Remote sensing observations for a catastrophic avalanche collapse in Langtang induced by the Gorkha, Nepal earthquake

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We demonstrated an assessment of the sediments caused by a catastrophic avalanche, induced by the main shock of the 2015 Gorkha Earthquake in Nepal. Calculation of decreasing coherence and visual interpretation of amplitude images by means of the Phased Array-type L-band Synthetic Aperture Radar-2 (PALSAR-2) have a high potential for delineating the hazardous zone. These delineated outlines area highly consistent with that from a high-resolution optical image of WorldView-3 (WV-3). The delineated sediment collapse areas were estimated as 0.63 km^2 (PALSAR-2 coherence calculation), 0.73 km^2 (PALSAR-2 visual interpretation), and 1.09 km^2 (WV-3), respectively. In the WV-3 image, surface features were classified into 15 segments, with the flowing, scattering, and other characteristics implying different physical properties; the different features suggest sequential collapse from multiple sources. Differences in the surface elevations of the collapse events estimated the total volume of the sediments as 5244.5 $\times 10^3$ m^3, with a error possibility between 3652.4$\times 10^3$ to 10687.4$\times 10^3$ m^3, most of which are distributed along the river bed and the water stream. Further elevation measurements after ice/snow melting would reveal a contained volume of melting ice and snow, which will contribute to numerical avalanche simulation and source considerations.

Keywords: the Gorkha, Nepal earthquake, avalanche, PALSAR-2, ALOS, WorldView-3, remote sensing