2015 年ネパールゴルカ地震の余震の自動震源決定

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Summary

We created a well-resolved aftershock catalog for the 2015 Gorkha earthquake in Nepal by processing 11 months of continuous data using an automatic onset and hypocenter determination procedure.

- We found around 15,000 aftershocks with Mc=2.
- The aftershocks are not only on the slip surface but also scattered through the entire hanging wall.
- The aftershock clusters are consistent with the two possible ramp structures in the Main Himalayan Thrust fault model (Hubbard et al., 2016).
- The 1D velocity structure is almost constant at Vp=5.9 km/s for a depth of 0-20 km, which is faster than previous model.

Data

- 42 stations in seismic network (NAMASTE) by Oregon State University (https://www.fdsn.org/networks/detail/XQ_2015/)
- 11 months of continuous data (June 2015-May 2016)
- Instrumental response correction and 2-10 Hz band-pass filter

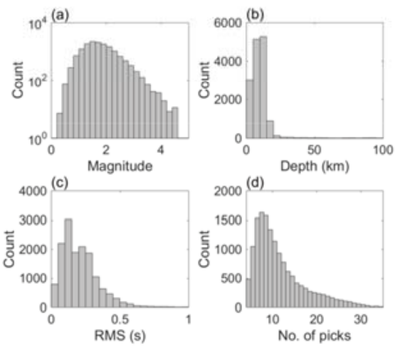
Methods

τpd picker — Detect P- and S-arrivals
Hildyard et al., 2008

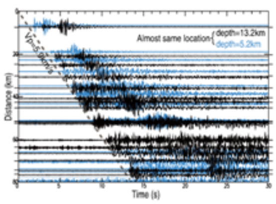
AutoHyp — Locate events from phase arrivals & amplitudes
Tamaribuchi, 2018

VELEST — Joint hypocenter determination with 1D velocity model and station correction factors; Relocate all events with the new 1D model
Kissling et al., 1995

Statistics

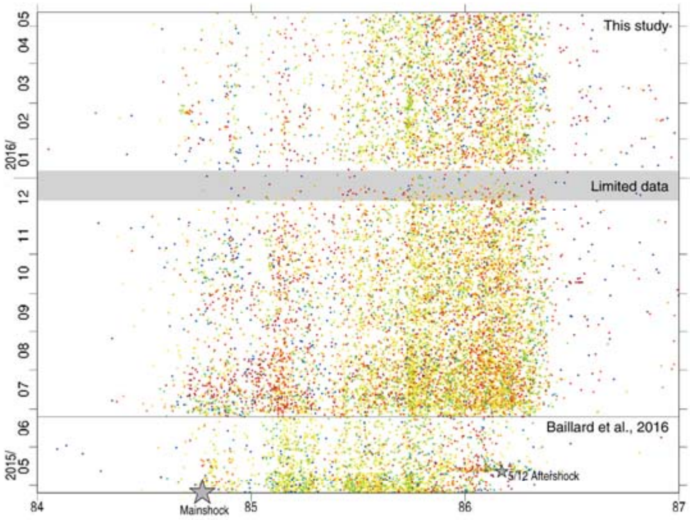


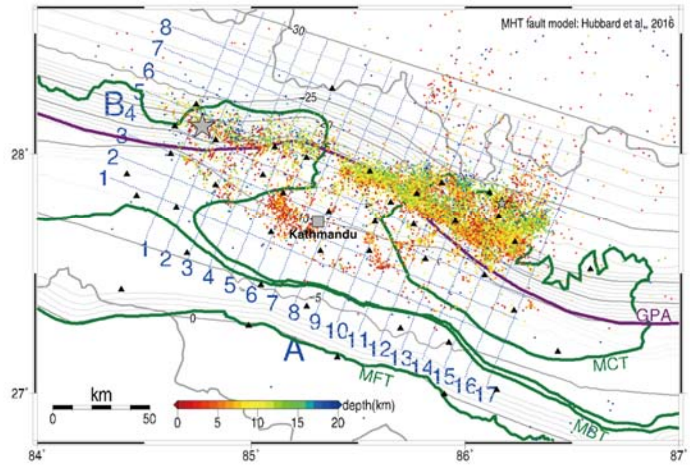
- 15,000 events with Mc=2
- Depth < 20km
- more than 6 picks



