Where are the boundaries of the South Caspian Basin?

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Abstract

The South Caspian basin (SCB) is among the largest intracontinental basins of the Alpine–Himalayan belt. Like Black Sea basin. The SCB is floored mostly by a rigid aseismic basement block that has significant influence on the deformation and seismotectonics of the surrounding Caucasus, Talesh, Alborz and Kopeh Dagh mountain ranges. The widely accepted view on the borders of South Caspian Basin (SCB) puts its southern and western borders along the Khazar and Talesh faults, respectively. The thrust faults are considered active and dipping towards land and it has been postulated that the SCB is being underthrusted beneath the Talesh and Alborz. I will present four new receiver function (RF) and teleseismic P tomography sections across west Alborz and Talesh, a number of precisely relocated seismic clusters along the southern borders of the SCB, and also results of crustal gravity modeling. Our RF sections does not show any underthrusting of SCB beneath the Alborz and Talesh and put the borders of the SCB crust along a line before the peak of the Alborz and Talesh Mountain ranges. Comparison of the seismicity with the RF sections and P teleseismic tomograms along the sections shows a sudden jump of focal depths across the boundary between SCB and its neighboring crustal blocks. The focal depths are between 15 to 50 km depth in the SCB but all events in the west Talesh and south Alborz are mostly shallower than 15 km. The jump in the depth of seismicity provides us an important clue to find the borders in the central and eastern borders of the SCB where there is no RF sections available. The deep seismicity along the borders of SCB implies the thick sedimentary cover (_˜ 20 km) is being deformed aseismically.
To estimate the borders of SCB everywhere along its coasts, we calculated a high-resolution 2-D ML shear velocity map of the SCB and its surrounding regions. The ML velocity is very sensitive to strong lateral variations of crustal thickness and varies between the velocity of Lg and Sn phases. By comparing our RF and seismicity results with ML shear wave tomography, we infer that the low plains of Gilan and Gorgan to the south of the Caspian Sea have high shear velocities similar to the SCB, implying that they are either underlain by an oceanic type crust or a transitional crust with a strong lateral crustal thickness gradient. The pattern of seismicity does not correlate with the postulated Khazar and Talesh thrust faults. Our extensive neo-tectonics field work along the Talesh and Khazar faults shows no convincing evidence for significant deformation and recent activity of the faults. Almost all the features previously recognized as active fault traces correspond to Plio-Pleistocene shorelines of the Caspian Sea. Crustal gravity modeling along a seismic profile across west Alborz require a denser crust for SCB crust but not enough to consider it oceanc type. Our new findings has profound effect on the assesment of seismic hazard along densely populated regions along the Caspian Sea coasts.

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