



*Geodynamic Processes
at Rifting and
Subducting
Margins*

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What Is GeoPRISMS?

- **Successor to the decadal NSF MARGINS Program**
- **Studies of origin & evolution of continental margins**
 - Community-driven, interdisciplinary, cross-divisional NSF-funded
 - Integrating field, theory, and modeling
- **Focus on rifts and subduction zones**
 - Geodynamic processes most active; continental crust formed
 - Where geology and society intersect; economic resources
- **Two broadly integrated initiatives**

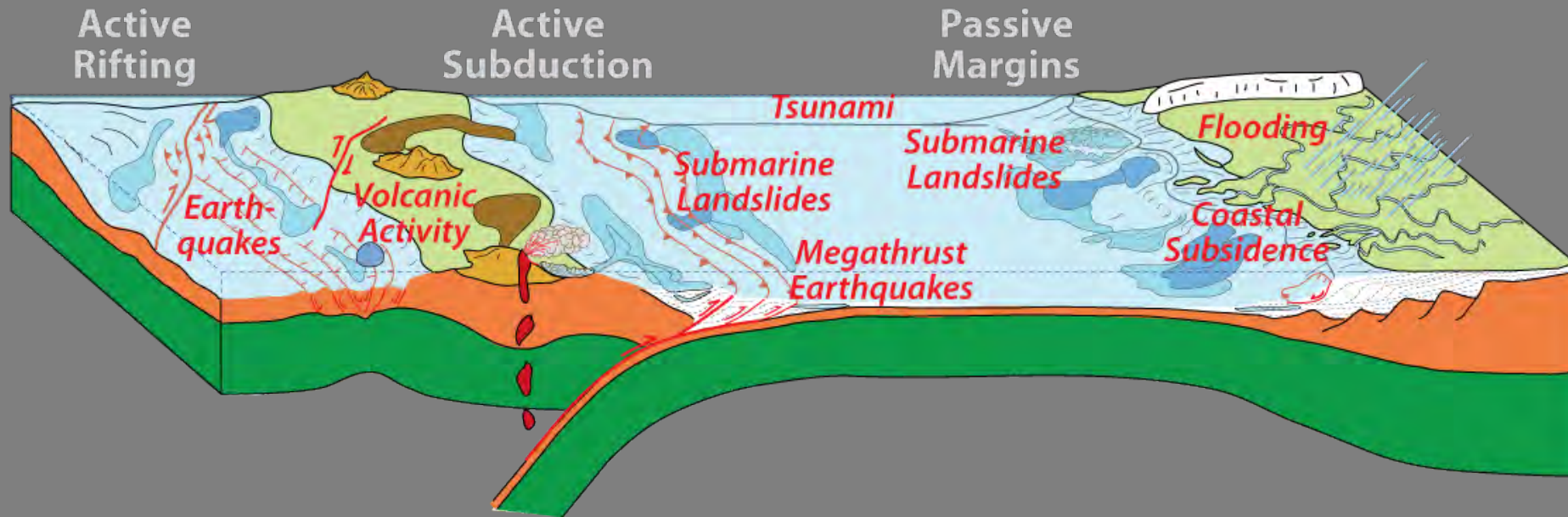
**Subduction
Cycles &
Deformation**



**Rift
Initiation &
Evolution**

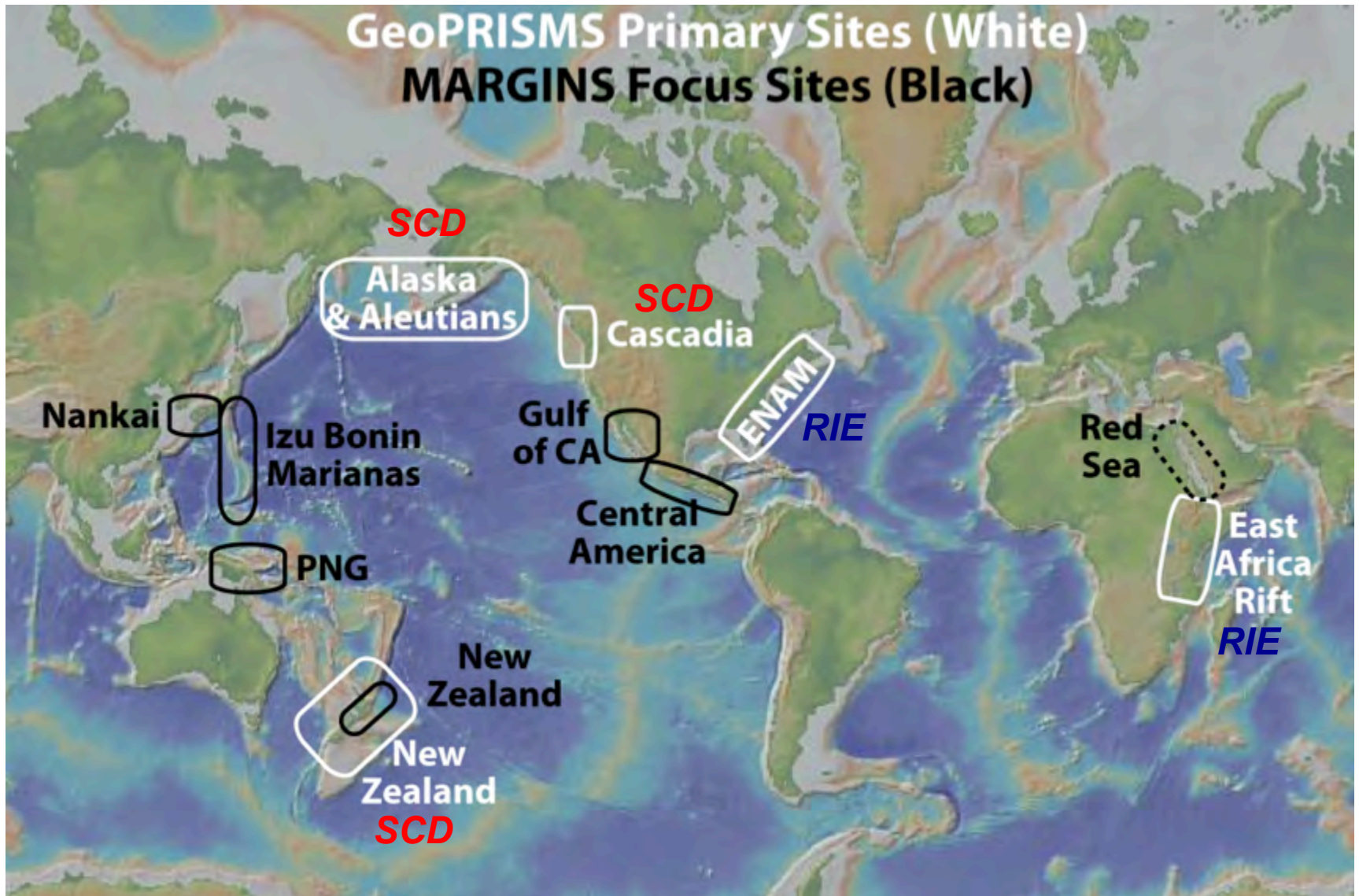
