LA-UR-22-29878

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Title:	Cascadia Hydrothermal Circulation IN Oceanic Crust
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Intended for:	CSES Geophysics Symposium
Issued:	2022-09-23

CHINOOK

Cascadia Hydrothermal Circulation IN Oceanic Crust

Center for Space and Earth Science

Geophysics Symposium, 22 September 2022

Los Alamos NATIONAL LABORATORY EST. 1943

Rapid Response IPD Project

Clara Stanbury[1], Glenn Spinelli[2], Robert Harris[3], Anne Trehu[3]

1. Los Alamos National Laboratory 2. New Mexico Institute of Mining and Technology 3. Oregon State University

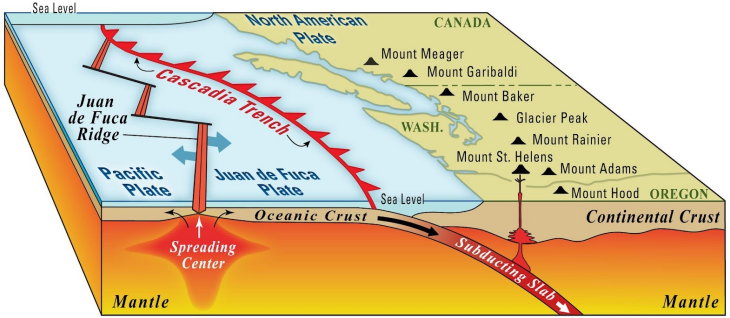
The Setting

Cascadia Subduction Zone

- Mag 9 earthquakes in past
- Temperature plays a role in seismicity
- Young, warm crust with high sedimentation rates
- Basement highs and pseudofaults

Goal:

Assess the thermal state of the Juan de Fuca plate entering the subduction zone, focusing on quantifying the effects of hydrothermal circulation



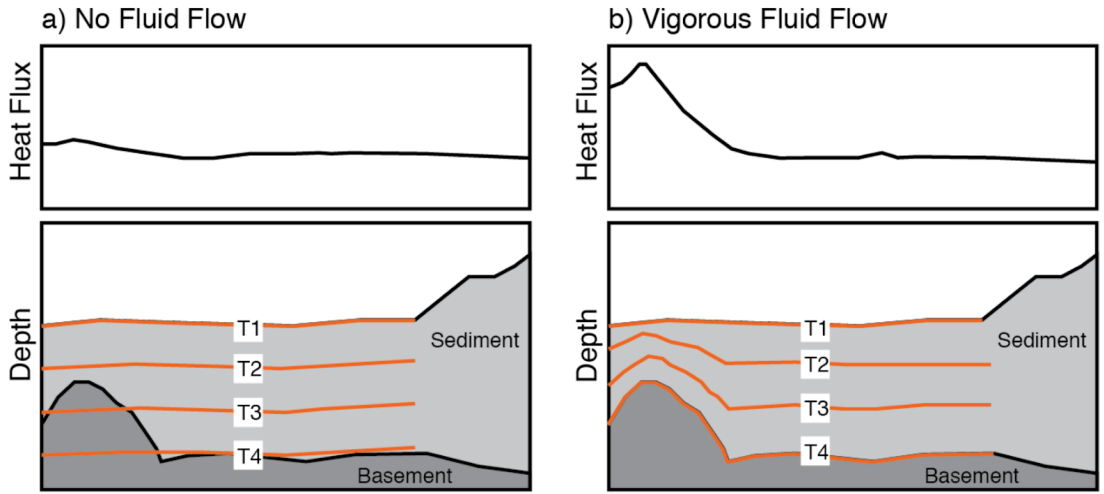
Basement Highs

Marine Heat Flow

q = -k dT/dz

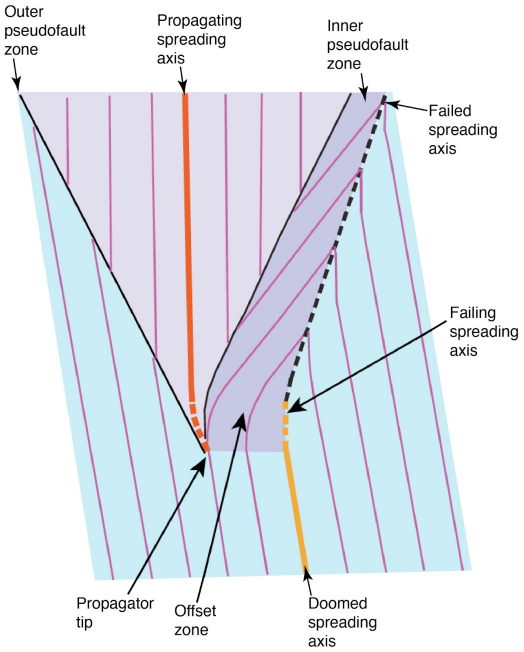
dT/dz = thermal gradient

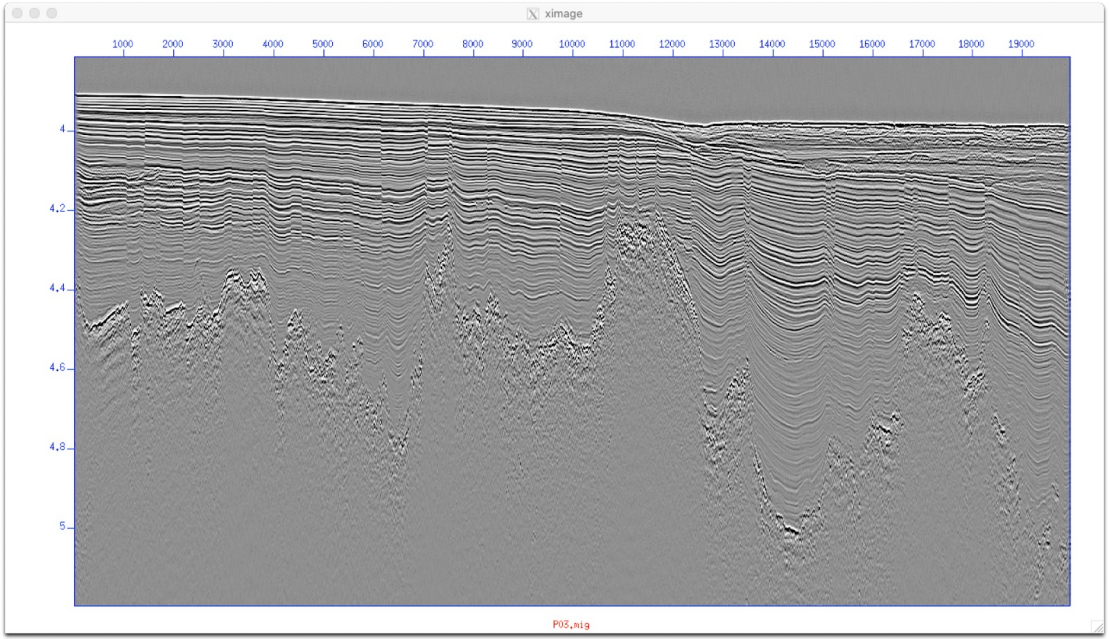
k = thermal conductivity



- Testing for hydrothermal circulation (HC) in basement/crust
- This would look like an isotherm along the crust (see b. T4)
- Appearance of HC is seen with higher heat flow above thinner layers of sediment (above basement highs)

