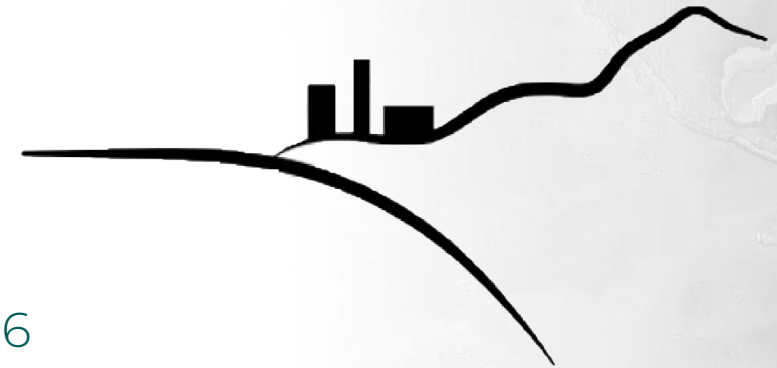
SZ4D

Subduction Zones in 4-Dimensions



Community Science Meeting, Apr 2026

www.sz4d.org

@SZ4D

contact@sz4d.org

What is SZ4D?

A ***community-led*** initiative to understand the science behind subduction zone geohazards

SZ4D brings together scientists across disciplines to build tools and resources needed to transform the science needed for forecasting **earthquakes, volcanic eruptions, tsunamis, landslides**, and **debris flows.**

"Defining the Limits and Possibilities of Predicting Geohazards"

3,000+

Primarily funded by NSF, SZ4D serves a growing community of scientists from around the globe.

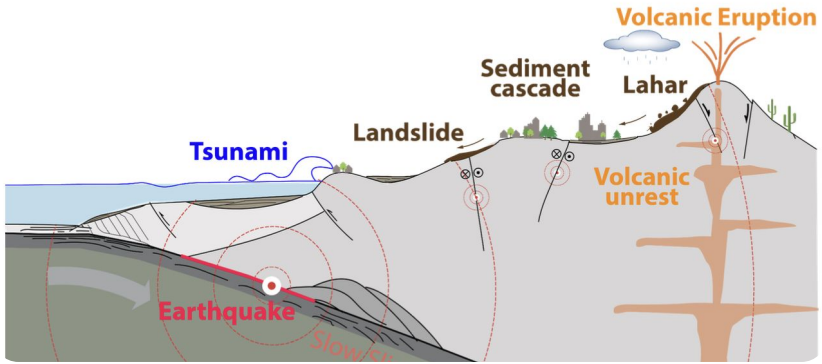
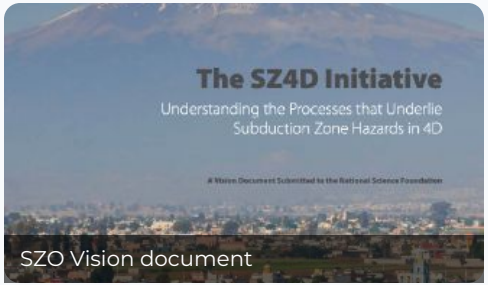


Photo from SZ4D community meeting in 2022, Houston

A Brief History...

1. 2016: SZO Vision

SZO community science meeting in Boise, ID leads to a vision document submitted to the NSF.



SZO Vision document

2. 2019-2022: RCNs

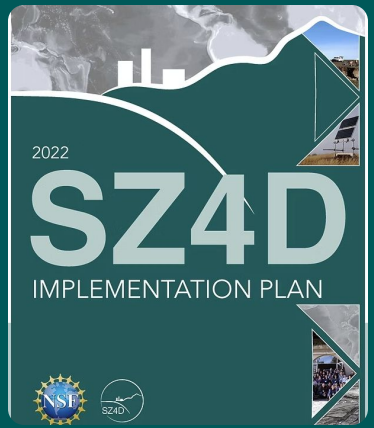
NSF Research Collaboration Networks Main groups:

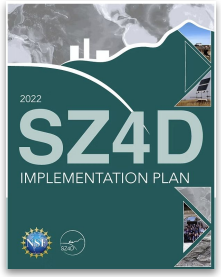
- Magmatic Drivers (MDE)
- Landscapes & Seascapes (LS)
- Faulting & Earthquakes (FEC)
- Equity & Capacity (BECG)
- Modelling Collaboratory (MCS)

Over ~2 years, ~75 members (with input from the wider community) drafted vision for cutting-edge subduction zone science in the coming decades.

