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Structural model of the eastern Achara-Trialeti fold and thrust belt using seismic reflection profiles

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Our study focused on the structural geometry at the eastern Achara-Trialeti fold and thrust belt (ATFTB) located at the retro-wedge of the Lesser Caucasus orogen (Alania et al., 2016a). Our interpretation has integrated seismic reflection profiles, several oil-wells, and the surface geology data to reveal structural characteristics of the eastern ATFTB. Fault-related folding theories were used to seismic interpretation (Shaw et al., 2004). Seismic reflection data reveal the presence of basement structural wedge, south-vergent backthrust, north-vergent forethrust and some structural wedges (or duplex). The rocks are involved in the deformation range from Paleozoic basement rocks to Tertiary strata. Building of thick-skinned structures of eastern Achara-Trialeti was formed by basement wedges propagated from south to north along detachment horizons within the cover generating thin-skinned structures. The kinematic evolution of the south-vergent backthrust zone with respect to the northward propagating structural wedge (or duplexes). The main style of deformation within the backthrust belt is a series of fault-propagation folds. Frontal part of eastern ATFTB are represent by triangle zone (Alania et al., 2016b; Sosson et al., 2016).
A detailed study was done for Tbilisi area: seismic refection profiles, serial balanced cross-sections, and earthquakes reveal the presence of an active blind thrust fault beneath Tbilisi. 2 & 3-D structural models show that 2002 Mw 4.5 Tbilisi earthquake related to a north-vergent blind thrust. Empirical relations between blind fault rupture area and magnitude suggest that these fault segments could generate earthquakes of Mw $\sim$ 6.5.
The growth fault-propagation fold has been observed near Tbilisi in the frontal part of eastern ATFTB. Seismic reflection profile through Ormoiani syncline shows that south-vergent growth fault-propagation fold related to out-of-the-syncline thrust. The outcrop of fault-propagation fold shown the geometry of the hangingwall structure with the syn-folding growth stratal sequence. Pre-growth Oligocene strata are overlain by Late (?) Quaternary alluvial fan gravels, sands and clays. Growth unconformity of back-limb showing flat clays unconformably on top of Oligocene sandstone and shale beds. The growth strata geometry of growth fold is related to the progressive limb-rotation model (Hardy & Poblet, 1994).

References

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