Geophysical Research Abstracts
Vol. 12, EGU2010-11703, 2010
EGU General Assembly 2010

The early diagenetic and PETROphysical behaviour of recent cold-water CARbonate mounds in Deep Environments (PETROCARDE)

Anneleen Foubert (1), Hans Pirlet (2), Mieke Thierens (3), Ben De Mol (4), Jean-Pierre Henriet (2), and Rudy Swennen (1)

(1) K.U. Leuven, Earth and Environmental Sciences, Heverlee (Leuven), Belgium (anneleen.foubert@ees.kuleuven.be), (2) Renard Centre of Marine Geology, University Ghent, Gent, Belgium, (3) Geology Dept. & Environmental Research Institute, University College Cork, Cork, Ireland, (4) GRC Geociencias Marines, University of Barcelona, Barcelona, Spain

Sub-recent cold-water carbonate mounds localized in deeper slope settings on the Atlantic continental margins cannot be any longer neglected in the study of carbonate systems. They clearly play a major role in the dynamics of mixed siliciclastic-carbonate and/or carbonate-dominated continental slopes. Carbonate accumulation rates of cold-water carbonate mounds are about 4 to 12 % of the carbonate accumulation rates of tropical shallow-water reefs but exceed the carbonate accumulation rates of their slope settings by a factor of 4 to 12 (Titschack et al., 2009). These findings emphasize the importance of these carbonate factories as carbonate niches on the continental margins. The primary environmental architecture of such carbonate bodies is well-characterized. However, despite proven evidences of early diagenesis overprinting the primary environmental record (e.g. aragonite dissolution) (Foubert & Henriet, 2009), the extent of early diagenetic and biogeochemical processes shaping the petrophysical nature of mounds is until now not yet fully understood.

Understanding (1) the functioning of a carbonate mound as biogeochemical reactor triggering early diagenetic processes and (2) the impact of early diagenesis on the petrophysical behaviour of a carbonate mound in space and through time are necessary (vital) for the reliable prediction of potential late diagenetic processes. Approaching the fossil carbonate mound record, through a profound study of recent carbonate bodies is innovative and will help to better understand processes observed in the fossil mound world (such as cementation, brecciation, fracturing, etc...).

In this study, the 155-m high Challenger mound (Porcupine Seabight, SW of Ireland), drilled during IODP Expedition 307 aboard the R/V Joides Resolution (Foubert & Henriet, 2009), and mounds from the Gulf of Cadiz (Moroccan margin) will be discussed in terms of early diagenetic processes and petrophysical behaviour. Early differential diagenesis overprints the primary environmental signals in Challenger mound, with extensive coral dissolution and the genesis of small-scaled semi-lithified layers in the Ca-rich intervals. The low cementation rates compared to the extensive dissolution patterns can be explained by an open-system diagenetic model. Moreover, Pirlet et al. (2009) emphasizes the occurrence of gypsum and dolomite in another mound system (Mound Perseverance) in Porcupine Seabight, which might be also related with fluid oxidation events in a semi-open diagenetic system. Along the Moroccan margins, fluid seepage and fluxes in pore water transport affect the development of mound structures, enhancing extensive cold-water coral dissolution and precipitation of diagenetic minerals such as dolomite, calcite, pyrite, etc. (Foubert et al., 2008). Recent carbonate mounds provide indeed an excellent opportunity to study early diagenetic processes in carbonate systems without the complications of burial and/or later meteoric diagenesis.

References

Foubert, A. and Henriet, J.P. (2009) Nature and Significance of the Recent Carbonate Mound Record: The Mound Challenger Code. Lecture Notes in Earth Sciences, Vol. 126. Springer, 298 pp. ISBN: 978-3-642-00289-2.

Pirlet, H., Wehrmann, L., Brunner, B., Frank, N., Dewanckele, J., Van Rooij, D., Foubert, A., Swennen, R., Naudts, L., Boone, M., Cnudde, V. and Henriet, J.P. (2009) Diagenetic formation of gypsum and dolomite in a cold-water coral mound in the Porcupine Seabight, off Ireland. Sedimentology. doi: 10.1111/j.1365-3091.2009.01119.x.

Titschack, J., Thierens, M., Dorschel, B., Schulbert, C., Freiwald, A., Kano, A., Takashima, C., Kawagoe, N., Li, X. and the IODP Expedition 307 Scientific Party (2009) Carbonate budget of a cold-water coral mound (Challenger Mound, IODP Exp. 307). Marine Geology, 259, 36-46.