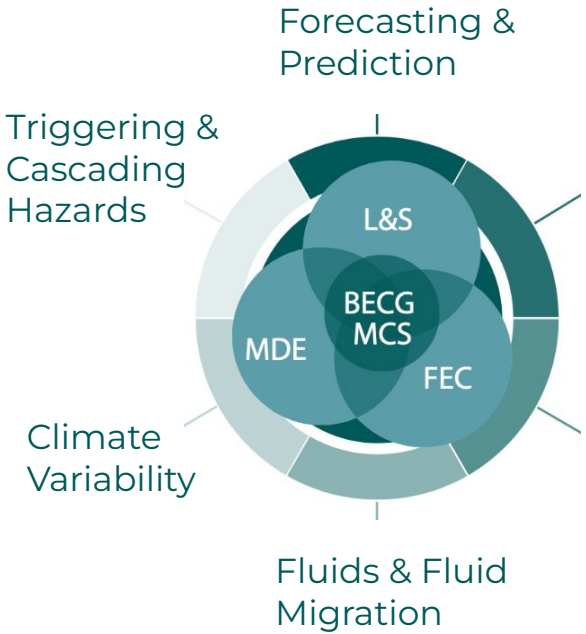
3. 2022: Implementation Plan

Published





The SZ4D Implmentation Plan: A Vision…



- **Community-driven**, multidecadal interdisciplinary scientific initiative to understand how the different components of subduction zone systems interact to produce and magnify **geohazards** over time

- **Key science priorities**, with tight integration across disciplines to understand science behind volcanic eruptions, earthquakes, tsunamis, mass wasting events; Identification of **cross-cutting themes**.

- Realizing the vision requies:
  - Focused field and laboratory infrastructure, modeling and computational capability
  - Building equity and capacity efforts.
  - Large-scale instrumentation of one or more subduction zones

The Catalyst: Laying the Groundwork

SZ4D Catalyst NSF (2022 - 2026)

RCN Committees continue, adding SZ4Grads, Building Equity & Capacity, Collective Impact, Operations & Planning, GeoArray, and more.

- Building community: workshops, webinars, and meetings
- Geographic selection & Chilean partnership, AndesNet (99+ ppl)
- Large-scale instrumentation: management & planning
- IMPACTS Community Of Practice
- GeoArray: Collective geologic field work (w/ Strabo NSF OSE)
- SZ4Grads: Supporting early-career geoscientists
- NSF Geohazards Center proposal ($15M, 5-yr; declined)

The MultiHazard Array

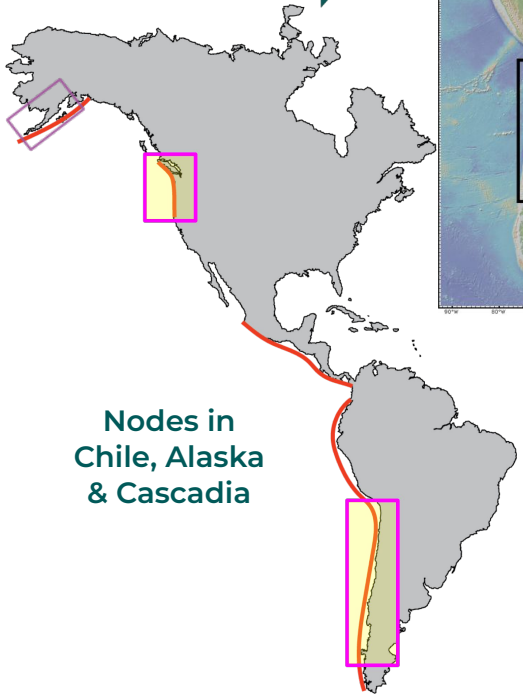
Vision & Planning

Implementation Plan highlights need for large-scale, long-term (decadal) instrumentation of subduction zones to answer science questions, & capture geohazard events.