- **Shoreline-crossing, i.e., “amphibious”**
 - Where most rifts and subduction zones occur
 - Geologic & geodynamic processes span the shoreline
 - Where focused, cross-divisional efforts most needed
- **Research at Primary Sites & Thematic Studies**

GeoPRISMS Tectonic Settings



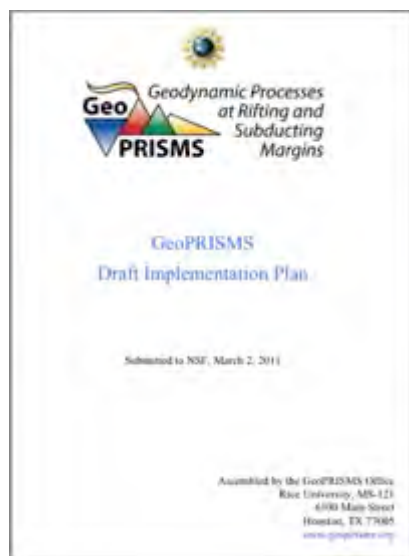
GeoPRISMS investigates the coupled geodynamics, earth surface processes, and climate interactions that build and modify continental margins over a wide range of timescales (from s to My), and cross the shoreline, with applications to margin evolution & dynamics, construction of stratigraphic architecture, accumulation of economic resources, and associated geologic hazards and environmental management.

