

New RV Belgica

Specific call for research proposals 2021



NORSEAT

Storegga and beyond – North Sea tsunami deposits offshore Shetland Islands

DURATION

15/12/2021 - 15/03/2026

BUDGET

€ 631 228

PROJECT DESCRIPTION

Tsunamis are relatively rare in the North Sea basin. The best-known example is the Storegga tsunami, which was caused by a large underwater landslide on the Norwegian continental slope ca. 8200 years ago and left a sedimentary imprint of major inundation at a range of onshore locations across the North Atlantic and the North Sea. Some of the coastal areas of the Shetland Islands also contain deposits of tsunamis that took place at ca. 5500 yr BP and ca. 1500 yr BP. This relatively limited evidence of past tsunamis might reflect a real low recurrence rate of tsunami events in the region. It may also be a bias, due to the nature of the North Sea basin and its coastlines, characterized either by limited accommodation space 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. In contrast to onshore tsunami deposits, offshore tsunami deposits have received significantly less 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 deep marine environments, well below the wave base of severe storms. Such offshore sedimentary tsunami archives are therefore of vital importance for improvement of our understanding of the tsunami hazard in the North Sea. In addition, knowledge of the position of relative sea level (RSL) at the time the tsunamis impacted the coastline is crucial for sediment transport and inundation modelling, and for developing improved risk assessments.

The overarching aim of the NORSEAT project is to couple onshore and offshore tsunami deposits in the Shetland Islands and to provide a chronological framework by reconstructing, for the first time, the Holocene relative sea-level (RSL) curve for the area. To achieve this, the NORSEAT project will make use of the new and superior geophysical imaging and coring capabilities of RV Belgica II and:

- 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 in recurrence intervals,
- 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,
- reconstruct a relative sea level curve for the Holocene, which is poorly constrained so far for the Shetland Islands, hereby more accurately assessing run-up heights of the palaeo-tsunamis.

RV/21/NORSEAT

The NORSEAT project will use a combination of geophysical imaging and coring tools. Sediment cores will be submitted to various standard core scanning methods prior to sampling. Background and event deposits will be characterized using a combination of standard and state-of-the-art sedimentological, geochemical, palaeontological and geochronological methods.

The expected outcomes of the NORSEAT project are:

- A new RSL curve for the Shetland Islands;
- An improved tsunami event stratigraphy for the Shetland Islands, by coupling known onshore records of tsunami inundation with the newly acquire offshore records;
- An improved understanding in the dynamics (run up height, backwash, involved sediment volumes) of tsunamis that have inundated the Shetlands Islands in the past, by combining the new tsunami event stratigraphy with the new RSL curve;
- An improved hazard evaluation for tsunami inundation for the Shetland Islands and NW Europe, which will be translated into a policy paper.

These project results will be of use for:

- the scientific community: the project results will significantly advance general concepts of offshore erosion and deposition by tsunamis. The project will likely also generate new proxies to distinguish tsunami deposits and infer tsunami sedimentation dynamics, as well as new applications of existing proxies. New RSL data from the Shetland Islands will significantly improve run-up estimates of the regional palaeo-tsunamis and, thus, future hazard assessments.
- society and policy makers: the project will extend our knowledge on the source mechanism, frequency, size and impact of tsunami events in the North Sea. It will provide crucial information on the imminent and long-term hazard towards all North Sea countries authorities, including Belgium, and, more specifically, UK Flood Risk management authorities. Results from the project will be shared with the respective Geological Surveys of North Sea countries. Outreach activities through a range of media outlets will contribute to rising awareness of the potential hazard among the general public.



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