Geodynamic Processes at Rifting and Subducting Margins

GeoPRISMS

RICE

GeoPRISMS: Amphibious Continental Margin Studies

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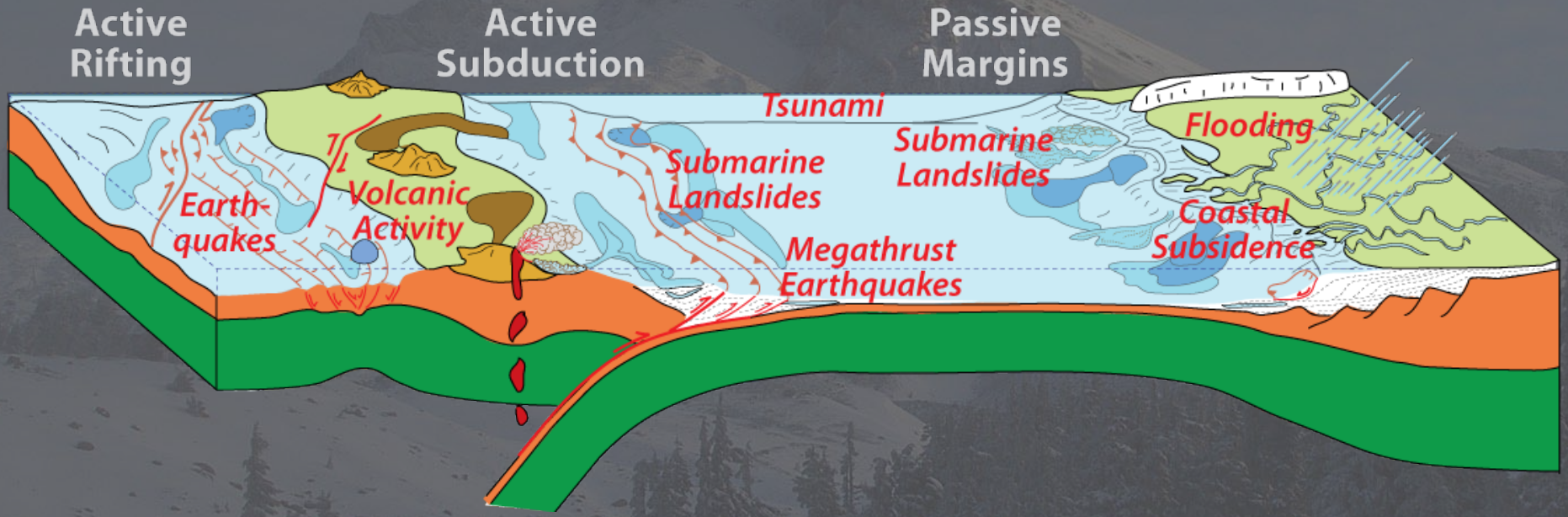
What Is GeoPRISMS?

- **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**
  - Where geodynamic processes are most active
  - Where continental crust is formed and modified
  - Where geology and society intersect
  - Where economic resources are formed and found
- **Shoreline-crossing, i.e., "amphibious"**
  - Where most rifts and subduction zones occur
  - Geologic & geodynamic processes span the shoreline
  - Where focused, interdisciplinary, cross-divisional efforts most needed
- **Guided by a community-developed science plan; coordinated by national office & steering committee.**

GeoPRISMS Tectonic Settings

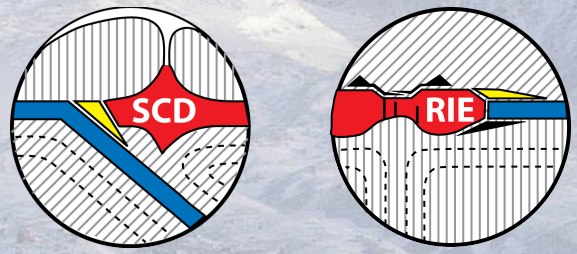


GeoPRISMS investigates the coupled geodynamics, earth surface processes, and climate interactions that build and modify continental margins *over a wide range of timescales (from s to My), and cross the shoreline, with applications to margin evolution & dynamics, construction of stratigraphic architecture,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

