composition and placed in a modified laboratory oven featuring dry conditions and a diurnal temperature regime (<7% relative humidity, 22-45°C). To evaluate evaporation effects, we determined mass losses and isotopic shifts over 32 days on a daily and four-day basis, respectively.
Although the classic paraffin oil-based collector exhibited the smallest mass losses, the tube-dip-in-water collector with pressure equilibration tube (Gröning et al. 2012) showed the best overall performance. Under the prevailing conditions, this design represents a good compromise. It provides an adequate evaporation reduction, resulting in negligible isotopic shifts, and the obtained samples are not prone to contamination with oil.

References:

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IAEA (2014): IAEA/GNIP precipitation sampling guide.