Received 27 Jan 2006

IODP Proposal Cover Sheet

537A-Full5

☐ **New** ☑ **Revised** ☐ **Addendum**

Above For Official Use Only

Please fill out information in all gray boxes

Title:	**Costa RIca Seismogenesis Project CRISP Program A SAMPLING AND QUANTIFY INPUT TO THE SEISMOGENIC ZONE AND FLUID OUTPUT. INSTALLATION OF LONG TERM MONITORING LABORATORIES.**		
Proponent(s):	**P. Vannucchi, T. Dixon, M. Kastner, H. Villinger,** G.I. Alvarado, U. Barckhausen, P. Clift, D.M. Fisher, S. Galeotti, R. Harris, G. Kimura, S. Lallemand, A.J. Maltman, J. Morris, A. Paytan,, M.J. Protti, C.R. Ranero, D. Scholl, S. Schwartz, R. von Huene		
Keywords: *(5 or less)*	Seismogenic zone, Middle America Trench, fluid flow, long-term monitoring, fault mechanics	Area:	Costa Rica

Contact Information:

Contact Person:	Paola Vannucchi		
Department:	Scienze della Terra		
Organization:	Università di Firenze		
Address	Via La Pira, 4		
Tel.:	+39 055 275 7494	Fax:	+39 055 218 628
E-mail:	paolav@geo.unifi.it		

Permission to post abstract on IODP-MI Sapporo Web site: ☒ Yes ☐ No

Abstract: *(400 words or less)*

CRISP is a project to understand the processes that control nucleation and seismic rupture of large earthquakes at erosional subduction zones. The uniqueness of CRISP is the possibility to reach the plate boundary across the transition from stable to unstable slip through a transect within the drilling capabilities of the Japanese riser ship *Chikyu*. Typical of erosive convergent margins, that occur along at least 50% of the global subduction zones, is the upper plate provenance of the material in the subduction channel and along the seismogenic zone. The nature and progressive changes of properties of this material down the subduction zone is presently unconstrained.

CRISP aims to test five hypotheses related to the transition from aseismic to seismic behaviour along erosive plate boundaries: **1):** The architecture of the subduction megathrust evolves down dip and the transition from stable to unstable slip corresponds to the transition from a fluid-rich, broad fault zone to a thinner and drier fault. **2)** Fluid pressure gradient and fluid advection affect localization of faulting and locking of erosional plate boundaries. **3)** Geological, physical and structural characteristics of material in the subduction channel influence fault mechanics, the transition from stable to unstable slip and the earthquake cycle. **4)** Fluid chemistry, P-T conditions and residence time affect the state of eroded material through upper-plate basement alteration, diagenesis and low-grade metamorphism. **5)** Variations in subducting plate relief, subduction channel thickness, material/fluid properties and distribution affect seismogenesis and rupture propagation.

CRISP Program A is the first step toward the deep riser drilling through the seismogenic zone, and it focuses on the characterisation of the subducting plate, lithology and fluid system, on sampling the shallow décollement, that most likely brings fluids generated at seismogenic depth, on installing long term monitoring laboratories to record microseismicity, monitor fluid pressure and measure the stress field evolution through the seismic cycle. A first evaluation of the subduction channel thickness, necessary to constrain the structural environment that will be drilled during the deep riser drilling, will be also pursued.

CRISP Program A involves drilling at five sites: two on the incoming Cocos plate; one at the slope toe; two on the middle-upper slope. These two latter sites are the two that will be deepen to reach the aseismic-seismic plate boundary during Program B.

Scientific Objectives: (*250 words or less*)

Hypotheses will be tested through realization of goals in both Program A and B. In particular Program A will contribute to the knowledge of the transition from stable to unstable slip through the following goals:
Goal #1: Characterize the composition, texture, and physical properties of subducting ocean sediment and oceanic igneous basement.
Goal #2: Constrain the fluid/rock interaction, the hydrologic system and the geochemical processes (indicated by composition and volume of fluids) active along the plate boundary and within the upper plate.
Goal #3 Estimate the composition, texture, physical properties and subduction channel thickness of the upper plate material entering the subduction channel.
Goal #4 Measure the stress field evolution across the up-dip limit of the seismogenic zone to determine the degree of locking.

Please describe below any non-standard measurements technology needed to achieve the proposed scientific objectives.

Long-term monitoring laboratories will require CORKs, strain-meters and seismo-meters installation.

Proposed Sites:

Site Name	Position	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
CRIS 1A	BGR 99-7 CMP 5740 8º 42.8579 -84º 15.7838	2115	120	150	270	Oceanic Reference site Characterize oceanic input to the subduction zone
CRIS 5A	BGR 99-6 CMP 1571 8º 46.055 -84º 12.470	2550	150	150	300	Instrumental site to characterize input to the subduction zone
CRIS 2B	BGR 99-7 CMP 4650 8º 48.3674 -84º 13.0675	2000	600	150	750	Penetration of décollement at shallow level, fluid flow regime, oceanic crust
CRIS 3A	BRG 99-7 CMP 2600 8º 35.23956 -84º 4.77852	530	700	200	900	Long-term monitoring, Characterise upper-plate basement, fluid flow
CRIS 4A	BGR 99-7 CMP 750 8º 68.0827 -84º 3.3615	170	850	100	950	Long-term monitoring, Characterise upper-plate basement, fluid flow