

$\delta^{13}\text{C}$ of isoGDGT-derived biphytanes in sediments of the Pearl River Estuary and adjacent coastal sea

GUODONG JIA

State Key Laboratory of Marine Geology, Tongji University,
Shanghai, China

The $\delta^{13}\text{C}$ values of Thaumarchaea-derived isoprenoid glycerol dialkyl glycerol tetraether lipids (isoGDGTs) may be a powerful tool for reconstructing variations in ocean carbon cycle, as it has been related to $\delta^{13}\text{C}$ of dissolved inorganic carbon ($\delta^{13}\text{C}_{\text{DIC}}$). However, the relationship between $\delta^{13}\text{C}_{\text{GDGTs}}$ and $\delta^{13}\text{C}_{\text{DIC}}$ is scarcely reported. We investigated this issue by measuring $\delta^{13}\text{C}$ of isoGDGT-derived biphytanes in sediments of the Pearl River Estuary and adjacent coastal sea and comparing it with $\delta^{13}\text{C}_{\text{DIC}}$ in the overlying water. Biphytanes were released from ether cleavage of isoGDGTs.

Our results showed that $\delta^{13}\text{C}$ values of individual biphytanes differ, indicating multiple archaeal source inputs to sedimentary isoGDGTs. We focused on the apparent isotope fractionation ($\varepsilon_{\text{BP3-DIC}}$) between crenarchaeol-derived biphytane (BP3), specific to *Thaumarchaea*, and $\delta^{13}\text{C}_{\text{DIC}}$ in the overlying water. In the estuary from the freshwater end to the typical seawater end, $\varepsilon_{\text{BP3-DIC}}$ decreased from -15.5‰ to -19.7‰, with the value -19.7‰ consistent with the biosynthetic isotope fractionation for a pure culture of an autotrophic marine *Thaumarchaea*. Our results thus indicate that in typical marine environments where terrestrial influences are minimal, $\delta^{13}\text{C}_{\text{BP3}}$ could potentially reflect seawater $\delta^{13}\text{C}_{\text{DIC}}$. The changing $\varepsilon_{\text{BP3-DIC}}$ in the estuarine environments may be caused by the varying pH that reflects changes in carbonate system in the freshwater-seawater interface.