

June 7-9, 2022

SZ4D-IPOC Coordination Workshop



www.sz4d.org



@SZ4D1



SZ4D Code of conduct

The SZ4D leadership team is committed to fostering the exchange of ideas and is dedicated to maintaining a safe, productive, and welcoming environment for all participants, no matter their function or their background.

This meeting is sponsored under a grant from NSF to the University of Washington. University policy prohibits discrimination because of race, color, creed, religion, national origin, citizenship, sex, pregnancy, age, marital status, sexual orientation, gender identity or expression, genetic information, disability, or veteran status. Any violation of this anti-discrimination policy is necessarily reported to the university for investigation.

All participants are required to abide by the SZ4D Code of Conduct. Reports of any potential violation of the Code of Conduct should be made to the SZ4D Program Manager Anaïs Férot (aferot@ucsc.edu) and will be routed to authorities as appropriate including legal authorities, home universities, and the National Science Foundation.

SZ4D Code of conduct

EXPECTED BEHAVIOR

- Treat all participants with respect, valuing a diversity of views and opinions.
- Be considerate, respectful, and collaborative.
- Acknowledge the contributions of others.
- Do not make audio/visual recordings of presentations unless permission is specifically approved

UNACCEPTABLE BEHAVIOR in all environments includes but is not limited to:

- Bullying, harassment, intimidation, or discrimination in in any form.
- Physical or verbal abuse by anyone to anyone.
- Sexual attention or advances, or inappropriate sexual references.
- Other conduct which could reasonably be considered inappropriate in a professional setting.

CONSEQUENCES

- Anyone requested to stop unacceptable behavior is expected to comply immediately.
- SZ4D leadership (or their designee) or security/local police may take action deemed necessary and appropriate, including:
 - immediate removal from the event,
 - prohibit attendance at a future event, online gathering, conference, workshop or field project.
 - send notification of an infraction to a Home Institution or Employer and/or NSF.

Goals for this meeting

- 1) Exchange of priorities
- 2) Identify opportunities and potential partnerships to pursue
For example, Accelnet proposal planning process
- 3) Develop meeting outcomes/recommendations to be addressed in final SZ4D implementation plan, and plan for transition into pilot and full stages of implementation
 - Encapsulated by workshop report
 - Please volunteer for writing committee
(hilley@stanford.edu)

What is SZ4D: Subduction Zones in Four Dimensions?

An NSF-funded **Research
Coordination Network** focussed on
the basic science underlying
geohazards in subduction zones
including earthquakes, tsunamis,
volcanoes and landslides

A priority in the National Academies
Earth in Time Decadal Report 2020 - 2030



McGuire et al., 2017



What is SZ4D: Subduction Zones in Four Dimensions?



Charged to develop a plan (report) to transform our understanding of geohazards in subduction zones by utilizing a combination of **instrumentation** and **activities**

The Research Coordination network does this through:

WORKING GROUPS themed around specific hazards and parts of the subduction system designing infrastructure and activities in support of a long-range science vision

INTEGRATIVE GROUPS planning infrastructure and activities that reach across the system

COMBINED ACTIVITIES cross-cutting groups and reaching out to the larger community via town halls, webinars, and workshops

Work with partners and funders to make plan a reality

What is SZ4D: Subduction Zones in Four Dimensions?



Working Groups define science goals and strategies



Faulting & Earthquake
Cycles Working Group
(FEC)



Magmatic Drivers of
Eruption Working Group
(MDE)

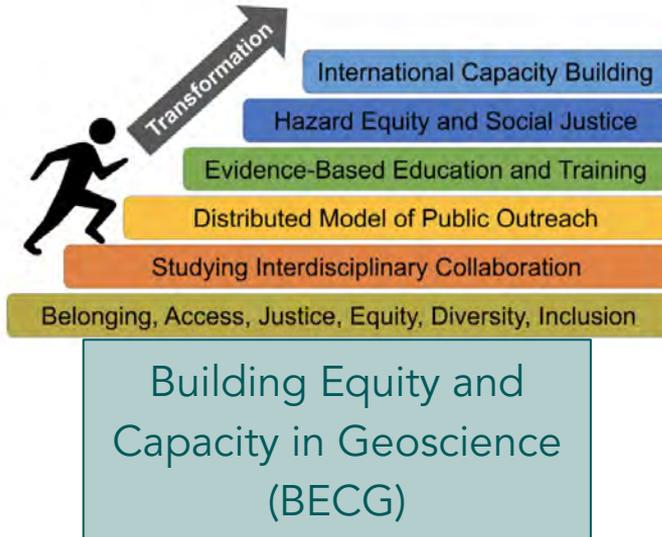


Landscapes & Seascapes
Working Group
(L&S)

What is SZ4D: Subduction Zones in Four Dimensions?



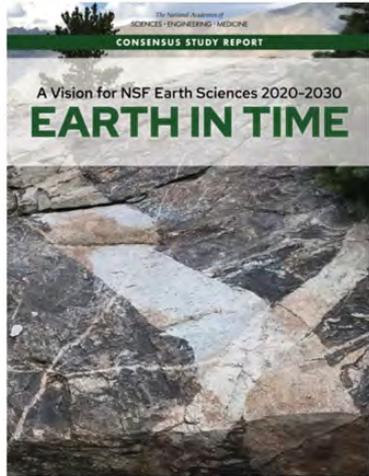
Integrative Groups planning infrastructure and activities that reach across the system



What is the purpose of these committees, town halls, webinars and reports?



To instigate a large-scale program



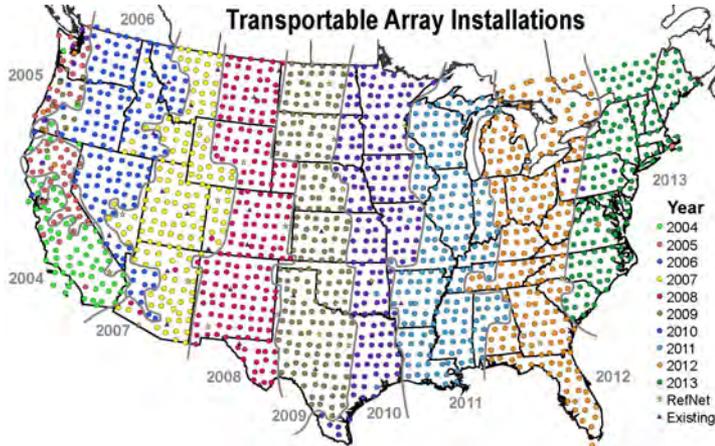
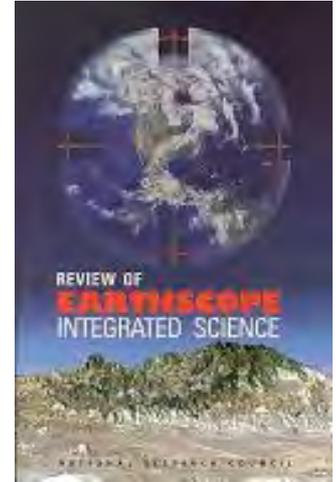
www.sz4d.org



Watch on YouTube

How do large-scale programs in the US happen?

