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Receiver function method for estimation of the shallow structure: example for Tabriz, Iran

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Receiver function method is widely used to estimate Earth crust and mantle structure. But to apply it to the estimation of weak low-velocity layers of shallow structure (1-5 km depth), which are important for prediction of earthquake strong ground motions for example, someone need to calculate receiver function at high frequencies, ˜3-8 Hz. High-frequency seismic waves are strongly scattered and calculation of receiver function in many cases become troublesome. To avoid this problem, we can use local small earthquakes. Receiver function approach is helpful to remove effects of source and path by deconvolution of the vertical component from the radial component. In its straightforward application receiver function is used to detect time delay of the Ps converted phases and then depths of the interfaces are estimated using a fixed velocity values in the layers. Instead, we use full waveform inversion of the receiver function into the velocity structure. We applied developed methodology to estimate shallow structures at a few sites in the region around the UNESCO World Heritage site Tabriz Baazar in Iran, constructed on about A.D.1400 or A.D.1500, with the purposes to estimate possible strong ground motions. Velocity of deepest layer was fixed according to the crustal structure. Receiver functions were inverted for velocity structure using Genetic Algorithm; propagator matrix algorithm was used to calculate theoretical receiver functions.

Keywords: Shallow velocity structure, Receiver function, Strong ground motion