



Establishing an empirical relationship between bare soil albedo and surface soil moisture on the moraine of the Zongo glacier (Bolivia) from in-situ measurements

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The Zongo glacier is located about 25 km north of La Paz (Bolivia) in the Cordillera Real. The non-glacierized areas represent one third of the catchment and are mainly covered by moraine deposits without vegetation. The objective of the study is to establish the relationship between bare soil albedo and soil moisture on the moraine. Surface albedo is measured since 2004 every 30 minutes in a meteorological station installed 5050 m above sea level on the lateral moraine. A soil moisture sensor (Delta-T's Thetaprobe) has been set up in November 2007 before the beginning of the rainy season to monitor in situ water content in the top five centimetres. The preliminary analysis of the first 20-days record, after correction of zenithal effects, shows as expected that albedo decreases with soil moisture. It decreases from 0.27 at the beginning of record, when the soil is dry, to 0.17 when it is wet. This 35% reduction is achieved within one day, simultaneously with a recorded increase of soil moisture due to precipitation. Excluding direct snow effect, the albedo time series of 2004-2005 shows a similar trend i.e. albedo measured during wet season is approximately 0.1 lower than albedo measured during dry season, which can modulate the net short-wave radiation by more than 10%. Based on the recorded variations, we propose a parameterization of bare soil albedo as a function of surface soil moisture, with the expected purpose of improving the hydrometeorological modelling of the Zongo catchment since the control of albedo variations on the surface energy balance is likely to influence the water

balance.