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Landslides triggered by the 2016 Kumamoto earthquake sequence: role of ground-motion directionality

Sebastian Specht (1,2), Ugur Ozturk (1,3), Georg Veh (1), Fabrice Cotton (1,2), and Oliver Korup (1)

(1) Institute of Earth and Environmental Science, University of Potsdam, Germany, (2) Helmholtz Centre Potsdam GFZ German Research Centre for Geosciences, Germany, (3) Potsdam Institute for Climate Impact Research, Germany

In April 2016 a destructive earthquake sequence (mainshock M_{JMA}=7.3) occurred along the Futagawa and Hinagu faults near Kumamoto city, Kyushu, Japan. We provide an assessment of some 500 mainly shallow landslides triggered by the earthquake sequence, which consists of >3500 events recorded. Immediately after the mainshock the Geospatial Information Authority of Japan supplied high-resolution digital photos from unmanned aerial vehicles that allowed creating an inventory of landslide source areas, accumulation zones, directivity, impacts on river channels, and several other key characteristics. The mainshock was a strike-slip earthquake. Ground shaking associated with this kind of earthquake has a significant directivity effect, where the long period shaking is larger on the fault-normal component compared to the fault-parallel component. This property offers an opportunity to analyse potential links between shaking directionality and landslide occurrence, especially as few data are available on landslide response to strike-slip earthquakes. We analysed the distribution of landslides according to the distance from the fault, and the angle between the fault strike and landslide strike. We use strong-motion data to investigate ground-motion directionality and derive fault-parallel and fault-normal time series of ground motion. We apply these waveforms to a simple Newmark sliding-block model to quantify the possible impact of ground-motion directionality on the spatial pattern of landslides.