GeoPRISMS Structure & Implementation

- **Two broadly integrated initiatives**

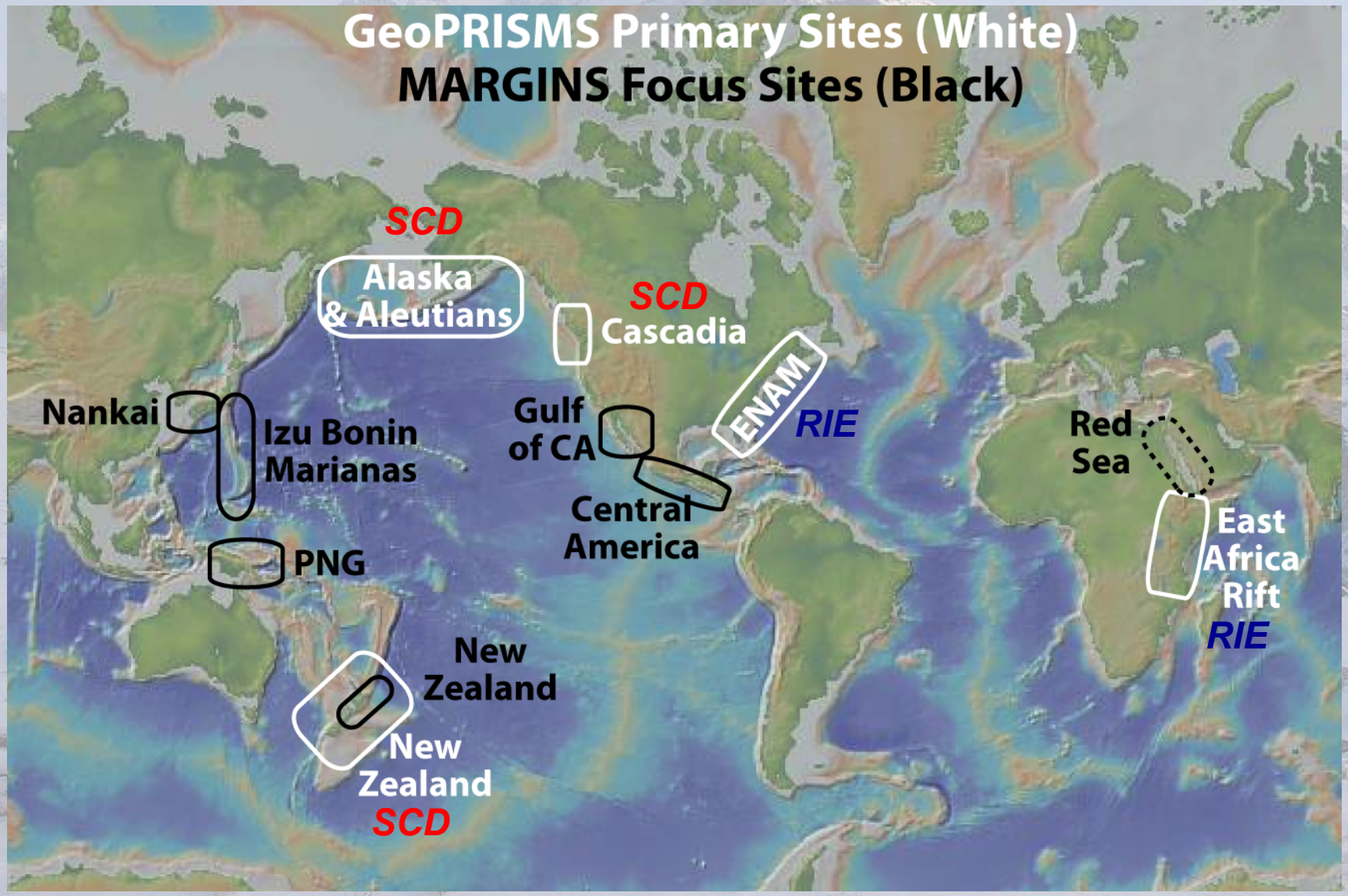
Subduction Cycles & Deformation



Rift Initiation & Evolution

- **Research at Primary Sites & Thematic Studies**
  - Five Primary Sites: three in North America, two international