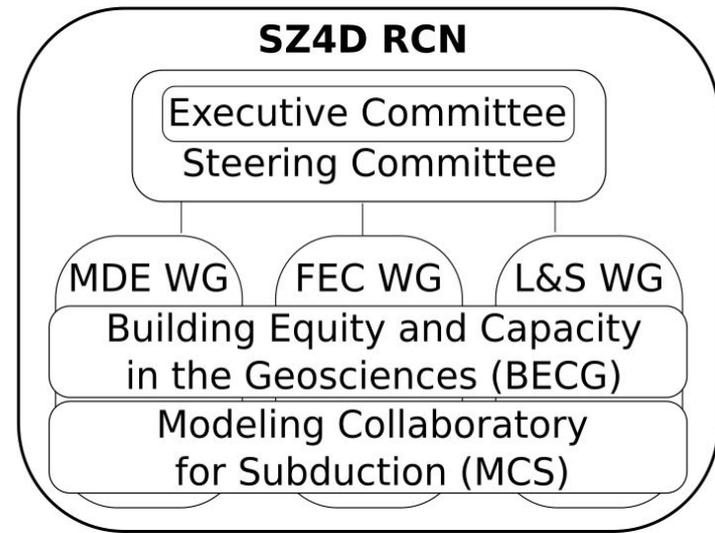
- Organize
- Write Reports
- Apply For Opportunities
- Coalesce within and across agencies



Who is SZ4D now?

74 US-based scientists on committees from 55 universities and research institutes

1500+ scientists engaged

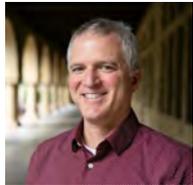


Steering Committee and Executive Committee

Who is here from SZ4D?



Emily Brodsky
U California Santa Cruz
Chair, ExCom
Chair Steering Committee, FEC



George Hilley
Stanford
Member, ExCom
Steering Committee, L&S



Diana Roman
Carnegie
Member, ExCom
Steering Committee, MDE



Anaïs Férot
U California Santa Cruz
Program Manager



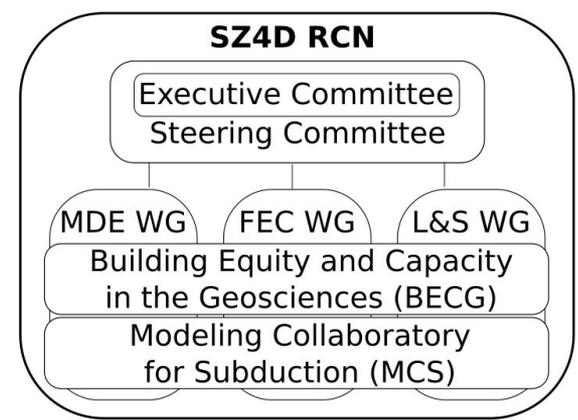
William Frank
MIT
Member, FEC



Demian Saffer
U Texas Institute for Geophysics
Member, FEC



Doug Wiens
Washington University in St. Louis
Steering Committee, FEC



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Anaïs Férot
U California Santa Cruz
Program Manager



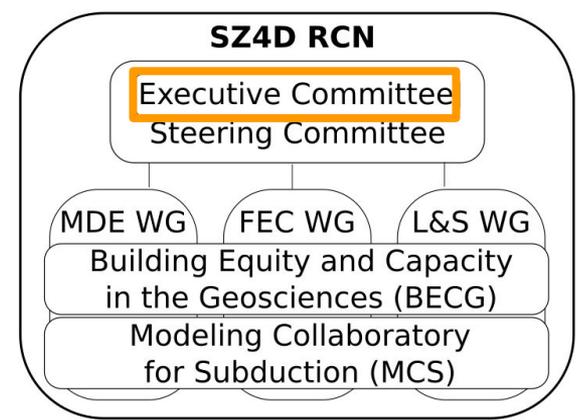
William Frank
MIT
Member, FEC



Demian Saffer
U Texas Institute for Geophysics
Member, FEC



Doug Wiens
Washington University in St. Louis
Steering Committee, FEC



Who will we be soon?



Open call includes international members

3 year rotation, staggered to cycle a third of the committee each year

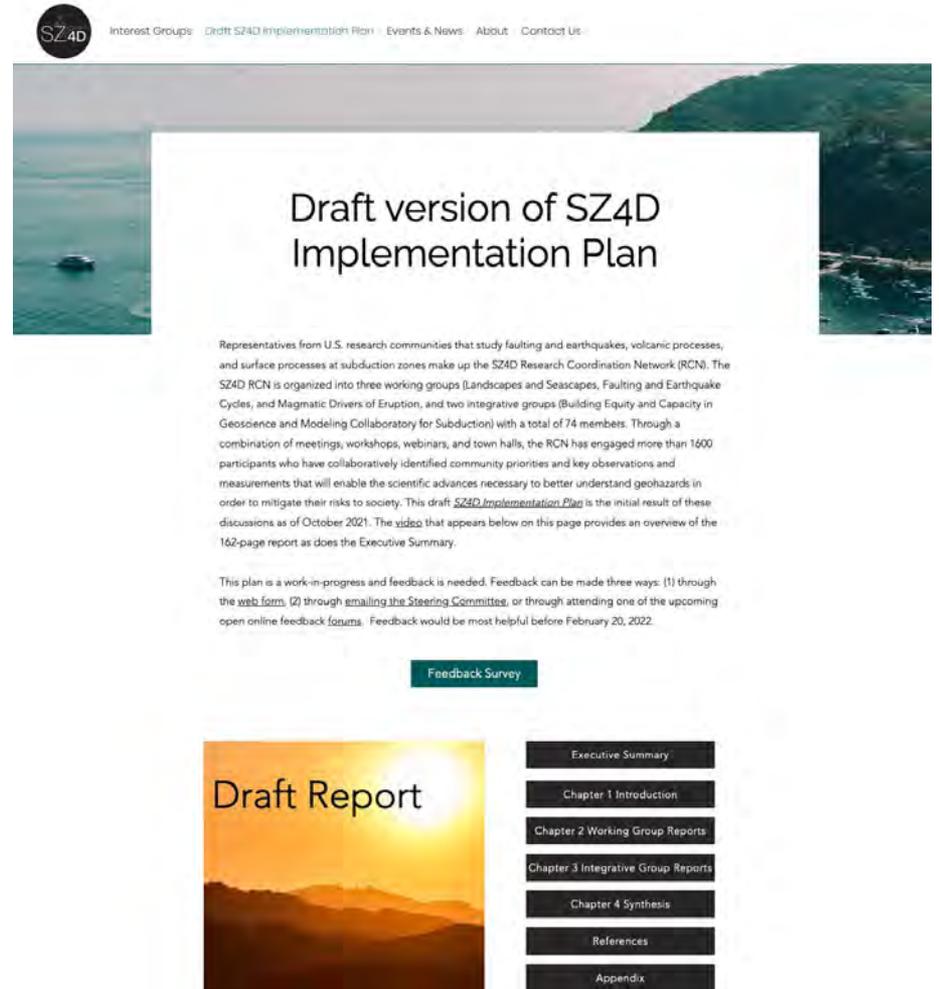
Volunteer or volunteer someone by July 1! [VOLUNTEER FORM](#)

The Draft Report

to provide a concrete starting place for discussions with agencies and potential partners

<https://www.sz4d.org/projects-3>

We need feedback!



