Geophysical Research Abstracts
Vol. 18, EGU2016-14573, 2016
EGU General Assembly 2016

Towards an improved inventory of Glacial Lake Outburst Floods in the Himalayas

Georg Veh (1), Ariane Walz (1), Oliver Korup (1), and Sigrid Roessner (2)

(1) Institute of Earth and Environmental Sciences, University of Potsdam, Potsdam, Germany (georg.veh@uni-potsdam.de), (2) Department Geodesy and Remote Sensing, Helmholtz Centre Potsdam - GFZ German Research Centre for Geosciences, Potsdam, Germany

The retreat of glaciers in the Himalayas and the associated release of meltwater have prompted the formation and growth of thousands of glacial lakes in the last decades. More than 2,200 of these lakes have developed in unconsolidated moraine material. These lakes can drain in a single event, producing potentially destructive glacial lake outburst floods (GLOFs). Only 44 GLOFs in the Himalayas have been documented in more detail since the 1930s, and evidence for a change, let alone an increase, in the frequency of these flood events remains elusive. The rare occurrence of GLOFs is counterintuitive to our hypothesis that an increasing amount of glacial lakes has to be consistent with a rising amount of outburst floods.

Censoring bias affects the GLOF record, such that mostly larger floods with commensurate impact have been registered. Existing glacial lake inventories are also of limited help for the identification of GLOFs, as they were created in irregular time steps using different methodological approach and covering different regional extents.

We discuss the key requirements for generating a more continuous, close to yearly time series of glacial lake evolution for the Himalayan mountain range using remote sensing data. To this end, we use sudden changes in glacial lake areas as the key diagnostic of dam breaks and outburst floods, employing the full archive of cloud-free Landsat data (L5, L7 and L8) from 1988 to 2015. SRTM and ALOS World 3D topographic data further improve the automatic detection of glacial lakes in an alpine landscape that is often difficult to access otherwise. Our workflow comprises expert-based classification of water bodies using thresholds and masks from different spectral indices and band ratios.

A first evaluation of our mapping approach suggests that GLOFs reported during the study period could be tracked independently by a significant reduction of lake size between two subsequent Landsat scenes. This finding supports the feasibility of generating a continuous glacial lake database, and thus, of an updated GLOF inventory. We discuss several challenges to our classification method, including complete or partial freezing of lake surfaces, as well as effects of turbidity and mountain shadows. Our future work will use this new inventory to infer the key environmental parameters of GLOF events in the Himalayas and to estimate regional hazard potential from existing lakes.