

SCD Implementation Plan

By Postdocs and Graduate Students

1. What governs the size, location, and frequency of great subduction zone earthquakes and how is this related to the spatial and temporal variation of slip behaviors observed along subduction faults?

Understand segment boundaries and individual segment behavior over multiple seismic cycles

Observations! Observations! Observations! -
paleoseismic, paleogeodetic, geodetic, seismological,
controlled source seismic imaging

Laboratory Experiments

Model the processes

These are all interconnected!

2. How does deformation across the subduction plate boundary evolve in space and time, through the seismic cycle and beyond?

Improve observation of the variability of seismic behaviors --
**MARGINS WITH ALONG-STRIKE VARIABILITY ARE
HIGHLY DESIRABLE!**

Investigate non-megathrust or splay faults

3. How do volatile release and transfer affect the rheology and dynamics of the plate interface, from the incoming plate and trench through to the arc and backarc?

- Laboratory experiments
 - Kinetics of volatile release, frictional properties, fault zone structure
- Relation of megathrust rheology to deeper slab-mantle coupling
- Comparisons of sites with varying amounts of serpentine

4. How are volatiles, fluids, and melts stored, transferred, and released through the
- Ground-truthing of models for presence of serpentine
 - Complete, detailed study of adjacent volcanoes
 - MT, geologic mapping, seismic velocity & attenuation, gas & arc geochemistry, phase equilibrium, geodetics
 - Coupling modeling with field observations of exhumed slab and wedge complexes with respect to

5. What are the geochemical products of subduction zone, from mantle and geochemical reservoirs to the architecture of arc lithosphere, and how do these influence the formation of new continental crust?

- Volcanic versus plutonic (rates of emplacement, growth, crustal architecture)

- Fieldwork on exhumed arc

- Active arc:

- Seismic survey

- Geochronologic framework

- Thermal models

6. What are the physical and chemical conditions that control subduction zone initiation and the development of

- Initiation – ~~more of a systems?~~ “more of a fundamental theme”
- Hypothesis testing: Two end members available of induced and spontaneous subduction initiation.
- To-do: obtain time records from end-member situations, modeling, compare circum-pacific sites
- Hypothesis testing: are ophiolites remnants of subduction initiation? implication for future research on the subject. To-do: field work with geophysics,

6. What are the physical and chemical conditions that control subduction zone initiation and the development of mature arc systems?