The screenshot shows the SZ4D website header with a navigation menu: Interest Groups, Draft SZ4D Implementation Plan, Events & News, About, and Contact Us. The main content area features a large title "Draft version of SZ4D Implementation Plan" and a detailed paragraph explaining the project's goals and the role of the Research Coordination Network (RCN). A "Feedback Survey" button is prominently displayed. Below this, a "Draft Report" section includes a cover image and a vertical list of report sections: Executive Summary, Chapter 1 Introduction, Chapter 2 Working Group Reports, Chapter 3 Integrative Group Reports, Chapter 4 Synthesis, References, and Appendix.

SZ4D Interest Groups: [Draft SZ4D Implementation Plan](#) Events & News About Contact Us

Draft version of SZ4D Implementation Plan

Representatives from U.S. research communities that study faulting and earthquakes, volcanic processes, and surface processes at subduction zones make up the SZ4D Research Coordination Network (RCN). The SZ4D RCN is organized into three working groups (Landscapes and Seascapes, Faulting and Earthquake Cycles, and Magmatic Drivers of Eruption, and two integrative groups (Building Equity and Capacity in Geoscience and Modeling Collaboratory for Subduction) with a total of 74 members. Through a combination of meetings, workshops, webinars, and town halls, the RCN has engaged more than 1600 participants who have collaboratively identified community priorities and key observations and measurements that will enable the scientific advances necessary to better understand geohazards in order to mitigate their risks to society. This draft [SZ4D Implementation Plan](#) is the initial result of these discussions as of October 2021. The [video](#) that appears below on this page provides an overview of the 162-page report as does the Executive Summary.

This plan is a work-in-progress and feedback is needed. Feedback can be made three ways: (1) through the [web form](#), (2) through [emailing the Steering Committee](#), or through attending one of the upcoming open online feedback [forums](#). Feedback would be most helpful before February 20, 2022.

[Feedback Survey](#)

Draft Report

- Executive Summary
- Chapter 1 Introduction
- Chapter 2 Working Group Reports
- Chapter 3 Integrative Group Reports
- Chapter 4 Synthesis
- References
- Appendix

The Draft Report

What does it say?

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The Draft Report

What does it say?

YouTube version

<https://youtu.be/T3TVyIGhFhg>

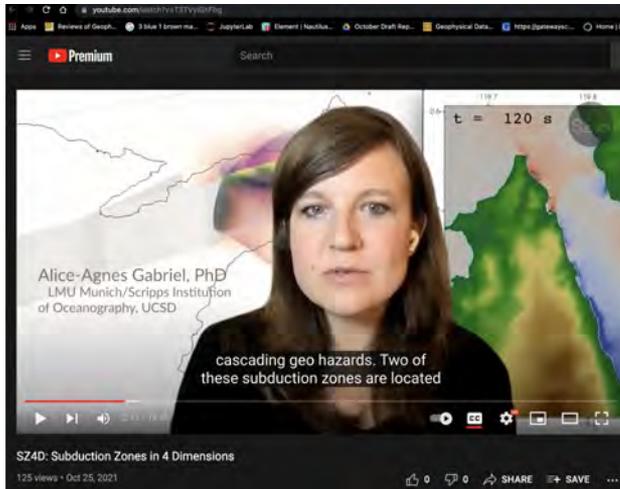


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The Draft Report

ONLY 7 PAGES
Translated into Spanish

YouTube version

<https://youtu.be/T3TVyIGhFhg>

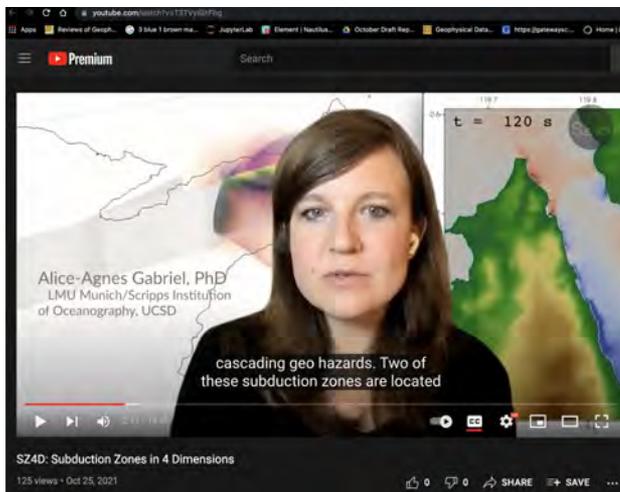


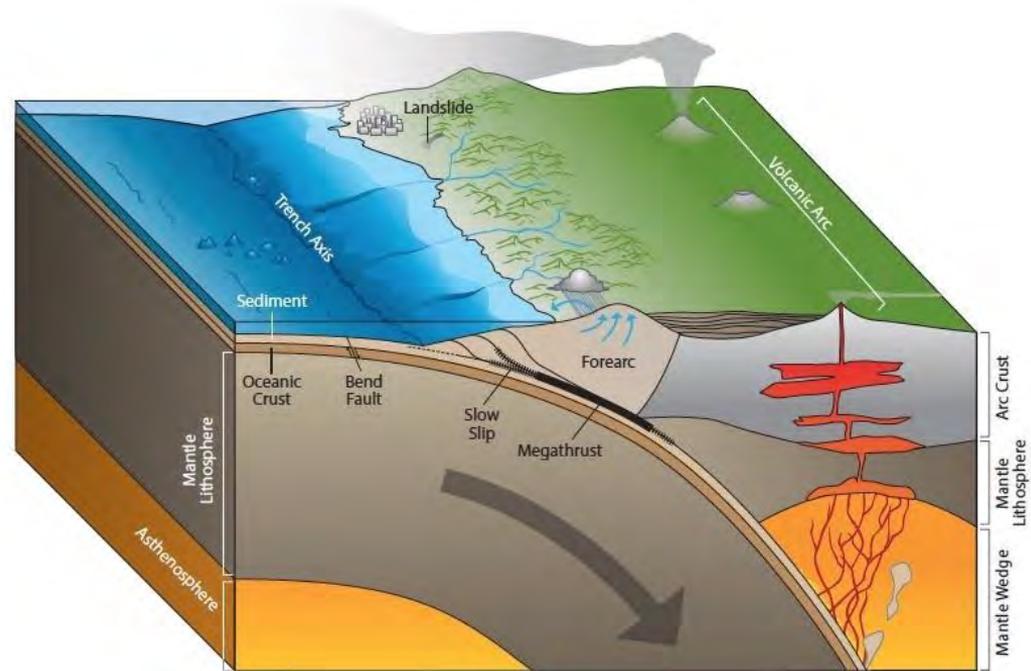
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The Importance of Studying Geohazards in Subduction Zones

Societally: The world's largest hazards converge

Scientifically: Natural laboratories need controlled conditions and systematic variables; Subduction zones have them along-strike



