

Future Projection of Glacial Lake Outburst Floods Hazard: A Hydrodynamic Study of the Highest Lake in the Dhauliganga Basin, Uttarakhand

Authors : Ashim Sattar, Ajanta Goswami, Anil V. Kulkarni

Abstract : Glacial lake outburst floods (GLOF) highly contributes to mountain hazards in the Himalaya. Over the past decade, high altitude lakes in the Himalaya has been showing notable growth in their size and number. The key reason is rapid retreat of its glacier front. Hydrodynamic modeling GLOF using shallow water equations (SWE) would result in understanding its impact in the downstream region. The present study incorporates remote sensing based ice thickness modeling to determine the future extent of the Dhauliganga Lake to map the over deepening extent around the highest lake in the Dhauliganga basin. The maximum future volume of the lake calculated using area-volume scaling is used to model a GLOF event. The GLOF hydrograph is routed along the channel using one dimensional and two dimensional model to understand the flood wave propagation till it reaches the 1st hydropower station located 72 km downstream of the lake. The present extent of the lake calculated using SENTINEL 2 images is 0.13 km². The maximum future extent of the lake, mapped by investigating the glacier bed has a calculated scaled volume of 3.48 x 10⁶ m³. The GLOF modeling releasing the future volume of the lake resulted in a breach hydrograph with a peak flood of 4995 m³/s at just downstream of the lake. Hydraulic routing

Keywords : GLOF, glacial lake outburst floods, mountain hazard, Central Himalaya, future projection

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