

SUBMARINE LANDSLIDES, TSUNAMI HAZARDS AND ASSOCIATED HABITATS FROM NORTH ATLANTIC CONTINENTAL MARGINS, OCEANIC ISLANDS AND SEAMOUNTS

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Associated/Interested Parties

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Willing to Attend Workshop

Yes

Target Names

Northern Caribbean/ West Africa continental margin/ Central Atlantic seamounts (Bermuda/Meteor) and ridges (spreading and fracture zone)

Geographic Areas of Interest

Southwest, East, Central

Relevant Subject Areas

Geology, Biology, Physical Oceanography

Description of Topic or Region Recommended for Exploration

Brief Overview of Area or Feature

Submarine landslides, and their associated potential for causing tsunamis, form some of the largest marine geohazards that can affect growing coastal populations, submarine infrastructure and the global economy. To document the location, magnitude and nature of failed seabed sections, tremendous efforts have been made to survey large portions of the continental margins on either side of the North Atlantic as well as around the oceanic islands off North Africa and southern Europe. Even with the decades of effort, many gaps remain where high-resolution mapping data necessary for assessment of submarine geohazards is not available. Large and potentially hazardous landslides have been partially or completely mapped offshore eastern Canada, Saharan North Africa, the Azores and Cape Verde Islands, offshore Western Europe from Portugal to Norway, yet it is expected that gaps in existing data hide vital details of known landslides and active seafloor structures or contain completely unknown landslide complexes. The collection of new data in these regions, especially offshore Western North Africa, the North Caribbean Margin and the Central North Atlantic Seamounts (e.g., Meteor Seamounts and Bermuda) and spreading and fracture zone ridges (examples shown in figure 1) presents an incredible opportunity to not only facilitate complete and more detailed geohazard assessment, but to push the boundaries of exploration into areas that have not been visited/mapped before.

Brief Summary of Current State of Knowledge

Accurate and actionable submarine geohazard assessment requires complete knowledge of the sources of the hazard and their characteristics. While some regions in the North Atlantic have been densely surveyed and are the focus of detailed evaluation, most have incomplete or no data on which to effectively evaluate current or past hazard potential. Although of lower frequency than the highly active margins of other ocean basins, hazards from earthquakes, landslides and tsunamis exist in the North Atlantic. But because of their very low-probability of occurrence over short-time scales and our limited understanding of the driving processes, they represent potentially high-risk events for which mitigation and management policies are not well developed.

Large earthquakes have occurred along the active continental plate boundaries (Cuba, Greater & Lesser Antilles, Gulf of Cadiz or west of the Tore-Madeira Rise, Charlie-Gibbs and Atlantis Fracture Zones), and

tsunamis they could possibly generate, and those resulting from submarine landslides, likely constitute one of largest hazards to the continental and oceanic island coastlines in the North Atlantic. That said, our ability to support such statements is limited by our current knowledge of the basic morphology, composition, structure, and geologic/ecologic processes of the seafloor in many of the areas where the hazards may be the greatest. Our current knowledge is limited to those areas where high-resolution bathymetry and seismic data allow us to identify landslides scars, canyons, mass transport deposits, and other structural features – low-resolution datasets are often incapable of capturing the often subtle seafloor morphologies that these features display.

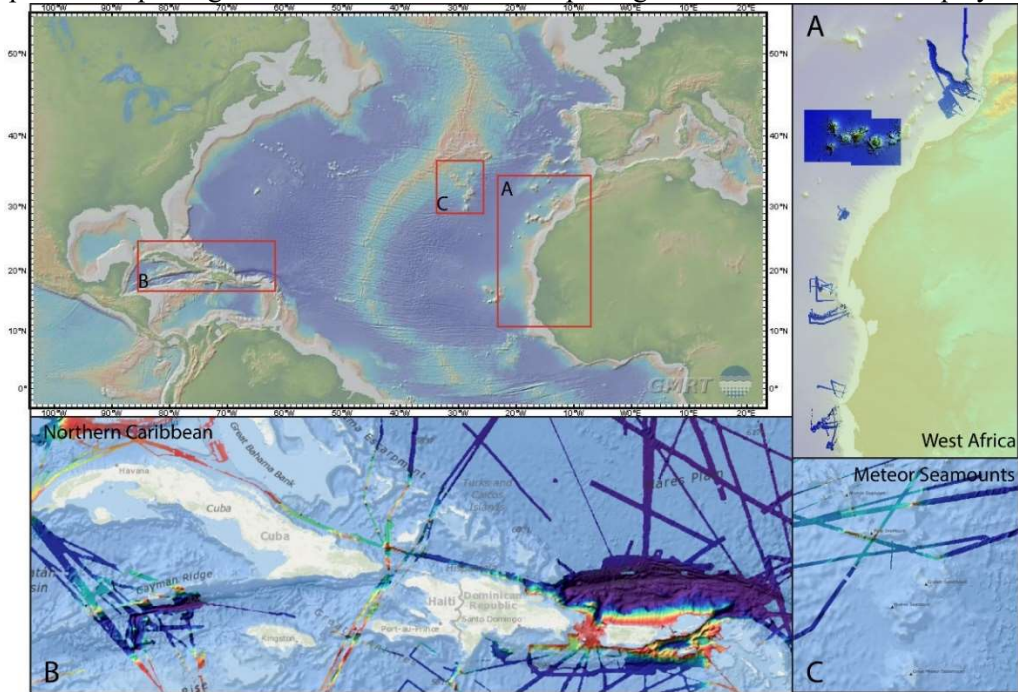


Figure 1. Examples of areas of known or suspected geohazards and extent of high-resolution data covering them (from NEIC and other sources)

Rationale for Future Exploration

The regions identified represent those where new data are expected to inform the community as to the presence, nature, and extent of submarine geohazards to countries bordering the North Atlantic Ocean and provide the information necessary to focus future efforts. While this is a primary goal, these areas also contain a wealth of basic geologic, biologic and physical oceanographic information that has not been documented. Submarine landslide headwall scarps have recently been demonstrated to provide substrate for specific faunal communities, creating unique habitats. In addition to filling gaps in existing data, exploratory surveys and baseline information are likely to facilitate new avenues of investigation across multiple disciplines which has been successfully demonstrated in past activities of this kind.

Surveys of the Caribbean region and western North Africa will support the infrastructure of developing nations, which do not have the means to carry out such work with hazards and resources assessments. All three regions provide unique geological and biological environments. Western North Africa borders the largest desert belt in the world with massive input of aeolian sedimentary deposits. The Caribbean region is a tropical region with majority of carbonate deposits and banks. The central Atlantic seamounts and ridges comprises of majority basaltic substrate and narrow valleys and topographic obstacles (seamounts), which direct oceanographic flow and species dispersal.

Relevant Partnerships

S4SLIDE (IGCP-640), ITN-SLATE, INSIGHT (CTM2015-70155-R), AtlantOS, ASTARTE, Commonwealth Marine Economies Programme, iAtlantic (H2020 project proposal, NERC Climatic Linked Atlantic Sector Science (CLASS), Global Tsunami Network (GTN), UNISDR Global Risk Assessment Framework