Goldschmidt 2024 Abstract
https://doi.org/10.46247/gold2024.24029

New planktonic and benthic clumped isotope records on the Mid-Pleistocene transition: towards better constraints on the seawater temperatures and $\delta^{18}O$

MARION PERAL[1,2], INIGO ANDREAS MÜLLER[2], LUCIEN NANA YOBO[3], THIBAUT CALEY[4], BRUNO MALAIZÉ[4], THOMAS EXTIER[4], ERIN MCCLYMONT[5], DOMINIQUE BLAMART[6], FRANCK BASSINOT[6], MATHIEU DAËRON[6], STEVEN GODERIS[2], PHILIPPE CLAEYS[2], DAVID HODELL[7], FATIMA F. ABRANTES[8,9], CARLOS ALVAREZ ZARIKIAN[10] AND EXPEDITION 397 SCIENTIFIC PARTY[11]

[1]CNRS, EPOC, Université de Bordeaux
[2]AMGC, Vrije Universiteit Brussel
[3]Texas A&M University
[4]EPOC, Université de Bordeaux
[5]Durham University
[6]Laboratoire des Sciences du Climat et de l'Environnement (LSCE/IPSL)
[7]University of Cambridge
[8]CCMAR - Centro de Ciências do Mar do Algarve
[9]IPMA - Instituto Português do Mar e da Atmosfera, I.P.
[10]International Ocean Discovery Program, Texas A&M University
[11]International Ocean Discovery Program

Presenting Author: marion.peral@vub.be

The Mid-Pleistocene transition (MPT) is marked by a progressive increase of glacial-interglacial cycle amplitude, a shift of the climatic response from a 41-ka cycle dominated to a 100 ka-cycle, a prominent asymmetry in large glacial inceptions and an extension of glaciation. This transition is associated with a cooling of the sea surface temperatures and an increase of the atmospheric CO_2 concertation, that could be associated with a change in the ice-sheet volume. One of the hypotheses to explain the MPT transition is the regolith hypothesis, based on the basal erosion of glaciers, resulting in changes in weathering and in ice-sheet volume. Here, we present two new clumped isotope records covering the MPT: 1) the core MD96-2048 from the southwest sector of the Indian Ocean, in which we analysed a surface-living planktonic foraminifer; and 2) the "Shackleton" site (IODP Expedition 397 Site U1385) in the Northeast Atlantic Ocean, with a focus on the benthic foraminifera.

1. The clumped isotope thermometer (D_{47}) is not affected by salinity and pH, allowing, in theory, accurate reconstructions of the surface water temperatures. Our results show colder D_{47}-temperatures compared to the other foraminiferal thermometers (transfer function and Mg/Ca) and organic thermometers (TEX_{86} and UK'_{37}). Also, no obvious cooling at the ocean surface is observed with D_{47} during glacials and interglacials, but an increase in the amplitude difference of temperatures between the glacial periods before and after the MPT.
2. The D_{47} also has the advantage of being independent from the isotopic composition of the seawater ($d^{18}O_{sw}$). As a consequence, by combining D_{47} and $d^{18}O$ from benthic foraminifera, the $d^{18}O_{sw}$ can be reconstructed. Our data are compared to osmium (Os) isotope measurements to observe potential changes in weathering intensity. Thanks to this unique combination of Os isotope and D_{47}, we can test the regolith hypothesis.