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## Glacial Lake Inventory of Bhutan using ALOS Data: Methods and Preliminary Analysis

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The Advanced Land Observing Satellite (ALOS) is a relatively new satellite. Its optical sensors are capable of making high-resolution digital surface models (DSM). For the first time, the task of constructing a regional-scale inventory for glacial lakes based on ALOS data has been undertaken. This study presents the data processing methods and the results of validation and analysis on the ALOS-based glacial lake inventory of Bhutan in the Himalayas. The analysis based on GPS measurements taken at Metatshota Lake in the Mangde Chu sub-basin, one of the glacial lakes assessed as potentially dangerous for flooding, shows a validation estimate of 9.5 m for the location of the ALOS-based polygon with the RMS of 6.9 m. A comparison with digitized data from the International Centre for Integrated Mountain Development (ICIMOD) illustrates that a significant amount of improvement in positioning and in evaluating terrain changes can be achieved using ALOS data. Preliminary analysis on the glacial lakes in four sub-basins, Mo Chu, Pho Chu, Mangde Chu, and Dangme Chu, reveals that the frequency distribution of lake sizes biases towards smaller lakes. Glacial lakes in the size of 0.01-0.05 km<sup>2</sup> account for approximately 55% in number and occupy 13% of the area. Together our results demonstrate the usefulness of high-resolution ALOS data with accurate DSMs in studying glacial lakes. High priority must be given to continuously improving and updating glacial lake inventory with high-resolution satellite data.

Keywords: GLOF, ALOS, inventory, Bhutan, Himalayas