SZ4D update for Marine Seismic Research Operations Committee

www.sz4d.org

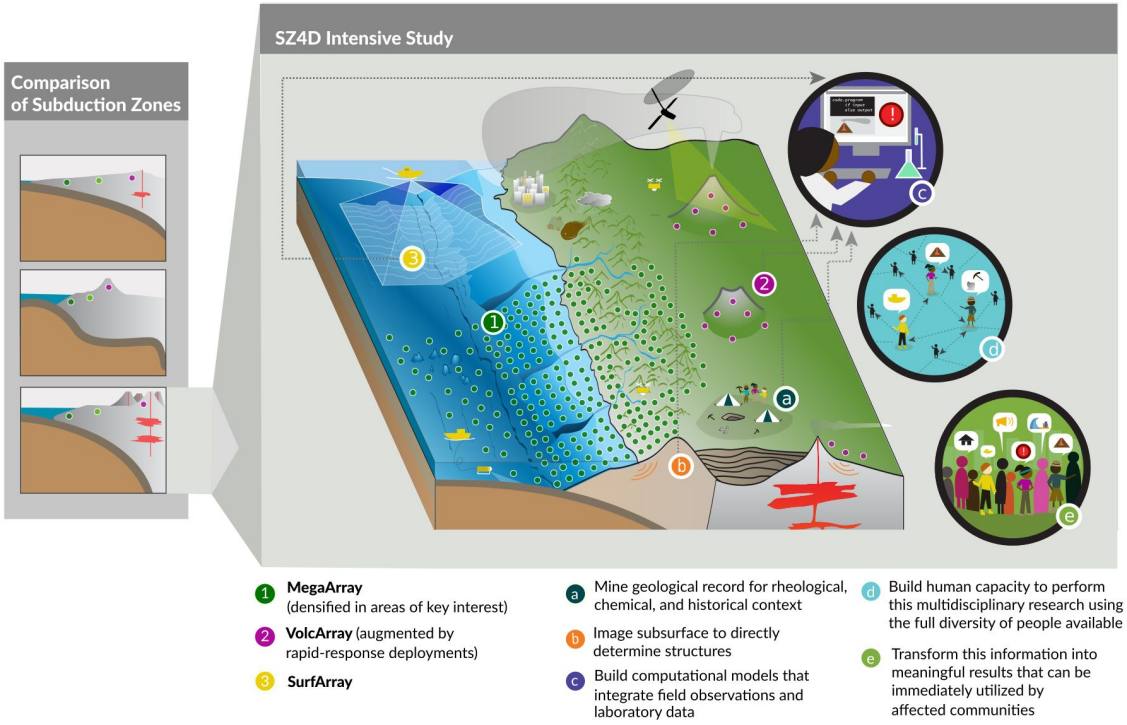
@SZ4D1

contact@sz4d.org

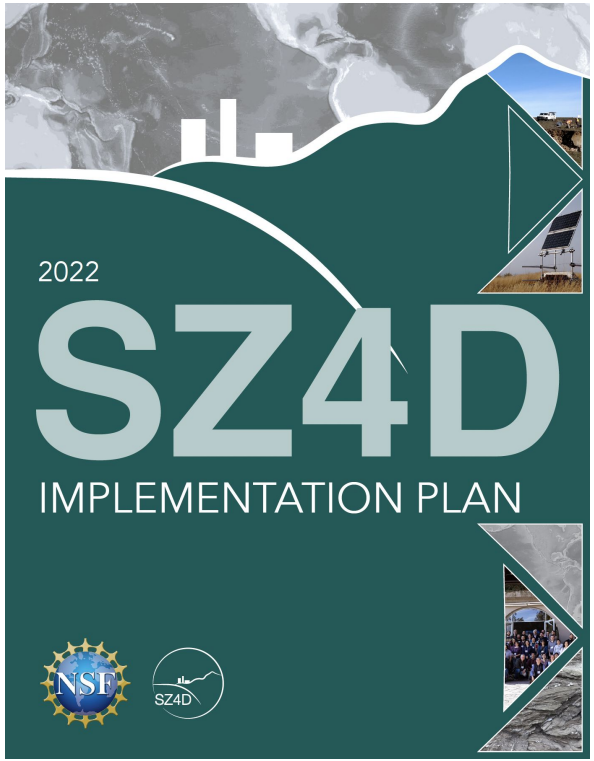
1) Overview & Status
2) Plans
4) Discussion

What is SZ4D?

