ENVIRONMENTAL CALIBRATION OF THE δD$_{ALKENONE}$ PALEOSALINITY PROXY

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Introduction

In recent years, the stable hydrogen isotope ratio of C_{37} alkenones (δD_{C37}) derived from haptophyte algae has been investigated as a means to track hydrologic shifts and reconstruct paleosalinity of the surface ocean (e.g. M'Boule et al., 2014, Simon et al., 2015, Schouten et al., 2006). Culture studies (e.g. M'Boule et al., 2014, Schouten et al., 2006, Sachs et al., 2016) have shown that a number of environmental factors effect hydrogen isotopic fractionation between alkenones and growth water, expressed as the fractionation factor α. The strongest positive influence on α is salinity, with higher δD_{C37} values and lower fractionation (higher α) at higher salinities, making this relationship attractive for paleosalinity reconstructions. However, the effect of factors other than salinity on δD_{C37} and, therefore α, needs to be better understood. Although sediment cores show promising results for δD_{C37} in the geological record (e.g. Simon et al., 2015), there is a lack of environmental calibration of this SSS proxy. When tested in SPM and sediments from the Chesapeake Bay, no correlation between α and salinity was found (Schwab and Sachs, 2011), but investigating a wider variety of environments is necessary to elucidate the usefulness of the proxy.

Results

We produced a core-top calibration of the δD_{C37} SSS proxy based on surface sediments from a south west transect in the North Atlantic, a large part of this area is under the influence of the Amazon plume causing a salinity gradient. The results (Figure 1) show similar values for α at comparable salinities as reported for *Emiliania huxleyi* culture studies (e.g., M'Boule et al., 2014, Schouten et al., 2006, Sachs et al., 2016), with the exception of a few samples. Nonetheless, no strong relationship with mean annual salinity is observed, which might be the result of the limited salinity gradient (33.9-36.4) covered by the Atlantic samples. A possible explanation for the data points which deviate from the culture results could be mixing of alkenones from *Emiliania huxleyi*, the most dominant alkenone-producing haptophyte in the modern ocean, with haptophyte species preferring lower salinity, coastal environments, which have been shown to fractionate less (M'Boule et al., 2014). This mixing could potentially affect the observed α-salinity relationship. Surface sediments from an east to west Mediterranean transect and a Skaggerak-Kattegat-Baltic Sea transect, covering a mean annual salinity gradient from 39-36 and 27-7 are currently being analysed for δD_{C37} and α_{C37} will be calculated using water isotopes collected at the same sampling points as sediments. Ancient DNA analysis of alkenone-producing communities in surface sediments along these transects will be done to help better understand the dominant alkenone-producing population and accurately calibrate the SSS proxy, since coastal and marine haptophytes fractionate differently (M'Boule et al., 2014).

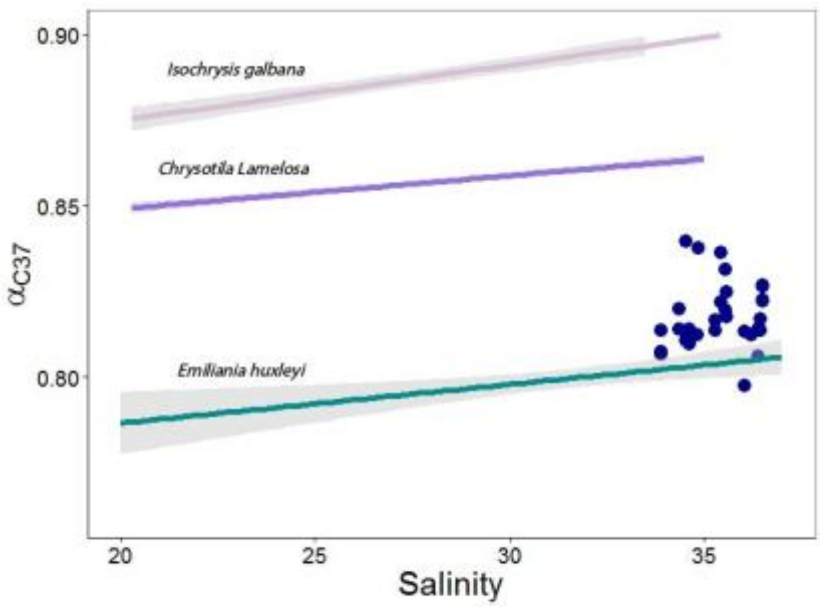

Figure 1 *Hydrogen isotopic fractionation of the C37alkenone (α) plotted against sea surface salinity for a set of North Atlantic surface sediments. This data is compared with the α-salinity response from culture data of* E. huxleyi *(Schouten et al., 2006, M'Boule et al., 2014, van der Meer et al., 2015, Sachs et al., 2016, this study),* C. lamellosa *(Chivall et al., 2014), and* I. galbana *(M'Boule et al., 2014).*

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