Estimation of temperature lapse rate based on remote sensing snow cover data

Fan Zhang (1), Hongbo Zhang (1), Ming Ye (2), Lide Tian (1), and Jingshi Liu (1)

(1) Chinese Academy of Sciences, Institute of Tibetan Plateau Research, Beijing, China (zhangfan@itpcas.ac.cn), (2) Department of Scientific Computing, Florida State University, Tallahassee, Florida, United States of America

In alpine regions, snow cover runoff simulation plays a key role in watershed water budget management. Temperature is one of the most important variables used to simulate the evolution of snow cover during snowmelt modeling. However, meteorological station networks rarely have enough spatial density for model application in high mountain catchments. In order to overcome the meteorological data shortage, this study develops a method to estimate daily temperature lapse rate (TLR) when multi-altitudinal temperature measurements are not available. TLR is calculated as the normalized temperature difference between the snow cover edge elevation at which temperature is assumed to be the critical snow fall temperature and a lower elevation at which a meteorological station locates. The daily snow cover edge elevation data were derived from MODIS data on board Terra and Aqua platforms. The method proves to be useful to mitigate the hydrological modeling difficulties regarding a high mountain catchment in south Tibet with data scarcity.