IODP Proposal Cover Sheet

922 - Pre

W Atlantic Cenozoic Slope Stability

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Title	Slope failure and stability of the Cenozoic western Atlantic: Causes and history (SASCWATCH)
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Keywords	Slope stability, climate feedbacks
Area	Cape Fear Slide

Proponent Information

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Abstract

Submarine landslides are a common geomorphological feature of the North Atlantic passive margin on both sides of the ocean and may be associated with destructive tsunamis that threaten large population centers along these coasts. In addition to this geohazard aspect, submarine landslides can act as agents of major mass transfer of material from the shallow to the deep sea. Submarine landslide deposits cover a significant fraction of the seafloor (up to 33%) on the western North Atlantic margin (WNAM), yet their causes, mechanical behavior, and frequency are still largely unconstrained. We aim to answer questions relating to submarine landslide frequency through the Cenozoic, the mechanical properties of sediments within mass transport deposits and underlying sediments, and links between submarine landslide timing, frequency, and regional tectonic and climate events. This will be accomplished by drilling three sites in and around the Cape Fear Slide, a recent submarine landslide offshore North Carolina, USA that has good seismic data coverage and is close to the present-day Gulf Stream. The objectives of this proposal are (1) to understand the timing and frequency of submarine landslides throughout the Cenozoic on the WNAM; (2) to test the mechanical properties of sediments within, below, and beyond the toe of the Cape Fear Slide and other slides; and (3) to probe the presence and prevalence of certain submarine landslide triggering mechanisms on the WNAM through the Cenozoic.

This proposal addresses the Climate and Ocean Change and Earth in Motion themes of the IODP Science Plan 2013-2023. For the Climate and Ocean Change Theme, triggering mechanisms and submarine landslide timing may have a link to ocean circulation and changes in regional and global climate. For example, a change in the Gulf Stream on the WNAM could influence slope stability through changes in water temperature or sediment transport and preservation. These influences are not straightforward, however, and constraining the timing of submarine landslides, and the properties of sediments involved, will be an essential element of teasing out the linkages. For the Earth in Motion Theme, we will investigate some of the complex feedbacks between factors that precondition sediments for failure and triggering mechanisms by measuring mechanical properties of sediments and comparing with timing and frequency of submarine landslides in the sedimentary record.

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Scientific Objectives

1. To understand the timing and frequency of submarine landslides throughout the Cenozoic.
2. To test the mechanical properties of sediments within, below, and beyond the toe of the Cape Fear Slide and older slides.
3. To probe the presence and prevalence of certain submarine landslide triggering mechanisms on the WNAM through the Cenozoic.

Non-standard measurements technology needed to achieve the proposed scientific objectives

Proposed Sites (Total proposed sites: 6; pri: 3; alt: 3; N/S: 0)

Site Name	Position (Lat, Lon)	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
CFS-01A (Primary)	31.5068128 -72.2344335	5401	1289	0	1289	Establish time-stratigraphic correlations; determine mechanical properties of sediments at or near the toe of runouts; determine properties of underlying material; correlation with climate and ocean circulation
CFS-02A (Primary)	32.5405987 -73.8988222	4970	1814	0	1814	Establish timing of slides; sample to determine source material; determine mechanical properties of failed material and inter-slide units; determine sedimentation rates; determine sediment provenance, particularly for inter-slide material, and correlate to changes in climate
CFS-03A (Primary)	33.1123080 -75.6777350	3274	600	0	600	Establish timing updip and correlate with CFS-01A; determine mechanical properties of unfailed material; determine sedimentation rates; correlate updip sediment provenance with downdip results; establish updip response to climate forcing
CFS-04A (Alternate)	32.096536 -71.993408	5392	1300	0	1300	Alternate for CFS-01A. Establish time-stratigraphic correlations; determine mechanical properties of sediments at or near the toe of runouts; determine properties of underlying material; correlation with climate and ocean circulation
CFS-05A (Alternate)	32.495864 -73.756714	5052	1800	0	1800	Alternate for CFS-02A; Establish timing of slides; sample to determine source material; determine mechanical properties of failed material and inter-slide units; determine sedimentation rates; determine sediment provenance, particularly for inter-slide material, and correlate to changes in climate
CFS-06A (Alternate)	32.9462196 -75.8012976	3035	600	0	600	Alternate for CFS-03A; Establish timing updip and correlate with CFS-01A; determine mechanical properties of unfailed material; determine sedimentation rates; correlate updip sediment provenance with downdip results; establish updip response to climate forcing