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Calendars



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Initiatives

- Science Overview
- Subduction Cycles and Deformation
 - o ExTerra
- Rift Initiation and Evolution

Sites

- Alaska
- Cascadia
 - o Cascad
- East Africa Rit
- Eastern North
- Eastern North America
 - Seismic Experiment

New Zealand

Themes

- Continental Crust
- Fluids and Maamas

Subduction Cycles and Deformation (SCD)

More about the SCD Implementation Workshop (Jan 5-7, 2011)
The SCD Implementation Workshop is now complete! More about the workshop outcomes.

Research Data Portal Education Meetings About Us

The GeoPRISMS SCD Initiative will address coupled processes active at subducting margins and explore linkages among them, spanning the updip limits of the accretionary wedge and incoming plate, to the deep mantle and plate boundary interface, and associated cycling of fluids

and volatiles, their role in rheology, melting, and magmatism, and ultimately, arc processes that lead to the growth of continental crust. This new initiative formalizes the strong linkages between SEIZE and SubFac recognized during MARGINS, and will facilitate the interdisciplinary exchange of knowledge within the subduction zone community, enabling transformative discoveries of this highly coupled system.

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

- · How are volatiles, fluids, and melts stored, transferred, and released through the subduction system?
- What are the geochemical products of subduction zones, from mantle geochemical reservoirs to the surface, and how do these influence the formation of new continental crust?
- What are the physical and chemical conditions that control subduction zone initiation and the development of mature arc systems?
- What are the critical feedbacks between surface processes and subduction zone mechanics and dynamics?

RESEARCH

Earth Connections: Deep Processes and Their Impact on Earth's Surface Environment



CHALLENGES

- 8 | What are the composition, structure, and dynamics of Earth's upper mantle?
- 9 | How are seafloor spreading and mantle melting linked to ocean arustal architecture?
- 10 | What are the mechanisms, magnitude, and history of chemical exchanges between the oceanic a usi and seawater?
- 11 | How do subduction zones initiate, cycle volatiles, and generate continental crust?



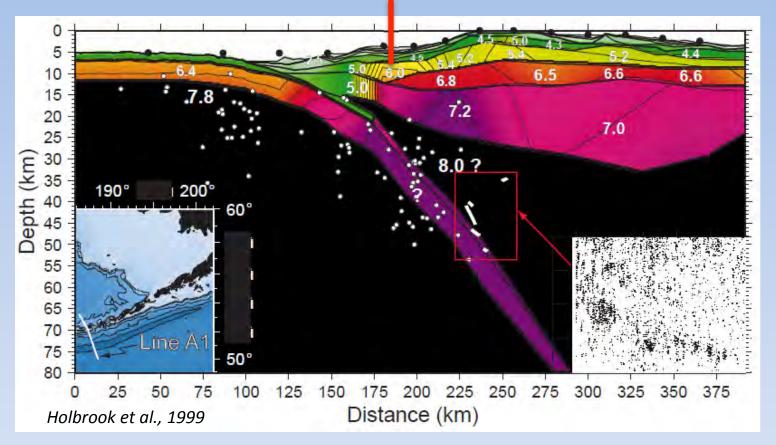
The primary transfer of energy and material from the deep Earth to the surface environment occurs when seafloor volcanism creates oceanic crust, including mid-ocean ridges, seamounts, volcanic islands, massive oceanic plateaus, and island arcs. Melting processes that generate these features leave nuanced records

