Study of the individual and combined effect of pCO_2 and temperature on the coccolithophore *E. huxleyi*

CAROLINE DE BODT[1]*, NICOLAS VAN OOSTENDE[2], JÉRÔME HARLAY[1], NATHALIE ROEVROS[1], KOEN SABBE[2] AND LEI CHOU[1]

[1]Laboratoire d'Océanographie Chimique et Géochimie des Eaux - ULB - Campus de la Plaine, CP208, boulevard du Triomphe, B-1050 Brussels (*correspondence: cdebodt@ulb.ac.be)

[2]Protistology & Aquatic Ecology, Ghent University (UGhent), Krijgslaan 281-S8, B-9000 Ghent

Human activities contribute significantly to the increase in atmospheric greenhouse gases such as carbon dioxide (CO_2). About one fourth of the anthropogenic CO_2 emitted to the atmosphere is absorbed by the ocean, leading to the acidification of seawater. Ocean acidification and global warming could influence the marine ecosystems, in particular those involving calcifying organisms. We studied the individual and combined effect of pCO_2 (glacial, present and year 2100 conditions) and temperature (13°C and 18°C) on the growth and calcification of *E. huxleyi*, a known blooming species in the contemporary ocean, using batch culture experiments. Photosynthesis and production of POC were significantly increased from the present to the future pCO_2 treatment. A significant effect of pCO_2 and of temperature on calcification was observed with a lower cellular PIC production at higher pCO_2 and at higher temperature. The coccolith morphology was, in addition, examined by SEM.

Spheroidal sandstone concretions – Their formation and significance in an Eocene seep system (Bulgaria)

E. DE BOEVER[1]*, D. BIRGEL[2], PH. MUCHEZ[1], J. PECKMANN[2], L. DIMITROV[3] AND R. SWENNEN[1]

[1]K.U.Leuven, Dep. of Earth and Environ. Sciences, Heverlee, Belgium (philippe.muchez@ees.kuleuven.be, rudy.swennen@ees.kuleuven.be) (*correspondence: eva.deboever@ees.kuleuven.be)

[2]MARUM, University of Bremen, Bremen, Germany (dbirgel@uni-bremen.de, peckmann@uni-bremen.de)

[3]Institute of Oceanology, P.O.Box 152, Varna, Bulgaria (geos@io-bas.bg)

Spheroidal sandstone concretions (< 0.1 – 15 cm diameter) are confined to Early Eocene shallow marine sands of the Dikilitash Formation near Varna (NE Bulgaria). Low calcite $\delta^{13}C$ values down to –45‰ VPDB demonstrated the link between their formation and methane-bearing fluids. Based on integrated field, petrographic, geochemical and lipid biomarker results, this study aims at clarifying the process of spheroidal concretion formation and the significance of these concretions in a methane seep system.

Field observations showed that the onset of concretion growth took place synsedimentary, near or at the paleo-seafloor, making spheroidal concretions a potential timing indicator for methane seepage events. In addition, their restricted spatial distribution, forming e.g. the building stones of m-diameter tubular concretions (i.e. the methane seepage plumbing system) and grapestone-like structures in fault zones, provides a viable spatial mapping tool for locations of focused fluid ascent.

The onset of low-magnesium calcite precipitation, in equilibrium with marine pore waters, was initiated at multiple nucleation sites (pervasive nucleation) as a result of the microbially-mediated anaerobic oxidation of rising methane, which might have created localized microenvironments of increased calcite supersaturation. Concretions > 0.5 cm diameter often show regular concentric banding of alternating cloudy calcite- and transparent calcite-cemented rings, recording growth from the centre outward under changing conditions of pore water geochemistry.