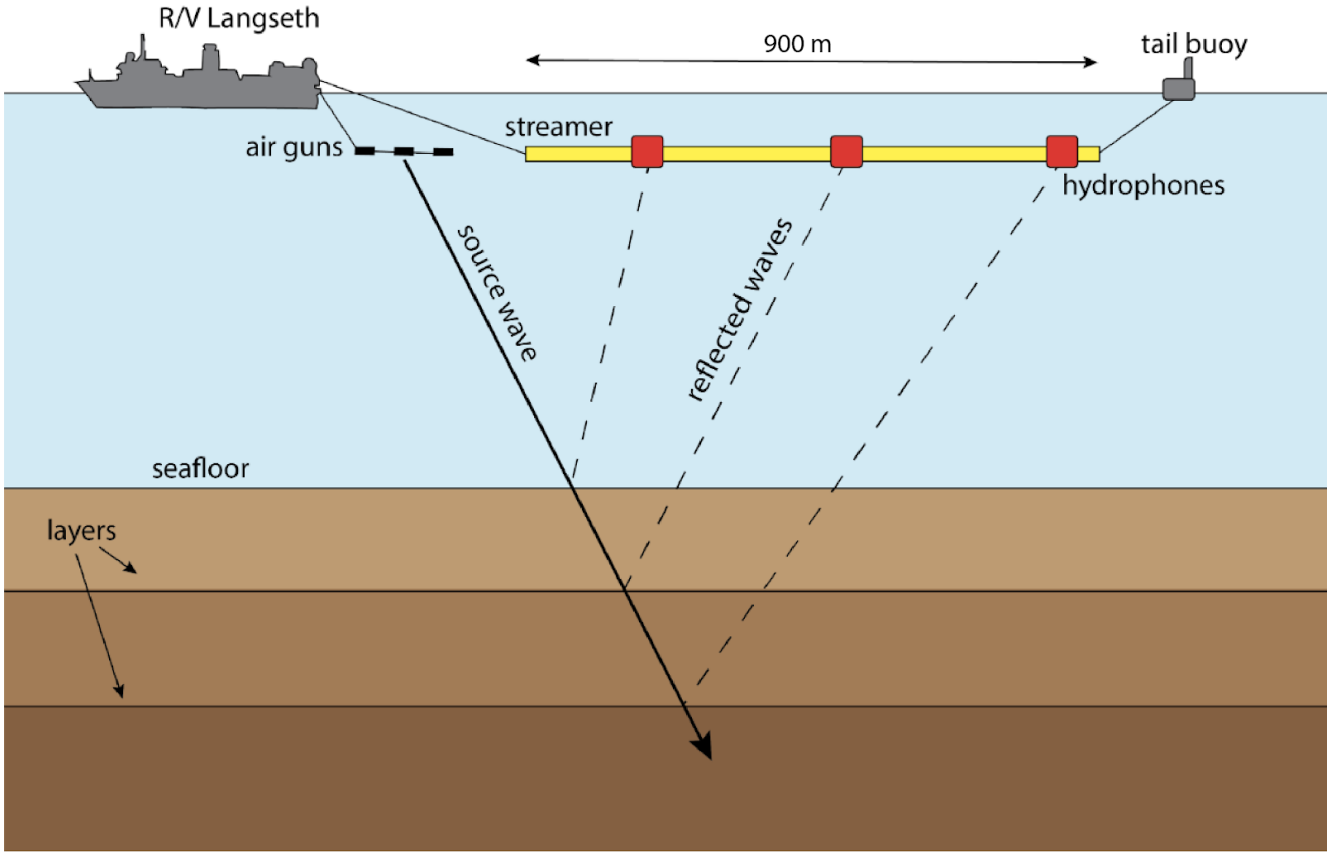
Pseudofaults





- Connection between crust of different ages
- Heat flow decreases with age
- How does this appear at Pseudofault 2 near the subduction zone?

