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Preliminary results from pre-site surveys for deep geological drilling below Ekström Ice Shelf (Sub-EIS-Obs)

Gerhard Kuhn (1), Boris Biskaborn (1), Olaf Eisen (1), Christoph Gaedicke (2), Tore Hattermann (1), Hartmut Hellmer (1), Nikola Koglin (2), Johann P. Klages (1), Emma Smith (1), Jan Tell (1), Ralf Tiedemann (1), Frank Wilhelms (1), Xiaopeng Fan (3), and Pavel G. Talalay (3)

(1) Alfred Wegener Institute, AWI, Marine Geology, Bremerhaven, Germany (gerhard.kuhn@awi.de), (2) Bundesanstalt für Geowissenschaften und Rohstoffe, BGR, Polarforschung, Hannover, Germany, (3) Polar Research Center, Jilin University, Changchun City, Jilin Province, China

During field seasons 2016/17 and 2017/18, pre-site seismic surveys were undertaken in the Ekströmis region of Dronning Maud Land, with the primary goal of building a stratigraphic age framework of sub-ice-shelf sedimentary strata. These sediments cover the Explora Wedge, a syn- or post-rift volcanic deposit. Expected ages range from Late Mesozoic to Quaternary. From new vibroseismic profiles, we selected sites for seafloor sampling with short cores through Hot Water Drill (HWD) holes of the oldest and of the youngest sedimentary sequences to confine their age time span. There is further potential for drilling deeper sediment cores with the support of international partners. Deep drilling should recover the sediments overlying the Explora Escarpment, in order to discover the context and nature of the Explora Wedge. We expect the overlying sedimentary sequences to reveal the history of polar amplification and climate changes in this part of Antarctica, the build-up of the East Antarctic Ice Sheet during past warmer climates and its Cenozoic and future variability.

We successfully sampled the sea floor with different tools through HWD holes at two sites selected from the reflection seismic data close to the German Neumayer Station III, and discovered a pebbly sea floor coated with bryozoan skeletons.

Present HWD holes penetrating the ice shelf to sample the sea floor will provide the unique opportunity for further piggy back experiments consisting of multi-disciplinary nature. For example, experiments and deploying measuring setup for oceanography, sea and ice shelf physics, geophysics, geology, hydrography, biogeochemistry could be potential future actions in order to characterise the ocean-ice-sediment interactions, processes and ecosystem observations. For season 2018/19 – besides additional geological sampling – it is planned to deploy a multiyear oceanographic mooring beneath the ice shelf. During future campaigns, we will try to launch an Autonomous Underwater Vehicle (AUV) either through a HWD hole, from a ship, or from the fast ice with the necessary power to operate and measure within the sub-ice shelf cavity.