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The nature of the Dezful Embayment and the Balarud Line in the Iranian Zagros

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The Dezful Embayment is a region of subdued relief and elevation within the Iranian Zagros, which has received a thick (>4000 m) accumulation of Neogene clastic sediments as a result of the Arabia-Eurasia collision. Major anticlines within the Dezful Embayment form the main hydrocarbon fields of Iran, and show that it is not a completely rigid block. Thrust earthquakes with hypocentral depths of up to 20 km demonstrate the involvement of the basement in this active deformation. The southwestern boundary to the Dezful Embayment is in rough alignment with the more prominent regions to the northwest and southeast, indicating that the deformation front of the Zagros is roughly linear: "embayment" is something of a misnomer. It is not completely clear why the Dezful Embayment should deform at a lower rate than adjacent regions, but differences in pre-Neogene stratal thicknesses across the Zagros suggest that the Embayment had a different structural history to adjacent areas back in pre-collision times. Presumably its basement has a different character, and specifically is stronger than adjacent areas. The northeast boundary to the Dezful Embayment is formed by the Mountain Front Fault, which is a major structural step in the Zagros. The eastern boundary is formed by a series of north-south right-lateral strike-slip faults, which collectively allow for the separation of oblique plate convergence in to thrust and strike-slip components ("strain partitioning"). The northern boundary to the Dezful Embayment is the Balarud Line, which has an unusual east-west trend for this part of the Zagros. It has been drawn as a left-lateral strike-slip fault, perhaps on the basis of the curvature of some of the folds that approach it from the northwest and southwest: they give the appearance of being deflected along the Line itself. However, there is no geological, earthquake or geomorphic evidence that the Line has left-lateral offsets along it. An alternative explanation is that it is a steeply-dipping boundary between different blocks of basement on the Arabian plate. Whereas this orientation is not favourable for reactivation in the late Cenozoic, the discontinuity across it does not permit easy lateral propagation of folds and underlying thrusts from adjacent areas. This explains why folds rapidly plunge and die out as they approach the Line.