Resolution check in depth

Aftershock Distributions





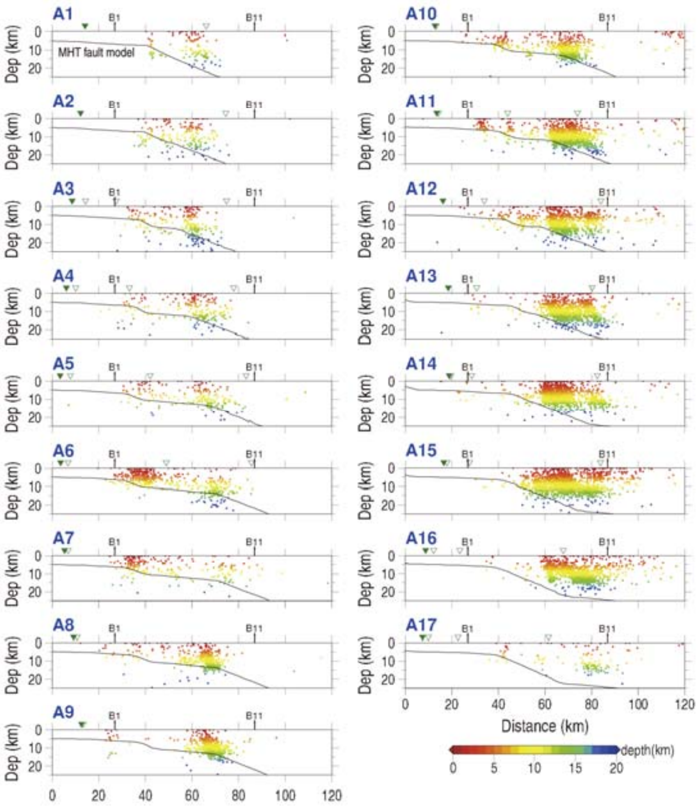
North of GPA

- 2 large clusters along the north of GPA (Gorkha-Pokhara Anticlinorium).
- Previous seismicity shows that they existed before the mainshock.
- They are areas with a large gradient of coupling (Stevens and Avouac 2015).
- Consistent with the major ramp structures in the Main Himalayan Thrust fault model (Hubbard et al., 2016).

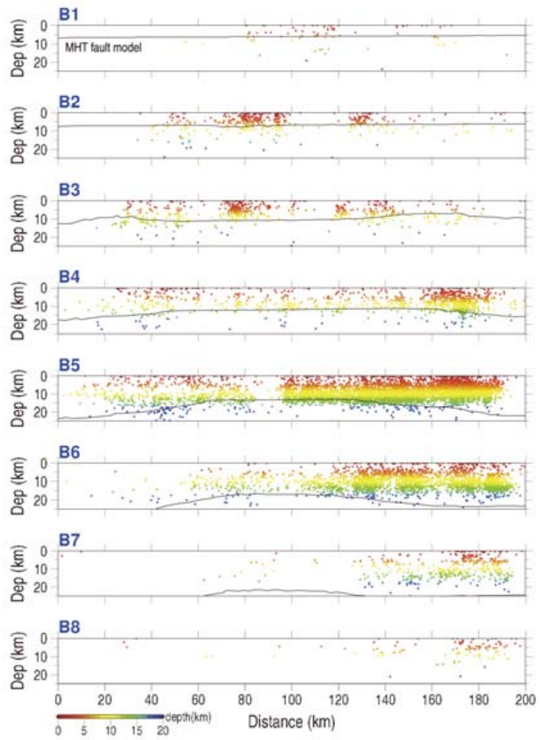
South of GPA

- Smaller shallow aftershock clusters in the south of GPA.
- Almost no seismicity prior to the Gorkha earthquake.
- We assume that they are activated by the mainshock ruptured the lower edge (northern end) of the locked MHT.
- They may be generated by the stress heterogeneities resulting from the shallower ramp structure.

NS Sections

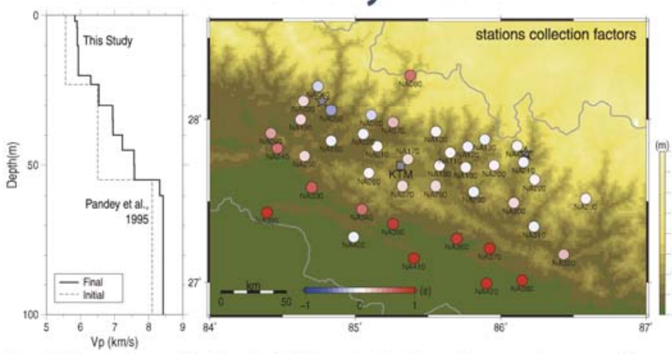


EW Sections



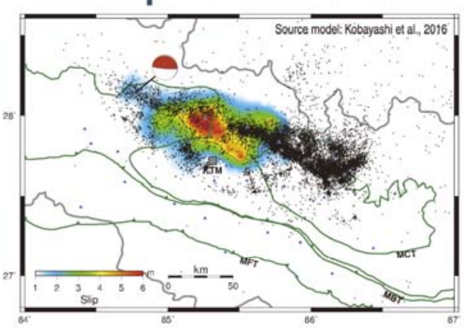
Most aftershocks are confined between the ground surface and the MHT shear zone, and the bottom of the aftershock is consistent with the 3D MHT model.

Inverted 1D Velocity Model



Vp=5.9 km/s for a depth of 0-20 km, faster than the previous model. Larger station correction factors at the lowland (Terai).

Mainshock Slip vs Aftershocks



Fewer events in the large slip area and more events on the two ramp structures surrounding the large slip area.