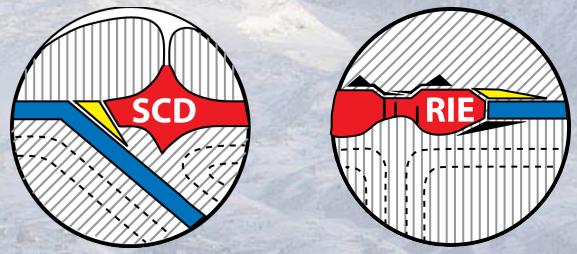
Where GeoPRISMS Works



GeoPRISMS Structure & Implementation

- **Two broadly integrated initiatives**

Subduction Cycles & Deformation

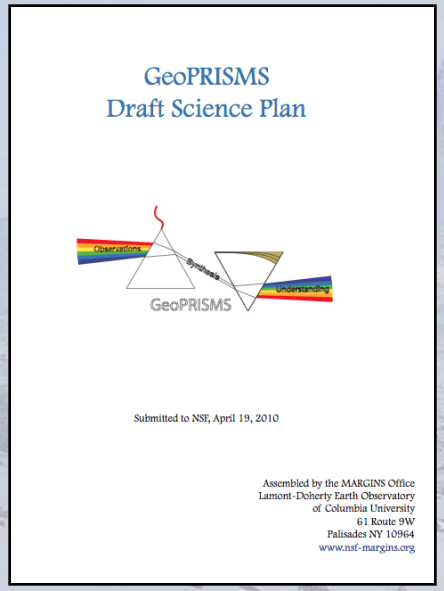


Rift Initiation & Evolution

- **Research at Primary Sites & Thematic Studies**
  - Five Primary Sites: three in North America, two international
- **Identifying & leveraging new opportunities:**
  - New facilities, e.g., EarthScope, Amphibious Array, IODP
  - Strong international & agency collaborations
  - Societal relevance, hazards, linkages to industry
  - Broaden education & outreach programs
- **Community building & communication:**
  - Workshops, student symposia/field trips, forums, luncheons
  - Informative newsletters, listservs, website, etc.

How Community Science is Done
(The GeoPRISMS Model)

"Living Documents"


GeoPRISMS
Draft Science Plan

Observations
Synthesis
Understanding
GeoPRISMS

Submitted to NSF, April 19, 2010

Assembled by the MARGINS Office
Lamont-Doherty Earth Observatory
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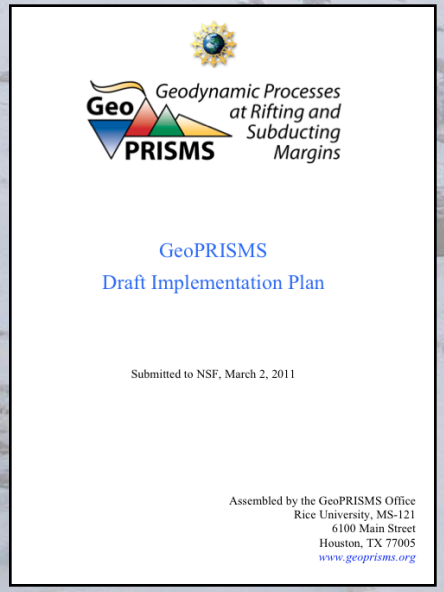
Geo PRISMS
Geodynamic Processes at Rifting and Subducting Margins

GeoPRISMS
Draft Implementation Plan

Submitted to NSF, March 2, 2011

Assembled by the GeoPRISMS Office
Rice University, MS-121
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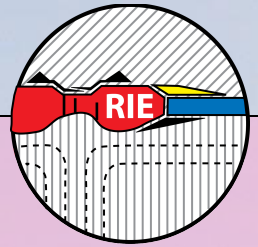
- **Community planning at workshops**
  - MSPW - Feb 2010
  - RIE IW - Nov 2010
  - SCD IW - Jan 2011
  - Alaska - Sep 2011
  - ENAM - Oct 2011
  - Cascadia - Apr 2012
  - EARS – Oct 2012
  - NZ – Apr 2013
- **Science Plans w/ research objectives**
- **Steering committee represents comm.**
  - Coordination & logistics through GeoPRISMS Office
- **GeoPRISMS funds: ~$5 M/yr**
- **Proposals guided by SP** (Deadline: July 1)
  - PI-driven, community-driven, workshop proposals
- **Program subject to regular review**

- **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 of earthquakes & slip behavior of subduction plate boundaries
- Spatial-temporal deformation patterns during the 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

Themes

- 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

- *Identifying controls on fault slip behavior and deformation history*
- *Understanding mantle wedge dynamics*
- *Fore-arc to back-arc volatile fluxes*
- *Metamorphic and igneous conditions and processes in subduction zones at depth*
- *Subduction initiation*

