Geophysical Research Abstracts, Vol. 7, 06387, 2005
SRef-ID: 1607-7962/gra/EGU05-A-06387

Multi-phase submarine Mega-slide Development on the Arctic Continental Margin North of Svalbard

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During the October 2004 R/V Jan Mayen EUROMARGINS survey North of Svalbard, we acquired a new geophysical data set, consisting of 4000 km2 high-resolution EM300 swath-bathymetry, as well as high-resolution seismic reflection profiles and gravity cores. The bathymetry data reveal the morphological variability and complexity of an enormous submarine landslide. This mega-slide is characterised by a multitude of several hundred metres high headwalls and backwalls. They are similar to the giant Storegga Slide headwalls on the mid-Norwegian margin but several times higher. The major headwalls have extreme steep slopes, up to 35 degrees, and cut through more than 1000-1400 m of sediment. The slide escarpments are heavily incised by canyons, further yielding sediments from the shelf or upper slope area towards the deep Arctic Ocean basins. Based on very characteristic morphological features, we infer that the slide was a multi-phase slope failure. The upper headwall cuts the shelf and upper slope region, in water depths of 200-500 m, and surrounds the entire slide scar area, forming a cauliflower-like depression. Within the slide scar area, more escarpments are present, but their characteristics vary from place to place. In the western part, a second headwall cuts away another 600 m of sediments, whereas in the eastern part, we observe several failure planes (glide planes), consisting of over 5 individual headwalls, separated by glide planes of sediment failures. Isolated sediment ridges are abundant within the slide area, on a hummocky background of smaller debris and slide blocks. The distal part of the slide displays enormous “outrunner” blocks up to several hundred metres in height. Seismic reflection profiles hardly reveal sedimentation within the slide area. Only part of the northern rim to within the upper part of the slide area is draped with some recent fan deposit, clearly indicating post-slide mass transfer. This sediment drape originates from sediment delivery to and subse-

quent transport from the major cross-shelf trough extending from the Hinlopen Strait. Outside the slide area, the shallower water areas surrounding the headwall show clear indications of iceberg dynamics, in the form of extensive crosscutting ploughmarks. These ploughmarks stop abruptly at the headwall. There is also no evidence of sediment deposition where iceberg ploughmarks cross the headwall. The lack of such evidence suggests a relatively recent timing of this slope failure, which is most likely post-LGM. The run-out distance of the multiphase Yermak megaslide is not easily assessed, due to the near-permanent ice cover in the distal part of the Eurasia Basin which was inaccessible during our cruise. Nevertheless, our new acoustic images the Arctic mega slide area to latitudes of nearly 81.6°N.