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Hisham A. Al-Siyabi¹, John P. Grotzinger² (1) Petroleum Development Oman, Muscat, Oman (2) Massachusetts Institute of Technology, Cambridge, MA

New Model for Tectonic Evolution of Neoproterozoic-Cambrian Huqf Supergroup Basins, Oman

Oman has prolific reservoirs within salt of Precambrian-Cambrian age, but exploration efforts have been restricted due to limited understanding of the tectonostratigraphic framework. New ages constrain the rift-related Abu Mahara Group to have been deposited between 730 and 700 Ma, whereas shelf facies of the overlying Nafun Group were deposited between 600 and 550 Ma. This 100 My unconformity precludes a simple relationship between Abu Mahara crustal extension and Nafun regional subsidence due to thermal decay. The Nafun Group is temporally continuous into the Ara Group; the onset of Ara subsidence occurred at ca. 550-548 Ma and was accompanied by a shift to arid climate, and uplift of basement blocks to form smaller basins that accumulated salt and carbonates. The youngest Ara strata are earliest Cambrian in age.

Ghadir Manquil-Mirbat subsidence is related to extension at ca. 725 Ma of a composite basement terrain comprising older Archean basement blocks stitched by older Pan-African (ca. 800 Ma) arcs, which was sutured to the younger terrains of the Arabian Shield at ca. 625 Ma. Nafun regional subsidence started at this time and is considered here to relate to dynamic depression of the lithosphere associated with subduction of oceanic lithosphere beneath the Arabian plate. Subduction is inferred to have occurred from the northeastern margin of Gondwanaland (eastern Oman) where an Andean margin resulted in orographic retroarc desiccation, in addition to uplift of basement blocks where subduction dip was gentle, analogous to the Bolivian segment of the Andes. Volcanic ashes and calderas within the Ara Group record subduction-related melting of the crust in a retroarc setting.