Seismic Data Acquisition



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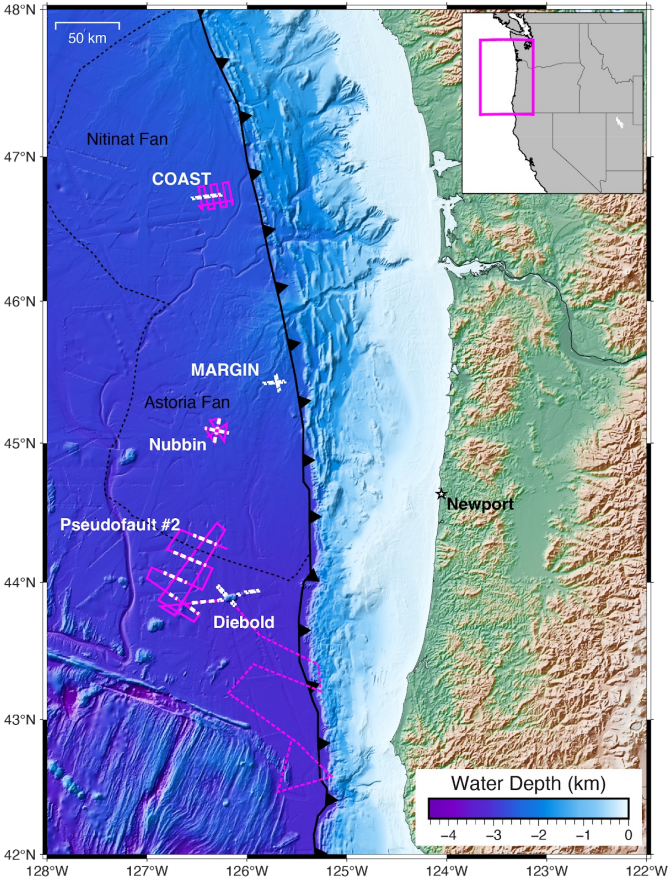
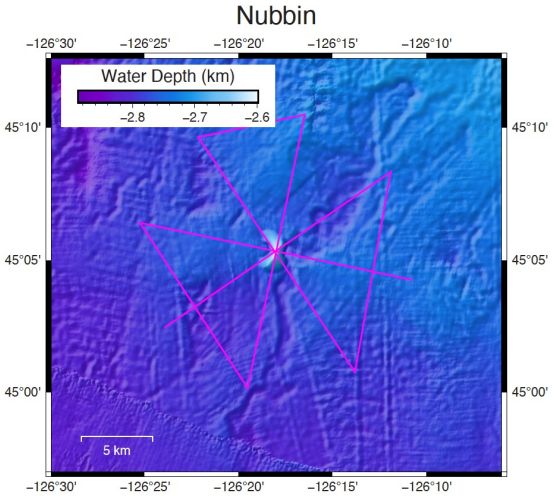
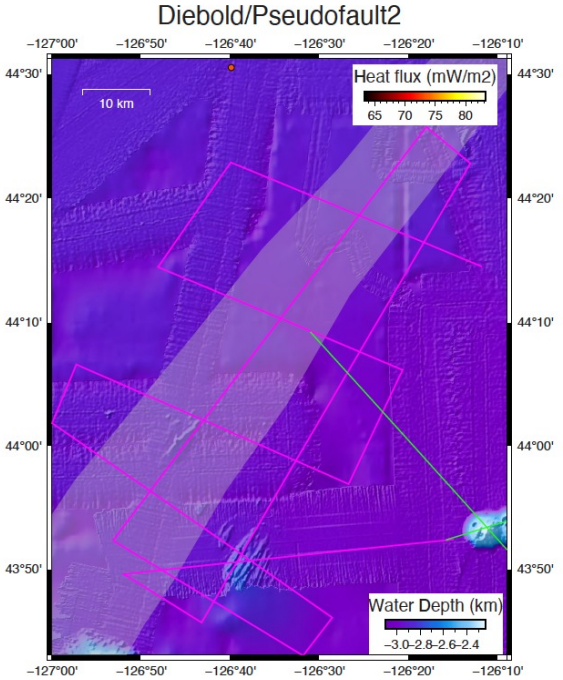
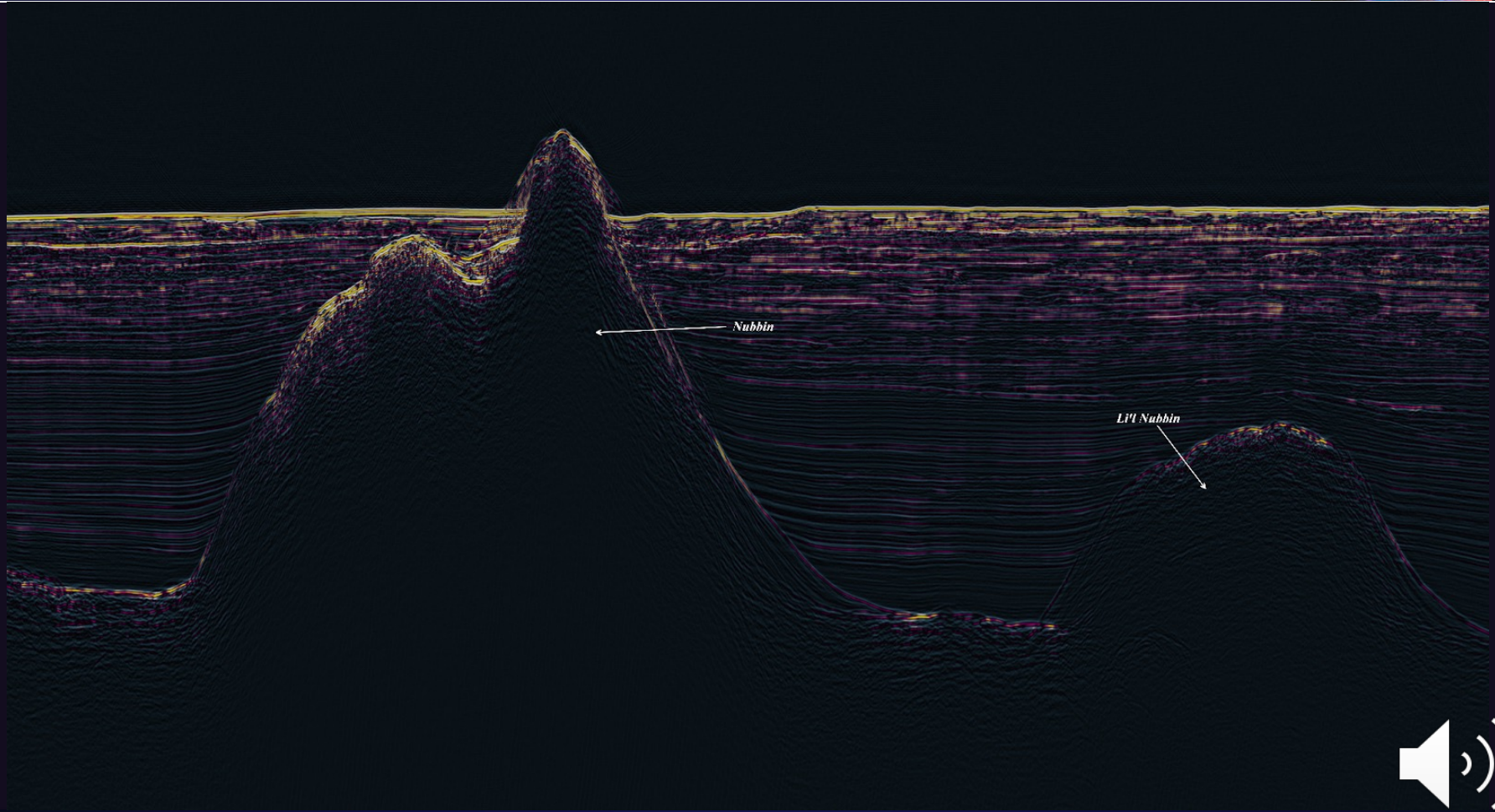






