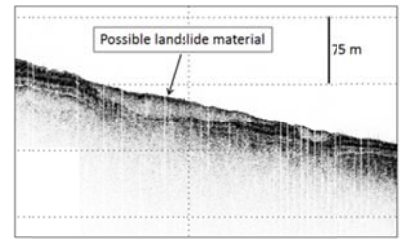


# MGL1407

USGS 2D Seismic Cruise

August 20 – September 13, 2014



MGL1407 addresses two scientific objectives for USGS: (1) to map sediment thickness as part of delineating the extended continental shelf of the United States beyond 200 nm as part of Law of the Sea studies, and (2) to collect transects of submarine landslides that will help determine the tsunami hazards that might affect the infrastructure and communities of the eastern seaboard.

## *Law of the Sea Studies*

**Background:** Article 76 of the Convention on the Law of the Sea specifies the criteria under which coastal States (i.e., nations) can delineate the Continental Shelf beyond 200 nm where the State can exert certain sovereign rights, such as management, conservation, or exploitation of natural resources. This region beyond 200 nm is called the Extended Continental Shelf (ECS). One of the two formulae that can be used is based on sediment thickness. The Atlantic margin is thought to have the second largest ECS of the United States and will most likely utilize the sediment thickness formula to delineate its ECS.

**MGL1407** is the first of two cruises to help determine sediment thickness in the region beyond 200 nm. In this first cruise, the tracks are being run primarily parallel to the margin to gather reconnaissance information, such as whether valleys of thicker sediment exist (for example along fracture zones or near seamounts) and to estimate sediment velocities so that the time measurements determined from the seismic data can be converted to thickness measurements. The second cruise will use data from 2014 to optimize sediment thickness data collection on lines perpendicular to the margin.

**Results to date:** The seismic data are providing exceptional clarity of not only the seafloor and basement surface, which will be used to determine sediment thickness, but also of the many sedimentary reflecting horizons that tell the story of the evolution of the continental margin. While much of the basic geologic history of the Atlantic margin is known from studies dating back to the 1970's and 1980's, the clarity of the newer data are exceptional. The basement has considerable relief and the sedimentary packages vary in their extent and thickness, making for variable sediment thicknesses. These measurements are helping to show where tracks need to be located for the second (2015) cruise.

## *Submarine Landslide Hazards*

**Background:** Since the 2004 Banda Aceh tsunami and the more recent 2010 Tohoku tsunami, the U.S. Nuclear Regulatory Agency has contracted with the USGS to evaluate tsunami hazards along the U.S. margins, because of the potential threat to, for example, nuclear power plants, coastal cities, industrial centers, and port facilities. Tsunamis on passive margins such as the Atlantic pose a challenge to regulators because these events are rare (i.e., low probability) but potentially devastating (i.e., high risk). The Atlantic margin is not immune to the potential tsunamigenic hazards, as demonstrated by (a) the 1929 Grand Banks tsunami, (b) measured and modeled overpressures on the NJ margin that can cause slope failure, and (c) evidence of enormous submarine landslides along the margin (such as the Cape Fear landslide).

**MGL1407:** One of the challenges in understanding the hazards posed by submarine landslides is that no single landslide has been mapped from its origin (headwall on the continental slope) to its runout on the lower rise/abyssal plain, with supporting evidence to show the aggradational and structural relationships in the subsurface among the different parts of the composite landslide system. MGL1407 will image two landslide transects: the Hudson composite landslide system and the Cape Fear landslide.

**Results to date:** The seismic data seaward of New York provide excellent imaging of the upper portions of the Hudson landslide system. The multibeam-only transects collected during the passage of hurricane Cristobal and the medevac provide additional excellent images of the seafloor and subbottom of the Southern New England landslide complex and others on the mid-Atlantic margin. The final line of the cruise (not yet collected) will image the Cape Fear landslide.

