Interaction between the Oman Range Structures and the Eastern Part of the Zagros Fold and Thrust Belt

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ABSTRACT

The Easternmost Persian Gulf coincides with the eastern termination of the Zagros fold and thrust belt, specifically the Zagros Simply Folded Belt (Stocklin, 1968; Sherkati and Letouzey, 2004; Molinaro et al., 2005), and its connection with the Makran accretionary complex to the east and the Oman Range to the south-east. The area coincides with the transition from the oceanic lithosphere subduction below the Makran-related Iranian crust eastwards to the collision between Arabian and Iranian plates westwards. This transition has been classically interpreted as a strike-slip system (the Oman line, Kadinsky-Cade and Barazangi, 1982). However, according to Searle et al., (1983) and Searle, (1988) no structural evidence of strike-slip displacement is present onshore in the Oman-Dibba zone. The study area deals with the frontal structures of both the Zagros fold and thrust belt and the Oman Ranges, and their boundary with the Arabian Foreland basin to the south and west respectively. Underneath the Zagros fold and thrust belt, the basement has been slightly tilted to the N-NE to form the base of the low-taper Zagros thrust wedge. Offshore, the frontal-most structures of the Oman Range consist of NE-SW trending folds and related thrusts developed above a SE tilted basement, showing a higher angle than the Zagros one, as a result of the lithospheric flexure related to the Oman Range. Both thrust fronts interfere in the eastern part of the study area, whereas they diverge westward leaving a foreland piece characterized by salt structures involving both the Precambrian-Early Cambrian Hormuz salt and the Neogene Fars salt. These salt structures developed during Paleozoic and Mesozoic times, although they were slightly reactivated during the Zagros deformation as evidenced by seismic data. The structural style of the Zagros fold and thrust belt, in the eastern Fars area, is dominated by roughly symmetric W-E trending folds, short in map view and double plunging, with local changes of trend. The folds have detached into the Hormuz salt underneath a thick succession (10-15km) of Paleozoic clastic rocks and Mesozoic-Cenozoic carbonates. These features have resulted from the reactivation of the previous salt structures since Early Neogene times when contractional deformation progressed forwards from the internal parts of the Zagros Mountains. On the other hand, Oman Range frontal structures are characterized by fault-related folds, also reactivating some previous salt structures. They developed earlier, during the Late Cretaceous and Paleogene. Deformation progressed forward as demonstrated by the shifted depocentres of strong subsident troughs that formed ahead of the thrust front. In these areas, extensional faults developed parallel to the emergent thrusts by bending of the flexed foreland. These structural features have been interpreted in the offshore seismic lines and observed onshore in the Kush e Kuh structure and are not in agreement with the interpreted strike-slip system along the Oman line. Similar tectono-sedimentary relationships are also observed north of the ZSFB, such as in the Faraghun structure. These similarities suggest that Oman and the internal Zagros mountains shared the same thrust front and foreland basin in Late Cretaceous to Paleogene times. Moreover, it is consistent with the presence of ophiolites or colour mélange in Oman, Kush e Kuh and internal Zagros which delineates the geometry of the suture of the transfer zone related to the opening of the Neo-Tethys Ocean. This transfer zone would be subsequently inverted from Late Cretaceous until Recent, with the inverted transfer zone being east of the Kush e Kuh. Due to its plate tectonic configuration, the easternmost Persian Gulf represents an exceptional

reference area for the study of mountain building processes involving salt horizons. Understanding the structural and timing relationships between the Zagros and Oman structures is fundamental to understanding the tectonic evolution and related petroleum systems of this region.