Seismic Data Results



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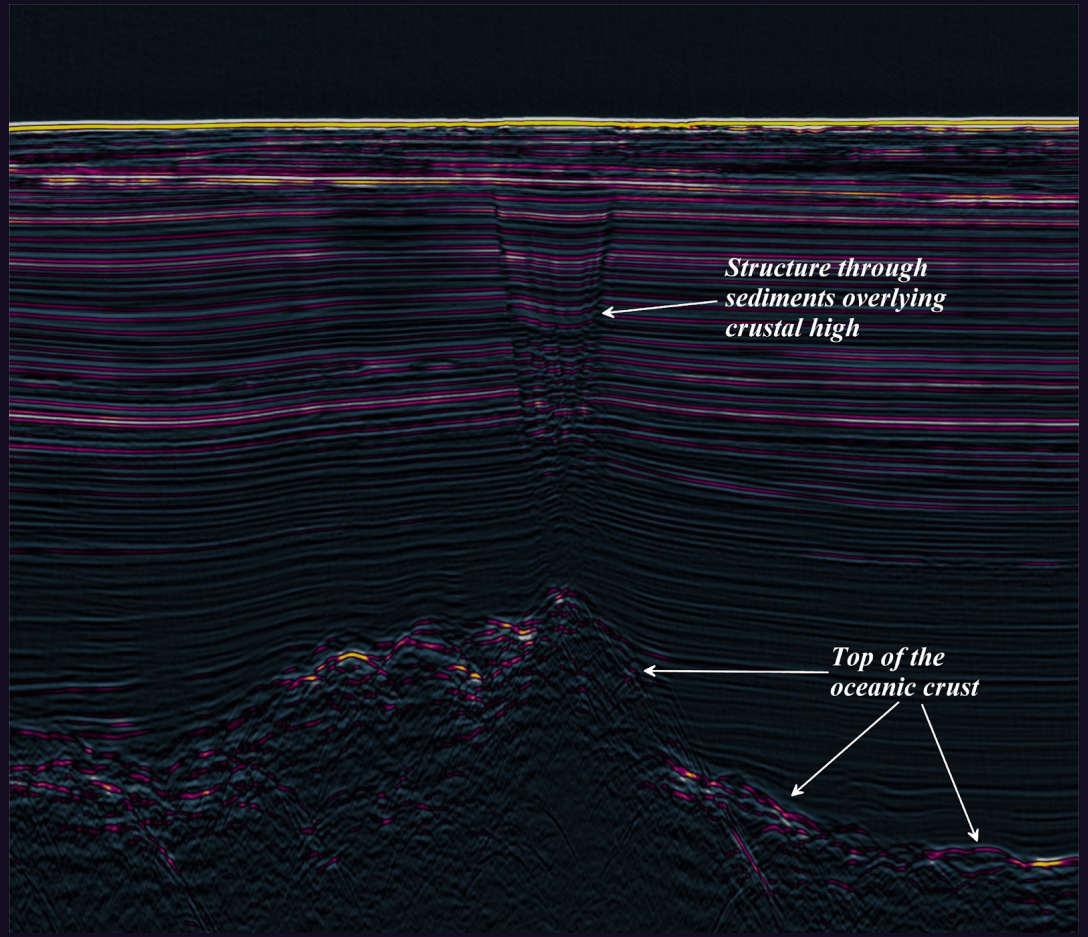
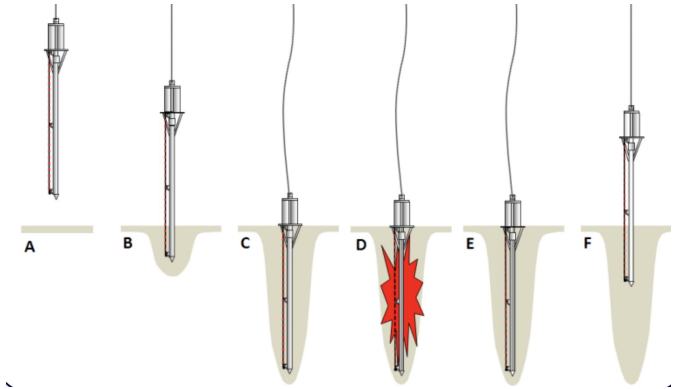


