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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Technical note: A microcontroller-based automatic rain sampler for stable isotope studies" *by* N. Michelsen et al.

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Dear colleagues, I have read with interest this interesting manuscript on the design of an automated rain sampler minimising evaporation and therefore ensuring scientifically sound data for stable isotope process studies. The manuscript is well structured and provides a wealth of references to see the state of the art in recent efforts to ensure proper precipitation sampling for stable isotope analysis. I appreciate very much the details revealed by the authors to enable reproduction of such analyser in self-made mode, therefore probably minimising costs for most users having access to a workshop.

The scientific findings are relevant, presented appropriately and comprehensively.

The indicated very low energy consumption and use of cheap commercial batteries is

a key advantage for successful application in many remote sampling scenarios. The setup may not be fully suitable for very cold conditions (anyway not below water freezing point).

The experimental setting is solid and provides evidence of negligible isotopic fractionation due to minimal unavoidable evaporation.

There are only few minor comments to potential users to improve the impact of the paper and minimise problems.

I did not find details on how to connect tubes through the caps into the individual bottles (two connections necessary per cap). This could be seen as very minor issue, but the connection through the cap needs to be completely air tight to atmosphere. One photo would suffice to clarify it.

One minor comment is related to the isolation of bottles after moving the upper disk to the next bottle position as discussed in section 2. This is the moment when each isolated bottle is keeping its actual air pressure at the time of closure, with its internal pressure not anymore being equilibrated via the tubing (page 3, line 15). The experimental data in Table 1 show in general an increased evaporation for hermetically closed bottles versus one bottle open to the atmosphere via a long tube (section 3.2.1, page 4 line 34). This could be caused by the atmospheric pressure fluctuations, resulting in periods of higher or lower pressure in the bottle versus the open atmosphere, and may induce pressure induced air flow and leakages (it is nearly impossible to keep a large area flat sealing pressure tight). The increase of losses with increased water amount could point to a solubility issue (slow penetration of liquid water according to filling height through plastic material).

A second comment is related to the bottle types. I did not find an address for the provider of suitable bottles. However the quality of bottles is of major influence for such study. At the IAEA we have previously (2004) performed long term experiments with nearly 60 different bottle types used for regular water sampling, all filled with same wa-

ter in triplicate and kept for 6, 12 and 18 months before analysis, recording the weight loss and isotopic shift. After 12 months more than half of bottle types showed evaporation losses above one percent of water weight, associated to delta18O changes of above 0.5 permille. Therefore the proper selection of bottle type is crucial for storage. Glass bottles could be perfect (however even some glass bottle types (!) caused evaporation by imperfect fitting of glass surface to plastic caps), but in most cases high quality HDPE bottles showed best performance at moderate price and robustness.

Overall the paper is of excellent quality and should definitively be accepted. Best regards, Manfred Gröning m.groening@iaea.org

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