- A community-driven initiative for a long-term, interdisciplinary research program to understand the limits and possibilities of predicting geohazards
- Utilizes subduction zones as ideal natural laboratories
- Works to create the multifaceted infrastructure and aligned activities to enable new discoveries
- Brings together a diverse community of scientists from a wide range of disciplines and backgrounds to study earthquakes, volcanic eruptions, and mass wasting



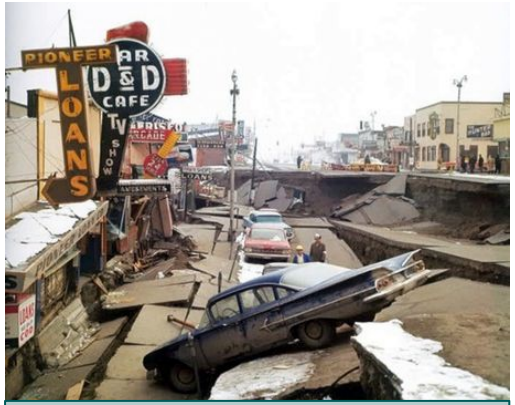
Implementation Report Released November 2022



CONTENTS

Hilley, G. E. (ed.), Brodsky, E.E., Roman, D., Shillington, D. J., Brudzinski, M., Behn, M., Tobin, H. and the SZ4D RCN (2022). SZ4D Implementation Plan. Stanford Digital Repository. Available at https://purl.stanford.edu/hy589fc7561. https://doi.org/10.25740/hy589fc7561

Working Groups defined science goals and strategies



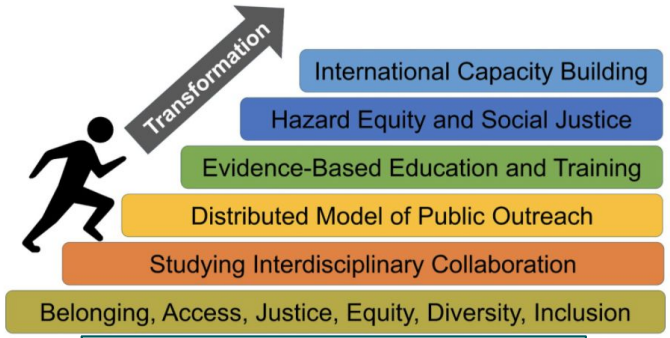
Faulting & Earthquake Cycles Working Group (FEC)

Magmatic Drivers of Eruption Working Group (MDE)

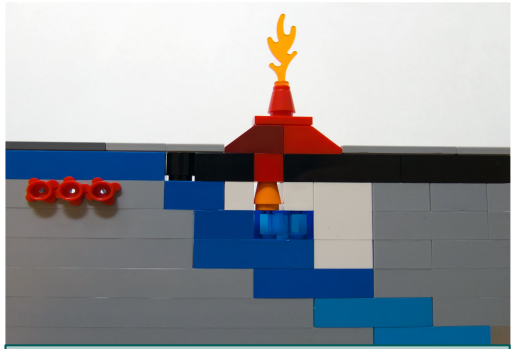
Landscapes & Seascapes Working Group (L&S)

SZ4D RCN Accomplishments

Integrative Groups formed to plan infrastructure and activities that reach across the system



Building Equity and Capacity in Geoscience (BECG)



Modeling Collaboratory for Subduction (MCS)

What do we need to do to make a real difference in defining the limits and possibilities of prediction?

Capture **events** in **context**

Requires long-term, systematic instrumentation
AND
collaborative, interdisciplinary regional focus