Heat Flow Data Acquisition



Marine Heat Flow

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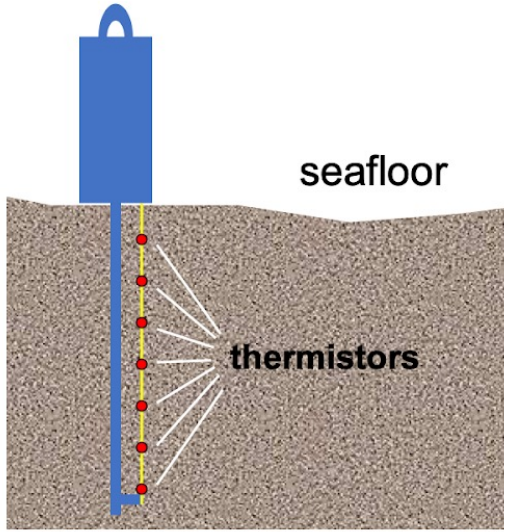
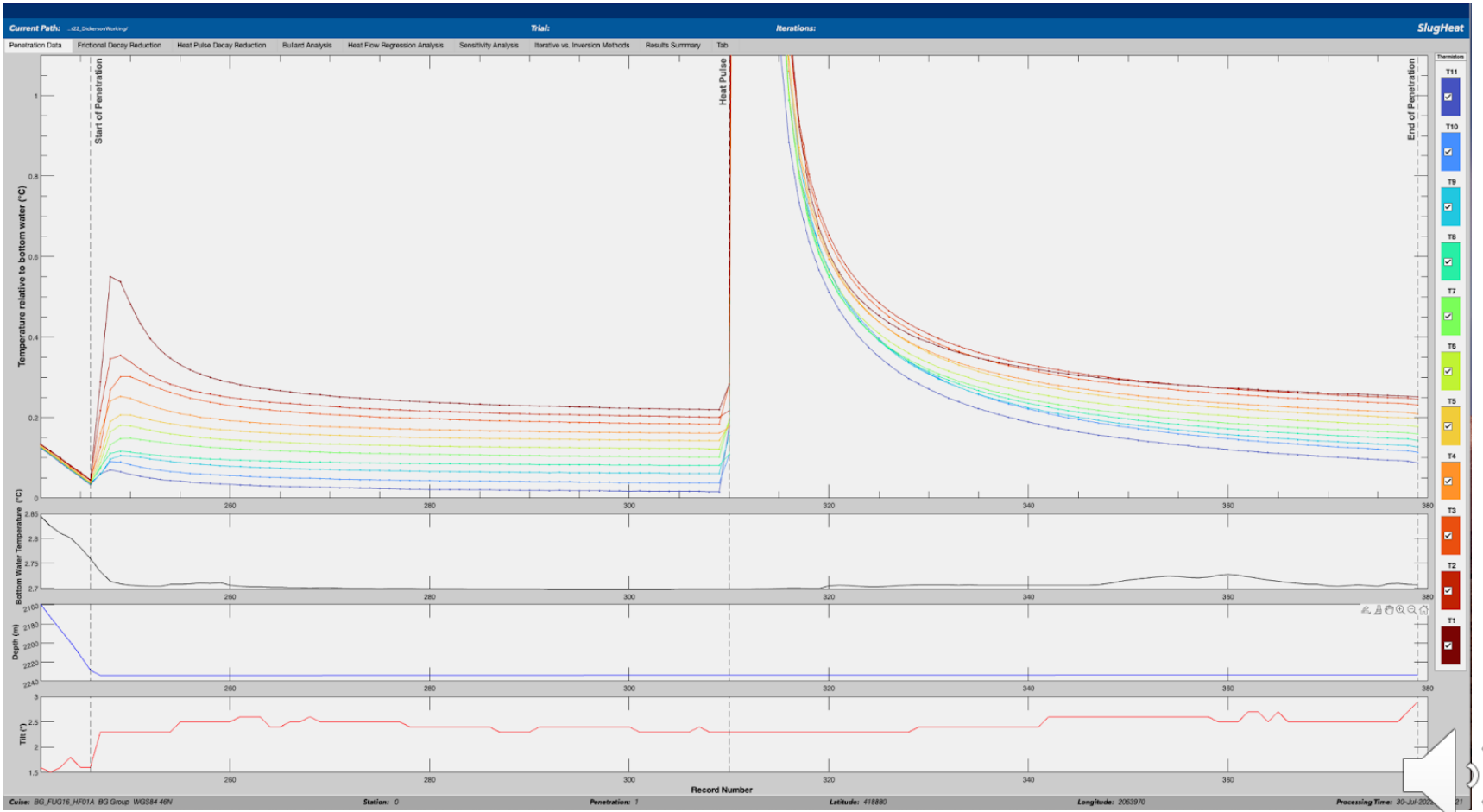


Heat Flow Data Acquisition

Heat Flow Data Results



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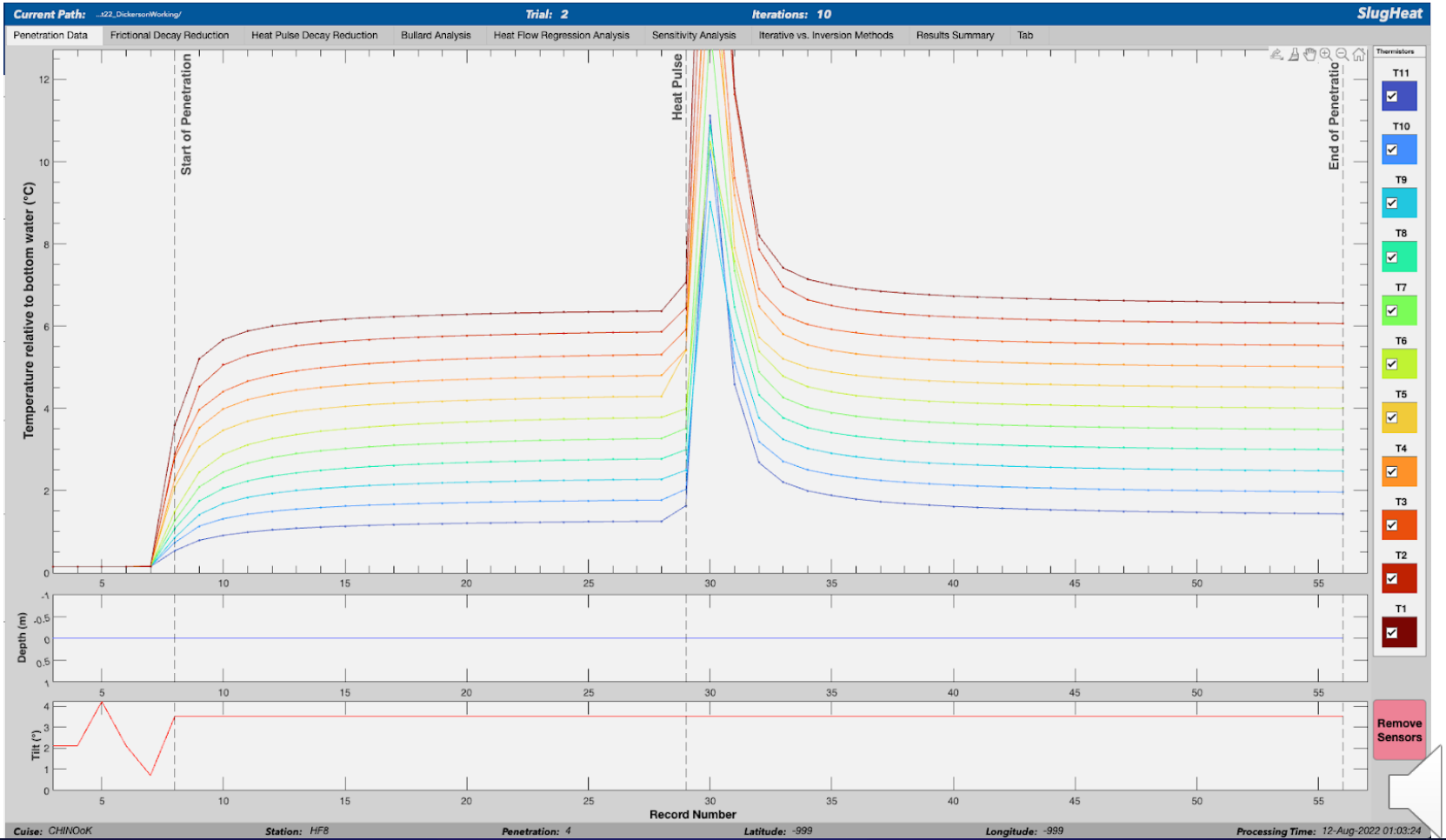