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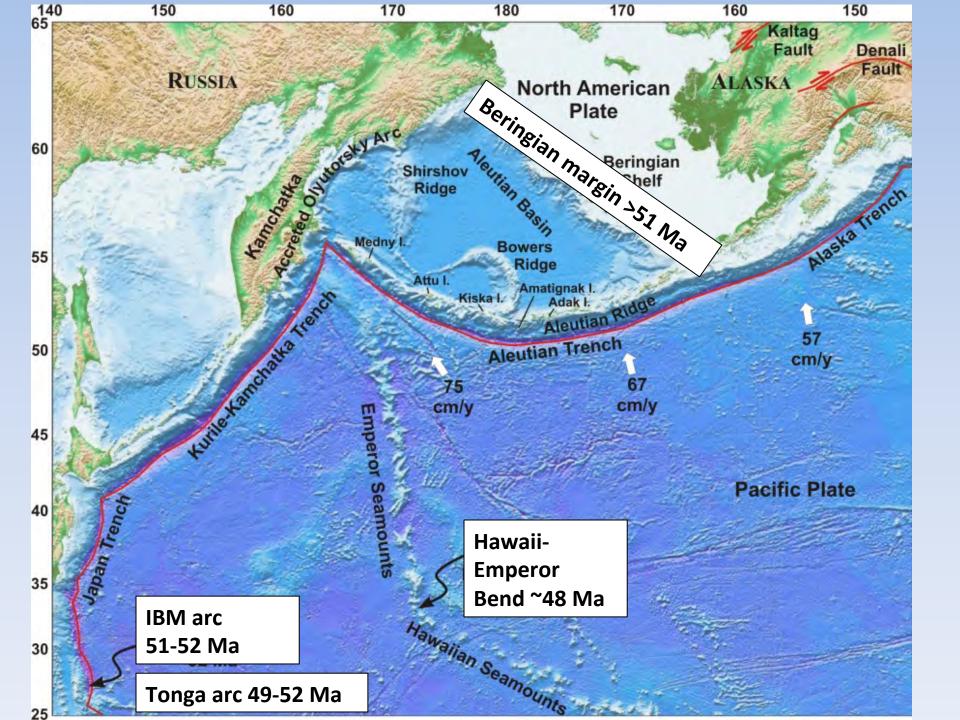
Scientific ocean drilling will:

 Pursue the challenge of penetrating the 5-6 km thick oceanic crust and directly sampling for the first time the underlying mantle from which all oceanic crust, and much of the continental crust, is derived

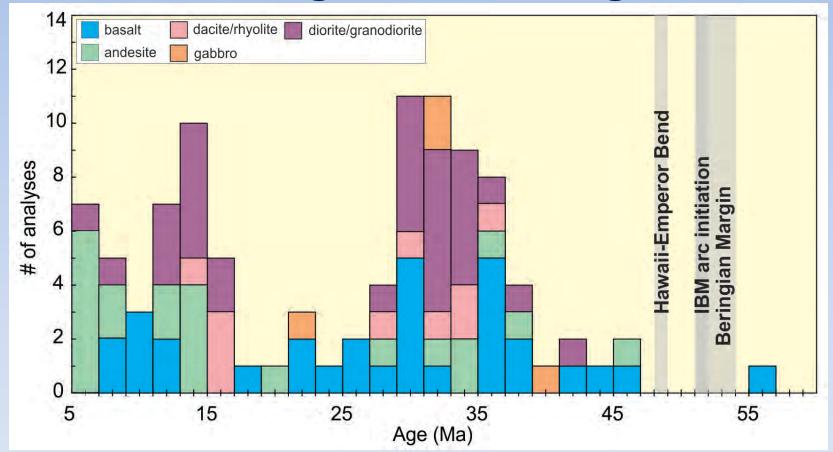
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- In order to understand how and when subduction began in the Aleutians, we need to drill into and sample forearc basement.
 - IBM & Tonga forearc sampling has been very successful
 - Progression of Aleutian volcanism is from south to north
- Must sample airfall tephra which can provide unparalleled record of explosive volcanism and magmatic history of an arc segment.



Aleutian magmatism through time



- Geochronologic data is sparse; biased towards plutons
- Episodic vs continues growth of island arc systems
- Boninites?

