CARBONATE CONTOURITE DRIFT SYSTEMS – THE ONGOING RESEARCH INITIATIVE

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PROJECT OBJECTIVES

- Investigate the role and influence of ocean currents on the architecture of shallow-water carbonate ramps, shelves and isolated platforms.
- Refine depositional models and current processes in coarse-grained drift systems.
- Assess the petrophysical characteristics of current-controlled deposition for improved interpretation of carbonate contourites and contourite drifts.
- Continue assembling dimensions of carbonate contourite systems for a comprehensive data base of such systems.

PROJECT RATIONALE AND GOALS

Many depositional and stratigraphic models in off-bank carbonates assume that most sediment transport is gravity driven. In particular, slope depositional models commonly consider variable mass gravity flows as the main factor in determining variable slope deposition (Playton et al., 2010; Reijmer et al., 2015). The recognition of the ubiquity of bottom currents in shallow and deep basins and their ability to move sediment requires adding currents as an important control on deep water carbonate sedimentation in addition to sea-level controlled production and gravitational export. This interaction between mass gravity flows and bottom currents can increase reservoir quality, as is the case in the giant reservoirs offshore Mozambique. In carbonates, current controlled deposits that are large reservoirs

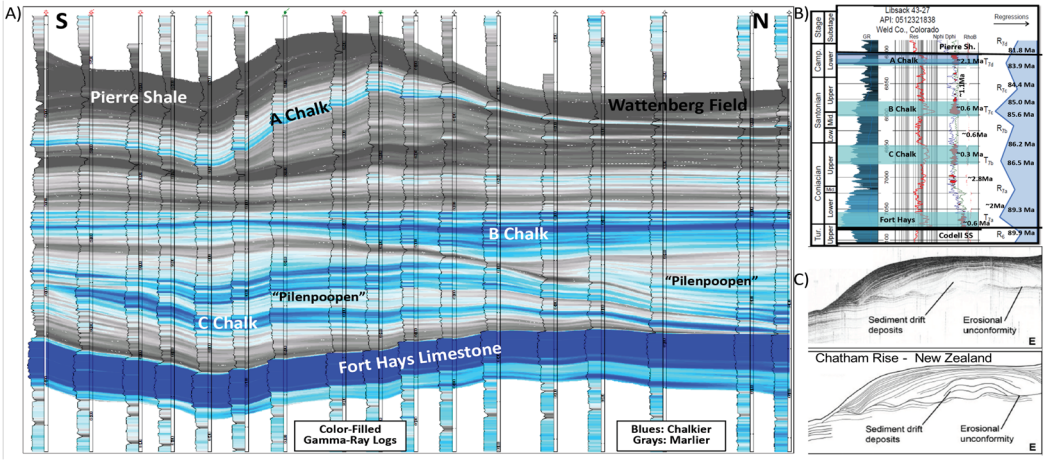

Figure 1: Revisiting the Upper Cretaceous Niobrara petroleum system with the aim of recognizing current control in the 30 mile cross-section across the Wattenberg Field Area, revealing that the chalk benches in the Niobrara are not nearly as blanket-like as Longman et al. (1998) inferred. Instead, considerable lensing of both the chalks and intervening marls is apparent, particularly in the C chalk, indicating that the system is basically a carbonate contourite drift (from Longman, 2020).

occur in the Upper Cretaceous chalk fields in the Central Graben of Denmark (Megson,1992). More recently, other carbonate plays in chalky facies have been re-interpreted as carbonate contourite drifts, like the Niobrara petroleum system in the western interior seaway (Fig. 1; Longman, 2020).

The influence of ocean currents on shallow-water carbonate systems is generally minimal but is important for platform drowning (Ling et al., 2021). Consequently, periods of widespread platform drowning can be taken as indicators of strengthening of the global circulation as is the case in the late middle Miocene in Southeast Asia (Eberli et al., 2010; Ling et al., 2021) and in the mid-Cretaceous when several platforms in the Pacific, Atlantic and Mediterranean realm drowned (Schlager, 1981).

The goal of this research initiative within the CSL is to identify current controlled from sea-level controlled deposition. It is our working hypotheses that some carbonate contourite drift systems have reservoir potential, although they are generally considered a risky play. Equally important is the role of currents in the drowning of isolated carbonate platforms and their sealing by fine-grained sediments. This research initiative aims to elucidate both the deposition and the erosion/non-deposition of carbonates due to ocean currents.

PROJECT PROGRESS AND FUTURE PLANS

In the past years, we have described three carbonate-specific types of contourite drifts that develop because of a feedback (Eberli and Betzler, 2019) and started to examine the current influence on the flank architecture of isolated platforms (Betzler and Eberli, 2019). This year we investigate the influence of currents on slope morphology, the role of currents to fill seaways between platforms, relating depositional processes to sedimentary structures, and the influence of ichnofabrics on petrophysical properties.

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