IODP Proposal Cover Sheet

811 - Full

Cape Fear Slope Stability

Title	The impact of recent warming and pore pressure rebound on slope instability
Proponents	P. Flemings, M. Hornbach, B. Dugan, D. Sawyer, J. Pohlman, R. Colwell, C. Ruppel, J. L'Heureux,
Keywords	Slope-stability, hydrate, tsunami, pore pressure
Area	Cape Fear

Contact Information

Contact Person:	Peter Flemings		
Department:	Jackson School of Geosciences		
Organization:	University of Texas at Austin		
Address:	10100 Burnet Rd., J.J.Pickle R	Austin	78758
Tel.:	512-471-6156	Fax:	
E-mail:	pflemings@jsg.utexas.edu		

Abstract

We propose to drill multiple locations at the Cape Fear Slide, offshore North Carolina to test two hypotheses: 1) Is hydrate dissociation caused by recent ocean temperature warming occurring and is this weakening the slope and contributing to slope failure? 2) Is pore-pressure rebound occurring in response to the most recent slide event and is this process controlling the rate, timing, and magnitude of slope failure? At each Site, we will drill companion LWD (Logging While Drilling) and APC (Advanced Piston Corer) holes. The material properties (porosity, permeability, strength) and the age and frequency of slope failures will be interpreted from core. High resolution temperature measurements, which are necessary for interpreting where hydrate dissociation occurs, will be acquired by both the APCT-3 and penetrometer measurements. High resolution pore pressure measurements will be acquired by a pore pressure penetrometer. Recent observations of both bottom water temperature change and changes in the rate of gas flux from these locations promise that active change is occurring at human timescales in this location.

This study addresses the Earth in Motion Theme of the IODP Science Plan for 2013-2023. We will increase our understanding of the processes driving landslides and we will provide real-time analysis of how carbon storage within the gas hydrate system evolves in response to ocean temperature changes, and therefore to climate forcing. As we integrate sediment depositional processes, slope failure and its recurrence, and evolution of the gas hydrate stability field, we will provide information on Earth in Motion at time-scales ranging from 100kys to yrs.

generated: Wed Oct 9 00:11:19 2013
by if340_pdf / planiglobe.com 2007 - 2013
(user 0.9497)

Scientific Objectives

The primary scientific objectives are three-fold. First, is the Upper Cape Fear is undergoing warming due to a recent shift in the position in the Gulf Stream? If so, is this warming contributing to slope instability at Cape Fear and the expulsion of free gas at the seafloor? Second, is pore pressure rebound occurring at Cape Fear and what are the processes of retrogradational failure at Cape Fear? Can we predict the timing and frequency of slides and is deformation ongoing? Third, do hydrate dissociation and fluid advection stimulate microbial biomass and activity? More broadly, the scientific objectives are to increase our understanding of the processes driving landslides and provide real-time analysis of how carbon storage within the gas hydrate system evolves in response to ocean temperature changes, and therefore to climate forcing.

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

Pore pressure penetrometers are now accepted technologies by the IODP (the T2P or SetPboth now adopted USIO tools). They have been deployed recently and accepted by the the USIO and the IODP. We also intend to use a Pressure Coring System (PCS) to recover intact cores in hydrate systems.

Proposed Sites

Site Name	Position (Lat, Lon)	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
CFS-10	33.03610817, -76.3252335	1025	200	0	200	This location is on the hanging wall above slide scarp on the strike line. We will drill companion LWD (Logging While Drilling) and APC (Advanced Piston Corer) holes. The material properties (porosity, permeability, strength) and the age and frequency of slope failures will be interpreted from core. High resolution temperature measurements, which are necessary for interpreting where hydrate dissociation occurs, will be acquired by both the APCT-3 and penetrometer measurements. High resolution pore pressure measurements will be acquired by a pore pressure penetrometer.172-105 4-A, 172-1054-B, 172-1054-C,
CFS-9	33.05423133, -76.303184	1075	200	0	200	Base of failure site on the strike line. We will drill companion LWD (Logging While Drilling) and APC (Advanced Piston Corer) holes. The material

