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Studying Himalayan Glaciers to understand atmospheric dynamics and ongoing cryosphere variations. Data and findings from the Changri Nup Glacier (Nepal, Himalaya)

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Continuous measurements of meteorological data and surface energy fluxes at Chagri Nup Glacier (Nepal Himalayas) have been carried out since February 2010, further to the installation of a supraglacial Automatic Weather Station at 5,700 m asl on the debris free surface of the glacier. Collected data allow to assess three-years of glacier energy balance and high resolution analysis of glacier albedo. We calculated ice and snow melt from AWS energy and meteorological data. Our findings have been validated against data from an ablation stake network located nearby the AWS.

Moreover, the impact of atmospheric absorbing aerosol (e.g. black carbon) deposition on snow albedo variability has been analysed. In fact, in this study, the energy data (from the AWS) were coupled with BC concentration (in snow) values, estimated from the BC atmospheric concentration (continuously measured at the Nepal Climate Observatory at Pyramid Station, 5050? m asl) thus making possible to investigate the relations between BC deposition in snow and percentage of albedo reduction at Changri Nup Glacier. Water fluxes from the ablation zone of the glacier were measured by way of a hydrometric station installed in summer 2012 at the glacier debris free snout (5,300 m asl), and are used to preliminary assess hydrological budget of the glacier. Our results could improve glacier melt modelling also considering BC impacts on snow albedo variability and then on snow melt rates. The next project step is to consider BC impacts on ice albedo variability and with this specific aim an experimental protocol to measure ice albedo and to measure and describe fine sparse debris and soot has been developed and is currently under test at the Changri Glacier surface.