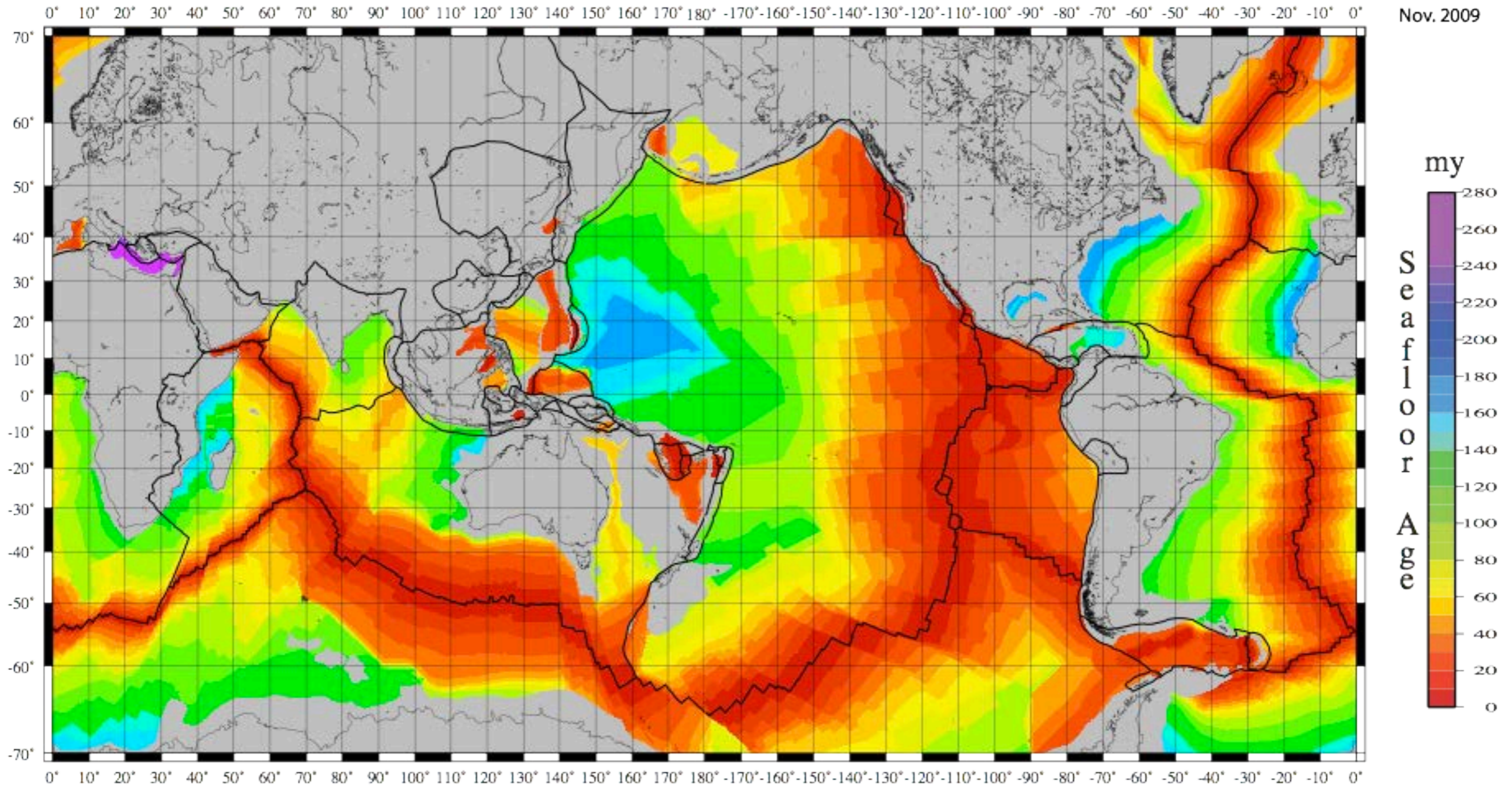
- Evolution – more of a “focus site” approach
- Focus on regions with clear time evolution and along- and across-arc variations
- Tools should include pretty much everything, with emphasis on time: geologic mapping, dating, seismic surveys, isotope studies of volcanic melt, modeling in 3 and 4 dimensions

7. What are the critical feedbacks between surface processes and subduction zone mechanics and dynamics?

- Broad application to potential primary and secondary sites
- Key: sediment influx changes along strike, between regions
- To-do:
 - Compilation of datasets of lithologies and sediment thickness
 - Integration of landscape evolution studies and geodynamic modeling

Recurring Criteria for Primary Site Selection

- Along strike variability
- Baseline information - geophysical, geological, geochemical, geochronologic
- Infrastructure
- Data availability




[w-cl28-240-02:gmt/scripts/akmodel] jadamec% crmptopoMON.gmt global (0 180, -180 0) -70 70 300 2

sfagexyz = "/data/datalib/Seafloor_age/Muller_08/age.3.6.xyz"

plates = "/data/datalib/PlateBndy/Bird_2003_pltBndys/PB2002_boundaries.dig"

Primary Site #2

A world map with a green and brown color scheme, showing continents and oceans. The map is centered on the Pacific Ocean, with North and South America on the right and Asia and Australia on the left.

