

Rupture Propagation of the 2015 M 7.8 Nepal Earthquake Derived from Seismic Arrays in Europe, China, and Japan

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We analyzed the 25 April 2015 Nepal earthquake (Mw 7.8) by back-projecting seismograms recorded at several large regional arrays in Europe, China, and Japan. The results indicate that the rupture mainly propagated towards the southeast with a rupture length of 100-120 km. The main energy was radiated in the first 40-60 s. The average rupture speed is ~2 km/s.

From global broadband waveforms, we observed significant continued energy radiation 60 s after the origin time. Locating the energy source by back-projecting data from European stations filtered between 0.05 and 0.5 Hz, we found that the source of the energy was located at east end of the source area.

Comparing back-projection results with slip models derived from inversion of longer period teleseismic body wave and InSAR (for example, ARIA), we find frequency dependence for the energy radiation. For example, slip models from InSAR data show large slip centered at an area that is 20-40 km east of the capital city Kathmandu, with very little slip around the epicenter. High-frequency energy, located by back-projections, shows a different pattern with strong radiation from the area between the epicenter and the city of Kathmandu, with smaller energy radiating from the area east of Kathmandu.