



## **Emergency satellite observation and assessment of a glacier lake outburst flood in Bhutan**

Hiroto Nagai, Takeo Tadono, and Shinichi Suzuki

Japan Aerospace Exploration Agency, Tsukuba, Japan (nagai.hiroto@jaxa.jp)

Following a glacial lake outburst flood (GLOF) on Jun. 28, 2015, in western Bhutan, the Japan Aerospace Exploration Agency performed an emergency observation on Jul. 2, 2015 using the Phased Array type L-band Synthetic Aperture Radar-2 (PALSAR-2) onboard the Advanced Land Observing Satellite-2 (ALOS-2, "DAICHI-2"). Based on a dataset generated from the Advanced Land Observing Satellite (ALOS) imagery, "The Glacial Lake Inventory of Bhutan using ALOS Data", the glacier lake that potentially contributed to this GLOF were identified at 28°4'7.7"N, 89°34'50.0"E, in a headwater of the Mo Chu river basin, western Bhutan.

A post-event lake outline was delineated manually using the acquired PALSAR-2 image. Pre-event outlines were delineated from previously acquired PALSAR-2 images (Apr. 23, 2015), Landsat 8 (Mar. 8, 2015), and ALOS (Dec. 22, 2010). The differences between these outlines reveal a remarkable expansion (+48.0%) from Mar. 8 to Apr. 23, 2015, followed by a remarkable shrinkage (−52.9%) from Apr. 23 to Jul. 2, 2015. This result indicates the lake to be a highly likely source of the flood. Topographically, it is located at a glacier terminus, surrounded by a moraine. Differing backscatter patterns between successive PALSAR-2 images in a certain part of the moraine suggest that it underwent some collapse, possibly as a result of the GLOF. More detailed investigations, including field surveys, are necessary to fully reveal and understand this event.