Foraminiferal multi-species stable isotope plots for paleo-water mass reconstruction: Examples from the Gulf of Cadiz and Alboran Sea

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Multi-species stable oxygen and carbon isotope analyses of various species of foraminifera can be used to infer their relative habitat depths [1]. Diagenesis may alter the isotopic composition but not obliterate the interspecific differences. Therefore, the relative ordering of different species in $\delta^{18}O$ vs. $\delta^{13}C$ cross-plots is generally robust to infer their life habitats in the water column [2]. Lightest $\delta^{18}O$ indicate tests calcified in warmest/superficial waters, while heavier $\delta^{18}O$ values calcified in cooler/deeper waters. Stable carbon isotopes are linked to symbiotic relationships, metabolic effects in foraminiferal shells or primary productivity at the surface and remineralization of organic matter at depth. This indicates that not only the paleo-depth habitat of foraminifera can be reconstructed, but also water mass characteristics and their environmental significance.

In this study we present a multi-species isotope investigation from two sediment cores recovered during MD194 EUROFLEETS Gateway and TTR-17 cruises, with the aim to reconstruct and trace the possible stratification of water masses in the Alboran Sea and the Gulf of Cadiz. Reconstructed seawater temperatures and densities from Holocene isotope data are in very good agreement with recent hydrographic data, verifying our method and allowing estimations of salinity in the order of ±0.25. Reconstructed temperatures (densities) for the Younger Dryas appear to be 7-10 °C (1 kg/m^3) cooler (heavier) resulting into slightly more saline waters compared to modern setting.

[1] Pearson & Wade (2009) *J. Foram. Res.,* 39:3, 191–217.
[2] Spezzaferri & Pearson (2009) *J. Foram. Res.,* 39:2, 112-119.