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What is the best time to take stream isotope samples for event-based model calibration?

Ling Wang (1), H. J. (Ilja) van Meerveld (1), Jan Seibert (1,2)

(1) Department of Geography, University of Zurich, Zurich, Switzerland (ling.wang@geo.uzh.ch; ilja.vanmeerveld@geo.uzh.ch; jan.seibert@geo.uzh.ch), (2) Department of Earth Sciences, Uppsala University, Uppsala, Sweden

Isotope data are valuable for hydrological model calibration because they improve model consistency and parameter identifiability. Although recent technical developments have made isotope analyses more accessible, event sampling still involves significant time and financial costs. Therefore, it is worth to study how many stream isotope samples are needed for hydrological model calibration and what the most informative sampling times are.

Our previous studies (Wang et al., 2017, 2018) on event-based model calibration using the Birkenes model and synthetic data showed that model performance improves significantly when two or three stream isotope samples are used for calibration and that the most informative samples are taken on the falling limb. However, when there are large errors in the isotopic composition of the rainfall, rising limb samples are more informative.

Aware of the limitations of synthetic data, we used a unique dataset from Switzerland with almost continuous precipitation, water level, and stream and precipitation isotope data for six rainfall events (von Freyberg et al., 2017) to determine which streamflow samples would have been most informative for model calibration if continuous measurements were not available. Our preliminary results show that the use of stream isotope samples in model calibration improved model performance for all calibration events and for some (but not all) of the validation events. In this poster, we will present the results on (i) the number of stream isotope samples needed for model calibration; (ii) the most informative sampling times during rainfall events; (iii) and the type of event (e.g. size, intensity) for which the use of isotope data during model calibration improves the validation performance for the other events most. These results provide guidance on when to obtain stream isotope samples for event-based model calibration and thus help to reduce the cost and effort in obtaining useful data for model calibration.

References

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