-	-	-	-	-	-	properties (porosity, permeability, strength) and the age and frequency of slope failures will be interpreted from core. High resolution temperature measurements, which are necessary for interpreting where hydrate dissociation occurs, will be acquired by both the APCT-3 and penetrometer measurements. High resolution pore pressure measurements will be acquired by a pore pressure penetrometer.
CFS-8	33.153132, -76.23295217	1125	200	0	200	Headwall penetration along the strike line. Constrain material properties, temperature and pressure to 200 m. Drill companion LWD (Logging While Drilling) and APC (Advanced Piston Corer) holes. The material properties (porosity, permeability, strength) and the age and frequency of slope failures will be interpreted from core. High resolution temperature measurements, which are necessary for interpreting where hydrate dissociation occurs, will be acquired by both the APCT-3 and penetrometer measurements. High resolution pore pressure measurements will be acquired by a pore pressure penetrometer
CFS-7	33.13138417, -76.2533685	1150	200	0	200	Located at base of scarp on strike section. We will drill companion LWD (Logging While Drilling) and APC (Advanced Piston Corer) holes. The material properties (porosity, permeability, strength) and the age and frequency of slope failures will be interpreted from core. High resolution temperature measurements, which are necessary for interpreting where hydrate dissociation occurs, will be acquired by both the APCT-3 and penetrometer measurements. High resolution pore pressure measurements will be acquired by a pore pressure penetrometer.
CFS-6	33.08701767, -76.22677433	1400	200	0	200	At each Site, we will drill companion LWD (Logging While Drilling) and APC (Advanced Piston Corer) holes. The material properties (porosity, permeability, strength) and the age and frequency of slope failures will be interpreted from core. High resolution temperature measurements, which are necessary for interpreting where hydrate dissociation occurs, will be acquired by both the APCT-3 and penetrometer measurements. High resolution pore pressure measurements will be acquired by a pore pressure penetrometer.
CFS-5	33.10031583, -76.2786845	1100	200	0	200	At each Site, we will drill companion LWD (Logging While Drilling) and APC (Advanced Piston Corer) holes. The material properties (porosity, permeability, strength) and the age and frequency of slope failures will be interpreted from core. High resolution

-	-	-	-	-	-	temperature measurements, which are necessary for interpreting where hydrate dissociation occurs, will be acquired by both the APCT-3 and penetrometer measurements. High resolution pore pressure measurements will be acquired by a pore pressure penetrometer.
CFS-4	33.1117075, -76.3227835	900	200	0	200	At each Site, we will drill companion LWD (Logging While Drilling) and APC (Advanced Piston Corer) holes. The material properties (porosity, permeability, strength) and the age and frequency of slope failures will be interpreted from core. High resolution temperature measurements, which are necessary for interpreting where hydrate dissociation occurs, will be acquired by both the APCT-3 and penetrometer measurements. High resolution pore pressure measurements will be acquired by a pore pressure penetrometer.
CFS-3	33.1199925, -76.34319983	900	200	0	200	At each Site, we will drill companion LWD (Logging While Drilling) and APC (Advanced Piston Corer) holes. The material properties (porosity, permeability, strength) and the age and frequency of slope failures will be interpreted from core. High resolution temperature measurements, which are necessary for interpreting where hydrate dissociation occurs, will be acquired by both the APCT-3 and penetrometer measurements. High resolution pore pressure measurements will be acquired by a pore pressure penetrometer.
CFS-2	33.14329367, -76.42241467	760	200	0	200	At each Site, we will drill companion LWD (Logging While Drilling) and APC (Advanced Piston Corer) holes. The material properties (porosity, permeability, strength) and the age and frequency of slope failures will be interpreted from core. High resolution temperature measurements, which are necessary for interpreting where hydrate dissociation occurs, will be acquired by both the APCT-3 and penetrometer measurements. High resolution pore pressure measurements will be acquired by a pore pressure penetrometer.
CFS-1	33.16348833, -76.49185	700	200	0	200	At each Site, we will drill companion LWD (Logging While Drilling) and APC (Advanced Piston Corer) holes. The material properties (porosity, permeability, strength) and the age and frequency of slope failures will be interpreted from core. High resolution temperature measurements, which are necessary for interpreting where hydrate dissociation occurs, will be acquired by both the APCT-3 and penetrometer measurements. High resolution pore pressure measurements will be acquired by a

-	-	-	-	-	-	pore pressure penetrometer.