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Cluster of structurally controlled DSGSDs above Kåfjorden, Northern Norway

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The slopes on the north-eastern site of Kåfjorden in Troms, Northern Norway, show an extraordinary concentration of slope deformation processes. In total 10 very large DSGSDs are aligned one after the other within a distance of only 30 km, and just intersected by tributary valleys. The majority of those DSGSDs are lying directly above the fjord. Failures are thus not only a thread for the local population but could affect a much larger area due to the generation of a displacement wave. All DSGSDs show a very high degree of internal deformation, fracturing and disintegration. Additionally, the slopes show a complexity of overlapping slope processes, including periglacial (rock glaciers) and paraglacial landforms (rock slope failures on decaying ice), as well as postglacial rock avalanche deposits. All have similar morphologies and are difficult to separate. We dated 5 of the lobate deposits and obtained ages that cluster in the first two millennia after deglaciation at Kåfjorden between 11 and 9 kyr ago. This makes it difficult to evaluate the hazard that is posed by the DSGSDs as no failure deposit reached the fjord and no younger deposit than 9 ka was found.

The development of the DSGSDs is strongly conditioned by pre-existing brittle and ductile Caledonian bedrock fabrics inherited from Paleozoic deformation events. Field mapping shows that most main back scarps are developed along inherited foliation and foliation parallel brittle faults. All back scarps show a similar orientation along the entire valley even if the foliation is folded and shows large attitude of variation in this region.

Satellite based InSAR data show a strong concentration of activity in the studied area on the north-eastern site of Kåfjorden, covering large areas of all DSGSDs. However, due to the high degree of disintegration in addition to widespread slope deposits it is in many cases difficult to obtain actual bedrock deformation rates. Observed displacements in InSAR data are influenced by superficial slope processes that overprint bedrock deformation at depth. Our differential GPS measurement time series on 3 DSGSDs demonstrate rather that only some parts of the DSGSDs are actively deforming.