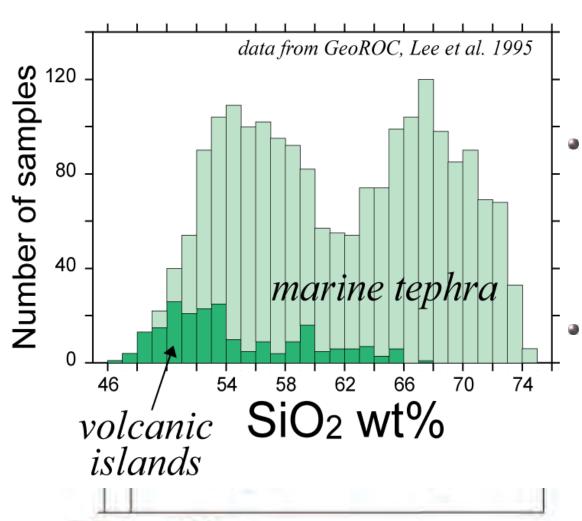
Izu Bonin

proximal

Mariana

fallout tephra

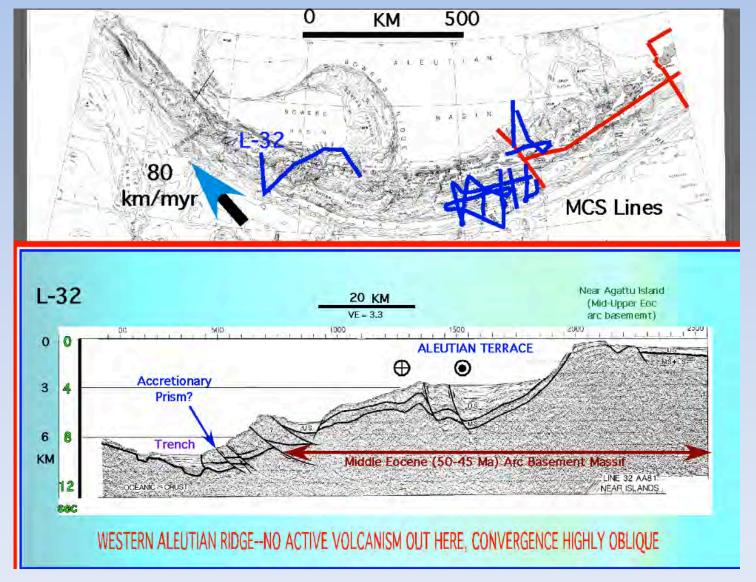
Mariana arc



- Tephra record of Izu-Bonin-Mariana Arc is good example of value of this work
- Tephra studies can complement and fill in gaps in the solid rock record
- Does not provide an accurate estimate of volumetric growth of the arc

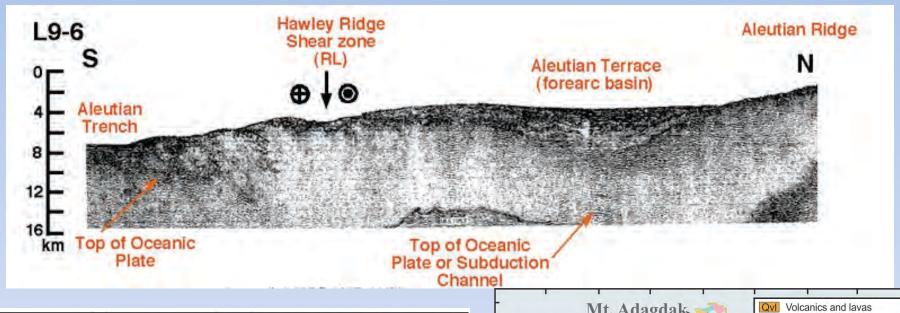
Izu-Bonin principally from ODP site 782A, Mariana mostly 458 & 459

Where to drill to recover Aleutian tephra and early arc crust?

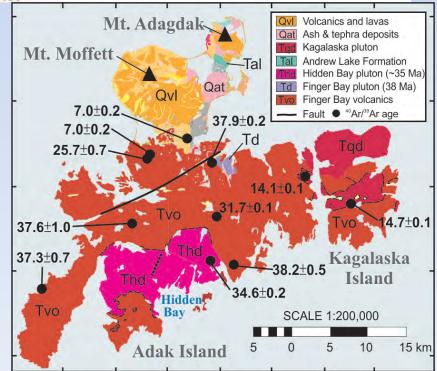


 Trans-tensional rifting in Near Islands may not provide clues to arc evolution

Where to drill to recover Aleutian tephra and early arc crust?







Where to drill to recover Aleutian tephra and early arc crust?