Instrumentation and activities as described in implementation report

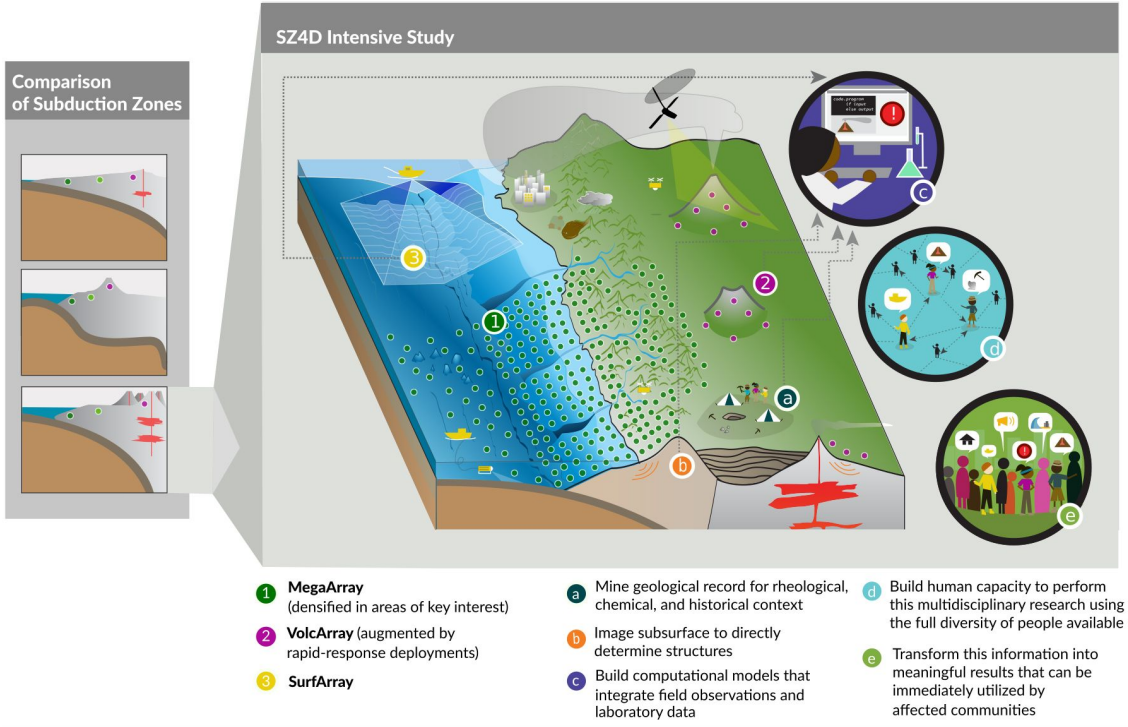
Observational arrays

- MegaArray
- VolcArray
- SurfArray

> MultiArray

Activities

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



SZ4D Implementation Report Fig. ES-1

Locations for study

Recommend

- Complementary domestic and international sites

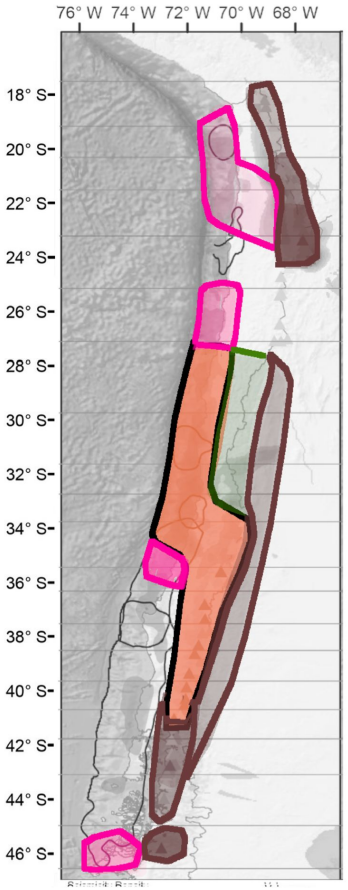
Focus Regions

- Chile

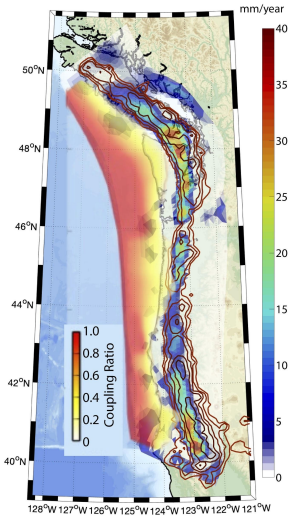
70% Instrumentation; 50% Activities

- Cascadia & Alaska

30% Instrumentation; 50% Activities

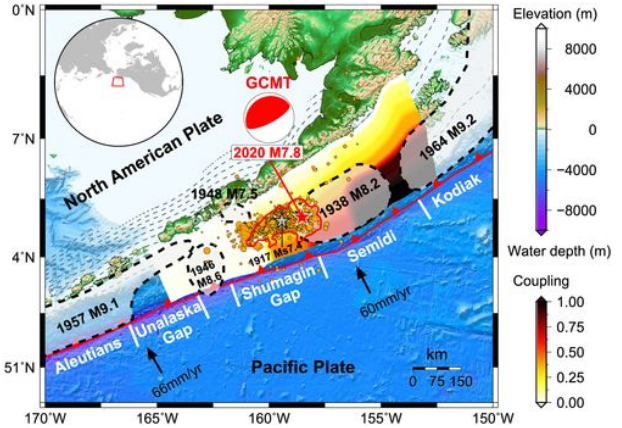


Outcome of AndesNet [2023]