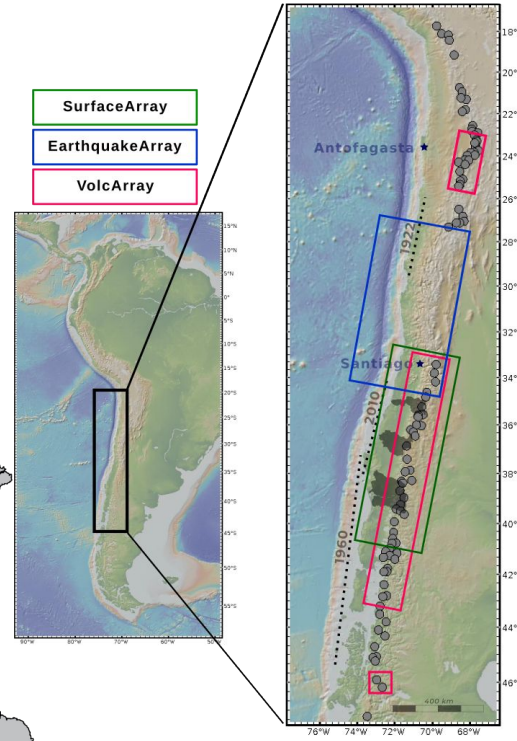
SZ4D Design Elements:

- EarthquakeArray
- VolcArray
- SurfaceArray
- GeoArray Field Stations (new)

Planned: NSF MSRI-2 Submission; Lead: Diana Roman & MSRI Team; Funding: NSF



Nodes in Chile, Alaska & Cascadia



Chile: 4 watersheds, a 500+ km segment of megathrust, and 22 active volcanoes

The MultiHazard Array

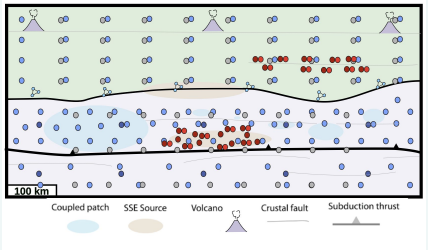
Chile: 4 watersheds, 500+ km segment of megathrust, 22 active volcanoes

EarthquakeArray

Offshore (850 x 200km)
Phase 1: 70 OBS + APG, 50 GNSS-A, 10 MT
Phase 2: 15 OBS, 8 GNSS-A

Onshore (850 x 200km)
Phase 1: 40 Seismometers, 36 GNSS
6 Microseismic arrays, 10 Seis, 10 GNSS

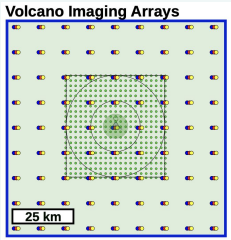
Phase 2: 10 Seis, 10 GNSS

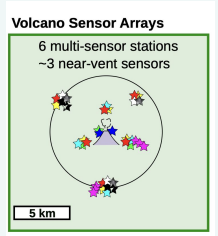


VolcArray

22 Volcano Sensor Arrays (10yr)
4 Ash Collectors, 6 Seismometers, 3 Tiltmeters
6 GNSS, 2 Webcams, 3 FLIR, 3 ScanDOAS
2 UV cameras, 2 MultiGas+met; (1200x100 km)

4 Imaging Arrays (2 yr)
80 BB seismic, 450 Nodal seismic
MT Survey, Bouguer gravity, Diffuse CO2



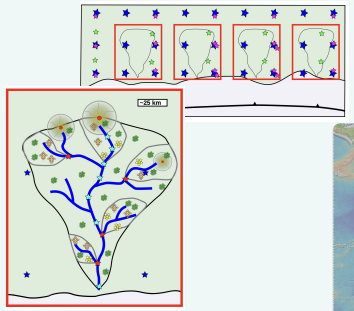


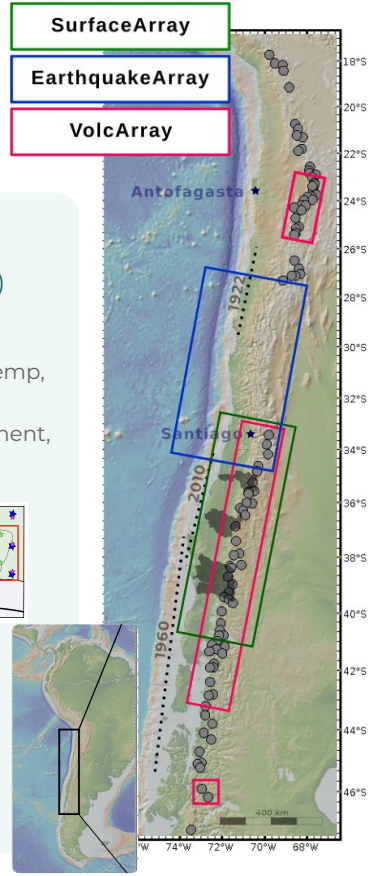
SurfaceArray

Backbone Array (850x200km)
27 Met Stations, 15 Seis, 10 GNSS;