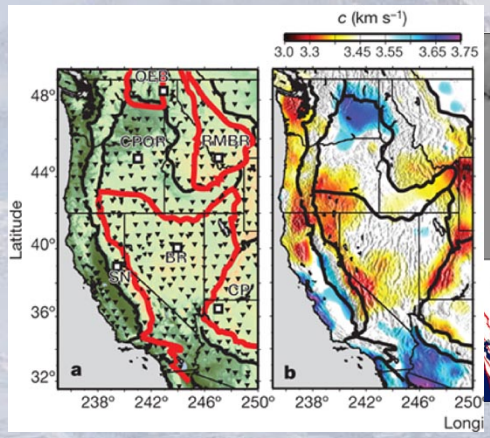
RIE

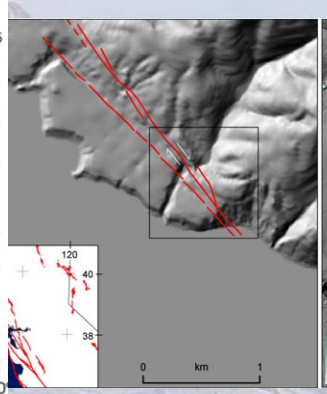
- *Rift obliquity*
- *Rift processes as functions of strain rate*
- *Volatiles in rift zone processes*
- *Sediment production, routing and transport during and after rifting*
- *Discrete events at rifted margins*

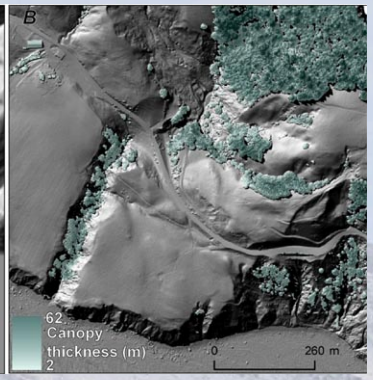
Research Strategies

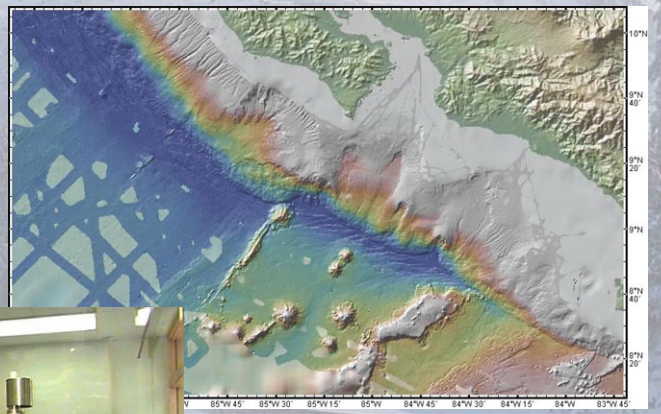
- Onshore-Offshore
- Interdisciplinary
- Community driven
- Collaborative

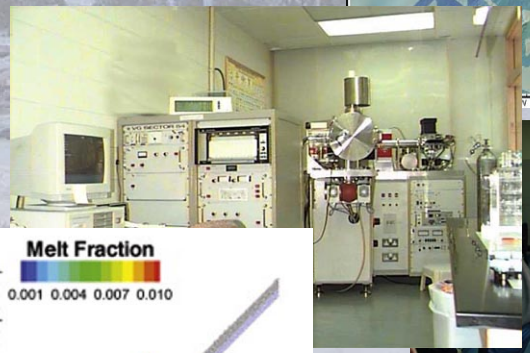
- Seismology
- Geodesy & Remote Sensing
- Other Geophysics (Heat Flow, MT, EM)
- Drilling, Coring & Logging (IODP, ICDP)
- Field Observations (Terrestrial & Marine)
- Experimental & Analytical
- Numerical Modeling

