Geophysical Research Abstracts, Vol. 8, 10106, 2006
SRef-ID:

What are we expecting from a deep drilling in the Gulf of Lion ?

C. Gorini (1), M. Rabineau (2), J.L. Olivet (3), D. Aslanian (3), and the GDR Marge Golfe du Lion Team

(1) CNRS, UMR8110 Processus et Bilans des Domaines Sédimentaires, Université des Sciences et Technologies de Lille1/UNST, Bâtiment SN5, 59655 Villeneuve d'Ascq, France , (2) CNRS, UMR6538, Domaines Océaniques, 1 place Nicolas Copernic, 29280 Plouzané, France, (3) IFREMER, DRO/GM, BP70, 29280 Plouzané, France

Thanks to an exceptionally huge quantity of data (seismic profiles of different resolution, cores, drillings) coming from both industry and academia, the Gulf of Lion has appeared in the last 5 years as a real natural laboratory. This development has been possible thanks to the creation of the " Golfe of Lion " group of active researchers from the French national GDR Marges working on continental margins with the Gulf of Lion as one case study, (http://gdrmarges.lgs.jussieu.fr). Here, we present, in the name of this group, the main objectives for a deep drilling at the toe of the continental slope in the Gulf of Lion. This drilling WMED-1A is part of a larger Complex Drilling project held by L. Jolivet with other drilling sites in the Mediterranean. Seeing the Gulf of Lion as a natural laboratory or observatory is due to a number a peculiar characteristics. Ţ First, it represent a segment of a continental margin which is both young (less than 35 Ma) and which slope gradient is very low (less than 1°). This allows the precise observation of its structuration and the detailed analysis of its sedimentary cover; its homologous margin, in Sardinia, is equally accessible. Such an entire system is a very rare object that needs to be used to validate models of continental break-up. Ţ Similarly, its large shelf and its low continental gradient, also enable the best possible observations for understanding the Messinian Mediterranean event as a whole. Here we can measure subaerial erosion on the shelf, observe markers of marine transgression on the slope and at the toe of the slope map the succession of detritic units and their lateral variation to evaporites. Ţ Finally, the shelf and slope of the Gulf of Lion have register with a great detail the successive glacioeustatic fluctuations of the last

500,000 years, giving precise paleobathymetric markers (shoreline position for example). This interpretation has been recently confirmed by the PROMESS European drilling project.

Interpretation of sediment strata gives therefore two kinds of information: information on paleoclimatic history and information on tectonic history of the margin. From the climatic point of view, we now try to identify the first glacioeustatic cycles (around 2,5 Ma ?), the signature and dating of changing cyclicities (around 0,8 Ma ?) and to correlate those climatic events and their effects from the coast down to the abyssal plain. From the tectonic point of view, detailed paleobathymetric markers, as those of the messinian surface and observations on all the sedimentary cover, should give markers with a precision never reached before to reconstruct the history of margin formation and evolution.

As a summary, the objectives of the drilling are from top to bottom of the record: 1) Date the initiation and the change in glacioeustatic cyclicities and evaluate the effect of alpine glacier on sedimentation. As the Gulf of Lion receives most of the sediments eroded from the Alps and transported through the Rhône River, we infer that the amount of sediment will vary significantly according to the existence or not of ice sheet and glaciers. 2) For the messinian: the end of the messinian episode is well known and dated, as drillings have reached the upper part of the evaporites. The beginning of the crisis is still a matter of conjectures. Our observations suggest a thick serie of “lower evaporites”, i.e. under the halite. The drilling will enable, according to its exact position, either to drill through the complete serie of evaporites (around 2 km thick) or to drill through its upper part, on the edge of the evaporitic basin and sample the first detritic deposits related to the lowering of sea-level. 3) For the Miocene and older sediments (Oligocene ?), the drilling combined to seismic reflexion data, will give the nature and dating of deposits of this badly known period in the Gulf of Lion. 4) For the substratum, seismic reflexion data (ECORS) image quite clearly, at the toe of the slope, the limit between continental crust and oceanic substratum. The highly reflective lower crust is clearly visible below the shelf but disappear below the continental slope. Refraction data confirm those observations: the upper continental crust thins to less than 5 km, and changes laterally to a relatively thin crust with high velocities which precise nature is still a problem. Magnetic maps also indicate a large smooth domain as sometimes observed at the toe of margins in the world. The aim of the drilling is to bring crucial information on the nature of this puzzling crust. Two cruises, one programmed at the end of the year (SARDINIA : multichannel deep penetrating seismic reflexion and refraction) the other one submitted for 2007 (ECLECTIQUE : multichannel high resolution and surficial cores) are companion and complementary projects to this drilling project that also coincide with a renewed in-

dustrial interest in the deep domain of the Gulf of Lion.