EGU25-572, updated on 22 Apr 2026
https://doi.org/10.5194/egusphere-egu25-572
EGU General Assembly 2025

Active tectonics of the South Caspian basin evidenced by seismic and field data

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The South Caspian Basin contains one of the thickest accumulated sedimentary sequences on earth with accumulated sedimentary sequences over 20 km overlying thin oceanic crust. The basin represents an enigmatic aseismic “block” within the Arabia-Eurasia collision, which moves relative to both Iran and Eurasia. To understand the nature and evolution of the South Caspian basin, a model of the tectonic motion of the basin has been built. The model integrates subsurface interpretation in the Caspian Basin with active tectonics studies from outcrops. The study is based on significant database including the results of geologic and geodetic studies, field-based and remote-sensing study of active faults, and the interpretation of offshore seismic reflection data in the central and southern parts of Caspian to examine the timings and styles of deformation in its interior and periphery.

The relative plate movements and faulting in the eastern Caspian lowlands on the eastern shores of the Caspian have been studied. The study has revealed several domains of folding and faulting within the South Caspian that are likely related to “thick skinned” faulting, based on their wavelength and asymmetry, as opposed to the thin-skinned deformation observed in the deeper basin, which is more likely related to movement within the mobile Maykop deposits. The thick-skinned structures of the Absheron Ridge in the central Caspian started to grow at 1.8 Ma and is related to onset of the present-day tectonic regime. The structures in the proximal offshore Kura domain are interpreted as the result of strike-slip deformation that can be traced onshore to structures that display prominent right-lateral displacement in Holocene age deposits. The anticlines started to form at 1.8 Ma with the folding and then replaced by faulting that continues to the present-day.

The results of the study refine our understanding of the present-day kinematics of the South Caspian Basin, and of the factors that may have helped cause an evolution in the tectonic configuration through time.