SEISMIC ANISOTROPY AND SHEAR WAVE SPLITTING IN WESTERN ALBORZ AND ADJACENT REGIONS

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We have determined the shear wave splitting parameters using data from a temporary network of 19 broadband stations that operated 2012 through 2014 in the western Alborz region in northwestern Iran. The Network consists of a main line and a few offline stations and covers the Caspian lowland regions in the Geelan province and crosses into the western Alborz, Tarom and Soltanieh Mountains in the Zanjan province. Average inter-station spacing for the main line is around 12 km. Core refracted phases SKS and SKKS were used from over 1000 teleseismic waveforms to measure fast polarization directions and delay times in the stations. Events in the epicentral distance range of 90 to 130 degrees were used. The minimum energy and the rotation correlation methods were used to measure the splitting parameters. The SplitLab (Wüstefeld et al., 2008) software was used for this purpose.

Figure 1 shows the splitting vectors for the two methods. The average fast-axis azimuth and delay time obtained from the rotation correlation method are 18.03±1.66º and 1.33±0.00 sec, respectively, for the minimum energy method these values are 13.40±1.25º and 1.72±0.04 sec, respectively. The general trend of the fast axes is NW-SW. A relative uniformity is seen in the directions of the fast axes. The change of direction across different tectonic regions is smooth and no abrupt variation is seen in the region. Stations in the Geelan lowland region are a bit more northerly oriented than those in the mountainous regions further south. This difference is no more than 10 degrees, but can point to a contrast in the nature of the lithosphere and upper mantle structure between the two regions. The South Caspian Basin is most probably a piece of oceanic lithosphere floored by an oceanic crust. The location of its southern boundary and its transition to continental Alborz, however, remains unknown, and it is unclear whether the Caspian lowlands are part of the Caspian Basin or the Continental crust of northern Iran. We suggest that the different fast axes directions in the north of the Alborz mountains may indicate that the lithospheric structure in the Geelan region may be different from that in the Alborz region. The fast axes make a sharp angle with the trend of the mountain ranges; the Alborz, the Tarom and the Soltanieh Mountains. These directions are subparallel to the motion of Iran with respect to Eurasia in the no-net-rotation frame of reference. In this respect, these results are in accord with previous results obtained in northwestern Iran (Arvin, 2013) and in eastern Turkey (Sandvol et al., 2003). The shear wave splitting results are interpreted as indicating the mantle flow in the asthenosphere beneath Iran.

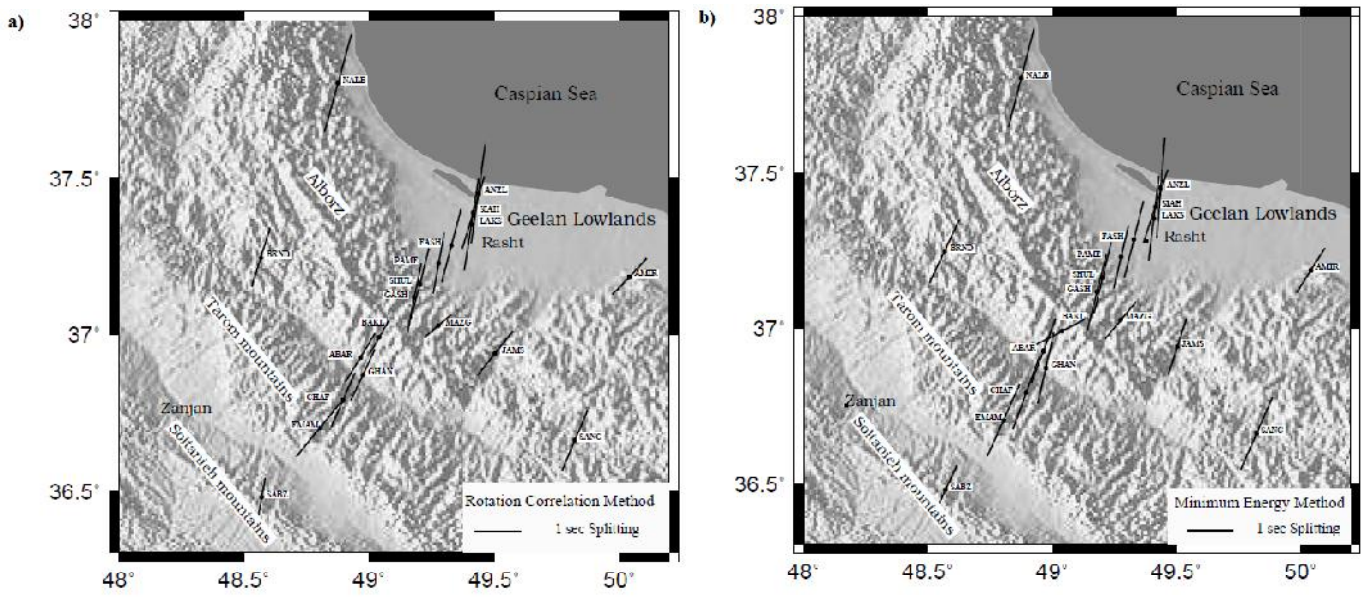

Figure 1. The obtained results by two methods a) Rotation correlation b) Minimum energy

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