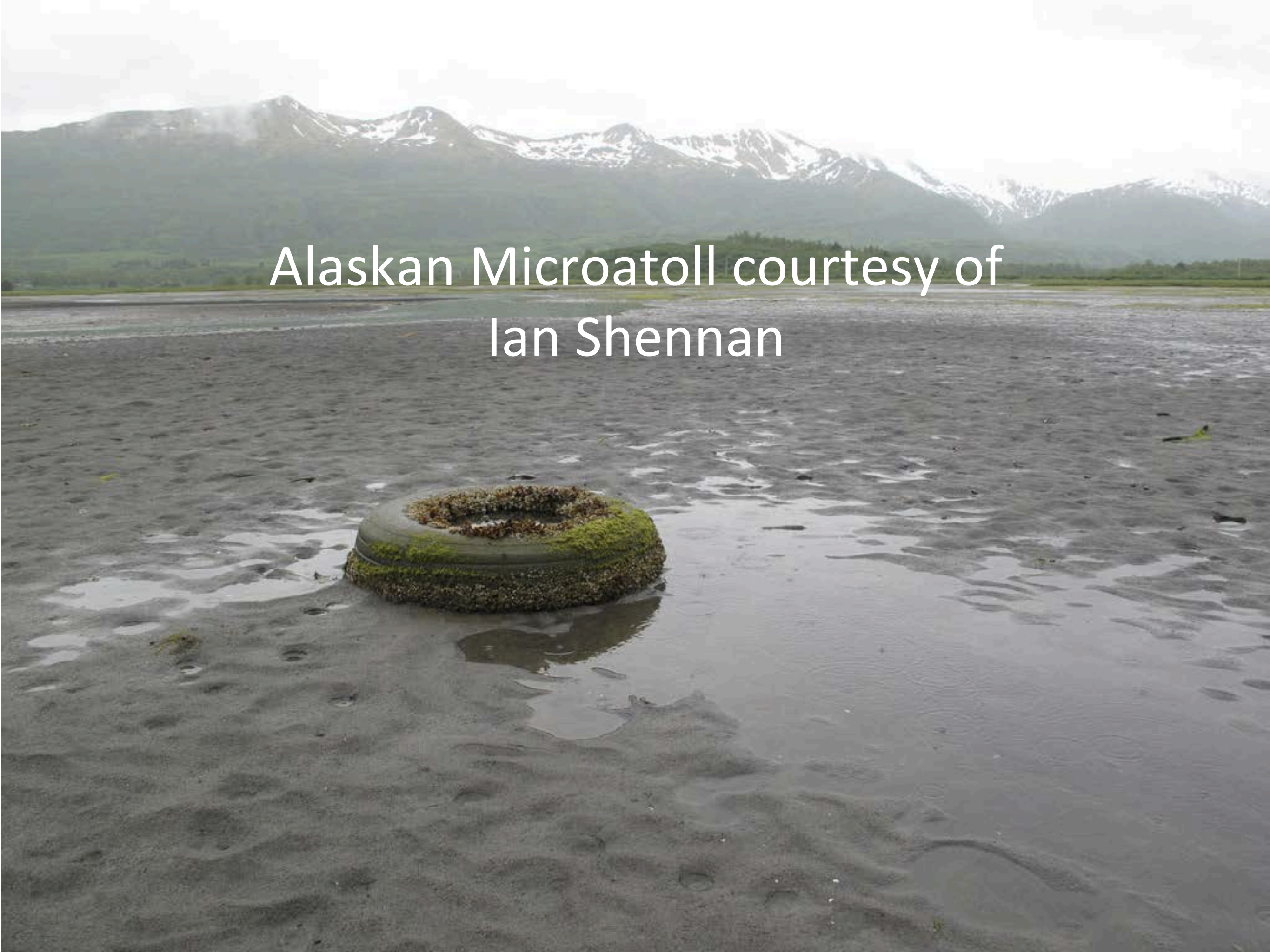
- Vote breakdown
 - New Zealand - 8
 - Cascadia - 3
 - Chile - 1

Thematic Studies

- Exhumed subduction systems
- Volatile effects on rheology and dynamics
- Volatile storage, transfer, and release
 - slab-mantle wedge interactions
- Subduction Initiation
- Feedbacks with surface processes

Broader impacts

- Directly relate to site and theme selection
- Distinguish GeoPRISMS from CORE
- Relevance of SCD research to public :
constraint of fundamental processes that control major hazards (earthquakes, volcanic eruptions provide instant connection to public interest).
- Greater public outreach
- Consistent student interaction from undergrad to grad level, with early career support
(Wiki site for students to maintain interaction outside of scheduled meetings)

A photograph of a microatoll in Alaska. In the foreground, a dark, circular structure, likely a microatoll, sits in a shallow pool of water on a dark, sandy beach. The structure is covered in green algae and has a central depression. The background shows a vast, flat landscape leading to a range of mountains with snow-capped peaks under a cloudy sky.

Alaskan Microatoll courtesy of Ian Shennan