Spatial Variability of $\Delta^{17}O$ in Meteoric Water in the Pacific Northwest

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Recent advances allowing for high-precision triple oxygen isotope analysis of water have given rise to a new second-order parameter, $\Delta^{17}O$, which describes the deviation from a reference relationship between $\delta^{18}O$ and $\delta^{17}O$. This tracer, like d-excess, reflects the degree of kinetic fractionation that has occurred during phase changes within the hydrologic cycle. However, unlike d-excess, $\Delta^{17}O$ in liquid precipitation does not vary with temperature, making it a useful tool to constrain the mechanisms driving the altitude effect observed with d-excess on the windward flanks of mountain ranges. We present $\delta^{18}O$, δD, and $\delta^{17}O$ data from stream waters along multiple east-west transects in the Pacific Northwest to develop a regional isoscape and explore the sensitivity of $\Delta^{17}O$ to changes in relative humidity and its relationship to d-excess and other isotopic parameters. Preliminary results show differences in the patterns of ^{17}O-excess and d-excess on the windward side of ranges. These suggest that temperature, in addition to subcloud evaporation, is playing a significant role in d-excess evolution. Furthermore, strong inverse relationships are observed between both ^{17}O-excess and d-excess with $\delta^{18}O$ in the Cascades lee, indicating that ^{17}O-excess can be used effectively to constrain evaporation under arid conditions in paleoenvironment studies where δD data is unavailable.