Geophysical Research Abstracts
Vol. 19, EGU2017-7543, 2017
EGU General Assembly 2017

Glacier Mass Balance in the Cordillera Vilcanota, Glacier Suyuparina, Cusco - Peru

Felipe Sikos (1), Claudia Giráldez (2), Simone Schauwecker (2,3), Edwin Molina (1), Wilfried Haeberli (2), Fabian Drenkhan (2,4), Nadine Salzmann (2,5), Maxwell Rado (1), Nicacio Chaparro (1), Jaime Samata (1), Andrés Flores (4), Carlos Saito (4), and Nilton Montoya (6)

(1) National University of San Antonio Abad of Cusco, Department of Geography, Cusco, Peru , (2) University of Zurich, Department of Geography, Zurich, Switzerland , (3) Meteodat GmbH, Zurich, Switzerland, (4) Pontifical Catholic University of Peru, Lima, Peru, (5) University of Fribourg, Department of Geosciences, Fribourg, Switzerland, (6) National University of San Antonio Abad of Cusco, Department of Agriculture, Cusco, Peru

The Cordillera Vilcanota is the second most glaciated mountain range in Peru, and concentrates approximately 279 km^2 of ice extent which corresponds to 25% of Peruvian glaciers. These glaciers have shrunk about 33% within the last 40 years and are a direct indicator of climate change impacts. Hydroclimatic changes in this region pose hazards and consecutive risks for local and regional livelihoods, socioeconomic activities and water supply. Therefore, it is important to understand high-mountain climatic and hydroglacial parameters and dynamics.

In 2010/11, the first mass balance measurements were made on the Suyuparina glacier and the adjacent Quisoquipina glacier. In 2013, we have continued measurements through the present, of which we present some of the results for Suyuparina glacier. The net point mass balance for the hydrological year 2013-2014 in the lower zone is highly variable with values between +0.2 m w.e. (accumulation) and up to -6 m w.e. (ablation).; whereas for the hydrological year 2014-2015 values range from +0.004 m w.e. (accumulation) to -0.047 m w.e. (ablation) depending on the particular microtopography (e.g. ice cliffs) of the glacier. In the accumulation zone, the average for two stakes was +1.4 m w.e. for the hydrological year 2012-2013 and 1.3 m w.e.,in 2013-2014, +1.2 m w.e. for 2014-2015; and +0.7 m w.e in 2015-2016, respectively. The water equivalent gain has been gradually reduced in the last estimate, depending exclusively on the rainfall regime. The velocity of the glacial flow from October 2013 to November 2014 is in the range of 10 to 20 m per year. The glacier retreat in the front corresponds to 48.49 m for the period 2010-2014. Total glacier area of Suyuparina has decreased by 7% from about 1.21 km^2 in 2009 to 1.13 km^2 in 2013. A seasonal pattern can be observed in the point mass balance, indicating less ablation in the wet season (December-May), continuous ablation in the dry period, and a high horizontal ablation due to its microtopography. Furthermore, a large dispersion of ablation at cliffs as a function of elevation persists due to the important influence of the irregular surface of the glacier. To estimate total annual mass balance with the direct glaciological method, the irregular topographic pattern must be considered for the whole glacier area by comparison with the geodetic method. In response to this need, a drone flight over the Suyuparina glacier was perfomed in 2016 in order to obtain a high-resolution DEM at 8cm/pixel. To complement this, terrestrial LiDAR measurements have been taken since 2015. This will allow to provide a mass balance for the whole Suyuparina glacier using the geodetic method. Future research should include estimations of the total mass balance in this type of glaciers to better understand the interactions between topography, climate and glaciers in a region of high importance for multi-sectorial water supply.