



Reservoir Capacity Calculation and Variation of Moraine-dammed Lakes in the North Himalayas: A Case Study of Longbasaba Lake

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Abstract: Glacial Lake Outburst Flood (GLOF) hazards have been paid more attention in Himalayan region. The accurate calculation of reservoir capacity of glacial lake is very important to estimate outburst flood peak discharge and simulate flood evolution. The Longbasaba Lake, a potential dangerous moraine-dammed lake, is located in Dingjie county of Tibet Autonomous Region. Its depth was measured by HydroboxTM high resolution echo sounder and 6916 samples were collected in field investigation held in September 2009. The maximum depth and average depth of Longbasaba Lake were respectively found to be up to 101.94 meters and 47.50 meters. Based on the same time Landsat Thematic Mapper (TM) image interpretation, lake basin shape was simulated by constructing Triangulated Irregular Network (TIN) and the reservoir capacity was 0.64×10^8 cubic meters. Furthermore, multi-source remote sensing images from 1977 to 2008, such as Landsat MSS, topographic map, Landsat TM and ASTER, were interpreted and digitalized by GIS software. The result showed that the length and area of Longbasaba Lake were increasing in the last 32 years and the tendency was more significant since 2000. The empirical formula of volume-area of moraine-dammed lake was built by analyzing the volume and area in different periods, which could be used to calculate the reservoir capacity of other moraine-dammed lakes in Himalaya region. Finally, based on the analysis of the interdecadal variations in temperature and precipitation from five weather stations in this region, and the same direction of lake expansion with the glacier recession, it could be demonstrated that the area increasing of Longbasaba Lake was the result of climate warming, glacier ablation and retreat.

Key Words: moraine-dammed lake; reservoir capacity; Sonar; Longbasaba Lake; Himalayas