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# Investigating paleoclimate using triple oxygen isotopes of clay minerals in weathering profiles

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Clay minerals formed in weathering profiles in direct contact with the atmosphere have isotopic compositions ($\delta^{18}O$, $D^{17}O$) related to climate (MAT, MAP), which can be used to infer paleoclimate from comparable analysis of shales and paleosols of the past. We report triple oxygen isotopic composition of modern soil clays weathered from basalt and rhyolite bedrock. The weathering profiles are from different climate zones of an E-W transect of North America from coastal Oregon to Idaho, where water compositions $\delta^{18}O$ ranges from -8.7‰ to -14.8‰, MAT from 11.9°C to 6.4°C, and MAP from 1981mm to 278 mm. Clay minerals and proportions were determined by XRD. Coastal Oregon samples have an average $\delta^{18}O$ of 9.12‰, Willamette Valley clays in western Oregon are + 13.0‰ while eastern Idaho locations have $\delta^{18}O$ of 12.95‰. Silt values (which may contain secondary quartz and detrital minerals) are in the clay range. We observed little or no trend in $\delta^{18}O$ of bulk clays in profiles from coast to the interior. However, the $D^{18}O$(clay-water) changes from 17.0 ‰ to 27.5‰ and plot around theoretical equilibrium bulk clay-water curve at different MAT. Thus, the lack of $\delta^{18}O$clay E-W trend is due to the opposing effects of decreasing $\delta^{18}O$water, and an increasing $D^{18}O$(clay-water) fractionation with decreasing temperature. Therefore, the $\delta^{18}O$ of bulk clay minerals alone is not resolving the isotope values of annual precipitation. The third isotope of oxygen was analyzed to resolve the effect of isotopically more negative and diverse water on $D^{17}O$. Clay differs in $D^{17}O$ from -0.189 to -0.055‰ from west to east. We are currently exploring the $\delta^{18}O$-$D^{17}O$ systematics of these clays. Additionally, we have analyzed clays from different depths in 1-3 m deep weathering profiles as a tool into the regionally changing/stable climatic conditions and soil processes in Holocene and will present these data.