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Preliminary results on landslides triggered by the Mw 7.8 Kaikoura earthquake of 14 November 2016 in northeast South Island, New Zealand

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This study presents the first results on analysis of the landslides triggered by the Mw 7.8 Kaikoura earthquake that occurred on November 14, 2016 in the region between the Hikurangi subduction system of the North Island and the oblique collisional regime of the South Island (Alpine Fault). The earthquake ruptured several faults that expand into two different tectonic domains which are compose of the strike-slip Marlborough fault system and the compressional North Canterbury Fault Zone. Here we present the preliminary mapping results of the distribution of landslides triggered by the earthquake. An extensive landslide interpretation was carried out using sets of optical high resolution satellite images (e.g. Sentinel-2 and Göktürk-2) for both the pre- and post-earthquake situation. The landslides were identified and mapped as polygons using multi-temporal visual image interpretation based on satellite imagery and morphological elements of landslide diagnostic indicators. Nearly 8,500 individual landslides with different sizes and types were mapped. The distribution pattern of the mapped coseismic landslides shows that the slope failures are highly concentrated along the ruptured faults and side slopes of the structurally controlled major rivers such as Hapuku and Clarence Rivers that drain the northeastern slopes of the region. Our spatial analysis of landslide occurrences with ground acceleration, lithology, slope, topographic relief and surface deformation indicated extensive control of steep slope and high topographic relief on landslides with ground acceleration as the trigger. We show that spatial distribution of slope failures shows decreasing frequency away from the earthquake faults up to 25 km towards east, and abundance of landslides spatially coincides with the coseismic fault geometries and aftershock distributions. We conclude that combined effect of complex rupture dynamics and topography primarily control the distribution pattern of the landslides triggered by the Kaikoura Earthquake sequence.