

STABLE CARBON ISOTOPE VARIATIONS IN THE OCEAN

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The two stable isotopes of carbon, ^{12}C and ^{13}C , vary in proportions in different reservoirs on earth. The ratio of ^{13}C to ^{12}C is commonly given relative to a standard (a belemnite from the Peedee formation in South Carolina and therefore called PDB). On the

basis of this standard $\delta^{13}\text{C}$ is defined as:

$$\left[\frac{^{13}\text{C}/^{12}\text{C}_{\text{sample}}}{^{13}\text{C}/^{12}\text{C}_{\text{standard}}} - 1 \right] \times 1000$$

The values for some major carbon reservoirs are: marine limestones, $\delta^{13}\text{C} = 0$; C-3 plants, $\delta^{13}\text{C} = -25$; air CO_2 , $\delta^{13}\text{C} = -7$. The inorganic carbon in the surface ocean is in isotopic equilibrium with atmospheric CO_2 and has a value of about 2. Organic matter in the shallow ocean ranges from -19 at high latitudes to -28 at low latitudes. The midlatitude value is around -21 . The transport of organic matter to depth and subsequent metabolism adds inorganic carbon to the water. The isotopic composition of dissolved inorganic carbon then reflects the amount of addition of this metabolic carbon. Figure 1 is a profile of $\delta^{13}\text{C}$ for the North Pacific. It is typical of other profiles in the oceans.

Carbon isotope measurements in all the oceans were made on the GEOSECS expedition. These values are given in the *GEOSECS Atlas* (1987).

See also

Carbon Cycle. Carbon Dioxide (CO_2) Cycle.

Further Reading

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- Sackett WM (1964) The depositional history and isotopic organic composition of marine sediments. *Marine Geology* 2: 173–185.

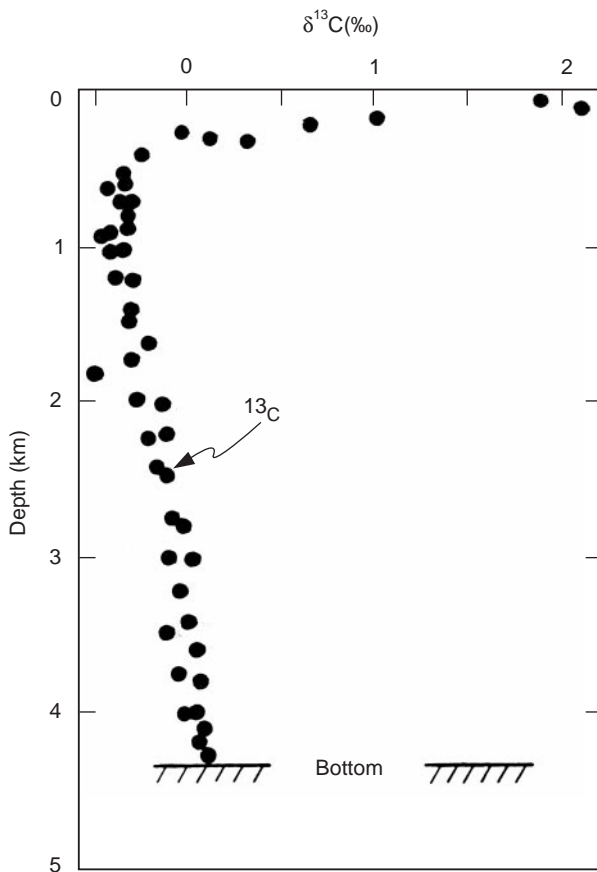


Figure 1 Variation of $\delta^{13}\text{C}$ in dissolved inorganic carbon with depth in the Pacific Ocean at GEOSECS Station 346 (28°N , 121°W) (Kroopnick, Deuser and Craig, 1970).

STERNIDAE

See LARIDAE, STERNIDAE AND RYNCHOPIDAE