

## **Along-Trend Variation of Shortening and Timing in the Zagros Fold-Thrust Belt, Kurdistan Region of Iraq (KRI)**

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### **ABSTRACT**

The Zagros Fold-Thrust Belt (ZFTB), a relatively underexplored hydrocarbon province in KRI, extends from southern Iran across northern Iraqi Kurdistan (KRI) to southern Turkey. We present a series of long (>200km) structural cross sections along the length of the Kurdish ZFTB to constrain the structural style and timing of deformation in this region. We recognize a strong correlation between structural style and the presence and phase of hydrocarbons in the Kurdish ZFTB. We observe that in general, large, simple anticlinal structures with low shortening contain more hydrocarbon resources than tight fault-related anticlines with high shortening. The sections also indicate widely variable net shortening along the ZFTB. Adjacent structural sections reveal rapid and significant shortening changes with soft-linked transfer zones between structural trends without major tear fault systems. In general, areas with low net shortening are the loci of major oil and gas accumulations. Our work supports multiple phases of deformation in the ZFTB. Deposition of syntectonic clastic rocks of variable thickness (Tanjero & Kolosh Formations) in SE KRI indicates that the earliest deformation started in the Late Cretaceous to Paleocene. This early deformation is followed by a tectonically quiescent period of slow widespread carbonate sediment accumulation from Eocene to Middle Miocene. This is followed by the main phase of Zagros shortening from Middle Miocene to Recent, with most shortening occurring within the late Pliocene to Recent. Our work also provides new constraints on the oldest phase of deformation, which is often difficult to interpret due to challenging seismic images and the lack of outcrop exposure of older rocks over critical areas. The significant thickness differences of the clastic units that are clearly observed both in the well and outcrop data may be indicative of syntectonic growth sedimentation. Understanding the older deformational episode is critical to unraveling the early history of hydrocarbon charge and trapping in the Kurdish ZFTB.