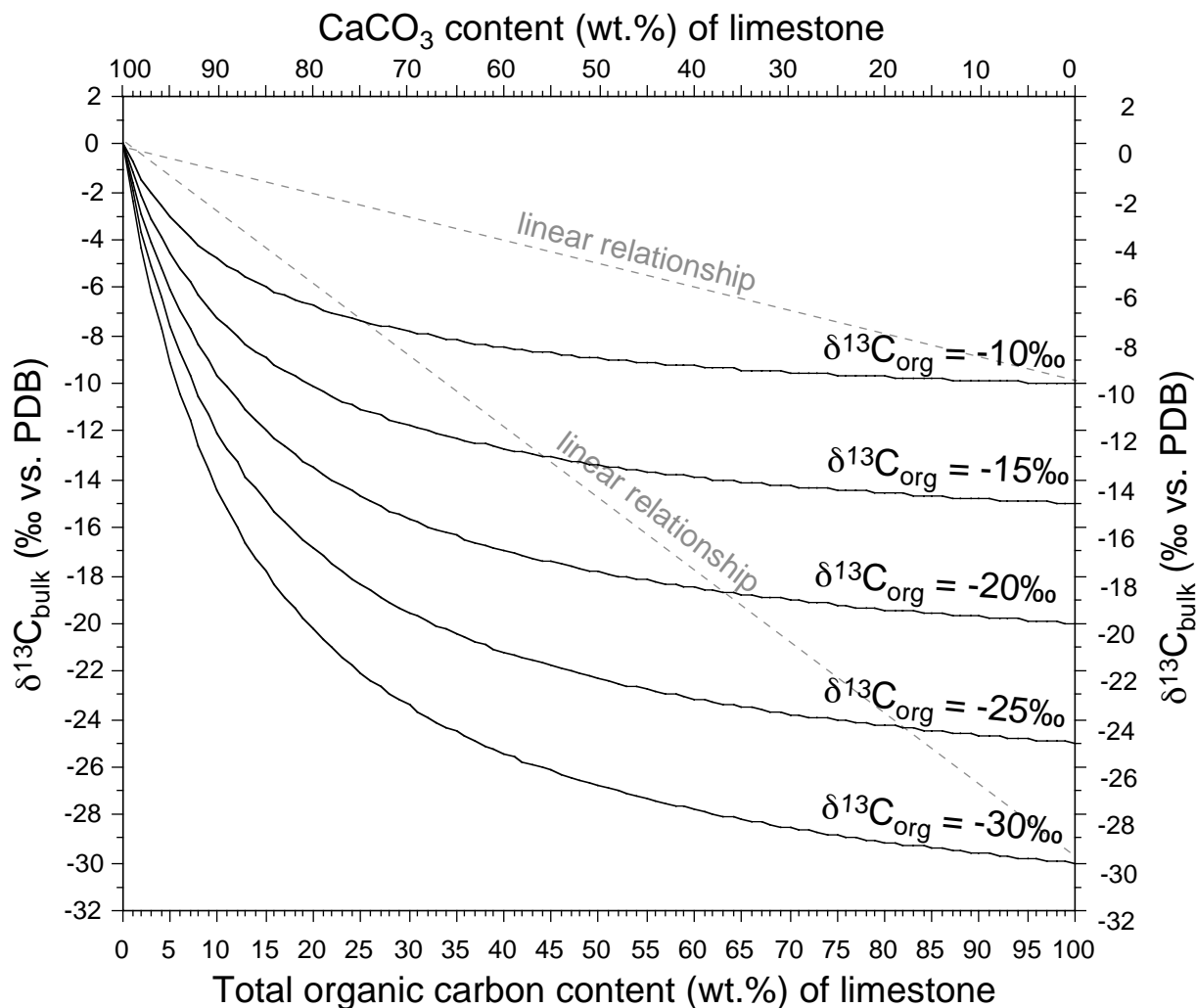


Isotopic Mixing Curves

The isotopic composition of a mixture of two components commonly does not vary linearly with the proportions of those two components. This non-linearity happens because the two components have different concentrations of the element in question.

For example, consider a mixture of organic carbon (which is 100% C) and CaCO_3 (which is 12% C). If we have a 50-50 (by weight) mixture of C_{org} and CaCO_3 , the mixture has much more (8.33x) light organic carbon than heavy carbonate carbon. Thus the isotopic composition of the mixture is dominated by the C_{org} . In any such system, the isotopic composition of an element in a mixture is pulled (here, downward) toward the isotopic composition of the component with the greater concentration of that element.



$$\delta^{13}\text{C}_{\text{bulk}} = \frac{\delta^{13}\text{C}_{\text{CO}_3} \frac{12}{100} \text{Wt}\% \text{CaCO}_3 + \delta^{13}\text{C}_{\text{org}} \frac{1}{1} \text{Wt}\% \text{C}_{\text{org}}}{\frac{12}{100} \text{Wt}\% \text{CaCO}_3 + \frac{1}{1} \text{Wt}\% \text{C}_{\text{org}}}$$

Weight-ratio of C

Other examples:

Any element (e.g., C, S) other than H or O in estuarine mixing of river water and seawater.

Any element (e.g., C, S, Sr) other than H or O in subsurface mixing of groundwater and seawater.

N in mixing of clean (nitrate-poor) and skanky (nitrate-rich) groundwater.

O in mixtures of quartz and calcite (or any two O-bearing minerals).

S in mixtures of pyrite and gypsum.