Geophysical Research Abstracts
Vol. 15, EGU2013-3107, 2013
EGU General Assembly 2013

Evaluation of a distributed energy balance model for a high-altitude glacier on the Tibetan Plateau using a time lapse camera system

Eva Huintjes (1), Tobias Sauter (1), Tobias Krenscher (2), Fabien Maussion (3), Jan Kropacek (2,4), Wei Yang (5), Guoshuai Zhang (5), Shichang Kang (5), Manfred Buchroithner (2), Dieter Scherer (3), and Christoph Schneider (1)

(1) Department of Geography, RWTH Aachen University, Germany, (2) Institute for Cartography, TU Dresden, Germany, (3) Department of Ecology, TU Berlin, Germany, (4) Department of Geosciences, University of Tuebingen, Germany, (5) Institute for Tibetan Plateau Research, Chinese Academy of Sciences, China

In the remote and high-altitude mountain areas of the Tibetan Plateau, climate observations as well as glacier-wide mass and energy balance determinations are scarce. Therefore, the application of models to determine reliable information on mass balance and runoff is important. Simultaneously, these circumstances make it difficult to evaluate the models.
Since 2009, we operate an automatic weather station (AWS) in the ablation zone of Zhadang Glacier (5.665 m a.s.l.). The glacier is easily accessible. It is situated in the southern-central part of the Tibetan Plateau (30.5°N) in the Nam Co drainage basin and ranges between 5.400 and 5.900 m a.s.l.
Based on these measurements over 2009-2012, we run and evaluate a physically based, distributed energy and mass balance model. The applied model couples an energy balance to a multilayer snow model and therefore accounts for subsurface processes like refreezing, subsurface melt and densification of the snowpack. First, the model is evaluated at point scale against measurements from the AWS. The results show that modelled accumulation and ablation patterns reproduce the observed changes in surface height very well. To evaluate the distributed model, we use daily images of a time lapse camera system installed nearby the glacier over 2010-2012. Therefore the non calibrated slope images had to be orthorectified using ground control points measured during field campaigns. The temporally and spatially highly resolved time series allows a detailed evaluation of the distributed energy balance model by analyzing the spatial and temporal heterogeneity of the snow line during the ablation season. First results show that the model captures the observed spatial heterogeneity of melt on the glacier surface.
Subsequently to the evaluation the model will be applied on several glaciers and small ice caps in remote areas on the Tibetan Plateau to determine the linkages between climate fluctuations and glacier variability.
The work is part of research projects funded by the DFG Priority Programme 1372: “Tibetan Plateau: Formation-Climate-Ecosystems” (TiP) and the BMBF research program “Central Asia and Tibet: Monsoon dynamics and geo-ecosystems” (CAME).