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Superimposition and structural reactivation of foreland basins in the mountain-front region, United Arab Emirates

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The mountain front region west of the Hajar Mountains and Musandam Culmination in the United Arab Emirates (UAE) comprises two superimposed foreland basin sequences. The earlier Aruma Basin is associated with the obduction of the Semail Ophiolite in late Cretaceous time; the overlying Ras Al Kaimah (RAK) Basin represents the extension of the Zagros foreland basin into the UAE.

The eastern margin of the RAK Basin is a foreland-facing faulted monocline, observed in outcrop. Within the basin, thick Palaeogene to Recent strata are affected by N-trending folds with positive flower geometry. East of the monocline, the Simsima structural marker is 'draped' across an imbricated stack of 'Sumeini Complex' nappes. The open folds of this cover sequence are a response to reactivation of the thrusts in the underlying obduction complex. Small, westward-directed thrust displacements of the ophiolite and the unconformity are observed. This interpretation implies significant shortening (perhaps 10-15 km) in Cenozoic time.

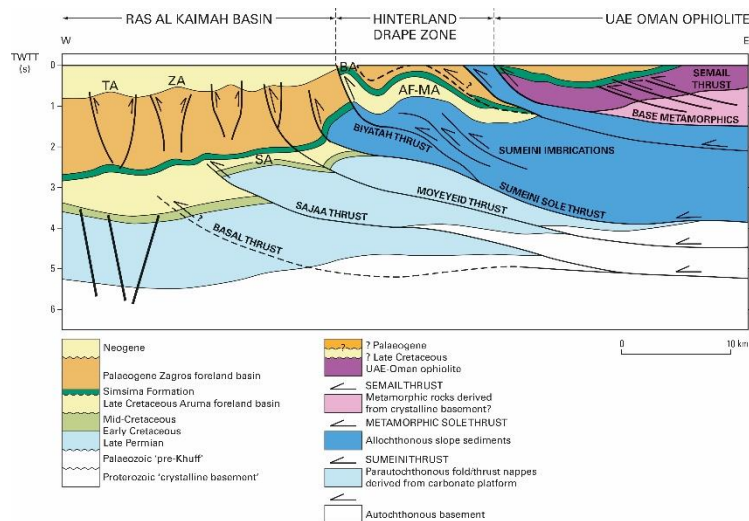


Figure 1: Schematic representation of the tectonostratigraphy of the Sajaa district, based upon an interpretation of Ministry of Energy Deep Seismic Reflection Line D1. 2.5x vertical exaggeration. Key: AF-MA, Al Fayya-Mualla Anticline; BA, Biyatah Anticline; FFM, Foreland-facing monoclinial downbend; SA, Sajaa Anticline; TA, Thunaya Anticline; ZA, Zubair Anticline. Left hand column applies to foreland; right hand column to nappe stack.

The UAE-Oman Ophiolite was a persistent provenance for coarse clastic material fed into the RAK Basin throughout the Cenozoic, and this detritus is the source of the observed aeromagnetic anomaly pattern, used to interpolate the structural interpretation between discrete seismic lines and outcrop. Folding of Cenozoic strata in the RAK Basin and the development of the Musandam Culmination is attributed to crustal shortening during the Zagros orogenic phase, involving reactivation of thrust structures established by the late Cretaceous obduction phase. The flower-like geometry and en-echelon character of the folding in the basin is compatible with reactivation of this orogenic substrate; the arcuate pattern of folding may reflect either a similar geometry of thrusts in the reactivated substrate, or lobate gravitational spreading and collapse of the ophiolite. The latter in turn is possibly a consequence of dynamic topography resulting from compression conducted through the Musandam Indenter. The post-orogenic Barzaman Formation is

also apparently folded, indicating that superficial deformation is probably continuing. The resulting N-S trend of folding is orthogonal to the general trend of the Zagros Orogen. Similar anomalous structural trends are observed in the Rocky Mountains, and elsewhere, and are believed to reflect strong local control of deformation by pre-existing structural anisotropy.

Reference:

Farrant et al. (2012) The Geology and Geophysics of the United Arab Emirates. British Geological Survey. 12 volumes.

