



## **Multi-temporal snow cover analysis with MODIS data in the Cordillera Barroso, Peru**

Hairo León (1,2), Edwin Loarte (1), Katy Medina (1), Luzmila Dávila (1), Antoine Rabatel (3), Randy Muñoz (4), Philipp Rastner (4), and Holger Frey (4)

(1) Instituto Nacional de Investigación en Glaciares y Ecosistemas de Montaña – INAIGEM, Peru (hleon@inaigem.gob.pe), (2) Facultad de Ciencias del Ambiente-FCAM, Universidad Santiago Antunez de Mayolo – UNASAM, Huaraz, Peru, (3) Université Grenoble Alpes, CNRS, IRD, Grenoble, France, (4) Department of Geography, University of Zurich, Zurich, Switzerland

The Cordillera Barroso in Southern Peru ( $17^{\circ}50'S$   $70^{\circ}45'W$ , 1750 – 5500 m a.s.l.), lost its glacier coverage completely in recent years. However, solid precipitation and related snow cover still play an important role in the hydrological cycle and the water supply for the three Peruvian Regions Moquegua, Puno and Tacna located in this zone. Therefore, the aim of the research was to assess the snow cover duration and its seasonal variability for the years 2015 to 2017.

Snow cover in this mountain range was analyzed using Level 3 products (MOD10A2 – Snow Cover Extent) obtained by the MODIS sensor onboard the Terra satellite. This data has been processed with GIS and remote sensing tools and software. Obtained results were then compared to climatic data from Peru's Meteorological and Hydrological Service (SENAMHI). Later, statistical correlation and tendency tests were applied in order to analyze the distribution and persistence of the snow cover.

Results indicate that the persistence of the snow cover in the Cordillera Barroso is about 80% over the three years of analysis. Snow accumulation is higher between January and March (austral summer) and lower between June and August (austral winter). During the dry period (May – August), snow cover is smaller and the persistence of the snow cover reaches 80%. During the wet season (September – April) the snow cover is larger with a persistence of 82%.

Interannual variation is not significant, but in 2016 a slight reduction of the snow cover persistence was registered due to the effects of the El Niño event. Strongest accumulation appeared between 4250 and 4750 m a.s.l., with a higher persistence (>80%) above 4750 m a.s.l. When applying the Mann-Kendall test for the snow cover dynamics assessment, no tendency was detected. This indicates that snow cover does not behave in a linear manner, increasing and decreasing as a function of time, but rather depends on atmospheric conditions, as pointed out by the linear Pearson correlation tests between the dependent variable (snow cover) and the independent variable (climatic data).