

The 2016 Mw7.8 Kaikōura earthquake in New Zealand from the perspective of the Hundalee Fault: Insights into the termination of a subduction zone

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The 2016 Mw7.8 Kaikōura Earthquake ruptured more than 20 faults over a distance of about 180 km. These complex dynamics call the general understanding of large magnitude earthquakes under reinvestigation. While most studies explore the large-scale co-seismic deformation and patterns, here we focus on the ~30 km-long Hundalee Fault, a structure located at the southern domain of the earthquake rupture and, across a zone where the Hikurangi margin is inferred to terminate.

We present pixel amplitude offset data derived by cross-correlating radar image couples of the Sentinel-I satellite mission, using a set of rectangular dislocations in an elastic half-space, downsampled by quad-tree partitioning, to calculate the amount of horizontal and vertical co-seismic displacements along the NE-SW trending Hundalee Fault and model its geometry.

It is intriguing to observe that surface displacements, up to 3.7 m dextral and 2 m vertical, were recorded for only ~50% of its northeastern fault-length. This work examines whether the lack of surface displacements along the southwestern half of the Hundalee Fault reflects lack of slip also in depth and whether this apparent barrier to earthquake rupture propagation occurs because the fault straddles a zone across which the plate-interface terminates. A clearer picture of the co-seismic behaviour of the affected sub-region will help to better understand the transition of a subduction to strike-slip transfer zone and potentially improve regional seismic hazard models in New Zealand.