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Snow-cover dynamics monitored by automatic digital photography at the rooting zone of an active rock glacier in the Hinteres Lantal Cirque, Austria

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Knowledge regarding snow-cover dynamics and climatic conditions in the rooting zone of active rock glaciers is still limited. The number of meteorological stations on the surface of or close to active rock glaciers is increasing. However, areal information on snow-cover distribution and its spatial dynamics caused by different processes on rock glaciers surfaces with a high temporal resolution from such remote alpine areas are mostly difficult to obtain. To face this problem an automatic remote digital camera (RDC) system was proprietary developed. The core parts of the RDC system are a standard hand-held digital camera, a remote control, a water proof casing with a transparent opening, a 12V/25Ah battery and solar panels with a charge controller. Three such devices were constructed and installed at different sites in the Central Alps of Austria. One RDC system is used to monitor the rooting zone of the highly active rock glacier in the Hinteres Langtal Cirque (46°59'N, 12°47'E), Central Schober Mountains, Austria. The 0.15 km^2 large NW-facing rock glaciers is tongue-shaped with a fast moving lower part (>1m/a) and a substantially slower upper part, ranging in elevation between 2455-2700 m a.s.l. The RDC system was set up in September 2006 and is located since than at 2770 m a.s.l. on a pronounced ridge crest that confines the Hinteres Langtal Cirque to the SW. The water proof casing was attached to a 1.5 m high metal pole which itself was fixed to the bedrock by screws and concrete glue. The viewing direction of the camera is NE. Hence, the image section of the RDC focuses on the rooting zone of the rock glacier and its headwalls up to c. 3000 m a.s.l. Photographs were taken daily at 3 pm providing the optimal lighting conditions in the relevant part of the cirque. 720 photographs were taken continuously in the period 12.09.2006 to 31.08.2008. These optical data were analysed by applying GIS and remote sensing techniques regarding snow-cover distribution, redistribution and duration in the foreground (i.e. ridge crest with cornice during winter) as well as in the background of the image section (i.e. the rooting zone of the rock glacier and headwalls). Snow was present on 75% of the photographs (used for further analysis) whereas on 25% of the photographs snow was absent also indicating the absence of perennial snow patches in the rooting zone. The results of the snow-cover analysis were combined with (a) climatic data – air temperature, air humidity, wind speed, wind direction and global radiation – from our meteorological station next to the rock glacier as well as with (b) ground surface and near ground surface temperature data recorded by miniature temperature dataloggers (MTD) at several sites in the cirque within and near the RDC image section. Results of detected relationships between different snow-cover and climatic parameters will be presented.