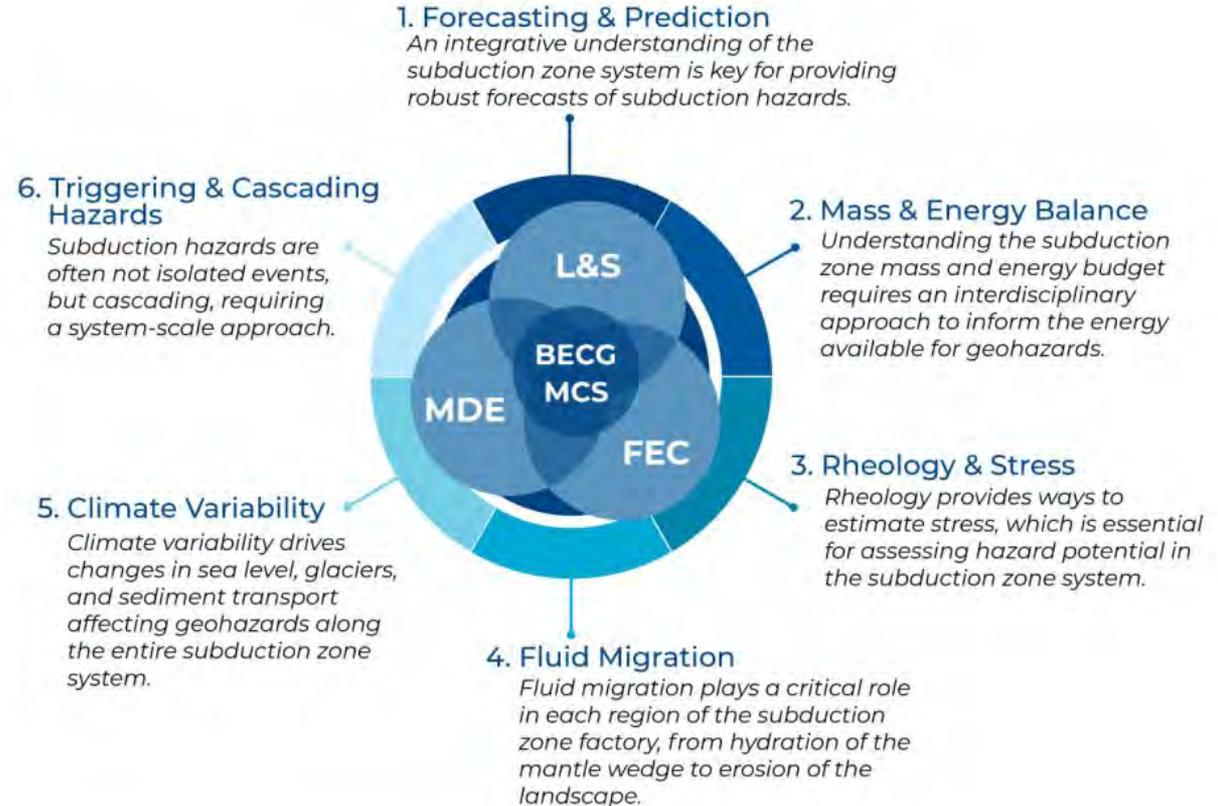
The Science: Driving Questions

- When and where do large damaging earthquakes happen?
- How do trans-crustal processes initiate eruptions at arc volcanoes?
- How do events within Earth's atmosphere, hydrosphere, and solid Earth generate and transport sediment across subduction zone landscapes and seascapes?
- What fraction of a subduction zone's energy budget goes into building and shaping subduction zone land- and seascapes?
- How can we transform the mindset of our geoscience community to embrace education, outreach, accessibility, capacity building, diversity, equity, inclusion, and social justice as critical components for the success of the SZ4D and future scientific endeavors by the geosciences community?