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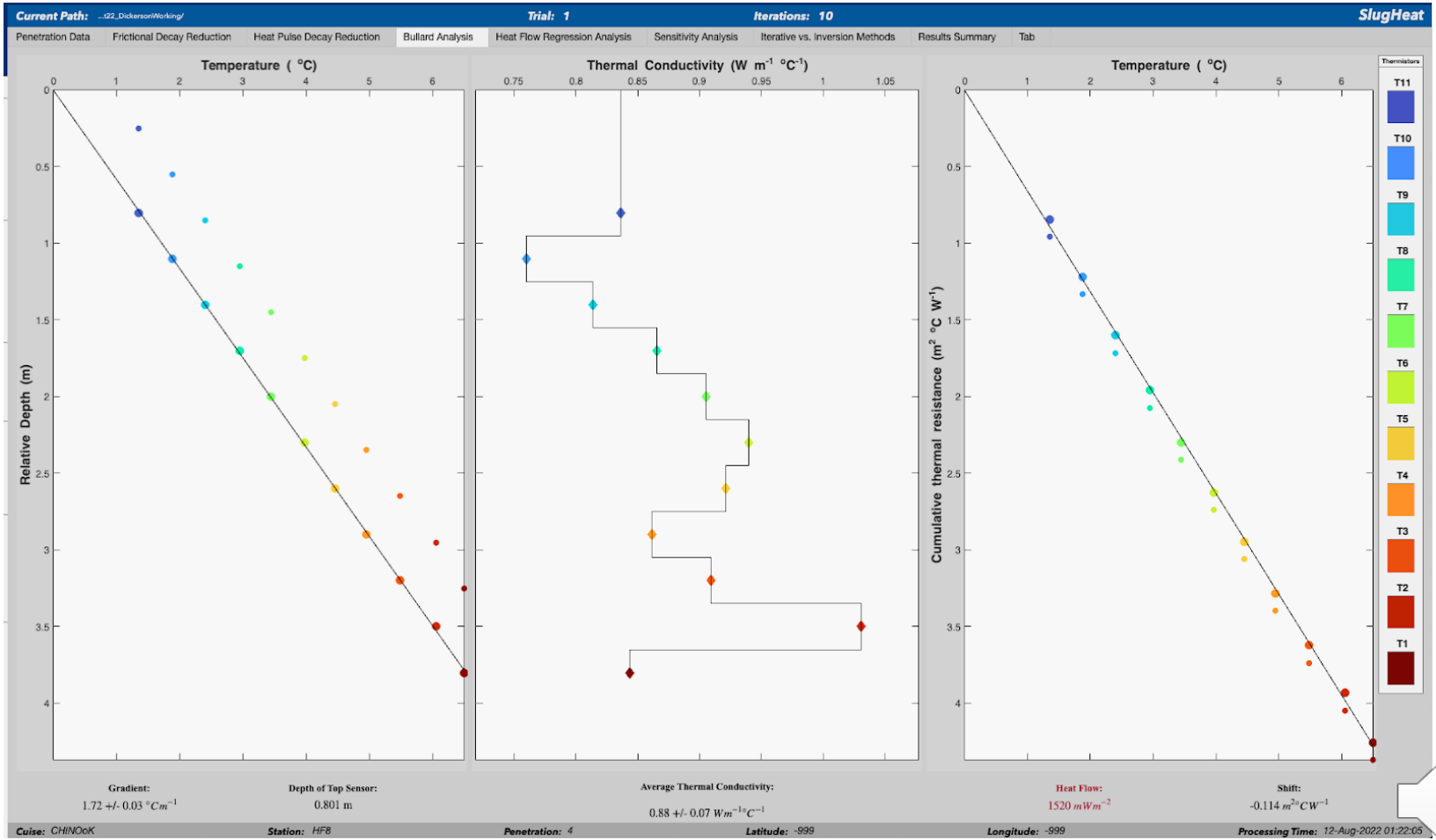
