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3-D P-Wave Velocity Structure Beneath Eastern Turkey

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High quality local earthquake data from the temporary network of Eastern Turkey Seismic Experiment (ETSE) were used in order to determine the 3-D P-wave velocity structure of upper crust for Eastern Turkey. Within the 32-station network, 524 well locatable earthquakes with azimuthal gaps $\leq 200^{\circ}$ and number of P-wave observations > 8 (corresponding to 6842 P-phase readings) were selected from the initial data set and simultaneously inverted. 1-D reference velocity model was derived by an iterative 1-D velocity inversion including the updated hypocenters and the station delays. The following 3-D tomographic inversion was iteratively performed by SIMULPS14 algorithm in a damped least-squares sense using the appropriate ray tracing technique, model parametrization and control parameters. Several tests with the synthetic data were conducted to assess the solution quality, suggesting that the velocity structure is well resolved down to $\sim$17 km. Overall, resulting 3-D P-wave velocity model led to a more reliable hypocenter determination indicated by reduced event scattering and a reduction of $\sim$%50 both in variance and residual (rms) values. With the influence of improved velocity model, average location errors did not exceed $\sim$1.5 km in horizontal and $\sim$4 km in vertical directions. Tomographic images revealed the presence of lateral velocity variations in Eastern Turkey. Existence of relatively low velocity zones (5.6 $<$Vp $<$6.0 km/sec) along most of the vertical profiles possibly indicates the influence of major tectonic structures such as North Anatolian Fault Zone (NAFZ), East Anatolian Fault Zone (EAFZ) and the Bitlis thrust belt correlated with the seismicity. Low velocity anomalies extend deeper along EAFZ down to $\sim$15km compared to a depth of 10km along NAFZ. Arabian plate is generally marked by relatively higher velocities (Vp$>$ 6.2 km/sec) in 10-15 km depth range.