

## $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ profiles in pedogenic carbonates

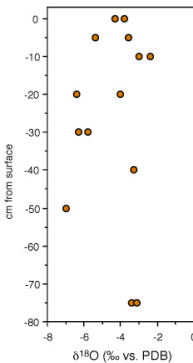
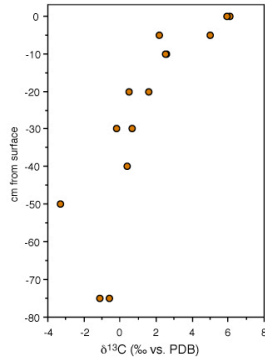
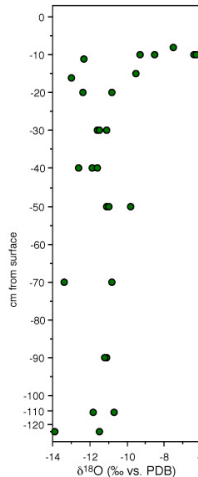
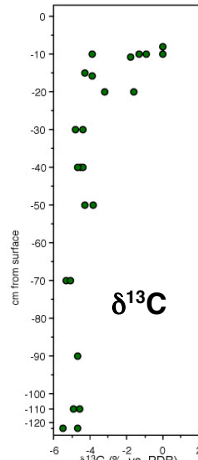
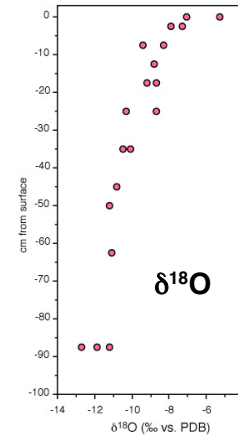
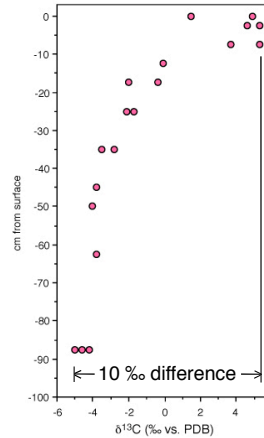
The plots at right show values of  $\delta^{13}\text{C}$  (top row) and of  $\delta^{18}\text{O}$  (bottom row) of pedogenic carbonates in soil profiles in the southwestern United States. Things to note include

1) Values of  $\delta^{13}\text{C}$  are typically smaller lower in the profiles, reflecting input of carbon from soil-gas  $\text{CO}_2$  generated by plant root respiration and/or by decay of soil organic matter. However, values of  $\delta^{13}\text{C}$  are commonly greater at the tops of the profiles because of mixing of soil  $\text{CO}_2$  with atmospheric  $\text{CO}_2$ .

2)  $\delta^{18}\text{O}$  values are typically negative in these profiles, because pedogenic carbonates are precipitated from meteoric water that has ultimately evaporated from the ocean (where  $\delta^{18}\text{O} = \sim 0$ ). The meteoric water thus has  $\delta^{18}\text{O} < 0$  relative to the SMOW standard, and  $\text{CaCO}_3$  precipitated from that water thus has values of  $\delta^{18}\text{O} < 0$  relative to the PDB standard. However, values of  $\delta^{18}\text{O}$  are commonly greater at the tops of the profiles because evaporation has increased the  $\delta^{18}\text{O}$  of soil  $\text{H}_2\text{O}$ .

The left three sets of data are from Quade, J., et al., 1989, Systematic variations in the carbon and oxygen isotopic composition of pedogenic carbonate along elevation transects in the southern Great Basin, United States: *Geological Society of America Bulletin*, v. 101, p. 464-475; the set at right is from Breeker, D.O., et al., 2009, Seasonal bias in the formation and stable isotopic composition of pedogenic carbonate in modern soils from central New Mexico, USA: *Geological Society of America Bulletin*, v. 121, p. 630-640.

Death Valley, California


 Spring Mountain, NV  
Elevation = 1950 m

 Spring Mountain, NV  
Elevation = 1550 m

 Central New Mexico  
C4 Grassland
