Soil pendant carbonate record of climate change in the Holocene and late Pleistocene

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Soil carbonate pendants from the Colorado Plateau region of USA record a continuous record of ecology and climate through the Holocene and late Pleistocene at high resolution. Pendants are on the underside of basaltic andesite boulders emplaced by debris flows throughout the Pleistocene; the resulting topographic inversion of former river valleys result in stable features in soils for 100s of thousands of years in this region. These pendants range in thickness from less than 1 mm to 100 mm; radiocarbon measurements indicate accumulation rates of 0.2 microns per year in the Holocene and Late Pleistocene. SIMS meaurements at *ca*. 10 micron spot-size for $\delta^{13}C$ and $\delta^{18}O$ show changes from C_3 to C_4 dominated vegetation from glacial to interglacial times ($\Delta\,\delta^{13}C$ *ca*. 8‰), with accompanying changes in $\delta^{18}O$ ($\Delta\,\delta^{18}O$ *ca*. 3‰) related to changes in $\delta^{18}O$ of infiltrating water. Soil temperature, moisture, and CO_2 monitoring indicates carbonate formation primarily in summer months and this is confirmed by Δ^{47} measurements for Holocene carbonates. There is a potential long-term climate and ecological record in these pendants as dating methods are extended beyond radiocarbon limits.