The power of an integrated geohazards approach

→ Scientifically overlapping goals

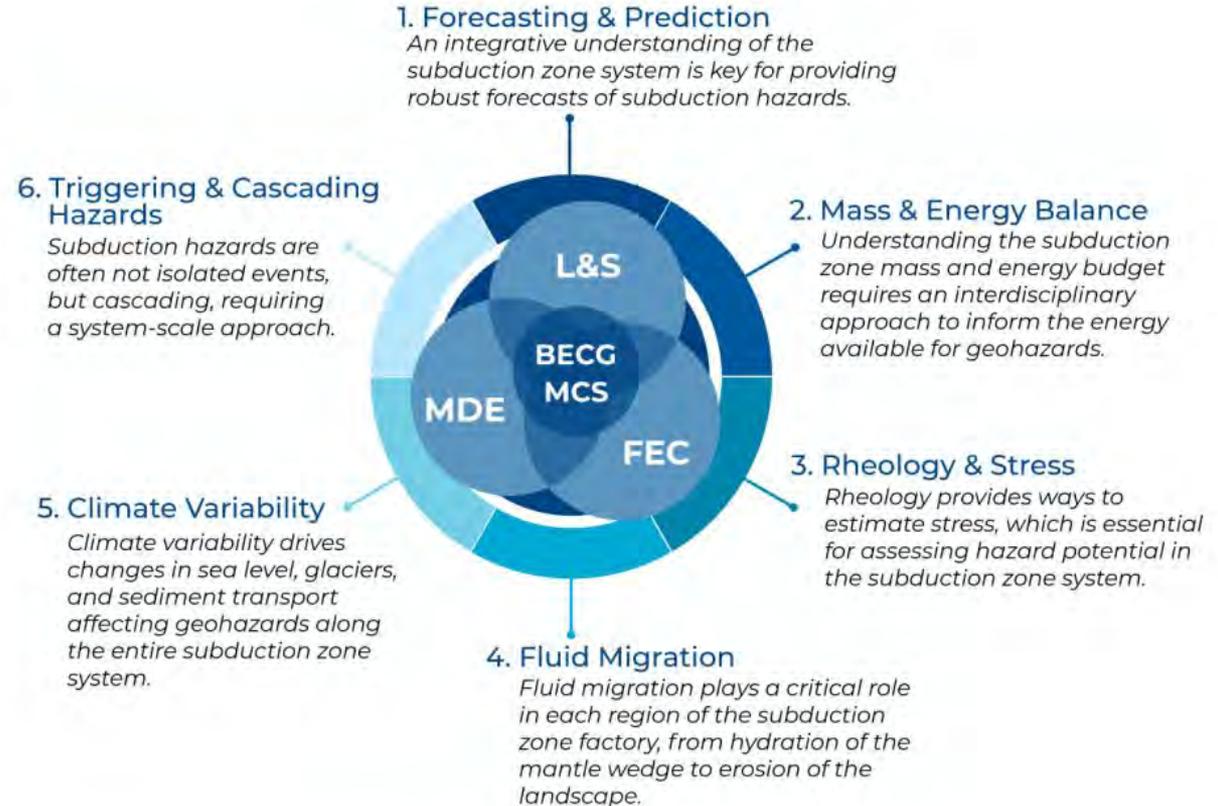
→ Practical overlapping needs



The power of an integrated geohazards approach

→ Scientifically overlapping goals

→ Practical overlapping needs

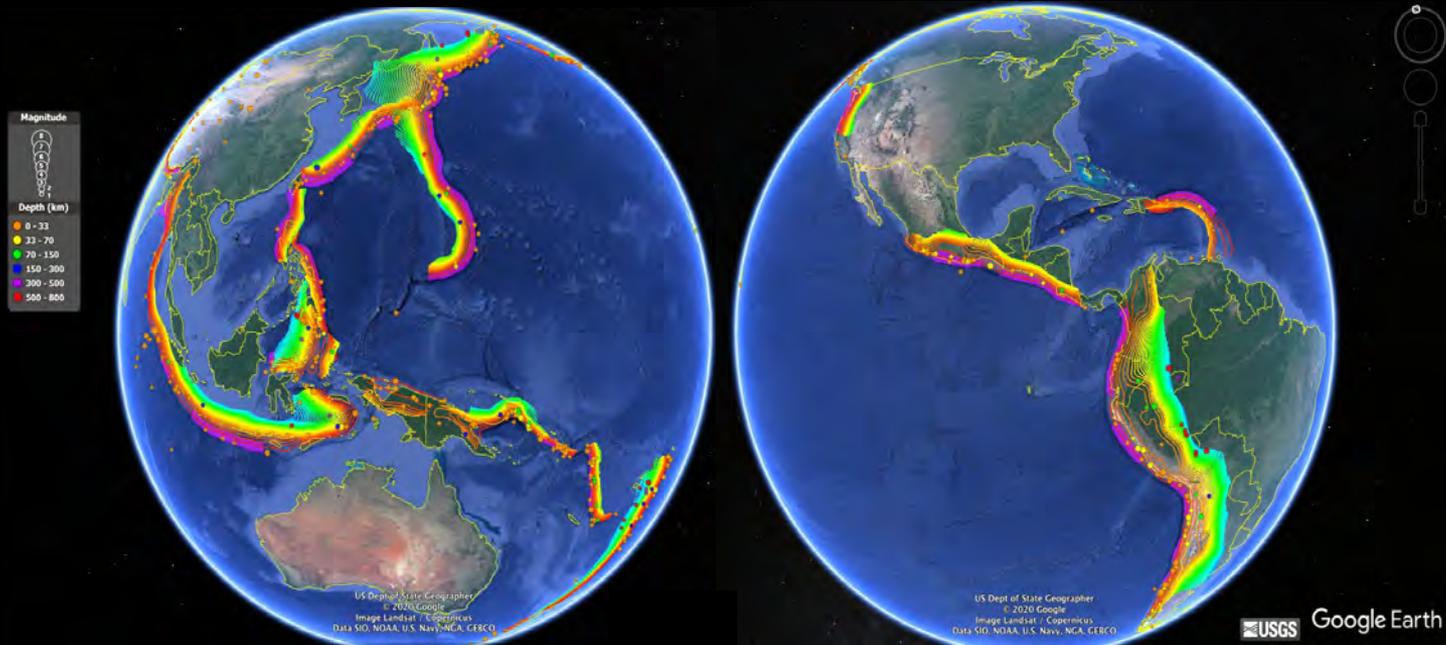


The challenge: We have to learn how to talk to each other!

Solving the Science Problems

What needs to be done?

- Traceability Matrices
- Notional Experiments



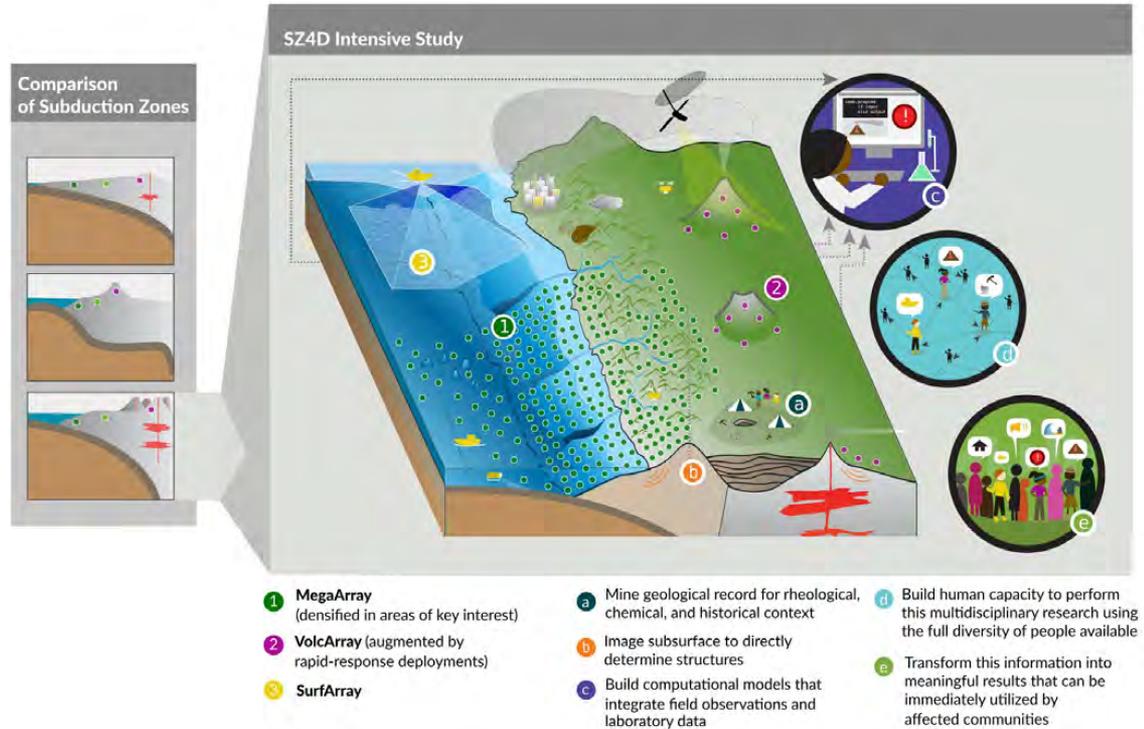
Instrumentation and Activities

Observational arrays

- MegaArray
- VolcArray
- SurfArray

Activities

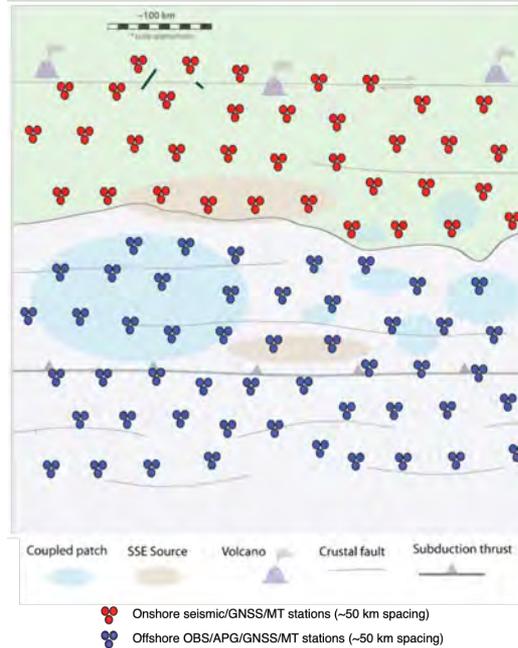
- Analysis of data from arrays
- Other observations:
 - Field geology
 - Geophysical imaging
- Numerical modeling
- Lab experiments
- Training and outreach



