

Sedimentary and geochemical conditions in the “Helgoland Mud Area” (SE North Sea) during the past 1000 years

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Helgoland is a small rocky island in the German Bight with an exposed rocky shore. The working area, SE of Helgoland, is a halotectonic depression filled with muddy sediment. Earlier studies suggest that this depression became rapidly filled with muddy sediments likely originating from the Elbe river that changed its bed eastwards in the course of the rising sealevel during the Late Holocene. Today, the water depth is between 20 and 30 m. A RoxAnn acoustic ground discrimination unit and shallow seismics together with seafloor sampling were applied to analyze the recent sedimentary conditions. Five sediment cores spanning the past millennium were investigated to reconstruct the sedimentary conditions through time. In addition one core was geochemically investigated using an XRF scanning device.

Today, the area is about 500 km² large characterized mostly by muddy, fine-skewed sediment. Its soft and smooth surface forms a clear contrast to the surrounding sandy areas that reveal typically rippled surfaces. The grain-size records show medium silt during the later part of the Medieval Warm Period (MWP, until the 14th century AD), followed by coarse silt during the Little Ice Age (LIA, until c. 1900 AD) and again finer sediments during the 20th century AD. The changes in grain size likely mirror calmer weather conditions during the MWP and the increased frequency and strength of severe storms during the LIA. This includes a calmer period during the Maunder Sun-Spot Minimum (around AD 1700) that was most likely supported by an increased number of negative NAO situations.

Among the elements investigated in Core HE215/4-2 the contents of the heavy metals Pb and Zn show two- and threefold increases starting already between 1600 and 1700 AD. Mining and extended metal production in the Oberharz Mountains in northern Germany became a blooming industry during the 17th century AD. It can be speculated that signals of this early industrialization were also transported into the North Sea via the Elbe and Weser rivers.