4 Watershed Arrays
Hillslope: Precip, Soil moisture/temp, Microseismicity

Stream: Precip, Discharge, Sediment, Microseismicity

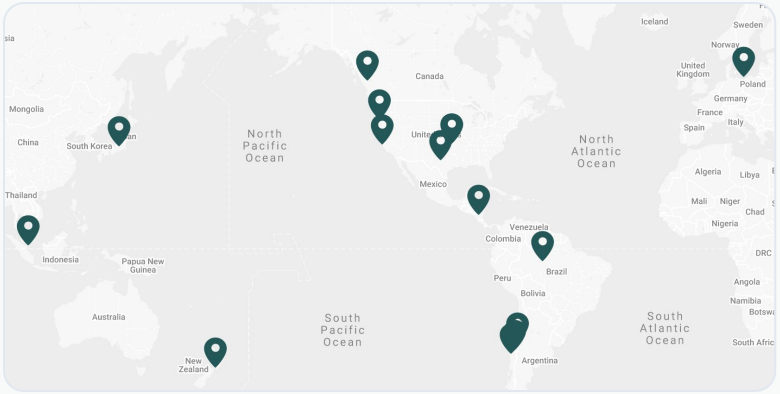




Lead: Diana Roman & MSRI Team · Funding: NSF · Planned: NSF MSRI-2 Submission

SZNet

International Coordination Network for Subduction Zone Geohazards



Supported by NSF Accelnet (2024-2027)

14 networks across 5 continents

(emphasis on Chile)

- Compare subduction zones globally using shared datasets and frameworks
- Coordinate instrumentation of key subduction zones for transferable insights
- Train and support a diverse, international early-career community

SZ4D

SZNet

International Coordination Network for Subduction Zone Geohazards

Exchange Program

Five U.S. and Chilean students conduct month-long research visits annually.

Field Trips

Annual field trips in Cascadia (2026), Andes (2027); ~20 participants

Workshops

In-person (e.g. this workshop) and virtual workshops (>150 ppl).

Webinars

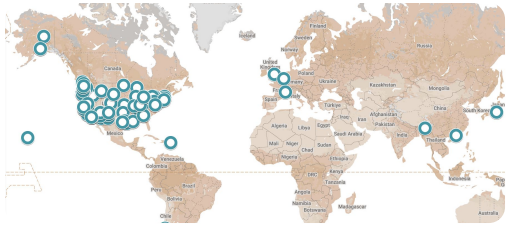
Monthly International Webinar Series showcasing SZ geohazards research work from international scientists

Where are we now?

The growing SZ4D community

Broad Scientific Engagement

Engaging **153 representatives** from **95 institutions** across US and South American research communities.



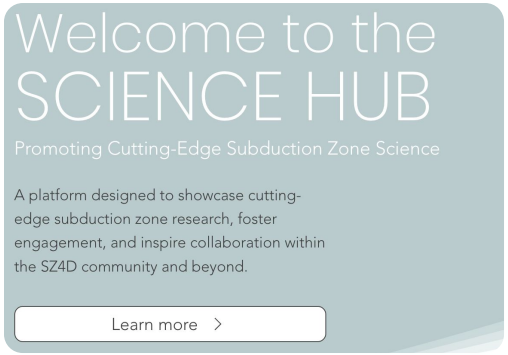
3,000+ Scientists

Scientist Matchmaking Platform

Inventory of **200+ researchers** seeking mutually beneficial partnerships to connect global expertise.

Science Hub

Web platform showcasing cutting-edge **subduction zone research**.



How does *this meeting* fit into the SZ4D initiative?

Primary Focus

This is primarily a **science meeting**, not a SZ4D planning meeting.

Future Vision

Highlight exciting science and identify **research paths** to undertake the implementation plan vision.

Cross-Cutting Science

Find science connections between **subdisciplines** and cross-cutting themes.

Tangible Actions

Identify **concrete activities** to advance geohazard forecasting within fiscal constraints.

QUESTIONS?