



Monitoring perturbations of earth surface process after the 2015 Gorkha earthquake in Nepal

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Large earthquakes can substantially perturb a wide range of Earth surface processes. The strong shaking caused by large earthquakes weakens rockmass, causes extensive landsliding, and alter the hydrological conductivity of the near surface. This leads to subsequent responses that include sediment loading of rivers and changes in subsurface water flow paths. The long term perturbation often last several years and even might outstrip the immediate co-seismic impact in their magnitude. Over time the system restores to background conditions, and the recovery process and transient timescales of different systems provide particularly valuable insights for predicting natural risks associated with the aftermath of earthquakes.

Here we will present results of the first 2 years of monitoring surface processes in the epicentral area of the 2015 Gorkha earthquake. The observations started immediately after the event and are planned to continue for a total of four monsoon seasons, in order to capture the full recovery process of the system until pre-earthquake conditions have been reached.

We have installed a comprehensive network of twelve river sampling stations for daily water and sediment sampling, covering all major rivers draining the earthquake-affected areas. Nested within this regional network, we have installed an array of 16 seismometers and 6 weather stations in the upper Bhotekoshi catchment. The field measurements are accompanied by repeated mapping of landslide activities using satellite imagery.

Our results show pronounced changes of the hydrological regime, underpinned by a marked change of seismic noise velocities, both indications of significant changes of the subsurface rock properties. Alongside, our landslide mapping documents about ten times greater landslide activity during the 2015 monsoon season than typically expected for this monsoon season. Very preliminary estimates for the exceptionally strong 2016 monsoon season are also elevated. This demonstrates the lingering natural hazards, lasting several years, due to earthquakes in perturbed landscapes.