Geophysical Research Abstracts
Vol. 15, EGU2013-13135, 2013
EGU General Assembly 2013

Glacier contribution to streamflow in the Nepal Himalaya from remote sensing and an ice ablation model

Adina Racoviteanu (1), Richard Armstrong (2), and Mark Williams (3)

(1) Laboratoire de Glaciologie et Géophysique de l'Environnement (LGGE), Saint Martin d'Heres, France (adina.racoviteanu@lgge.obs.ujf-grenoble.fr), (2) National Snow and Ice Data Center, University of Colorado, Boulder CO 80309 USA, (3) Institute of Arctic and Alpine Research, University of Colorado, Boulder CO 80309 USA

This paper focuses on the contribution of annual glacier ice melt to streamflow in two watersheds situated in the monsoon-influenced part of the Nepal Himalaya (Trishuli and Dudh Kosi basins). We used a simple elevation-dependent ice ablation model to estimate the annual contribution of glacier ice melt to streamflow. Glacier area and hypsometry were extracted from Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) and IKONOS remote sensing data combined with elevations from the Shuttle Radar Topography Mission (SRTM) data. Long-term hydro-meteorological measurements from ground stations were used to calculate average discharge values at various elevations and distances from the glacier outlets, which we compared to glacier melt estimates from the ice ablation model. We found that glacier ice melt was positively correlated with the basin glacierized area and contributed 48.2% to annual flow in the Langtang Khola watershed (43.5 % glacierized area) and 14.5% in the Hinku watershed (34.7% glacierized area). The contribution of glacier ice melt to measured discharge decreased substantially towards lowland locations in both study sites, i.e. 5.7 % of streamflow for Trishuli, 75 km from glacier termini, and 5.1% for Dudh Kosi, about 50 km from the glacier termini. Glacier ice melt from debris-covered tongues was a minor source, contributing 0.5 to 0.9% of the streamflow, respectively, at these two stations. We independently evaluated the ice ablation approach with synoptic sampling of stable water isotopes (δ18O and δD) collected during the post-monsoon season, which helped us quantify the contribution of various sources of water to river flow. Mixing models showed groundwater was an important component of river flow within only tens of kilometers of the glacier outlets in the post-monsoon season.