## **IODP** Proposal Cover Sheet

922 - Pre

W Atlantic Cenozoic Slope Stability

Received for: 2017-10-02

| Title       | Slope failure and stability of the Cenozoic western Atlantic: Causes and histo   | ory (SASCV                            | VATCH)                                    |
|-------------|--|---------------------------------------|---|
| Proponents  | Hugh Daigle, Sajjad Abdullajintakam, Anne Becel, Andy Fraass, James Gib<br>Miller, Davin Wallace, Lindsay Worthington, Amelia Shevenell, Bobby Reece<br>Donna Shillington, Michael Strasser, Tiago Alves, Kiichiro Kawamura, Jan L | son, Priyan<br>e, Nicolas E<br>.aberg | k Jaiswal, Nathan<br>spinoza, Jenna Hill, |
| Keywords    | Slope stability, climate feedbacks   | Area                                  | Cape Fear Slide                           |
|             | Proponent Information  |                                       |   |
| Proponent   | Hugh Daigle  |                                       |   |
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| Country     | United States  |                                       |   |

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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.
- To test the mechanical properties of sediments within, below, and beyond the toe of the Cape Fear Slide and older slides.
  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) |
|-----------------------|-----------------|------------|----------|--------|----|
| Toposed Siles (Total  | proposed sites. | , o, pm. J | , an. 5  | , 100. | 0) |

| Cita Nomo                             | Position                  | Water Penetration (m)          |      | (m) | Drief Site engelije Objectives |  |
|---------------------------------------|---------------------------|--------------------------------|------|-----|--------------------------------|--|
| (Lat, Lon) Depth<br>(m) Sed Bsm Total |                           | Brief Site-specific Objectives |      |     |                                |  |
| CFS-01A<br>(Primary)                  | 31.5068128<br>-72.2344335 | 5401                           | 1289 | 0   | 1289                           | Establish time-stratigraphic correlations; determine mechanical<br>properties of sediments at or near the toe of runouts; determine<br>properties of underlying material; correlation with climate and ocean<br>circulation  |
| CFS-02A<br>(Primary)                  | 32.5405987<br>-73.8988222 | 4970                           | 1814 | 0   | 1814                           | Establish timing of slides; sample to determine source material;<br>determine mechanical properties of failed material and inter-slide units;<br>determine sedimentation rates; determine sediment provenance,<br>particularly for inter-slide material, and correlate to changes in climate               |
| CFS-03A<br>(Primary)                  | 33.1123080<br>-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<br>(Alternate)                | 32.096536<br>-71.993408   | 5392                           | 1300 | 0   | 1300                           | Alternate for CFS-01A. Establish time-stratigraphic correlations;<br>determine mechanical properties of sediments at or near the toe of<br>runouts; determine properties of underlying material; correlation with<br>climate and ocean circulation   |
| CFS-05A<br>(Alternate)                | 32.495864<br>-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<br>(Alternate)                | 32.9462196<br>-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                                       |