



Uncertainty of rapid earthquake source inversion using the regional seismogeodetic networks around megacity Istanbul

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During the 20th century, a series of devastating earthquakes occurred along the north Anatolian fault, which generally propagated westward towards Istanbul, leaving the main NAF segment beneath the Marmara Sea as a seismic gap. For the nearby megacity Istanbul, rapid seismic hazard assessment is of most importance. A key issue is how such strong earthquakes can be characterized reliably and rapidly using the regional seismogeodetic monitoring networks. For this purpose, a new source imaging tool has been developed and improved. Several tests are carried out to estimate uncertainties of the kinematic rupture models inverted from synthetic data that were generated based on 3D dynamic modelling of different scenario earthquakes. In the kinematic inversion, a practical 1D earth model is used and uncertainties in the hypocenter location and focal mechanism are considered to investigate their influences on the inversion results. It is found that the rupture processes can be well reconstructed using the current monitoring networks if the same earth structure, hypocenter location, fault geometry and focal mechanism are adopted as used in the forward modelling. In comparison, if some reasonable uncertainties are included in these input parameters, no substantial changes are observed in the key source parameters, such as the moment magnitude, the fault size and centroid location, which are essential for rapid hazard assessment, while the spatial distribution and the peak value of fault slip may have significant bias. Finally, the potential and limitation of the current seismogeodetic networks around the megacity Istanbul for real-time earthquake source imaging are discussed.