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SlamZ: Slide activity on the Hikurangi margin, New Zealand – First results of the RV Sonne expedition $SO_2$47

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Submarine landslides are important geologic hazards. Although they have been the focus of research for decades, there is still a clear lack in knowledge with respect to the interplay between tectonic movements, slope architecture and sediment physical properties of slope strata, as well as gas hydrate dissociation as controlling factors of slope stability or respectively slope failure processes.

The main scientific goal of the Sonne expedition $SO_2$47 undertaken in spring 2016 was to gain a better understanding of the factors controlling slope destabilization, especially the interaction of tectonic steepening and gas hydrate transformation, at different tectonic settings along the Hikurangi subduction zone east of New Zealand's North Island. This active continental margin is characterized by various potential triggers for slope failure, e.g. (I) a wide range of tectonic movements which are associated with high seismicity, numerous active faults, sediment uplift and slope over-steepening, and (II) large gas hydrate deposits whose current upper stability limit in some places correlates with the breakoff points of slides. The target areas of $SO_2$47 were the frontal accretionary ridge at Rock Garden and the Tuaheni landslide complex (TLC) further north offshore Gisborne.
Bathymetric as well as high-resolution seismic reflection and Parasound data were used to select suitable position for 53 gravity cores with a total length of ∼150 m which were recovered along systematic transects from the undisturbed slope sections to the slid masses in both working areas. In addition, six long sediment cores (three in both working areas) with a total length of approx. 470 m were drilled utilizing the MARUM Bremen drill rig MeBo200. These include a 105 m long continuous sediment core (core recovery > 95%) from an undisturbed slope section in the vicinity of the Tuaheni slide complex. This core represented the first long (i.e. longer than 50 m) sediment record from the Hikurangi margin. This drilling operation was paired with dense in-situ heat-flow measurements.
Sedimentological, geotechnical, geophysical and geochemical analysis of the core material as well as sampled pore fluids and gases will enable a deeper insight into the slide kinematics, potential trigger mechanisms and timing of failure events. Furthermore, these data allow us to test hypotheses regarding the key role of sediment physical properties and/or gas hydrate dissociation and therewith the mechanics of submarine landslides; what are potential trigger mechanisms: uplift and over-steepening vs. sediment physical behaviour.