Where GeoPRISMS Works



“Living Documents”

How Community Science is Done (The GeoPRISMS Model)



- **Community planning at workshops**
 - MSPW - Feb 2010
 - ENAM - Oct 2011
 - RIE IW - Nov 2010
 - Cascadia – Apr 2012
 - SCD IW - Jan 2011
 - EARS – Oct 2012
 - Alaska – Sep 2011
 - **New Zealand – Apr 2013**
- **Science Plans w/ research objectives**
- **Proposals guided by SP (Deadline: July 1)**
 - PI-driven proposals (individual, team, postdoc)
 - Community-driven proposals (e.g., Amph. Array)
 - Workshop proposals (planning, science, synth.)
- **Leveraging new opportunities**
 - New facilities and infrastructures
 - International and agency collaborations
- **GeoPRISMS is open, all can participate!!**



GeoPRISMS Structure & Topics

Rift Initiation and Evolution (RIE)

- Where and why continental rifts initiate
- Fundamental rifting processes; feedbacks in time & space
- Controls on the architecture of rifted continental margins
- Mechanisms & consequences of fluid & volatile exchange



Subduction Cycles and Deformation (SCD)

- Controls on size, frequency, slip behavior of subduction plate boundaries
- Spatial-temporal deformation patterns during seismic cycle
- Linkages between volatiles & plate boundary rheology
- Volatile storage, transfer, & release in subduction systems
- Geochemical products of subduction; continent creation
- Subduction zone initiation and arc system formation
- Feedbacks between surface processes & subduction dynamics

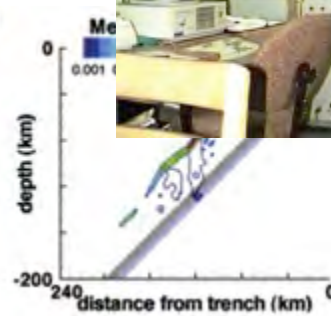
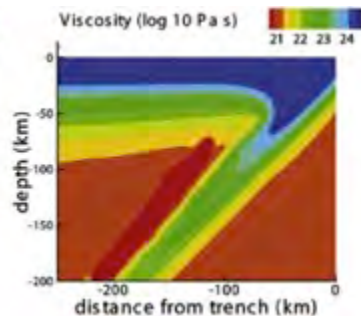
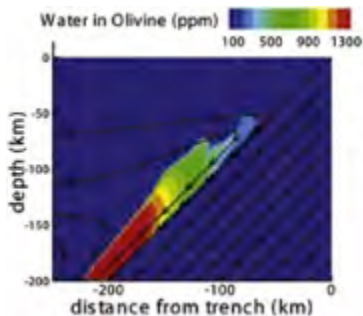
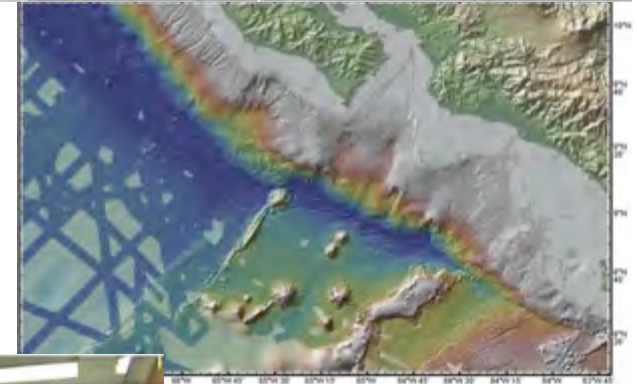
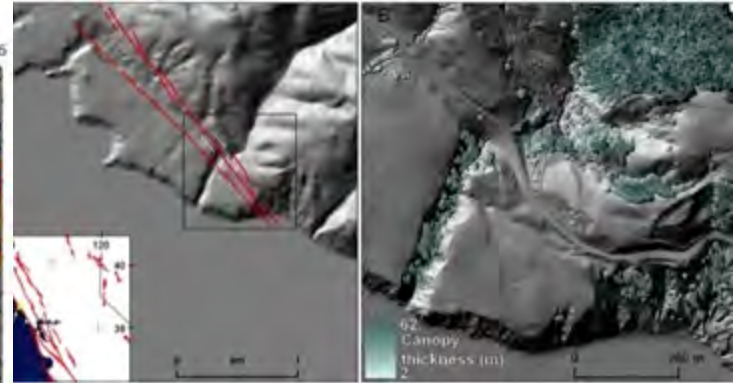
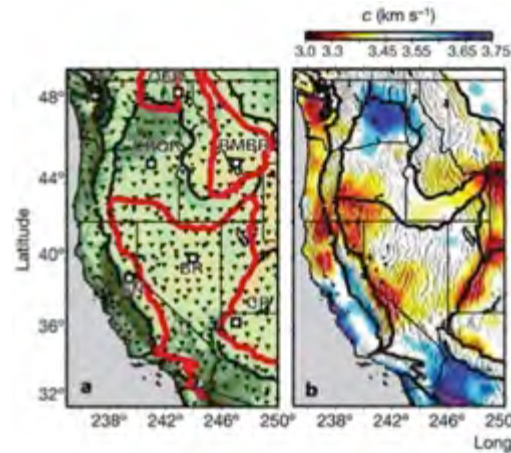
GeoPRISMS Thematic Studies

