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Neotectonic evidence of active folding in NE Iraq and SE Turkey suggests the Taurus-Zagros thrust belt is underlain by a locked, northeast-dipping megathrust

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The Arabia-Eurasia continental collision provides an excellent opportunity to better understand the deformational behavior of continental crust, particularly the extent to which strain is localized along major fault systems. For example, major fault systems are important in absorbing intracontinental convergence in the western portion of the collision zone along the conjugate North and East Anatolian strike-slip faults in Turkey, and in the eastern portion of the collision, where oblique convergence is partitioned onto the Zagros fold-thrust belt and the dextral Main Recent strike-slip fault in Iran. However, it remains unclear if major fault systems are equally important in accommodating Arabia-Eurasian convergence in the central portion of the collision zone because the surface expression of late Cenozoic deformation in this area has not yet been clearly established. Using along-track ASTER stereo imagery and a new three-dimensional visualization and mapping technique designed for use with such data, I have discovered widespread geomorphic evidence of recent folding in the Taurus-Zagros Mountains of Turkey, Syria and Iraq along the southern margin of the East Anatolia Plateau. The new mapping software is called RIMS (Real-time Interactive Mapping System; Bernardin et al., 2006) and is a freely available, interactive, real-time virtual-reality mapping application which allows users to manipulate and analyze virtual terrain displays consisting of georeferenced satellite imagery that is draped over a digital elevation model, similar to those generated by Google Earth. Within the RIMS environment users can record geomorphic evidence of active deformation by placing georeferenced and attributed polyline mapping directly on the virtual terrain model. I have used RIMS to analyze Aster VNIR L1B scenes (15m pixel resolution) draped over Aster DEMs (30m pixel resolution), and have found that

geomorphic evidence of recent folding along the southern margin of the East Anatolia Plateau is particularly well developed in three areas. (1) In the vicinity of Idil (37˚ 16'N, 41˚ 52'E), on the eastern flank of Karacalidag volcano, Plio-Quaternary (?) lava flows are deformed by south-vergent anticlines. (2) Likewise, in the NE Mosul area (36˚ 35'N, 43˚ 27'E), Quaternary (?) geomorphic surfaces are folded and modern rivers show evidence of local sediment accumulation behind anticlinal ridges which thus appear to be actively perturbing the drainage profiles. (3) In the Tolafarush area (34˚ 27'N, 45˚ 12'E), modern rivers also show evidence of local sediment accumulation within the core of a syncline deforming Pliocene Bakhtiari Formation. These observations conflict with long-standing kinematic models of the central portion of this mountain belt in which oblique convergence is partitioned onto distributed strike-slip faults within the East Anatolian Plateau and orogen-parallel thrust-belts within the Greater and Lesser Caucasus Mountains to the north (Jackson, 1992). As a result, I propose that the upper-crustal shortening reflected by the young fold belt along the southern margin of the East Anatolian Plateau is balanced at depth by underthrusting of Arabian basement along a northeast-dipping, southeast-directed megathrust, in a style analogous to that seen in the Himalayas within the Indo-Asian collision zone. My elastic dislocation modeling of regional GPS data suggests that the megathrust is presently locked.