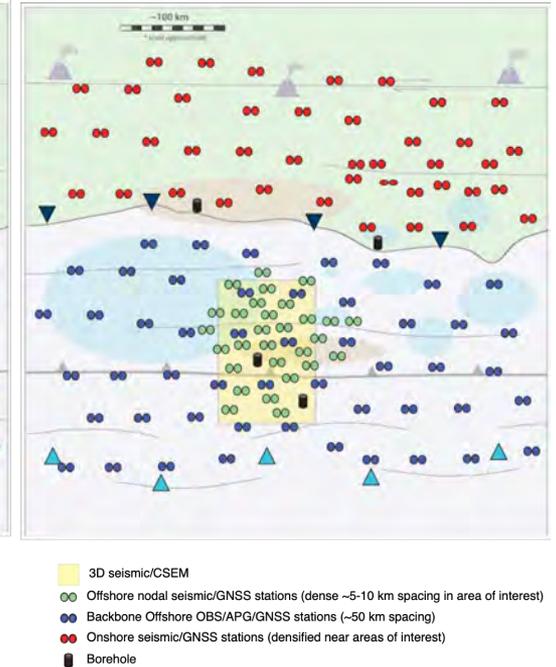
MegaArray Schematically

- Backbone imaging and characterization of subduction zone behavior
- Detailed, *long-term* characterization of areas of interest
 - Variations in coupling behavior

Phase 2A Observations



Phase 2B Observations

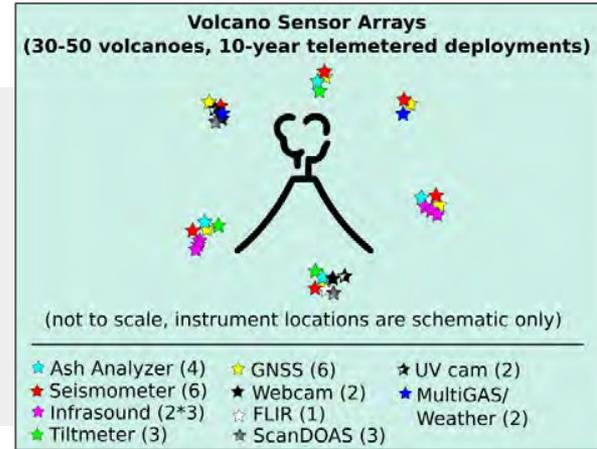


Geophysical observations inform and informed by modeling, experimental and geological activities

VolcArray Schematically

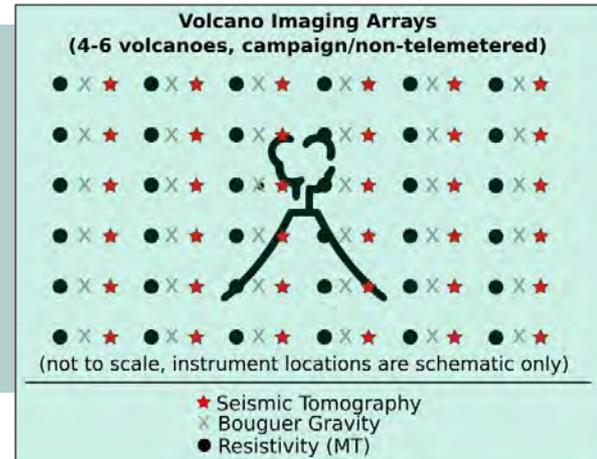
Volcano Sensor Arrays

Goal: Observe evolution of monitored parameters in near-real time from background state through eruption



Volcano Imaging Arrays

Goal: Quantify magma supply rate from the mantle, the geometry of the trans-crustal magmatic system, and eruptive histories



Both observational arrays interleaved with modeling, experimental, and geological activities

SurfArray Schematically

Notional Experiment

Select paired subduction-zone segments that control for (as best as possible) non-targeted factor, while letting single factor vary.

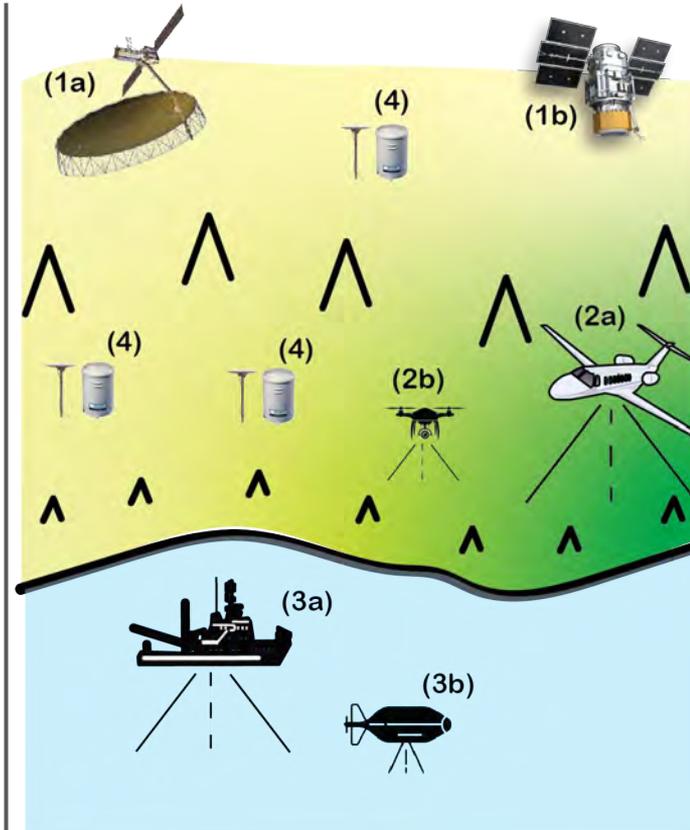
Subduction-zone segments with similar tectonic rates, but different climates (e.g., different latitudes of Chile)



Subduction-zone segments with constant climate, but differing tectonic rates (e.g., Cascadia versus Chile)



Schematic Array Configuration



Topography and deformation
(1a) NISAR observations for quantifying surface deformation.
(1b) WorldView observations for comprehensive digital-terrain model construction and change detection.

(2a) Airborne Lidar for high-resolution topography in densely vegetated areas.
(2b) Drone-based optical and lidar observations for change detection and rapid response.

Bathymetry
(3a) Ship-based seismic and bathymetry.

(3b) AUV-based ultra-high-res bathymetry and CHIRP

Environmental sensors
(4) Environmental sensor network (GPS, precip measurements, stream gauges) to quantify mass fluxes.

Instrumentation and Activities

Observational arrays

- MegaArray
- VolcArray
- SurfArray

Activities

- Analysis of data from arrays
- Other observations:
 - Field geology
 - Geophysical imaging
- Numerical modeling
- Lab experiments
- Training and outreach



