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Crustal structure of Khorasan (E-NE Iran) using the Rayleigh wave tomography

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Classical surface wave tomography based on waveform scattering through seismic data has an important role in studying the structure of the Earth's crust and upper mantle on regional and global scale. The shallow crustal velocity structure is studied using earthquake waveforms in Khorasan/E-NE Iran. For this purpose, 522 local recorded waveforms with $M \geq 4$, which occurred between 53° - 63° E and 30° - 42° N, were selected. Therefore, all available vertical components of waveforms recorded at the stations in the Iranian Seismological Center (IrSC), the International Institute of Earthquake Engineering and Seismology (IIEES), and the IRIS global network collected in the period between January 2006 to October 2020. Then, some data selection criteria were applied for each waveform, including (i) SNR > 4, (ii) the gap time less than 2 s within the expected signal window (1.5-4.5 km/s), (iii) epicentral distance greater than 20 km. The multiple-filter analysis technique was then applied by the computer program in seismology Hermann and Ammon (2013) to measure Rayleigh wave dispersion curves in the period range of 3-50 s. Finally, Rayleigh wave 2D horizontal group velocity maps are calculated by the fast marching surface wave tomography method. Our tomographic results indicate some local low velocity anomalies appeared in the W-NW of the study area where it connected with the East-Alborz tectonic structure. Also, the Doruneh Fault System clearly separates Kopeh-Dagh tectonic zone and Central Iran micro-plateau. However, a high velocity anomaly appears in Kopeh-Dagh tectonic zone at periods larger than 16 s and 30 s.