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TWO-POINT SOURCE MODELING BY ITERATIVE DECONVOLUTION AND NON-NEGATIVE LEAST SQUARES

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The source complexity of the Mw7.1 (USGS) Van, Eastern Turkey earthquake of October 23, 2011 is studied using full waveform inversion of seismic records at near-regional distances (120-220 km) and relatively low frequencies (0.05-0.15 Hz). The study relies on iterative deconvolution and on a new method in which pairs of point sources on the fault plane are systematically grid searched, and the moment-rate time functions of the 2-point source models are *simultaneously* calculated by the non-negative least squares inversion (Zahradník and Sokos, 2014). The latter method might provide better results than the iterative deconvolution method, in particular when the station coverage is poor. The analysis was performed using the ISOLA software (Sokos and Zahradník (2013).

Both real and synthetic data were used and it is demonstrated that the wave field in the above mentioned ranges of the epicentral distance and frequency is sensitive enough to distinguish two main subevents of the Van earthquake, separated from each other by ~10-15 kilometers and ~4 seconds. The double-event character of the Van earthquake is indicated even by a simplified single-point source model, optimally when the trial point source is near the earthquake centroid.

The same methods have recently been applied to investigation of complexity of the Mw7.6 Costa Rica 2012 earthquake. The multiple point source inversion leads to two main subevents. Based on the iterative deconvolution the first subevent was located near the centroid, and the second one was situated 20 km along strike and 10 km down dip from the first subevent and 6 sec later. Based on the non-negative least-squares, the source might have been more compact in space and time, and the latter method also provided an uncertainty estimate.

The simple indicators of the source complexity developed in this paper are useful in practice in the first hours after an earthquake, when the source position is known only approximately and finite-fault models of slip evolution are not yet available.

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