Phased Implementation

- **Phase 0**

RCN

- **Phase 1**

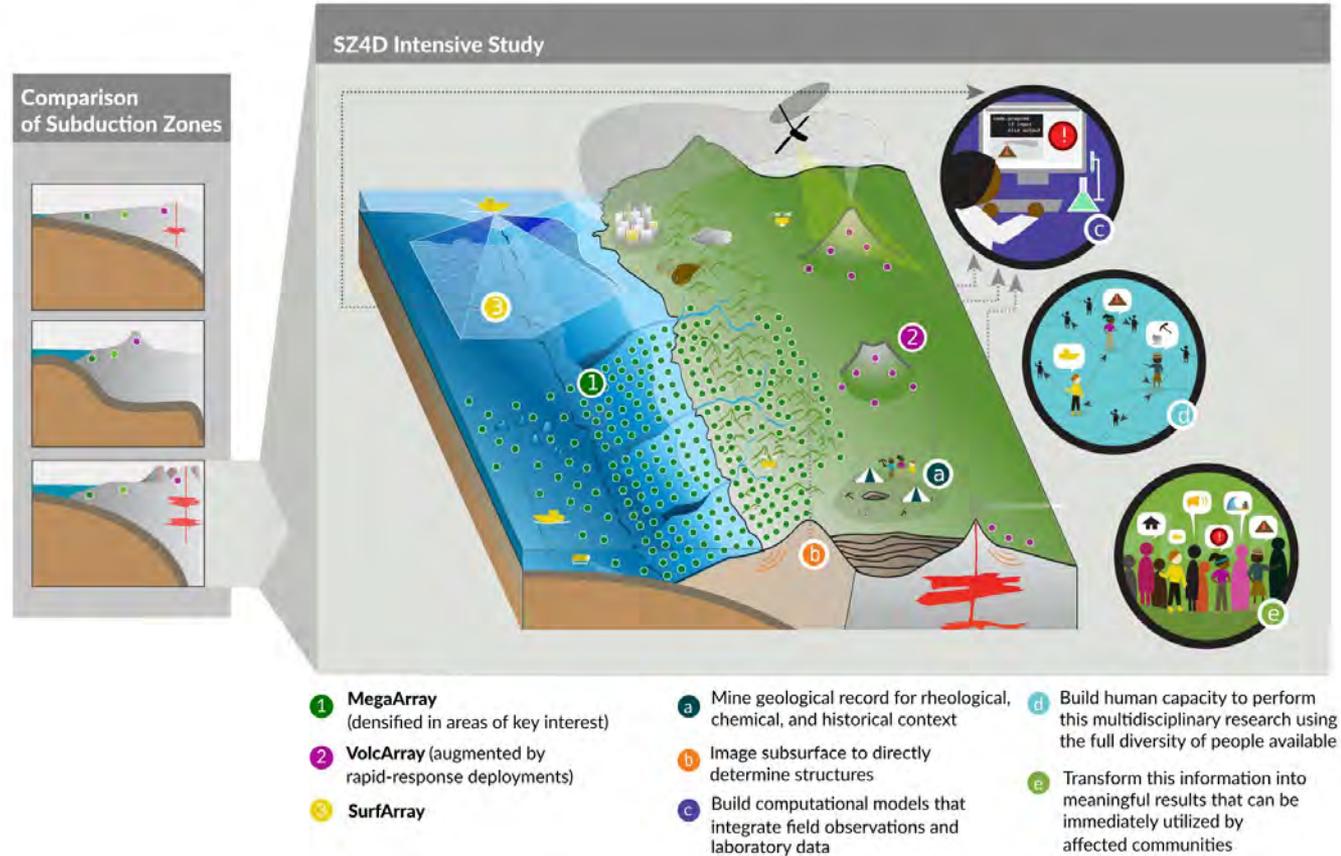
Pilot Activities and Experiments

- **Phase 2**

Full Field Experiments

- **Phase 3**

Synthesis and Integration



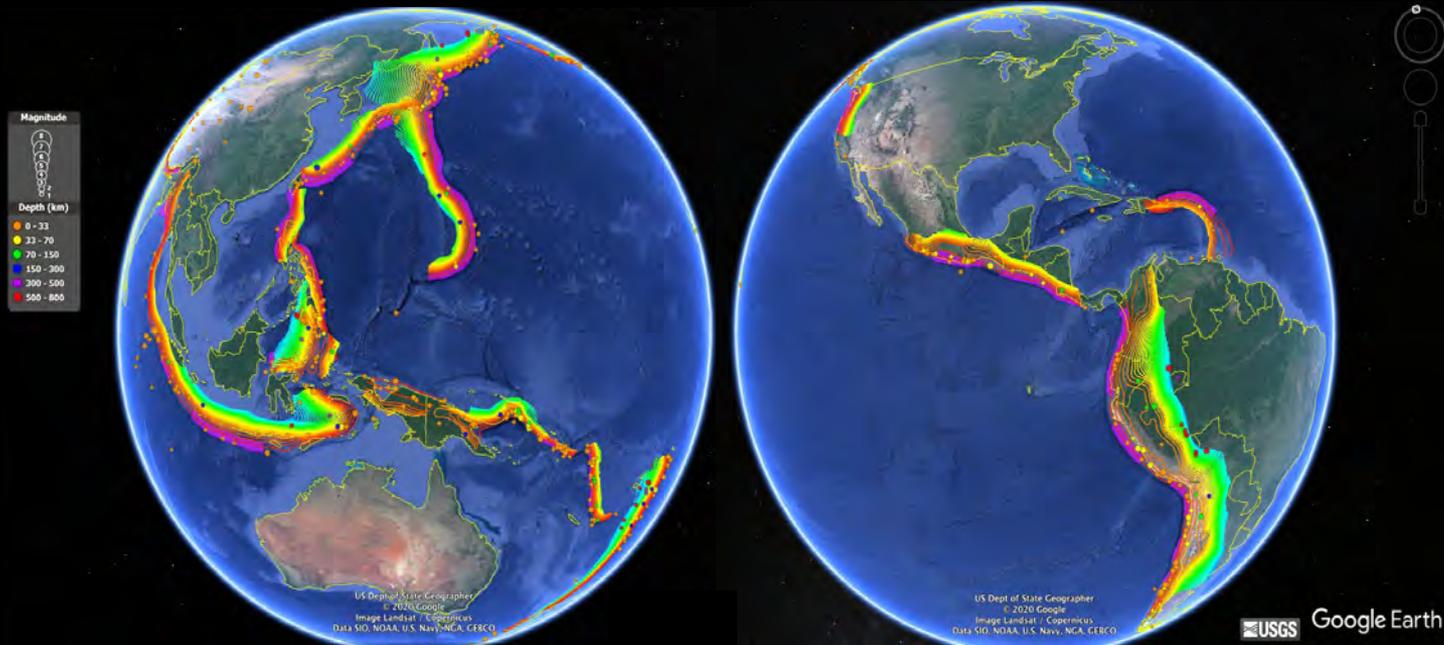
Solving the Science Problems

What needs to be done?

- Traceability Matrices
- Notional Experiments

Where should it be done?

- Key requirements
- Subduction zone inventory



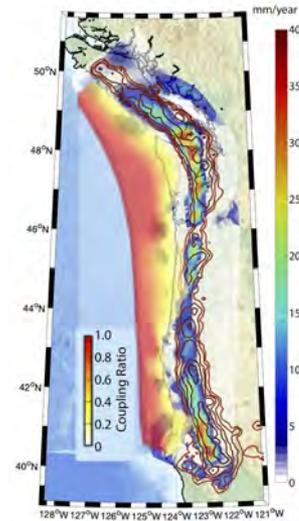
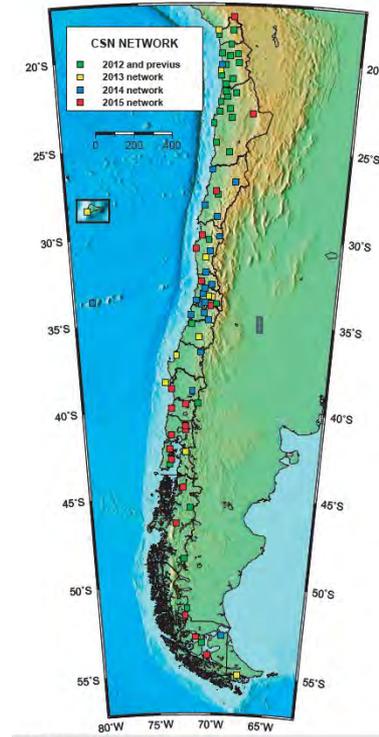
Locations for study