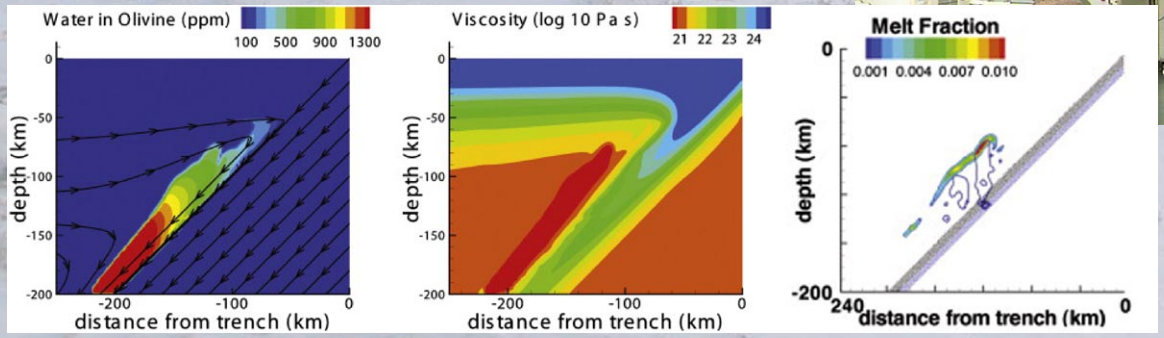












Opportunities for Students & Postdocs

- **Education & Training** (postdocs, graduate students)
  - AGU Best Student Presentation prizes (deadline November)
  - Distinguished Lectureship Program (deadline summer)
  - Postdoctoral Fellowships (NSF solicitation, July 2, 2012)
  - Student (and post-doc) symposia & field trips at workshops

Alaska Student Symposium

ENAM Student Sympos

Student Symposium

- **Objectives:**
  - Students gain geologic background, scientific motivation, and programmatic information to participate fully in workshop.
  - Students present their research in a friendly forum.
  - Students get to know conveners and organizers and each other.

  > Build a a strong student community, that lasts throughout the workshop and beyond.

- **During the workshop, you will :**
  - Meet regularly to discuss workshop topics and questions.
  - Prepare a unified student perspective and proposed site research plan (which could the final workshop plan!)
  - Serve as scribes and co-leaders for break-out discussions.
  - Enjoy a student dinner to discuss, research workshop, and career paths.

- **Your contributions are critical to final decisions!**

Communications & Data Access

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

In This Issue:


GeoPRISMS Newsletter

Issue No. 26, Spring 2011

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Rice University • 6100 Main Street • Houston, Texas USA • 77005

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 Abers, 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. Niva Ranjeet, Karen Benedetto, 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-Sendejas – Administrative Coordinator, Charles Bopp – Science Coordinator, and Alison Henning – Education and Outreach Coordinator (see page 3 for bios). 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

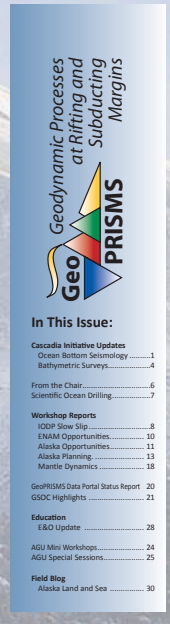
Upcoming Meetings

Apply Now!

Alaska Planning Workshop
Subduction Cycles & Deformation Primary Site
September 22-24, 2011 - Portland,OR
Application due: June 25

Earthscope – GeoPRISMS Science Workshop for Eastern North America
Rift Initiation & Evolution Primary Site
October 27 - 29, 2011 - Lehigh University
Application due: August 1

Apply online at http://www.geoprisms.org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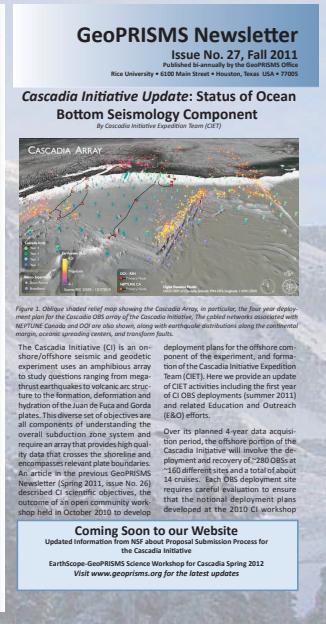
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Rice University • 6100 Main Street • Houston, Texas USA • 77005

***Cascadia Initiative Update*: Status of Ocean Bottom Seismology Component**

By Cascadia Initiative Expedition Team (CIET)

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 cabled networks associated with NEPTUNE Canada and OOI are also shown, along with earthquake distributions along the continental margin, oceanic spreading centers, and transform faults.

The Cascadia Initiative (CI) is an on-shore/offshore seismic and geodetic experiment uses 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 (CIET). Here we provide an update of CIET 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 OBSs at ~160 different sites and a total of about 14 cruises. Each OBS deployment site requires careful evaluation to ensure that the notional deployment plans developed at the 2010 CI workshop

Coming Soon to our Website

Updated information from NSF about Proposal Submission Process for the Cascadia Initiative

EarthScope-GeoPRISMS Science Workshop for Cascadia Spring 2012

Visit www.geoprisms.org for the latest updates

More info: ***http://www.geoprisms.org***

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**

info@geoprisms.org

www.geoprisms.org

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