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Active tectonic morphology and submarine deformation of the northern Gulf of Eilat/Aqaba from analyses of multibeam data

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A high-resolution marine geophysical study was conducted during October–November 2006 in the northern Gulf of Aqaba/Eilat (gulf head). The gulf head can be subdivided into the Eilat and Aqaba subbasins separated by the north-south-trending Ayla high. The Aqaba submarine basin appears starved of sediment supply, apparently causing erosion and a landward retreat of the shelf edge. Along the eastern border of this subbasin, the shelf is largely absent and its margin is influenced by the Aqaba fault zone that forms a steep slope partially covered by sedimentary fan deltas from the adjacent ephemeral drainages. The Eilat subbasin, west of the Ayla high, receives a large amount of sediment derived from the extensive drainage basins of the Arava Valley (Wadi 'Arabah) and Yutim River to the north–northeast. These sediments and those entering from canyons on the south-western border of this subbasin are transported to the deep basin by turbidity currents and gravity slides, forming the Arava submarine fan. Large detached blocks and collapsed walls of submarine canyons and the western gulf margin indicate that mass wasting may be triggered by seismic activity. Seafloor lineaments defined by slope gradient analyses suggest that the Eilat Canyon and the boundaries of the Ayla high align along north- to northwest-striking fault systems—the Evrona Fault Zone<???> to the west and the Ayla Fault Zone<???> to the east. The shelf–slope break that lies along the 100 m isobath in the Eilat subbasin, and shallower (70–80 m isobaths) in the Aqaba subbasin, is offset by approx. 150 m along the eastern edge of the Ayla high. This offset might be the result of horizontal and vertical movements along what we call the Ayla Fault on the east side of the structure. Remnants of two marine terraces at 100 m and approx. 150 m water depths line the southwest margin of the gulf. These terraces are truncated by faulting along their northern end. Fossil coral reefs, which have a similar morphological appearance to the present-day, basin margin reefs, crop out along these deeper submarine terraces and along the shelf–slope break. One fossil reef is exposed on the shelf across the Ayla high in about 60–63 m water depth but is either covered or eroded in the adjacent subbasins. This fossil reef is offset along the offshore Evrona Fault. The offshore extension of the Evrona Fault offsets a fossil reef along the shelf and extends south of the canyon to linear fractures on the deep basin floor.