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Aftershock seismicity of the 2015 M7.8 Gorkha Earthquake, Nepal: implications for faulting and structure near the Main Himalayan Thrust

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In response to the April 25, 2015 M7.8 Gorkha earthquake on the Main Himalayan Thrust in Nepal, we deployed a rapid response seismic network known as NAMASTE (Nepal Array Measuring Aftershock Seismicity Trailing Earthquake) for ∼11 months beginning ∼7 weeks after the main shock. The network consisted of 41 broadband and short-period seismometers and 14 strong motion sensors at 46 sites across eastern and central Nepal. The network spanned a region approximately 210-km along-strike by 110-km across strike. The region covers the earthquake rupture area from east to west and extends from south of the Main Frontal Thrust to the northern edge of the rupture from south to north, with a station spacing of ∼20 km.

Using the data from this network, we relocate thousands of aftershocks, calculate their magnitudes, and determine the focal mechanisms for the larger events. We used Boulder Real Time Technologies Antelope seismic analysis tools and the HypoDD double-difference earthquake location algorithm to obtain locations. We used the program HASH to calculate focal mechanisms for events using first motion polarities and amplitude ratios.

Relocations of aftershocks from the NAMASTE network appear to illuminate the Main Himalayan Thrust at depth as well as several other possibly related fault structures, including strike-slip faults. We observe significant along-strike variability in seismicity across the rupture area and discuss possible correlations between co-seismic and post-seismic slip models and the aftershock distribution. We present interpretations of possible structures that may have limited the extent of rupture and that may control the nucleation pattern of future earthquakes.