



Foraminiferal organic linings: molecular and isotopic composition.

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Fossil foraminiferal tests composed of calcium carbonate have long been used by paleoclimatologists to decipher past changes in physical and chemical properties of seawater. Empirical relationships, derived from core top data and culturing experiments, relate changes in isotopic values and trace metal composition to key environmental parameters such as temperature, salinity and seawater trace metal concentrations. Foraminiferal organic linings, being composed of insoluble organic matter, are also preserved in the fossil record and as such represent a source of information complementary to foraminiferal carbonate. Organic linings, generally found between the test and the cytoplasm, require careful isolation and cleaning to avoid contamination. Linings are isolated by allowing the carbonate to dissolve in the presence of an ion exchange resin. Once isolated and cleaned, the linings of several species of recent and fossil benthic foraminifera are analysed by pyrolysis-gas chromatography-mass spectroscopy. This technique identifies the macro-molecular composition of the organic linings, thus allowing us to determine any inter-species variations and the degree of diagenesis that may have taken place during fossilisation. Measuring the stable isotopic composition ($\delta^{13}\text{C}$, $\delta^{18}\text{O}$) of the organic linings further allows us to constrain the relationship between calcium carbonate test, organic lining and ambient seawater. In particular, combining the carbonate and organic lining derived oxygen isotope data could significantly improve current sea surface temperature reconstructions.