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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Monthly resolved biannual precipitation oxygen isoscape for Switzerland" *by* Z. Kern et al.

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Two important related reference works have been found since the manuscript had been closed and submitted to ACPD. These references further support the reliability of our data and the proposed interpretation. Lack of altitude dependence in δD for fresh snow samples collected in the early 1970s was reported above a certain height ($\sim$3900 m) from the Mt. Blanc region (Moser and Stichler 1974). However the high elevation samples stood out of the general trend were tagged as 'high degree of deviation' and were not considered in the evaluation. A latter study reported a major discontinuity in the variation of δ18O (δD) with altitude in the Saint Elias Mts (Holdsworth et al. 1991). They called this pattern as 'isoδ-step'. As these early observations relied

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on surface snow samples post depositional changes in the surface snow (Moser and Stichler 1974) could not be excluded or distinct snow events collected during sampling episodes might also complicated the interpretation (Holdsworth et al. 1991). Our dataset consists of exclusively monthly precipitation samples; therefore any post depositional process can be definitely excluded so the found isotopic pattern must be related to atmospheric processes. In addition, the regular multiannual monitoring guarantees that the observed trend distortion of vertical isotopic profile cannot be explained by an occasional anomaly or a haphazard mixture of samples related to distinct precipitation events. It is also interesting to note that Holdsworth et al. (1991) proposed a hypothesis regarding the layered structure of the lower troposphere to explain the trend distortion found for water isotope profiles in the late 1980s in the St Elias Mts. They hypothesized different moisture source for lower and higher sites, wrote that for the lower near-to-surface layer the moisture source must be from the immediate Gulf of Alaska, while for the upper, free air region the moisture source may be from a more distant part of the N Pacific, and they hypothesized that the isoδ-step developed at the boundary of these layers, actually the planetary boundary layer (PBL) using the nomenclature of our manuscript. However Holdsworth et al. (1991) had to refrain from a conclusive interpretation due to the relative scarcity of direct meteorological evidence (i.e. upper air data). We could use a recent dataset of PBL developed from quality checked upper air data with daily resolution in our study, and the seasonal lifting of the isoδ-step could be linked to the elevation changes of PBL. However, Holdsworth et al.'s (1991) precursor study should be definitely cited in our final manuscript.

Holdsworth, G., S. Fogarasi, and H. R. Krouse Variation of the stable isotopes of water with altitude in the Saint Elias Mountains of Canada, J. Geophys. Res., 96(D4), 7483–7494, doi:10.1029/91JD00048. 1991. Moser H. and Stichler W, Deuterium and oxygen-18 contents as an index of the properties of snow cover, Symposium on Snow Mechanics, IAHS Publ 114, 122-135, 1974.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 9895, 2013.