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Revisiting the Kaikoura (New Zealand) M7.8 earthquake by combining Sentinel-1, Landsat 8 and source complexity. Implications for tsunami modelling.

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The Kaikoura (New Zealand) M7.8 earthquake occurred on November 13, 2016 and was quickly identified as a very complex event. Multiple faults ruptured reaching the surface, several of which occurred at sea leading to a moderate tsunami (over a meter height) that flooded locally coastal areas. In addition, many landslides were triggered, leading to substantial damages to the road network.

The Copernicus Sentinel-1 constellation is a joint initiative of the European Commission (EC) and the European Space Agency (ESA) that provide Europe with an operational Earth Observation radar capacity. The Kaikoura event has once again highlighted the central role by spaceborne SAR displacement measurements to improve our knowledge of seismic hazard and, consequently, the notion of risk.

In the current work, we aim to combine the coupling of several independent observations, including satellite imagery (SAR and optical), seismology, tsunami records as well as modelling results (seismic source, soil deformation and tsunami), in order to better take into account the complexity of the earthquake, induced secondary phenomena, and thus, better target impacted areas. Indeed, the vast majority of earthquake tsunami generation models do not realistically integrate the spatio-temporal evolution of the co-seismic deformation, but most consider simplified static dislocation models.

We carry out SAR interferometry and image correlation analyses in order to refine the knowledge of the earthquake-related deformation. Simultaneously, the spatio-temporal evolution of ground deformation is integrated. The results are compared and further analysed to serve as a source for a tsunami generation model in the near-field context.