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## An easy-to-use, low-cost evaporation protection to collect more reliable stable water isotope data with Teledyne ISCO portable samplers

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Off-the-shelf portable automatic water samplers, such as the 6712 full-size portable sampler (Teledyne ISCO, Lincoln, USA), are often used in remote locations to collect precipitation or streamwater for subsequent analysis of deuterium and oxygen-18. The bottles inside these automatic samplers remain open during the full duration of sampler deployment and the collected water samples can thus be subjected to evaporation and vapor exchange. Both processes are known to alter the isotope composition of the water sample, and thus the questions arise as to 1) how credible the isotope measurements from automatically collected water samples are and 2) how can these isotope effects in the automatic water sampler be reduced?

We evaluated these questions through laboratory and field experiments in which we quantified the change in isotope composition in the water samples with respect to ambient conditions (air temperature and relative humidity), storage duration, and sample volume. We found that isotope fractionation in the water samples was substantial under very warm and dry condition, when sample volumes are small or when sample storage exceeded 10 days. To address these problems, we have designed an evaporation protection method which modifies autosampler bottles using a syringe housing and silicone tube. We performed paired experiments with open vs. evaporation-protected bottles in Teledyne ISCO 6712 full-size portable samplers to evaluate our design. We could show that the evaporation protection successfully reduced isotope fractionation in the water samples for storage durations of up to 24 days and for a wide range of ambient conditions; e.g., while deuterium concentrations in the water samples in open bottles changed by ca. 3‰ under very warm and dry conditions, no isotope effect was measured in the bottles equipped with the evaporation protection. Because our design is very cost efficient it can easily be implemented to upgrade Teledyne ISCO's 6712 full-size portable samplers or other similar devices for collecting more reliable isotope data.