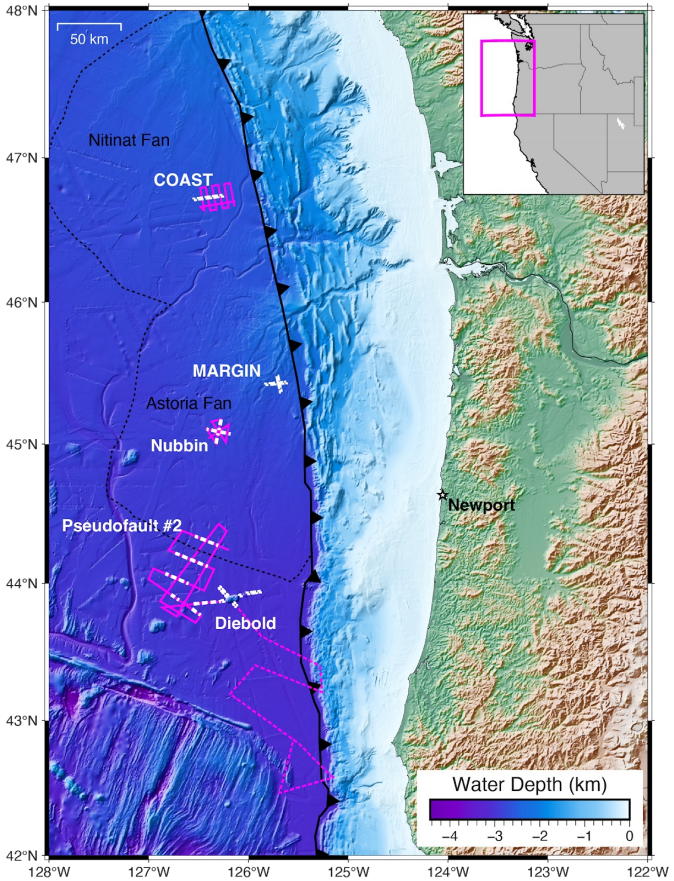
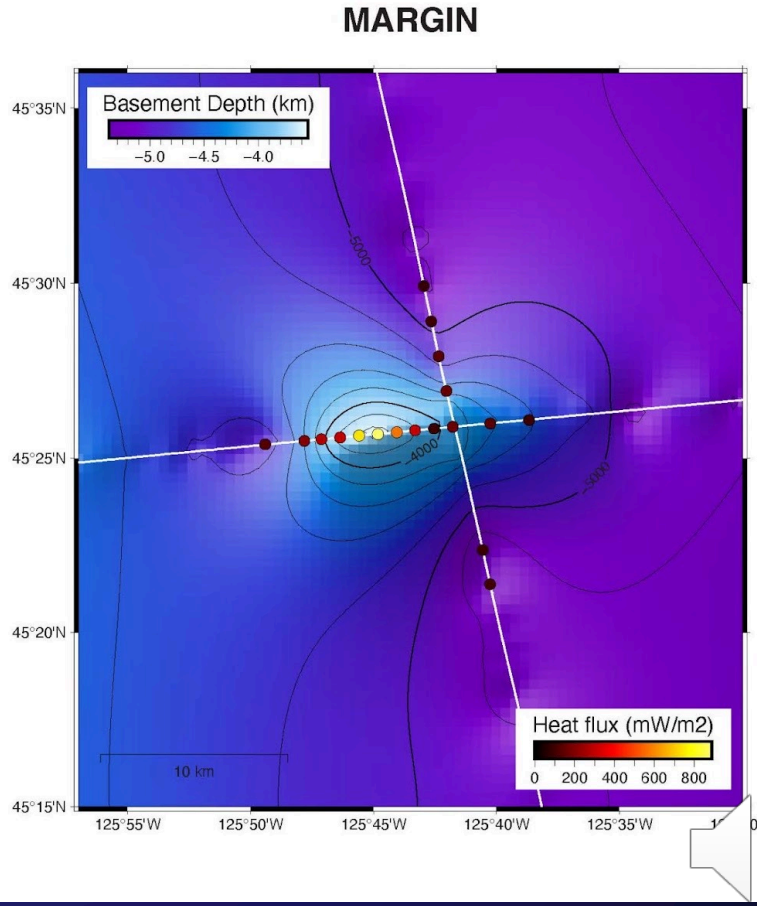
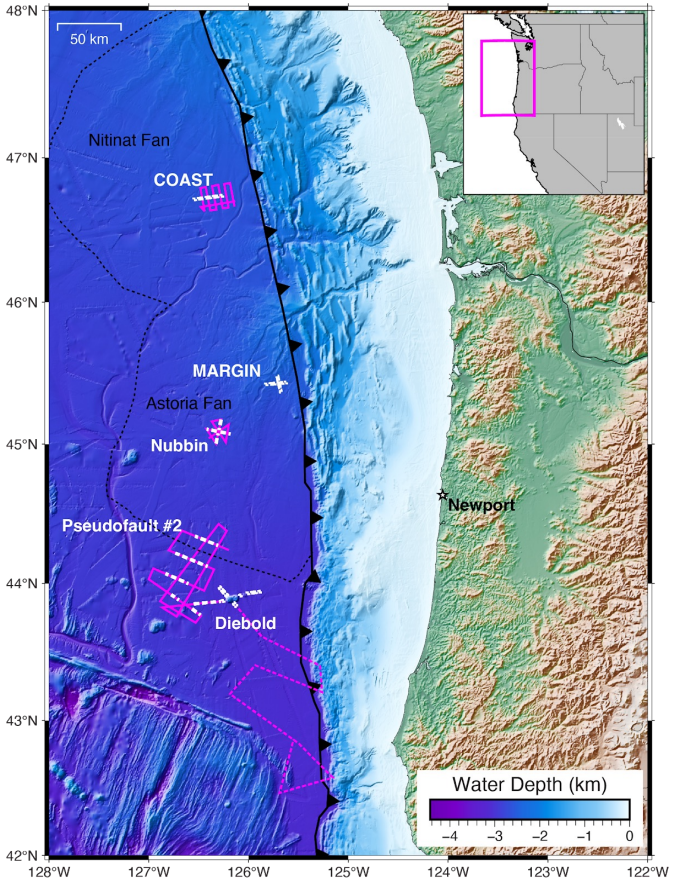


