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Air temperature, radiation budget and area changes of Quisoquipina glacier in the Cordillera Vilcanota (Peru)

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The Peruvian Andes host about 71% of all tropical glaciers. Although several studies have focused on glaciers of the largest glaciered mountain range (Cordillera Blanca), other regions have received little attention to date. In 2011, a new program has been initiated with the aim of monitoring glaciers in the centre and south of Peru. The monitoring program is managed by the Servicio Nacional de Meteorología e Hidrología del Perú (SENAMHI) and it is a joint project together with the Universidad San Antonio Abad de Cusco (UNSAAC) and the Autoridad Nacional del Agua (ANA). In Southern Peru, the Quisoquipina glacier has been selected due to its representativeness for glaciers in the Cordillera Vilcanota considering area, length and orientation. The Cordillera Vilcanota is the second largest mountain range in Peru with a glaciated area of approximately 279 km2 in 2009. Melt water from glaciers in this region is partly used for hydropower in the dry season and for animal breeding during the entire year. Using Landsat 5 images, we could estimate that the area of Quisoquipina glacier has decreased by approximately 11% from 3.66 km2 in 1990 to 3.26 km2 in 2010. This strong decrease is comparable to observations of other tropical glaciers.

In 2011, a meteorological station has been installed on the glacier at 5180 m asl., measuring air temperature, wind speed, relative humidity, net short and longwave radiation and atmospheric pressure. Here, we present a first analysis of air temperature and the radiation budget at the Quisoquipina glacier for the first three years of measurements. Additionally, we compare the results from Quisoquipina glacier to results obtained by the Institut de recherche pour le développement (IRD) for Zongo glacier (Bolivia) and Antizana glacier (Ecuador). For both, Quisoquipina and Zongo glacier, net shortwave radiation may be the most important energy source, thus indicating the important role of albedo in the energy balance of the glacier surface. This indicates the importance of understanding the role of snow cover in ablation processes of tropical glaciers.