AAPG International Conference
Barcelona, Spain
September 21-24, 2003

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4D Evolution of Fold and Thrust Belts: Comparisons of Analogue Models with the Zagros

This paper presents a series of scaled analogue models designed to simulate thrust development in oblique subduction settings such as the Zagros fold belt in Iran. The models were constructed to produce doubly-vergent Coulomb wedge thrust belts with a pro-wedge and a retrowedge separated by an uplifted orogenic core. Models were constructed from homogeneous layered sandpacks in a 2m x 2.5 m deformation rig. Progressive evolution of the orogenic wedges was monitored using digital photography and animated for analysis. The analogue experiments have investigated subduction obliquities from orthogonal (90°) to as low as 50° obliquity. Variations in sandpack thicknesses and basal detachment frictional characteristics were also investigated. Orthogonal subduction models produce long, linear, critically tapered pro-wedge fold thrust belts parallel to the subduction margin together with a narrow, uplifted core and a steep retrowedge thrust system. Oblique subduction models produced doubly vergent thrust wedges with thrust faults parallel to the margin. There was little evidence of discrete strike-slip faulting with oblique displacements being accommodated along low-angle thrust systems. Variations in sandpack thicknesses and basal detachment frictions produced along-strike variations in thrust and fold geometries. Analysis of animations of these models shows how the thrust systems nucleate and propagate. In particular it is clear that at any one time several thrusts are moving simultaneously.

Animated models together are used to demonstrate the variations in structural styles in these thrust belts. Map patterns in the models are compared with those in the Zagros fold and thrust belt in Iran using LandsatTM data.