



Fold growth and drainage evolution of the Perman - Bana Bawi Anticline (Northern Iraq)

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The Zagros fold- and thrust belt is a seismically active orogen, which is the result of the Cenozoic collision between the Eurasian and the Arabian plates. Kinematic models based on GPS networks suggest a north-south shortening between Arabia and Eurasia in the order of 2-2.5 cm/a. Most of this deformation is partitioned within the Zagros mountains in S-SW directed folding and thrusting as well as in NW-SE to N-S trending dextral strike slip faults.

We investigate in this work the growth of the Perman - Bana Bawi anticlines (northeast of Erbil in Kurdistan region) by means of structural field work and tectonic geomorphology based on a geological map and ASTER remote sensing data (digital elevation model and satellite images). The Perman - Bana Bawi anticline forms a slightly S-shaped NW-SE striking fold chain over an exposed distance of more than 80 km. The dominant wavelength of the fold train is about 8 km. The backlimb dips with about 35° to the NE and the forelimb has a mean dip of about 45° towards SW.

Hydrologically, there are few rivers with all-year flow conditions and therefore the dominant fluvial erosion mainly takes place in the months with periodical precipitation, which varies between 700 and 3,000 mm/a (i.e. during the winter months). The presence of wind gaps and the pattern of deflected rivers suggest that the Perman and the Bana Bawi anticline initially developed as individual structures. The lateral growth directions are constrained by fanned drainage, which are especially in the cylindrical parts of the fold strongly overprinted by transverse rivers perpendicular to the fold axis. Although incising the same stratigraphic strata, the erosion pattern on backlimbs clearly differs from the tributary pattern on the forelimbs. The backlimbs are characterized by drainage parallel to the fold crest and asymmetric forked networks. Forelimbs are more strongly dissected by rivers with higher sinuosities with an older generation partly oblique to the slope.

The southeastward and northwestward diverted river tributaries between the Perman and the Bana Bawi anticlines as well as their junction in a narrow outlet probably suggests that both anticlines started to amplify as individual segments and joined during lateral propagation.