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

*Hiroto Nagai¹, Manabu Watanabe¹, Naoya Tomii¹, Takeo Tadono¹, Shinichi Suzuki¹

1. Japan Aerospace Exploration Agency

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 km² (PALSAR-2 coherence calculation), 0.73 km² (PALSAR-2 visual interpretation), and 1.09 km² (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 $5244.5 \times 10^3$ m³, with a error possibility between $3652.4 \times 10^3$ to $10687.4 \times 10^3$ m³, 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