Recommend:

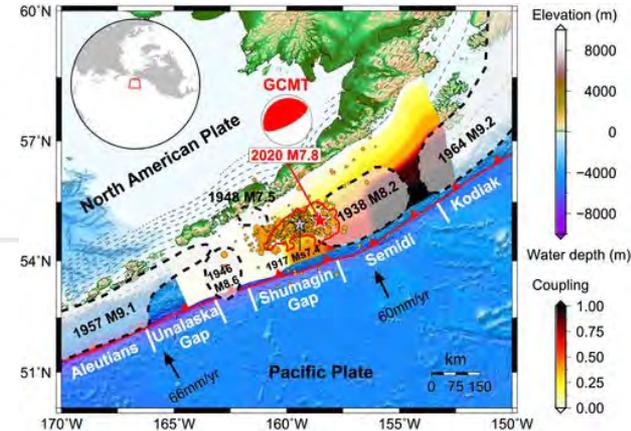
- Complementary domestic and international sites

Regions of Special Interest:

- **Chile**
- Cascadia
- Alaska



Bartlow (2020)



Liu et al. (2020)

Why is an NSF-funded initiative so interested in Chile?

Most active, accessible margin with significant numbers of large events in a single country

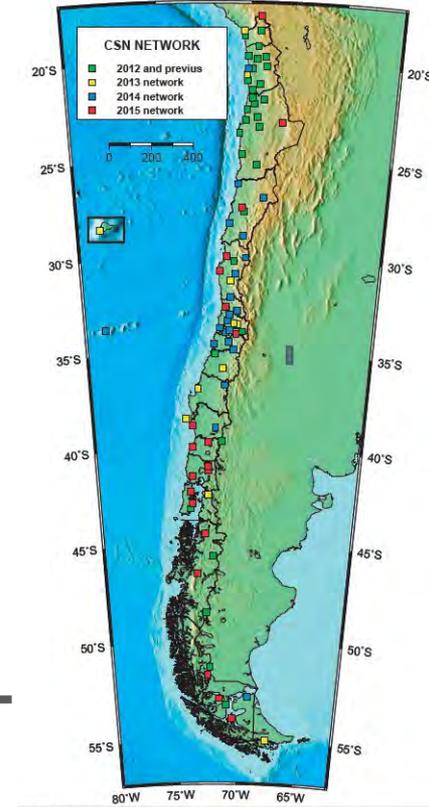
+

Significant expertise allow for deep collaborations

+

Existing data and understanding allow for more sophisticated studies

Opportunity to make a significant contribution to geohazards research



How likely is the initiative to get funded?

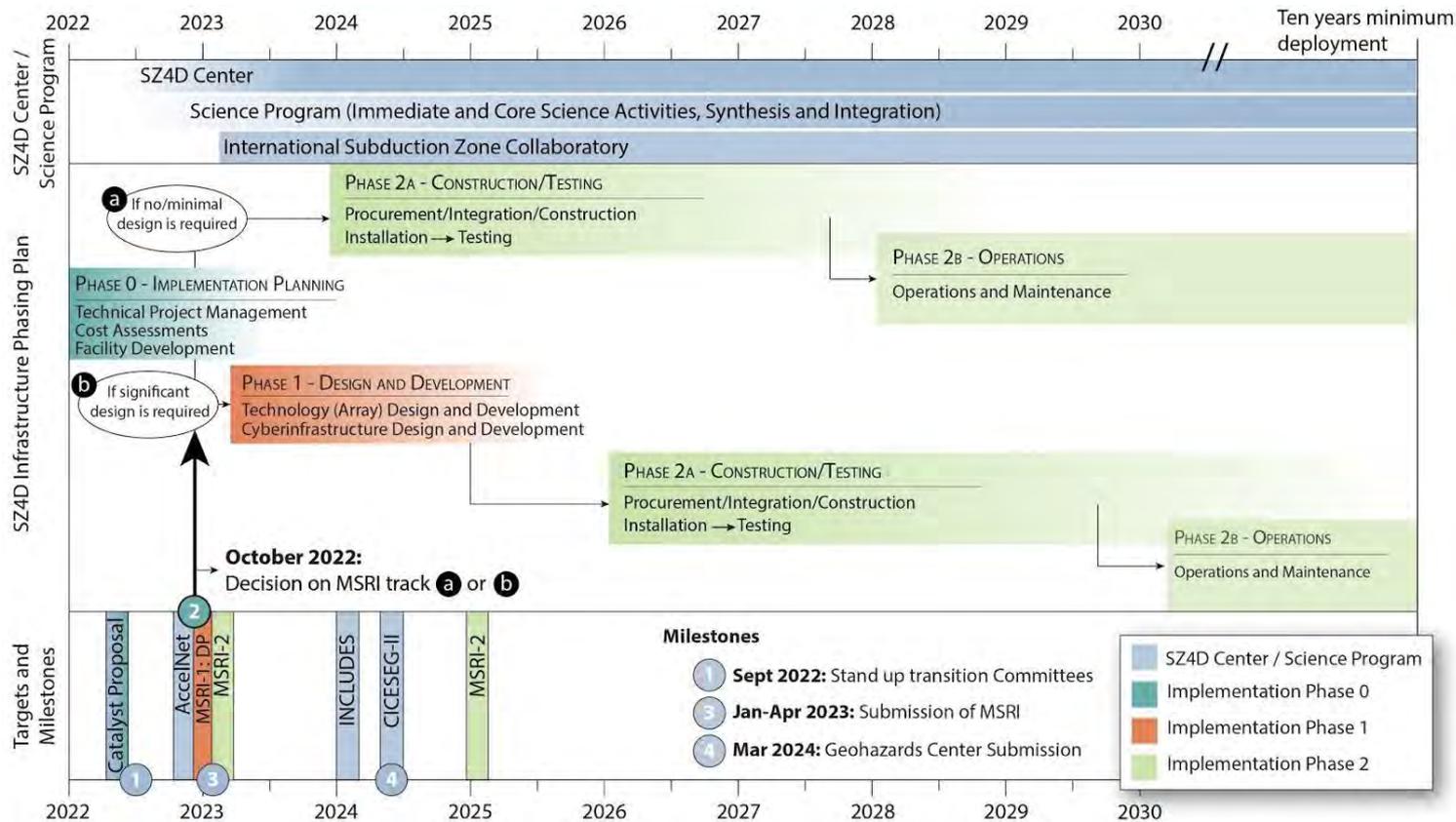
Positive feedback from NSF and a priority in the decadal report

Have provided significant planning funding

Have internal committee overseeing SZ4D

An initial pilot (or other infrastructure) proposal due winter 2023

The Road Ahead



Working together:

What are the international community's priorities?

We cannot do everything, what is most important? Where can we contribute most?

Meeting Structure

TUESDAY

- Open Zoom Session. Overview of current projects and initiatives
- First breakout session: Scientific convergence

WEDNESDAY

- Morning:
 - Report-back
 - Breakouts based on hazards
- Afternoon: Strategies to answer the questions
 - Thunder talks: 3-5 minutes description of potential projects
 - Sign up by lunch with Anaïs aferot@ucsc.edu
 - Mixed breakout sessions

THURSDAY

- Morning: Report back and planning for known opportunities