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High Resolution Velocity Structure in Eastern Turkey

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We investigate the crustal and upper mantle structure of eastern Turkey where the Anatolian, Arabian and Eurasian Plates meet and form a complex tectonic structure. The Bitlis suture is a continental collision zone between the Anatolian plateau and the Arabian plate. Broadband data available through the Eastern Turkey Seismic Experiment (ETSE) provided a unique opportunity for studying the high resolution velocity structure. Zor et al. (2003) found an average 46 km thick crust in Anatolian plateau using six-layered grid search inversion of the ETSE receiver functions. Receiver functions are sensitive to the velocity contrast of interfaces and the relative travel time of converted and reverberated waves between those interfaces. The interpretation of receiver function alone with many-layered parameterization may result in an apparent depth-velocity trade-off [Ammon et al., 1990]. In order to improve previous velocity model, we employed the joint inversion method with many layered parameterization of Julia et al. (2000) to the ETSE receiver functions. In this technique, the receiver function and surface-wave observations are combined into a single algebraic equation and each data set is weighted by an estimate of the uncertainty in the observations. We consider azimuthal changes of receiver functions and have stacked them into different groups. We calculated the receiver functions using iterative time-domain deconvolution technique and surface wave group velocity dispersion curves between 10-100 sec. We are making surface wave dispersion measurements at the ETSE stations and have incorporated them into a regional group velocity model. Preliminary results indicate a strong trend in the long period group velocity in the northeast. This indicates slow upper mantle velocities in the region consistent with Pn, Sn and receiver function results. We started with both the 1-D model that is obtained with the 12 tones dam explosion shot data recorded by ETSE network [Gurbuz et al., 2004] and the existing receiver function inversion results. In fact, we observe that the inversion results are independent at the starting model and converges well to the same final model. We don't observe a significant change at the first order discontinuities of model (e.g. Moho depth), but we obtain better defined depths to low velocity layers.

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