- **Subsidiary but complementary to primary site studies**
 - Fundamental processes, parameters not at primary sites
 - Comparative studies; exhumed systems; lab, modeling studies
- **Justified in the context of, and integrated with, primary site (and MARGINS focus site) studies**
- **SCD Themes**
 - *Controls on fault slip behavior and deformation history*
 - *Mantle wedge dynamics*
 - *Fore-arc to back-arc volatile fluxes*
 - *Metamorphic and igneous conditions and processes in subduction zones at depth*
 - >> *ExTerra: Exhumed Terranes*
 - *Subduction initiation*

Research Strategies

- Onshore-Offshore
- Interdisciplinary
- Community driven
- Collaborative

- **Seismology**
- **Geodesy & Remote Sensing**
- **Other Geophysics (Heat Flow, MT, EM)**
- **Drilling, Coring & Logging (IODP, ICDP)**
- **Field Observations (Terrestrial & Marine)**
- **Experimental & Analytical**
- **Numerical Modeling**



New Zealand Workshop Objectives

- **Build the GeoPRISMS Community**
- **Establish priorities for future research in New Zealand: i.e., key science questions, research targets, and approaches (*What, Where, and How*)**
 - Guide proponents, reviewers, and NSF (for GeoPRISMS funds)
 - Enable new collaborations, research opportunities
- **Define a *portfolio* of research opportunities in New Zealand. Within that, identify:**
 - Potential GeoPRISMS investments in EARS
 - Other potential projects, partners, participants, programs
- **Revise the GeoPRISMS Implementation Plan**

Communications & Data Access

- **Communication**
 - GeoPRISMS website
 - GeoPRISMS newsletter
 - GeoPRISMS listserv
- **Data Access**
 - GeoPRISMS Data Portal
 - MARGINS Data Portal

GeoPRISMS Newsletter

Issue No. 26, Spring 2011

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Welcome to GeoPRISMS

Julia Morgan, GeoPRISMS Steering and Oversight Committee Chair
Rice University

I am excited to introduce the inaugural issue of the GeoPRISMS Newsletter (#26 in the series that includes the MARGINS Newsletter). Over the last year MARGINS successfully transitioned into GeoPRISMS, and the program is off to a running start. The first GeoPRISMS Office opened at Rice University last October, as the last MARGINS Office closed its doors at Lamont Doherty Earth Observatory.

The genesis of GeoPRISMS was unquestionably a community effort, but it would not have been possible without the able guidance of the previous MARGINS chair, Geoff Allen, and his staff. Geoff deserves extraordinary thanks for shepherding the MARGINS Program through its decadal review, guiding the community through planning the MARGINS successor, and for smoothing a rapid program and office transition as the GeoPRISMS Office started up. New Ranget, Karen Benvenuto, and Andrew Goodwillie, who staffed the MARGINS Office at Lamont, provided invaluable assistance, keeping the MARGINS Office open to ensure a gradual and graceful transition throughout the fall. Previous MARGINS Chairs Julie Morris, Garry Karner, and Brian Taylor also left

