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Snow cover and ground surface temperature on a talus slope affected by mass movements. Veleta cirque, Sierra Nevada, Spain

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This paper analyses the thermal ground behaviour on an alpine talus slope located at the foot of the north wall of the glacial cirque on the Pico del Veleta (3398 m, 37º03'21"N, 3º21'57"W, MAAT: -0,4ºC) in Sierra Nevada, SE Spain. There are frequent mass movements on this talus slope, particularly in its central section, caused by the abundant presence of fine-grained sediment and by the water from snowmelt and/or ice degradation in the ground or permafrost (Gómez et al., 2003).

To determine the snowmelt pattern and ocurrence of permafrost, a continuous ground surface temperature was kept by installing 6 mini-loggers (HOBO Pendant) along the descending profile of the central talus, which is 170 m long with altitudes ranging from 3180 m at the higher end to 3085 m at the lower end. A thermal borehole was also installed at a depth of 2 m at the base of the slope on an active rock glacier.

The results obtained for the period October 2008 – September 2009 show that, in contrast to alpine talus slopes (Luetschg et. al., 2004; Lambiel and Pieracci, 2008), the upper part of the slope is characterized by mean annual ground surface temperatures (MAGST) lower than at the base of the talus, possibly due to the effect of the shadow of the cirque wall. The MAGST oscillate between 0.592ºC at the station near the slope apex (S2) and 1.836ºC at the station near the base (S5). In winter-spring, when the talus slope is covered with snow, the GST are stabilized at all stations between mid-October and early November. The minimum GST, which express the BTS conditions, oscillate between 0.232 and 0.01ºC, depending on the month, with lowest values recorded during the month of April. Only one station (S3, mid-slope) recorded negative values (max. value : – 0.549ºC in December and – 0.211 in April). In summer, the snow disappears fairly quickly between mid- and late July on the intermediate stretch of the talus slope (S3, S4, S6), where the majority of the flows detected occur. In the mid-upper part (S5, S2) the thaw occurs in mid-August.

The GST data provide evidence of the current absence of permafrost along the talus slope profile, although some years ago it was detected using BTS methods (Gómez et al., 2003.

Gómez-Ortiz, A., Palacios, D., Luengo, E., Tanarro, L. M.; Schulte, L. and Ramos, M., 2003. Talus instability in a recent deglaciation area and its relationship to buried ice and snow cover evolution (Picacho del Veleta, Sierra Nevada, Spain). Geografisca Annaler 85 A (2), 165-182.
Lambiel, C. and Pieracci, K. 2008. Permafrost distribution in talus slopes located within the alpine periglacial belt, Swiss Alps. Permafrost and Periglac. Process. 19: 293–304
Luetschg, M.; Stoeckli, M.; Lehning, M.; Haeberli, W., and Ammann, W. 2004. Temperatures in two boreholes at Flüela Pass, Eastern Swiss Alps: the effect of snow redistribution on permafrost distribution patterns in high mountain areas. Permafrost and Periglac. Process. 15: 283–297.

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