



Storegga and beyond – North Sea tsunami deposits offshore Shetland Islands (NORSEAT)

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Evidence of past tsunamis is relatively rare in the regions around the North Sea basin. This may reflect a real low recurrence rate of tsunami events in an area far away from active continental margins. It may also be an observational bias, caused by limited accommodation space onshore or by poor preservation of event deposits due to erosion or anthropogenic reworking, which results in an underestimation of the tsunami hazard of the entire basin. However, on the Shetland Islands, there are good stratigraphic evidence for three Holocene events at 8200 yrs BP, 5500 yrs BP and 1550 yrs BP. In contrast to these observed onshore tsunami deposits, offshore tsunami deposits have received little attention, although they are much more likely to be preserved in the sedimentary record and to contain pristine tsunami depositional signatures, especially those deposited in sufficiently marine environments, well below the storm wave base. To identify such offshore sedimentary tsunami archives is of vital importance to improve our understanding of the tsunami record and potential geohazard around the North Sea region.

We present the first results from a research cruise with RV Belgica to the Shetland Islands, conducted in the framework of the Storegga and beyond – North Sea tsunami deposits offshore Shetland Islands (NORSEAT) project. The aim of this project is to couple onshore and offshore tsunami deposits in the Shetland Islands and to provide a robust chronological framework by reconstructing, for the first time, a Holocene relative sea-level (RSL) curve for the area. To achieve this, the project will:

- Trace the tsunami deposits that are well documented onshore in the Shetland Islands towards the offshore realm, study their extent and characteristics in detail, and verify whether the offshore record possibly holds evidence of more events, providing new insights into recurrence intervals;

- To couple onshore and offshore archives to produce full reconstruction of major tsunami event dynamics, contributing to an improved coastal hazard assessment in the wider region;
- To reconstruct a RSL curve for the Holocene, which is poorly constrained thus far for the Shetland Islands, allowing a more accurate assessment of run-up heights for the identified palaeo-tsunamis.

During the first RV Belgica research cruise, which took place in December 2022, new geophysical data (multibeam bathymetry and backscatter, sub-bottom profiler) were collected from selected areas around the Shetlands Islands. Preliminary interpretation of the sub-bottom data shows a predominantly parallel-stratified seismic facies, indicating an open marine sedimentary environment, but with occasional local wavy boundaries between parallel-stratified and obliquely-stratified units. These promising different facies and stratigraphic relations will be investigated further with an additional coring and sampling campaign in September 2023.

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