Geophysical Research Abstracts
Vol. 15, EGU2013-1890, 2013
EGU General Assembly 2013

Analyzing the importance of wind-blown snow accumulations on Mount

Alexander Nestler (1), Matthias Huss (1), Rouben Ambartsumian (2), Artak Hambarian (3), Sandra Mohr (1), and Flavio Santi (4)

(1) Department of Geosciences, University of Fribourg, Fribourg, Switzerland (matthias.huss@unifr.ch), (2) Institute of Mathematics, National Academy of Sciences, Yerevan, Republic of Armenia, (3) Engineering College, Engineering Research Center, American University of Armenia, Yerevan, Republic of Armenia, (4) Cage Holding SA, Geneva, Switzerland

Armenia's climate has a predominantly continental character with high amounts of precipitation and low temperatures during wintertime and a lack of precipitation together with high temperatures during summer. On the volcano Mount Aragatz, snow is relocated by strong winds into massive accumulations between 2500 and 4100 m a.s.l. during the winter season. These snow accumulations appear every winter in regular patterns as cornices on the lee side of sharp edges, such as those of ridges and canyons, which are arranged in a radial manner around the central crater. The biggest cornices almost outlast the hot period and provide considerable amounts of melt water until they disappear completely by the end of August. Snow melt water is known to have a high economic importance for agriculture on the slopes of Mount Aragatz and in the surroundings of Armenia's captial Yerewan. The aim of this study is to estimate the quantity of water naturally stored as snow on Mount Aragatz, and to what degree the use of geotextiles can prolong the lives of these snow accumulations.

The characteristics and the spatial distribution of snow cornices on Mount Aragatz were determined using classical glaciological methods in June/July 2011 and 2012, involving snow depth soundings, water equivalent measurements and snow melt monitoring using ablation stakes, together with GPS mappings and classifications obtained from satellite images of the snow cornices. The combination of these data with ASTER DEMs and local weather data allows the modelling of the formation of wind-driven snow accumulations. Statistical relationships between the measured extent and volume of the snow cornices and surface parameters such as slope, aspect and curvature are established. In order to analyze the meltdown of the snow accumulations and the consequent impacts on runoff generation and the hydrological regime, a glacio-hydrological model integrating topographic parameters and meteorological data is applied. The combination of in-situ field data and satellite information allows an estimation of the water volume that is stored in the form of snow on Mount Aragatz. Using numerical modelling, we extend these results to other years, and calculate past and future water yields from snow melt from Mount Aragatz.

This study is performed in the frame of the Armenian-Swiss project "Freezwater" that aims at an artificial managing of snow melting to better time the release of melt water at low cost. In the past few years, an artificial glacier was built up successfully, and geotextiles were used to reduce the melt rates of snow cornices. In order to estimate the efficiency of geotextiles in delaying the melt-down, ablation rates of protected snow surfaces were compared to those of uncovered areas. This study will contribute to the understanding of aeolian processes within the cryosphere as well as it will help to gain engineering knowledge concerning a new and efficient water storage technique.