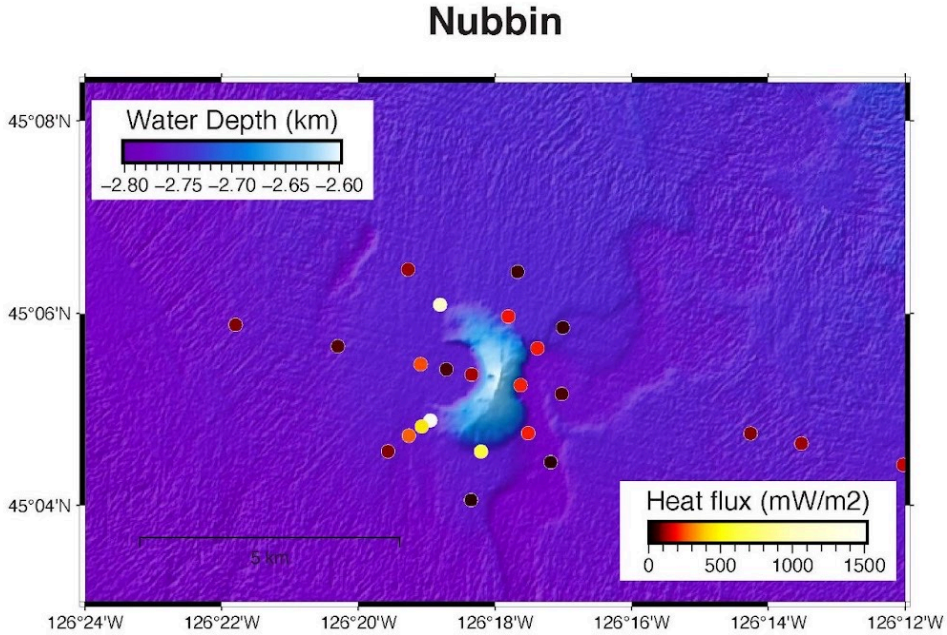
Fluid Flow at Margin



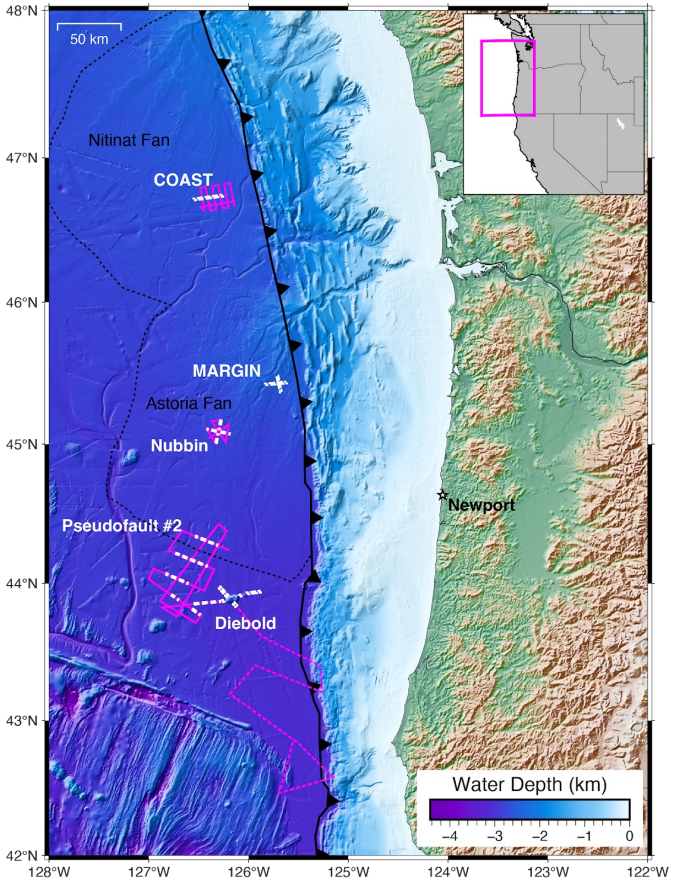


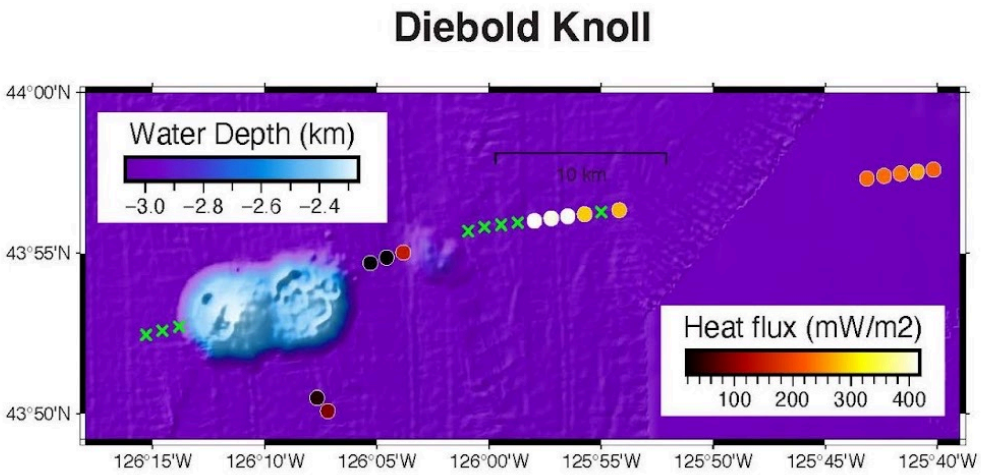
Discharge at Nubbin





Recharge at Diebold

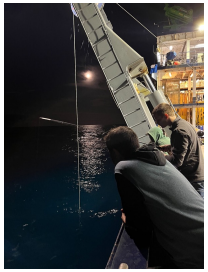


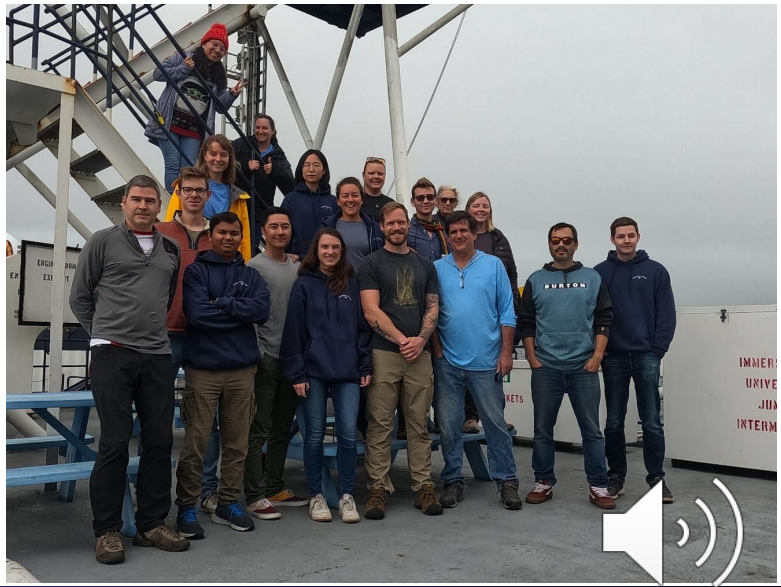


Planned Future Work

Working on paper interpreting the Pseudofault #2 seismic results

Potential follow-up projects include further heat flow expeditions with new probe model in May 2023





End Presentation Slides
Following slides submitted to CSES
for reporting purposes only

Collaborative Activity

- I spent 20 full days on board the RV Langseth
- Collaboration to start paper on Pseudofault 2 results with science party members and PIs from Oregon State University and New Mexico Tech
- I am still at LANL as a Post-Bacc until May of 2023
- Proposal for SSA Abstract planned for 2024
- Impacts due to unforeseen circumstances: the research cruise was cut short by one week due to engine malfunction

Collaborative Activity

1 – 2 Slides

- how much time was spent by students at LANL
- any visits by University PI, how long, how many
- any visits by LANL PI at University, how long, how many
- any other project related visits or meetings
- any other project related new collaborations with outside organizations

Follow-on Activity

1 – 2 Slides

- Did any new collaborations result from student/university interactions?
- Still in contact with student or University PI?
- Where is the student now? (if a student was involved in your Rapid Response Project, would the project/student benefit from follow on as a Student Fellow)?
- Any proposals resulted / submitted / planned?
- Status of proposals submitted
- Any other follow on or new project activity planned
- Any other personnel follow on (student -> postdoc, student to other student project, postdoc -> staff conversions)
- Which program offices might be interested in this project? (note any program office contact and interest)

Project Challenges and Feedback

1 – 2 Slides

- Staffing (Student / PostDoc / Staff availability)
- What would your ideal amount of funds be in an FY to maximize success?
- Project oversight /reporting – too much, too little, something different needed?
- Facility availability (e.g. access to LANCE, labs, etc)
- Impacts due to COVID, other unforeseen circumstances