their unique imprints on the MARGINS Program, and all are jointly responsible for motivating and guiding the previous decade of ground-breaking interdisciplinary research on continental margins. Things have happened very rapidly in the GeoPRISMS Office since it opened. Three new staff members have joined the office: Alana Chapa-Sanchez – Administrative Coordinator, Charles Bopp – Science Coordinator, and Alison Henning – Education and Outreach Coordinator (see page 3 for bio). The new GeoPRISMS website is up and running (<http://www.geoprisms.org>), and new content and functionality is being added by the day (see page 19). The office has hosted or co-hosted two community planning workshops, and delivered the GeoPRISMS Implementation Plan to NSF. As usual, AGU kept us very busy, with the GeoPRISMS Townhall and Student Forum, and the GeoPRISMS Student Prize. The Distinguished Lectureship Program has just finished its 2010-2011 season, and new speakers have been identified for the year to come. And we are now preparing for several more planning workshops that will take place within the year (see "Upcoming Meetings" on the previous

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Cascadia Initiative Update: Status of Ocean Bottom Seismology Component

By Cascadia Initiative Expedition Team (CIT)



Figure 1. Oblique shaded relief map showing the Cascadia Array, in particular, the four-year deployment plan for the Cascadia OBS array of the Cascadia Initiative. The colored networks associated with NEPTUNE Canada and OOI are also shown, along with earthquake distributions along the continental margin, seismic spreading centers, and transform faults.

The Cascadia Initiative (CI) is an on-shore/offshore seismic and geodesic experiment using an amphibious array to study questions ranging from megathrust earthquakes to volcanic arc structure to the formation, deformation and hydration of the Juan de Fuca and Gorda plates. This diverse set of objectives are all components of understanding the overall subduction zone system and require an array that provides high-quality data that crosses the shoreline and encompasses relevant plate boundaries. An article in the previous GeoPRISMS Newsletter (Spring 2011, issue No. 26) described CI scientific objectives, the outcome of an open community workshop held in October 2010 to develop deployment plans for the offshore component of the experiment, and formation of the Cascadia Initiative Expedition Team (CIT). Here we provide an update of CIT activities including the first year of CI OBS deployments (summer 2011) and related Education and Outreach (E&O) efforts.

Over its planned 4-year data acquisition period, the offshore portion of the Cascadia Initiative will involve the deployment and recovery of ~280 OBS at ~160 different sites and a total of about 14 cruises. Each OBS deployment site requires careful evaluation to ensure that the national deployment plans developed at the 2010 CI workshop

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MARINE GEOSCIENCE DATA SYSTEM

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GeoPRISMS Data Portal

Continental margins are the Earth's principal tool for producing hydrocarbon and metal resources, for earthquakes, landslides, volcanic and climatic hazards, and for the greatest population density. Despite the societal and economic importance of margins, many of the mechanical, fluid, chemical and biological processes that shape them are poorly understood. The GeoPRISMS *g* Program, supported by the National Science Foundation *g* and built upon the NSF MARGINS *g* program, focuses upon the coordinated, interdisciplinary investigation of the continental margins through two initiatives: the Subduction Cycles and Deformation (SCD) *g* and RIE Initiation and Evolution (RIE) *g*. In order to address the fundamental scientific questions, each initiative is associated with Primary Sites to address a wide range of field, experimental and theoretical studies spanning broad spatial and temporal scales.

Click to Enable Map Client

NSF MARGINS *g* program, focuses upon the coordinated, interdisciplinary investigation of the continental margins through two initiatives: the Subduction Cycles and Deformation (SCD) *g* and RIE Initiation and Evolution (RIE) *g*. In order to address the fundamental scientific questions, each initiative is associated with Primary Sites to address a wide range of field, experimental and theoretical studies spanning broad spatial and temporal scales.

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More info: <http://www.geoprisms.org>

Opportunities for Students & Postdocs

- **Education & Training**

- AGU Best Student Presentation prizes (deadline November)
- Distinguished Lectureship Program (DLP)
- Postdoctoral fellowships (NSF solicitation, July 1)
- Student (and post-doc) symposia & field trips at workshops



**Alaska
Student
Symposium**



**ENAM
Student
Sympos**



You Can Participate in GeoPRISMS

- Attend Upcoming Workshops, AGU Mini-Workshops
- Participate in On-Line Forum Discussions
- Communicate with GSOC Members & Conveners
- Sign Up for Listserv and Newsletters
- Browse the MARGINS and GeoPRISMS databases, bibliographies, reports
- Test out the MARGINS mini-lessons
- Follow us on

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- **Do GREAT Science!! Send Us Reports, Images, etc.**