Topographic changes due to the 2004 Chuetsu earthquake

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On 23 October, a Mw 6.6 earthquake occurred in Chuetsu, Niigata prefecture, Japan, which triggered more than 7000 landslides and greatly modified the local topography.

After the earthquake, a 2-m-resolution Light Detection and Ranging (LiDAR) Digital Elevation Model (DEM) was surveyed in the epicentral area in 2005. Recently, the high-resolution and multi-temporal Light Detection and Ranging (LiDAR) Digital Elevation Models (DEMs) or DEM generated from stereo pair of remote sensing images have been proven valuable in monitoring geomorphic, co-seismic and volcanic surficial deformations. Hence, we studied the topographic changes due to the Chuetsu earthquake using pre-earthquake 10-m-resolution and post-earthquake 2-m-resolution DEMs data. The slope angle, relief and roughness all increased, indicating the Chuetsu earthquake is roughening the topography in the epicentral area. By subtracting the pre-earthquake DEM from the post-earthquake DEM, we obtained the co-seismic landslide volume to derive catchment-scale average denudation depth. The denudation distribution indicates correlation with local relief, as well as the uplifting caused by fault-related folding on the hangwall of Muikamachi fault.