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# Seismic Characterization of a Calciclastic Submarine Fan in the Cenozoic Foredeep of the Oman Mountains

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## ABSTRACT

Carbonate turbidites are much less studied and known of their clastic counterpart. Only recently (Payros and Pujalte, 2008) some attention has been dedicated to the Calciclastic Submarine Fans (CSF hereafter). Few discoveries have been made in these sediments in the Middle East, and particularly in the Oman Mountains foredeep basin, they represent well known potential reservoir horizons (Hertig et al., 1995). Despite this, little attention has been so far dedicated by the Oil industry to these deposits, because of the issues with reservoir quality. Thus, 3D seismic examples of these possible reservoirs are not available in UAE and, as per author knowledge, in the literature regarding Middle East basins.

ADNOC and OMV have recently acquired a 3D seismic survey in the area NW of Al Ain (Granser et al., 2015) covering the southern end of the Pabdeh foredeep. The survey is large enough to image the margin of the foredeep on three sides (West, South and East). This new seismic data provide a good basis for the detailed interpretation within the foredeep basin and consequently, for the needed seismic characterization of CSF.

This study aims at defining in detail a CSF through the interpretation of a 3D seismic survey for the first time in UAE. Detailed horizon picking of different seismic cubes (PSTM and RAI) and seismic attribute extractions are the main tools to define geometry, architectural elements and depositional environments of the turbidite system.

The Cenozoic (Pabdeh) foredeep of the UAE developed as a result of loading in front of the Oman Mountains thrust-and-fold belt verging to the West. Subsidence started during the middle Eocene (Rus Fm.). A thick Eocene and Oligocene succession infilled the basin with shallow marine carbonates at the margins and shales and resedimented carbonates (calciturbidites) at the depocenter. By the end of the Oligocene the basin was closed. Subsequent deposits are represented by alternations of evaporates and continental-derived clastics (the Miocene lower Fars Fm.). The late Miocene tectonic phase partially involved the infilling of the foredeep, in the Eastern area of the basin. Unfortunately, the lack of velocity information in the only available well within the 3D survey outline prevented a precise calibration of the interpreted seismic horizon into a semi-regional chronostratigrahic framework. In spite of this limitation, a relative chronostratigraphy and a basin evolution defined by major depositional-structural events can be built with confidence based on the seismic interpretation.

A clear karstified surface has been interpreted on the western side of the 3D seismic survey. This surface is affected by a series of normal faults running NS with the hanging wall block to the East slipped down and the western block affected by the subaerial exposure. The interpreted CSF seems to have been formed along the faults with a NNW-SSE direction toward the foredeep depocenter. The system presents a main

feeder channel showing erosive features in seismic, a channel mouth at the slope break and laterally defined by faults and a depositional lobe clearly defined by seismic attribute extractions (RMS amplitude and Swetness).

The mapped SCF shows striking similarities in term of size, environments and architectural elements, not only with the depositional model for a medium-size CSF as depicted by Payros and Pujalte (2008), but also with the depositional model for Clastic Turbidites as described by Mutti et al. (1999). This analogy can be used to infer the facies distribution within the CSF with the predictive facies tract defined for clastic turbidites (Mutti et al., 1999). A tentative facies distribution for a CSF can be anticipated using this approach even without any real control point (well), and keeping in mind some caveats as the different hydrodynamic behavior of clastics and carbonate grains, and the uncertainties on the sediment source of the system under analysis.