



Tectonic versus Structural Inversion, a Seismic Based Example from the Zagros Simply Folded Belt in Iraq

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The Zagros Thrust Fold Belt (ZTFB) is a well-known example of the positive tectonic inversion. The pre-Tertiary repeated NE-SW extensional movements resulted into the formation of NW trending grabens. At least two phases of rifting and deposition of fault controlled rift sequences were recognized. Post-Tertiary co-axial contraction resulted into co-axial tectonic inversion and development of SW migrating foreland folded belt. The co-axiality of the positive tectonic inversion is indicated by the complete control of the spatial configuration of the older grabens on the configuration of the later formed major folds. This phenomenon led to the conclusion that the tectonic inversion was accompanied with structural inversion and the extensional movements on the former normal and gravity faults were inverted into reverse movements along the same faults. But the seismic data showed that the former normal faults were generally dipping at considerably high angles to the later horizontal compressive stresses which made the structural inversion on these faults mechanically very hard and even impossible.

Careful analysis of seismic data from many places on the Zagros simply folded belt in Iraq shows that the major folds were formed as a detachment folds. These detachment folds were formed at the intersection between the former normal faults and the sole thrust. They grew and complicated by the interaction with several NE-dipping, SW-migrating thrusts that climbed up-stratigraphy from the sole detachment and stepping up via several bedding plain thrusts and duplexes and then via the flexural slip and flexural flow surfaces. Back limb back thrusts and fore limb triangle and crush zones had also complicated the structural relations more and more. Crush zones which are stack of triangle zones were mainly developed on the forelimbs of the major folds. A kinematic and mechanical model is suggested for the structural evolution of these major folds.

The study shows that the tectonic inversion is not necessarily accompanied by structural inversion.