



## **Solving the puzzle of an isolated high-Alpine drumlin: Hornkees, Austria**

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Larger streamlined landforms, in particular drumlins, are frequently found in lowland environments where they attest to fast ice flow; they are comparatively rare in upland environments where smaller streamlined landforms (i.e. flutes) and erosional landforms (e.g. ice-moulded bedrock) are found much more prominent.

We here report geomorphological and sedimentological field observations from a small drumlin formed during the last c. 200 years in the foreland of Hornkees, a small valley glacier in the Eastern Alps. This drumlin is located in the middle of the valley floor, upvalley of a bedrock obstacle, and consists of overridden and glaciotectionised outwash overlain by subglacial traction till of varying consistency. Using lithofacies analysis, clast fabric and clast shape data as well as structural measurements (e.g. of shear planes and fold axes) and in-situ soil penetrometer measurements we demonstrate that this drumlin is likely to represent one of the rare cases in upland environments where the primary mechanisms of fast flow and subglacial sediment deformation have been preserved and can thus be studied in detail. We present our dataset with the aim of generating discussion of these mechanisms and outline the significance of such rare cases as modern analogues not just for palaeo-studies, but also for our understanding of material properties from an engineering-geological standpoint.