PETROPHYSICS OF CARBONATE DRIFTS

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PROJECT OBJECTIVES

- Prepare a data report of the samples from the delta drift in the Maldives.
- Complete the analysis of the petrophysical properties of delta drift deposits in the Majella.
- Relate log signature of carbonate drift deposits and relate to drift type and mineralogy.
- Produce a catalogue for discriminating logs of slope and basin deposits from carbonate contourite drifts.

BACKGROUND AND PROJECT RATIONALE

For her Ph.D. research, Emma Giddens started to assemble a large data set of laboratory measurements of petrophysical properties of the Miocene delta drifts in the Maldives and Cretaceous drift strata in the Maiella. Photomicrographs of the samples provide information on the grain size and sorting, as well as pore types of these carbonate drift samples. Because of the good sorting in these current-controlled deposits, the correlation between porosity and permeability as well as porosity and velocity are better than in shallow-water carbonates. Likewise, the formation factor m has a narrow range from 1.7 -2.9 (Giddens et al., 2019). The question is, is this unique petrophysical behavior also present in finer-grained carbonate contourite drifts? A preliminary comparison of log data from the coarse-grained delta drift in the Maldives and the confined drift in the Santaren Channel in the Bahamas, reveal

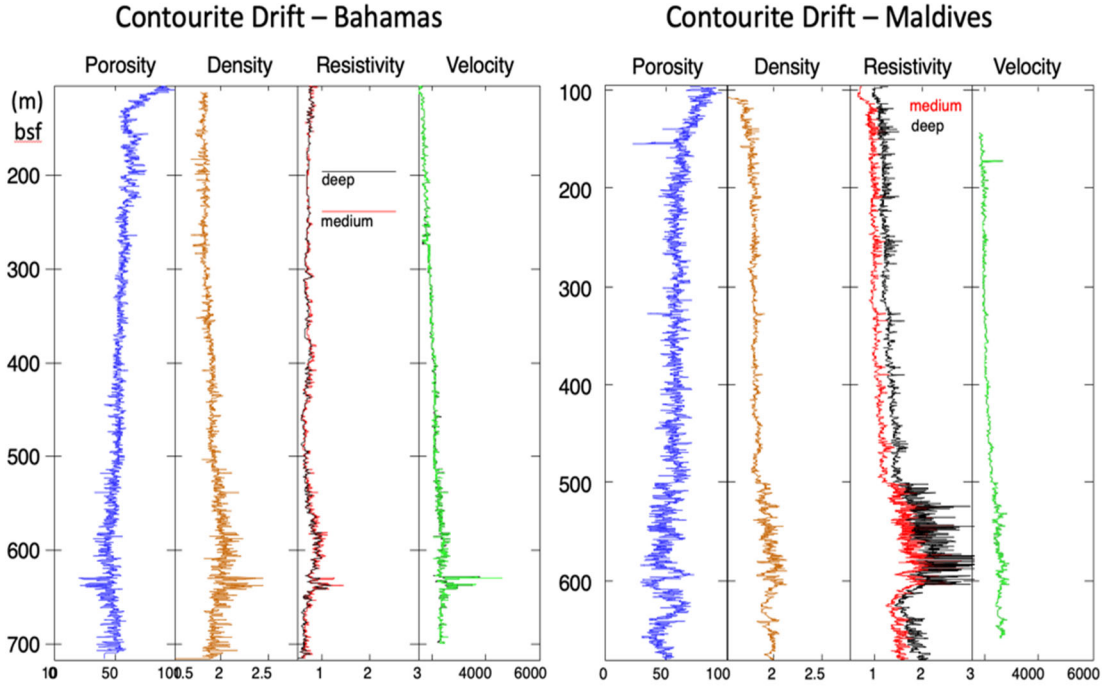

Figure 1: Comparison of logs through the fine-grained Santaren Drift in the Bahamas and the coarser-grained drift in the Maldives. Both log suites show similar log characteristics and a uniform behavior with little variations.

similar log characteristics (Fig. 1). Both logs display little variation in several logs, indicating a generally uniform log signature of carbonate contourite drifts. This project is intended to complete Emma's research with the goal of assembling a comprehensive petrophysical database of carbonate contourite drifts. These data from both laboratory and log will be compared to existing data from prograding slope carbonates to provide guidance for distinguishing petrophysical properties between carbonate contourite drifts and carbonate slope and turbidite packages.

WORKPLAN

Laboratory analyses: Additional samples from the Maiella delta drift will add to the existing data set. In addition, velocity, porosity, resistivity and permeability will be measured on plug samples from drifts on the Marion Plateau in Australia and from the Bahamas. Some of the Marion Plateau samples have been measured in earlier studies by Guido Bracco Gartner (unpublished) and we will request samples from ODP Site 1006 from the Santaren Drift in the Bahamas. The Marion drifts are slightly different in mineralogy as they contain admixtures of siliciclastics and less aragonite than the Maldives and Bahamas drifts.

Petrographic Analysis: From each plug measured, a thin section has been cut for petrographic analysis allowing grain size and sorting to be determined, as well as pore structure to be assessed and associated with the petrophysical measurements. Texture and mineralogy of each sample will be determined, and the pore type of each sample will be analyzed with digital image analysis. SEM imagery will be used to assess the micropore structure.

Log analysis: The log data through the studied drifts were collected by Schlumberger during the ODP and IODP expeditions. These log suites from cores drilled into the three contourite drifts will be used to document the log characteristics of the different drift deposits.

Comparison to slope successions: In all three study sites, contourite drifts are deposited on top of slope carbonates, allowing the petrophysical properties of these two systems to be compared. Kenter et al. (2002) measured the slope sections in the Bahamas and Ehrenberg et al. (2004) assembled the data for the Marion Plateau, while Emma Giddens measured the slope carbonates in the Maldives.

GOAL

The goal of this study is to assemble a comprehensive petrophysical database of carbonate contourite drifts. These deposits are potentially either underexplored carbonate reservoirs or seals in the petroleum system.

REFERENCES

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