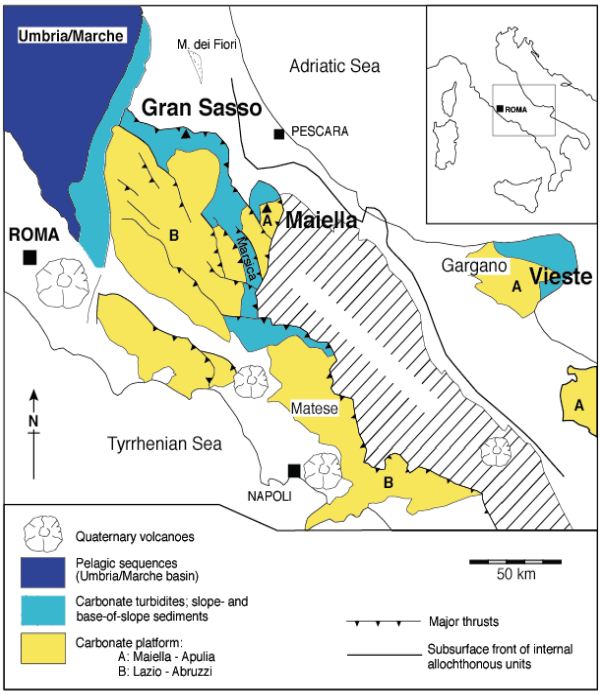
Petrophysical Characterization of Carbonate Turbidites in Outcrop and Subsurface, Maiella Platform, Italy

Irena Andisa Maura, Gregor P. Eberli, and Daniel Bernoulli[1]
[1] *Geological Institute, University Basel, Switzerland*

Project Purpose

In the search for new plays in carbonates, slope sections and calcareous turbidites, breccias, and megabreccias have received renewed attention. To date, only a few reservoirs are producing from carbonate breccias and/or calcareous turbidites. In a previous project, we assessed the reservoir potential of the re-deposited carbonates in the slope sections and the basin adjacent to the Maiella platform exposed in the Abruzzi, Italy (Figure 1) (Eberli et al., 2006). The aim of this follow-up project is to assess the porosity and permeability in a core from the Adriatic offshore through the time equivalent sections in the subsurface portion of the Maiella platform margin. This core is made available for this study by ENI.



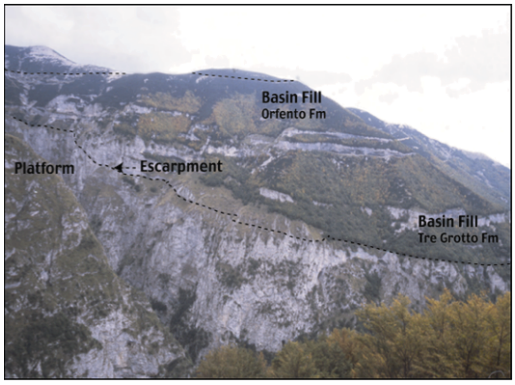


Figure 1: (Left) location map of t he Maiella Platform Margin. (Right) Photograph of the lower portion of the escarpment and the onlapping megabreccias (white clif fs in forest), turbidites and hemipelagic sediments (Tre Grotte and Orfento Formations). Horizontal view is approximately 1.8 km and vertical view is approximately 1 km.

Scope of Work

The work will integrate the outcrop and subsurface data sets of the Cretaceous and Tertiary slope and basin strata along the Maiella platform. The offshore well is the focus of this study. It will include core descriptions and a series of petrophysical measurements that are compared to log analysis. In addition, the sequence stratigraphic analysis of the core will be compared to the analysis performed in outcrop by Vecsei et al. (1998). This comparison will address questions surrounding the stratigraphic position (highstand versus lowstand) of carbonate turbidites.

Project Tasks

Core description and sampling of the cores will be performed in the core facilities of ENI in Milano, Italy. The petrophysical measurements will include sonic velocity, porosity, permeability, and some resistivity measurements. A thin section will be cut from the end of each plug for analysis of texture, pore structure, and the diagenetic paragenesis. Digital image analysis of the pore structure will allow relating pore structure to both the acoustic and hydraulic properties. The porosity and permeability measurements of the outcrop samples are completed (Figure 2). They will be complemented with velocity, selected resistivity measurements and the digital image analysis. The outcrop and core data sets will be compared to check if the outcrop samples are similar to the subsurface samples. The petrophysical measurements will also be compared to the log suite from the well for calibration of the slope and basin facies to the log signature. Furthermore, in order to differentiate the age and characterize the facies, a sequence stratigraphic analysis will be performed on the core.

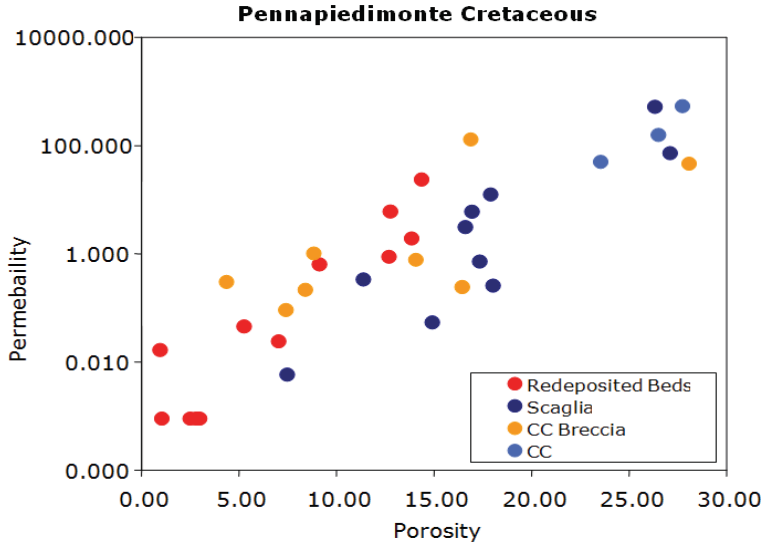


Figure 2: Porosity versus permeability of megabreccias and turbidites (red dots) and the corresponding background sediment (Scaglia, dark blue dots). Breccias rich with rudist debris (Calcare Cristallini CC Breccia, orange dots) have generally less porosity and permeability than the fine-grained sediments (Calcare Cristallini, CC, light blue dots).

Key Deliverables

This project will provide a comprehensive petrophysical and diagenetic characterization of mass gravity flows along the Maiella carbonate platform and an assessment of the reservoir potential of re-deposited carbonates from their seismic and log expression.

References

Eberli, G.P., Bernoulli, D., Cruz, E.F., 2006, Reservoir Potential of Re-Deposited Deep-Water Carbonates. CSL Annual Meeting, p. 41-42.

Vecsei, A., Sanders, D., Bernoulli, D., Eberli, G.P. and Pignatti, J.S. (1998), "Cretaceous to Miocene sequence stratigraphy and evolution of the Maiella carbonate platform margin, Italy.", In: De Graciansky, pp.C., Jacquin, T. and Vail, pp.R. (Eds.); Mesozoic and Cenozoic Sequence Stratigraphy of European Basins, SEPM Spec.Publ. 60, p. 53-74.