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Detection of movements in the basal layer of the seasonal snow cover by means of inclination data loggers, Cuiña Cirque, Sierra de Ancares (Northwestern Spain).

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Seasonal snow cover attains significant thickness and duration on the rock slopes of the Cuiña Cirque, Sierra de Ancares, Northwestern Spain (latitude 42º50' N; longitude 6º49' W; 1.860 m.a.s.l.). The basal displacement of the snow cover is responsible for an intense geomorphological activity comprising detachment of bedrock fragments, transport of clasts, abrasion of rock surfaces and formation of protalus ramparts. A field experience aimed at detecting movements in the basal layer of the snow cover was carried out during winter and spring of 2008. Two miniature data loggers with built-in inclination sensors were mounted inside protective steel boxes 80 x 80 x 55 mm in outer dimensions. The sensor measures inclination values in x-, y- and z-axis. Each of the logger axis is aligned with one of the three main sides of its protective box. Both boxes were placed on the surface of a 28º angle rock slope in early autumn 2007. When the snow cover builds up and starts to move downslope it pushes the boxes, modifying logger inclination values as these travel over the irregularities of the substrate. Variations in measured inclination values can be directly related to movement events. Three-dimensional inclination data were recorded with a frequency of 12 minutes from the beginning of January to the end of May 2008. The first box experienced four events of slow, continuous movement, up to 11 days long, interrupted by periods of stability. These events occurred in February and March, and they are considered to be the consequence of snow glide-type movement. The fourth event ended abruptly with a sharp shift of inclination values, followed by a long, final period of stability. This sudden shift is interpreted as the result of a full-depth avalanche. The second box experienced three events of slow, continuous movement, coincident in time with those experienced by the first box. The abrupt shift of inclination values due to a full-depth avalanche was also present. The proposed method makes possible to detect movement events in the basal layer of the snow cover and it also permits to distinguish between slow (glide-type) and rapid (avalanche-type) movements.

Key words: seasonal snow cover, inclination data logger, snow glide, full-depth avalanche, Cuiña Cirque, Sierra de Ancares.

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