



Magnitude, frequencies and timing of submarine landslides on high-latitude continental margins

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High-latitude continental margins contain a climatically controlled heterogeneous sediment archive that is driven by glacial advances and retreats to and from the shelf edge. The fundamental control of this heterogeneity on continental slope stability is exemplified along the Norwegian-Barents Sea-Svalbard (NBS) passive continental margin, where some of the largest known submarine landslides have been reported. To understand the factors driving this instability, published landslides and newly discovered events from seismo-acoustic mapping are catalogued within a GIS based on geometry, pre-conditioning, triggering and age estimates. Frequency-magnitude (F-M) distributions show similar abundances for small ($< 0.1 \text{ km}^3$) and medium landslides ($0.1 - 10 \text{ km}^3$) compared to landslide inventories from non-glaciated margins. However, large ($> 10 \text{ km}^3$) and extreme events ($> 1000 \text{ km}^3$) are far more common in high latitudes, which we relate to high sedimentation rates and overpressure build-up during peak glaciation. Along with fine sediment gliding planes, these pre-conditioning factors are highly consistent along the margin, while final triggering is believed to come from isostatic rebound-related seismicity. Taking tectonic differences along the NBS-margin into account, landslides off the Norwegian coast on one hand and off the Barents Sea margin on the other show similar recurrence rates. Remarkably, these rates are higher in the interglacial by a factor of 0.6 orders of magnitudes (compared to glacial times) for medium sized events (every 200 a) and up to 1.5 orders of magnitude for extreme events (every 2500 a). Together with the F-M distribution, this is an indicator that a) tectonic division of the NBS margin is not a major factor for landslide occurrence, b) continental margin instability is higher in interglacial stages and c) a potential climate control on landslide initiation becomes more important with increasing landslide volume.