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Crustal Anisotropy from Local Observations in Marmara Region-TURKEY

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Abstract
In this study, we evaluate shear wave anisotropy from micro earthquakes recorded by 29 stations installed in the frame of TURDEP (Multi-Displinary Earthquake Researches in High Risk Regions of Turkey, Representing Different Tectonic Regions) Project and also KOERI (Kandilli Observatory and Earthquake Research Institute) stations in the Marmara Region . We have applied three methods: 1-Aspect ratio, 2-Cross-correlation and 3-Systematic analysis of crustal anisotropy (Zhigang Peng and Yehuda Ben-Zion,2004) to the events occurred during one year from 2007 to present and recorded by three component digital seismograms to see the resolution. The polarization of fast S wave (the first arriving shear wave) is determined by the linearity of the particle motion of shear waves with maximizing as a function of azimuth for the aspect ratio method. Also, the results from the three methods are compared with each other. Especially, the results obtained from Aspect ratio and from Cross-correlation methods are approximately consistent with each other. In the study area, the polarization of the faster shear waves is dominantly NW-SE and shows nearly uniform distribution. The results are consistent with Crampin & Evans (1986). Shear wave velocity anisotropy has been evaluated as due to vertical, fluid-filled, aligned fractures or cracks, micro cracks, or aligned pore space (Crampin et al., 1984; Crampin and Booth, 1985). The polarization direction of the fast split shear wave is nearly parallel to the direction of the cracks alignment and hence parallel to the maximum horizontal stress direction in this region. If considering tectonic structure and tectonic evolution of the study area, it can be easily seen that the Sea of Marmara is a marine basin in northwest Turkey that connects the Aegean Sea with the Black Sea, and includes a series of tectonically active basins at the western end of the right-lateral North Anatolian Fault (NAF).If comparing our results and neotectonic stress of the study area, it can be said that they are compatible with each other. We also applied the seismic tomography to shed light the low velocity zones which are related to heat flow distribution in the region. Moreover the dispersion curves have been investigated to determine the velocity change in the frame of the selected region.