



## **Monitoring of soil and air-rock temperatures in the Western Massif of the Picos de Europa (Spain)**

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In this paper we study the ground thermal regime and air-rock interface in the Western Massif of the Picos de Europa (Cantabrian Range, Spain). This calcareous massif is highly affected by karstification processes. Quaternary glaciers, fluvio-torrential processes and present-day periglacial processes also contribute to explain the landforms present in this massif.

Up to 9 dataloggers were installed during 6 years in different sites in terms of altitude, orientation, slope and geomorphological setting recording temperatures every two hours. The number of freeze-thaw cycles in the soil (between 0 and 16) was controlled by the depth of the snow cover. The temperatures in the interface rock-air showed between 30-60 cycles, reaching 119 and 130 during the year 2007-2008. Extreme minimum temperatures in the soil oscillate between 0.3 and -6.3, while in the rocky walls the loggers recorded temperatures between -7.3 and -14.3°C.

Monitoring of soil temperatures around the ice patch – the only one in the massif today – resulted in slightly negative mean annual temperatures. These conditions may reveal the existence of sporadic permafrost on debris that cover the ice patch. Both the buried ice and the permafrost are in disequilibrium with the current environmental conditions of the massif.