

FINAL REPORT PROGRAM LEFE

Program LEFE CYBER	Project Title Salinity Inferred by Alkenone during the Pliocene using Hydrogen isotope Reconstruction	Years 2015
PI: Marc de RAFELIS (present address : marc.derafelis@get.omp.eu) - UMR 7193 IStEP – UPMC/SU (at the time of the project) – Paris France Participating Laboratories : - UMR 7159 LOCEAN – UPMC/SU – Paris France - NIOZ/BGC - Netherlands		Other funding sources UPMC-SU Financement ATER
<p><i>Context</i></p> <p>In marine palaeoenvironment, salinity remains one of the most complex/essential parameters to be reconsidered. In recent years, stable isotopes on biomarkers, specially on alkenones, seem to provide very promising solution.</p> <p><i>Objectives / scientific questions</i></p> <p>Molecular isotopy on biomarkers (i.e. D/H on alkenones) requires analytical know-how that the proposing team wanted to acquire. The SAPHIR project, in association with the NIOZ, consists of a transfer of skills to master a very promising proxy in terms of paleoclimatic reconstruction.</p> <p><i>Main results</i></p> <p>The members of the SAPHIR project spent a stay at the NIOZ in the laboratory of Prof. Schouten in order to acquire the specificities of the protocols (preparation and analysis using an GC-IRMS) of the $\delta D_{\text{alkenone}}$ measurements. After a learning phase (15 days) thanks to M. Van der Meer, first samples from a mission on the Pliocene outcrops of Sicily were analyzed (still at the NIOZ). The main objective was to verify 1- the control of protocols/facilities at the UPMC lab and 2- the feasibility of acquiring valuable isotopic values on this type on samples from outcrops and not from boreholes (Figure 1).</p> <p>Preliminary tests including replicates on internal standards and natural samples (Pliocene limestone) are depicted on figure 1 and reveal very consistent values when compared to Upper Miocene sediments from the DSPD42B core 380A from the Black Sea (Vassiliev et al., 2012). An important issue of these results is the amount of sediment/rock (field sampling) needed to perform compound specific analyses of hydrogen isotope ratios (δD) : best results were obtained with 15-20g of dried sediments.</p> <p>The Pliocene deposits of Punta Piccola (Sicily) show regular alternation (precession control of the sedimentation) of grey marls and organic-rich levels so called sapropels. These sapropelic sediments correspond to anoxic bottom seawater and strong freshwater runoff. During a Pliocene precession cycle (~20 000 years), sediment cycles should mainly reflect strong contrast between high (or normal) and low salinity in the environment. The Figure 2 shows $\delta D_{\text{alkenones}}$ of the both lithologies and reveals that sapropelic sediments correspond to strong depleted D/H isotopes ratios. Because $\delta D_{\text{alkenones}}$ are positively correlated with salinity (Schouten et al. 2006), these results show that this kind of isotopic approach could be a powerful tool for paleosalinity reconstructions.</p>		

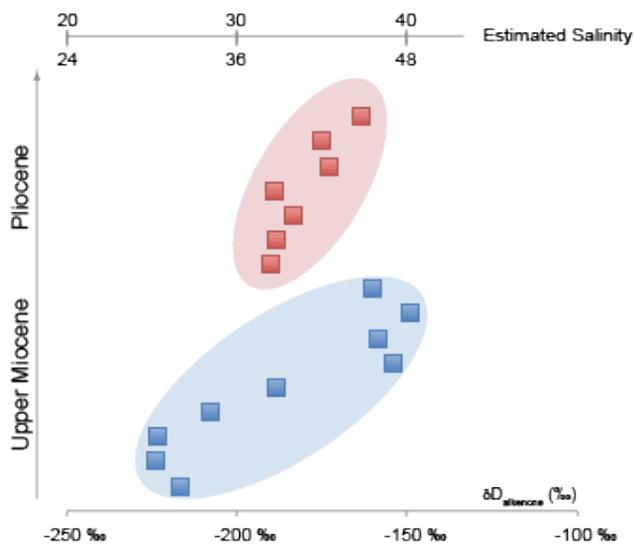


Figure 1: δD_{C37} alkenones in the mediterranean realm: blue squares are from the Upper Miocene (Black Sea, Vassiliev et al. 2013); red squares are from the Lower Pliocene (Sicily, this study). Estimated salinities are from Schouten et al. (1996) with two scales corresponding to different specific (coccolith) calibration.

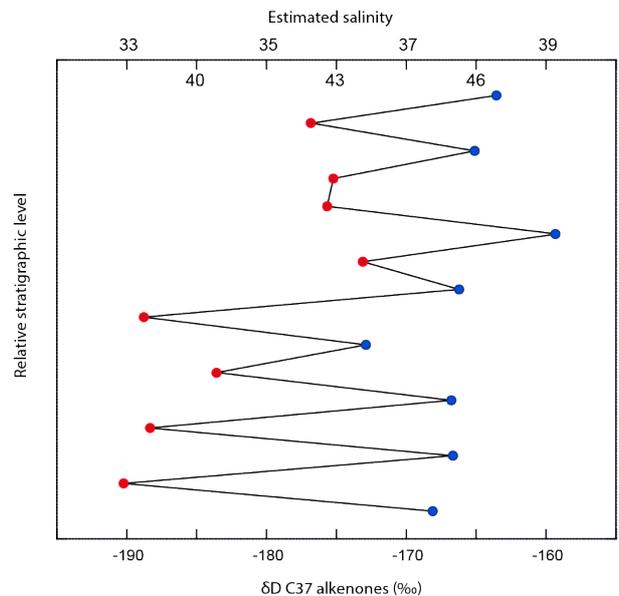


Figure 2: $\delta D_{alkenones}$ of the Upper Pliocene of Sicily (Punta Piccola section). Blue circles are marls, red circles are sapropels. Low salinity estimations are from *E. huxleyi* calibration and high salinity from *G. oceanica* calibration (Schouten et al. 1996).

Future of the project :

The project leader (M. de Rafélis) left UPMC and the SAPHIR team in July 2015 and oriented his research towards other areas. In parallel, a post-doctoral internship at the NIOZ on the development of biomarker geochemistry in collaboration with Pr. S. Schouten was obtained to ensure the continuity of the project (2015-2017). For the same reasons, this structuring aspect of the project has been abandoned.

*Nombre de publications, de communications et de thèses
(citer au maximum 5 publications en lien direct avec le projet)*

No publication except an abstract at the EGU meeting in 2016:

Rousselle G., Beltran C., Sicre M.A., de Rafelis M. & Schouten S., 2016. vol 18, egu 2016-15549.