**Abstract Bellwald**

This PhD study focuses on the characterization, timing, preconditioning and triggering of submarine slides in high-relief fjord systems and in the open ocean. It increases our knowledge on areas vulnerable for large slope failures and their depositional environments in the past and future. Regional and global implications of processes active in fjords systems and the open ocean have been discussed, and comparisons with other intraplate settings and deglaciation histories have been done. To better evaluate and differentiate between trigger mechanisms and preconditioning factors, we have simulated pore pressure generation in 2D Finite Element Models, estimated earthquake magnitudes based on attenuation models and generated mass movement frequency plots using a statistical approach. This study includes analysis on high-resolution seismic TOPAS profiles, high-resolution 3D P-Cable seismic data, high-resolution bathymetric data and different types of sediment cores. In addition, previously published sediment cores and seismic profiles have been used.

The study areas include the North Sea Trough Mouth Fan (TMF), the south-western Barents Sea, and west- and mid-Norwegian fjords and lakes, with case studies in Hardangerfjorden. The sediment basins of Norwegian fjord systems, which have been carved out during repeated Pleistocene ice advances, are filled by several hundred meters of sediments. The basin infill can commonly be subdivided into two seismic units: a lower unit characterized by glacimarine sediments, and an upper unit dominated by mass transport deposits (MTDs).

The case study from Hardangerfjorden and the compilation of information from west and mid-Norwegian fjord systems indicate increased mass movement activity in the Early and Late Holocene. The mid-Holocene, on the other hand, appears to be a quiet time period regarding mass movements.

Earthquakes have been suggested as the most likely final trigger mechanism of submarine mass movements in all of the four papers. Several meter-sized MTDs, dated to the Younger Dryas deglaciation and Early Holocene, indicate highest seismic activity at 11300-8200 cal. yrs BP in Hardangerfjorden, with earthquake recurrence rates of 1/200 years. The mass movement frequency plots indicate at least 33 potential individual seismic events, giving earthquake recurrence rates of 1/200 years and 1/300 years for the Early and Late Holocene time periods, respectively.

Rock avalanche deposits, identified in both sub-bottom and bathymetric data in the inner part of Hardangerfjorden, correlate with large slide scars and comprise mobilized sediment volumes which, in previous studies, have been modeled to initiate large tsunamis. We further observe a correlation between colluvial processes and submarine mass movement processes, indicating that subaerial rock avalanches might act as a trigger for submarine mass movements.

Climate-related processes, such as increased sedimentation rates, are also evaluated as potential trigger mechanism for the observed mass movements in the studied fjords. However, increased sedimentation rates are not always correlating with enhanced mass movement activity. Thus, it is concluded that sediment supply alone cannot explain slope failure, but may have acted as a preconditioning factor.

Sedimentation rates used for the numerical modeling of pore pressures and slope stability of the North Sea TMF during marine isotope stage (MIS) 6 are of similar order as the sedimentation rates calculated for deglacial periods in fjords. The numerical model consists of units characterized by glacigenic debris flows (GDFs) and an inferred (glaci)marine layer at the base of the GDFs, which seems to have the inherited potential to act as a weak layer. Slope stability has been modeled for different ice sheet configurations and sedimentation patterns. However, it seems that temporally-variable rapid sediment loading of the North Sea TMF does not generate sufficient excess pore pressure to cause the Tampen Slide failure at the end of MIS 6. Performing attenuation modeling, we suggest an earthquake of magnitude M = 6.9 or larger to have triggered this slide.