



## **Geomorphological evidence for snow-push activity at a seasonal, late-lying snowpatch site, Añares Sierra, northwestern Spain.**

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The push effect associated with the movement of a snow cover has been identified as a major process in the origin of subnival geoforms, including small pronival ramparts. In this contribution we present the results of a geomorphological survey carried out in the central sector of the backwall of the Cuiña Cirque, Añares Sierra, northwestern Spain (lat. 42°50'N, long. 6°49'W; 1.860 m.a.s.l.), focussed on the identification and description of nival geoforms whose origin is attributed to snow-push mechanisms. The site is characterized by the occurrence of a thick, seasonal, late-lying snow cover, affected by slow movements mainly due to snowslide and short-range full-depth avalanches. A wide array of micro- and meso-forms have been identified on rock slopes comprising plucked steps, detached blocks, polished surfaces, abrasion tracks, striae, grooves, crescentic marks and asymmetric rock bumps. Distinctive features have also been identified on deformable sediment substrate including ploughing blocks embedded in the substrate with characteristic upslope furrows and downslope mounds; fines-rich diamict ridges showing worn-edged clasts with scratched and striated surfaces; nearly flat bulldozed surfaces; embedded blocks occurring in the proximal slopes of diamicton ridges and bulldozed surfaces; and strongly compacted fines-rich diamicton, pressed against rock outcrops. Taken as a whole the field observations suggest that snow-push is a particularly effective geomorphic process in the subnival environment.

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Key words: seasonal snow cover, snow-push, snowslide, subnival environment, Añares Sierra.