

## Correlation of charge on C with $\delta^{13}\text{C}$ in Earth-surface C-bearing materials

This diagram shows something every Earth-surface geochemist knows: the biological processes that reduce carbon favor the lighter isotope of carbon, so that charge on C and  $\delta^{13}\text{C}$  are correlative in the spectrum from bicarbonate and carbon dioxide to methane.

The diagram also shows something a bit more subtle: the same correlation of charge and  $\delta^{13}\text{C}$  exists within organic matter, and presumably even within the organic matter of individual organisms. For both marine organic matter and terrestrial organic matter, lipids carry a more negative charge on C and have a lower  $\delta^{13}\text{C}$ , whereas carbohydrates carry a near-neutral charge on C and have a greater  $\delta^{13}\text{C}$ . Thus the trend across the entire diagram also exists within components of organic matter.

Finally, the same trend exists within inorganic atmospheric carbon (carbon dioxide and carbon monoxide): the less charged form (CO) has the lower  $\delta^{13}\text{C}$ .

