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First field-based observations of δ^2H and δ^{18}O values of precipitation and other water bodies in the Mongolian Gobi desert

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Hydrogen (δ^2H) and oxygen (δ^{18}O) isotope values of water are widely used to track the global hydrological cycle and the global δ^2H and δ^{18}O patterns of precipitation are increasingly used in studies on animal migration, forensics, food authentication and traceability studies. However, δ^2H and δ^{18}O values of precipitation spanning one or more years are available for only a few 100 locations worldwide and for many remote areas such as Mongolia data are still scarce. We obtained the first field-based δ^2H and δ^{18}O isotope data of event-based precipitation, rivers and other water bodies in the extreme environment of the Dzungarian Gobi desert in SW Mongolia, covering a period of 16 months (1). Our study area is located over 450 km north-east from the nearest IAEA GNIP station (Fukang station, China) from which it is separated by a mountain range at the international border between China and Mongolia.

Isotope values of the collected event-based precipitation showed and extreme range and a high seasonal variability with higher and more variable values in summer and lower in winter. The high variability could not be explained by different origin of air masses alone (i.e. NW polar winds over Russia or westerlies over Central Asia; analyzed using back-trajectory HYSPLIT model), but is likely a result of a combination of different processes affecting the isotope values of precipitation in this area. The calculated field-based local meteoric water line (LMWL, δ^2H=(7.42$\pm$0.16)δ^{18}O-(23.87$\pm$3.27)) showed isotopic characteristics of precipitation in an arid region. We observed a slight discrepancy between the filed based and modelled (Online Isotope in Precipitation Calculator, OIPC) LMWL which highlighted the difficulty of modelling the δ^2H and δ^{18}O values for areas with extreme climatic conditions and thus emphasized the importance of collecting long-term field-based data. The collected isotopic data of precipitation and other water bodies provide a basis for future studies in this largely understudied region.

(1)Burnik Šturm M., Ganbaatar O., Voigt C.C., Kaczensky P. (2016) First field-based observations of δ^2H and δ^{18}O values of precipitation, rivers and other water bodies in the Dzungarian Gobi, SW Mongolia. *Isotopes in Environmental and Health Studies*, doi: 10.1080/10256016.2016.1231184