

**Authigenic carbonate
precipitation at the end-
Guadalupian (Middle Permian)
in China: Implications for the
carbon cycle in ancient anoxic
oceans**

MASAFUMI SAITOH

Authigenic carbonate may have played a major role in the global carbon cycle in Earth's history. The carbon isotopic composition of authigenic carbonates in ancient oceans have been assumed to be significantly lower than that of seawater DIC, although the $\delta^{13}\text{C}$ values of authigenic carbonates in the past has not been analyzed in detail. We report authigenic carbonates in the uppermost Guadalupian (Middle Permian) rocks at Chaotian, Sichuan, South China. Monocrystalline calcite crystals <20 mm long are common in the black mudstone/chert sequence that was deposited on a deep slope/basin along the continental margin. The calcite precipitation corresponds stratigraphically with denitrification and sulfate reduction in the anoxic deep-water mass. Relatively high $\delta^{13}\text{C}$ values of the authigenic carbonates (largely -1‰) compared with those of organic matter in the rocks (ca. -26‰) suggest that the main carbon source of the carbonates was seawater DIC. The calcite crystals precipitated in an open system with respect to carbonate, possibly near the sediment-water interface rather than deep within the sediments. The $\delta^{13}\text{C}$ values of the carbonates were close to the value of seawater DIC due to mixing of remineralized organic carbon with the large DIC pool in the oceans. $\delta^{13}\text{C}$ values of authigenic carbonates in the anoxic oceans might have been systematically different from the values in the oxic oceans in Earth's history. Authigenic carbonates with relatively high $\delta^{13}\text{C}$ values in the ancient anoxic oceans may have had a less substantial influence on the bulk $\delta^{13}\text{C}$ values in geologic records than previously suggested.