Bartlow (2020)

Liu et al. (2020)



SZ4D Governance

Engaging ~150 representatives from ~95 institutions across the globe

SZ4D Center Steering Committee

Executive Committee

Collective Impact Planning CIC

Operations Planning Committee OPC

SZ4D Committees on Committees CoC

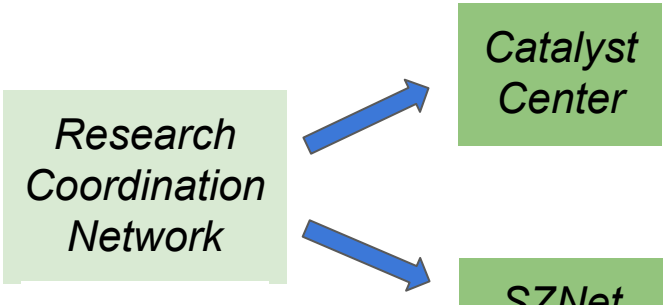
Working & Integrative Groups

- Building Equity and Capacity with Geoscience Integrative Group — SZ4Grads
- Faulting and Earthquake Cycles Working Group
- Landscapes and Seascapes Working Group
- Modeling Collaboratory for Subduction Integrative Group
- Magmatic Drivers of Eruption Working Group

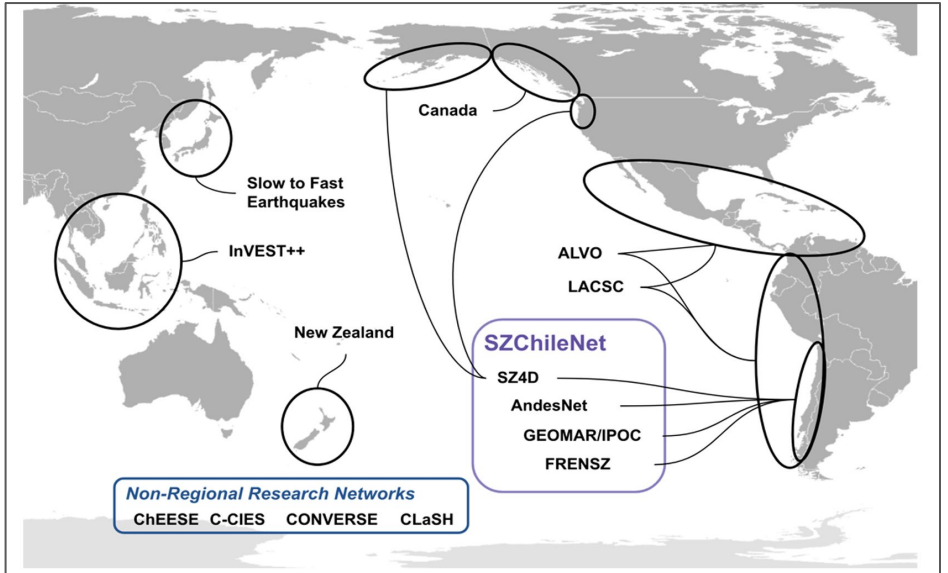
Regular rotations of committees and annual call for volunteers - sign up!

Recent Accomplishments: Funding & Products

- Implementation report released November 2022
- Funding for the Catalyst Center project ~$2M
- Funding for SZNet through Accelnet International Network-to-Network Collaborations program ~$2M



Implementation Plan



Accomplishments: Catalyst Center

Catalyst Proposal

1. A staffed center that organizes the work and Builds Equity and Capacity with Geoscience (BECG) following a Collective Impact model.
    a. E-newsletter launched (1380 subscribers), website & listserv updated
    b. Community Meeting Houston, Nov 14-16
    c. Townhalls/Presentations at AGU, SZS, SAGE/GAGE,SSA + Virtual (June 2023), Earth Educators Rendez-Vous
    d. Translation services (Implementation Plan and Zoom meetings)
    e. Bylaws and new committees launch engaging ~150 scientists
    f. Partnership with AndesNet
    g. BECG plan revised to focus on matchmaking and communities of practice
    h. SZ4Grads webinars
2. Technical project management to realistically evaluate costs and trade-offs of the instrumentation options.
    a. Array regions defined (blobs on the map) based on Termas El Corazón Meeting 2.0, June 12-14, 2023
    b. Preliminary instrumentation lists assembled
    c. Data management task force launched
    d. Network performance models begun
    e. Cable Committee Report
3. Preparatory work for the geological, modeling and laboratory facilities that include workshops and modest engineering design work.
    a. Lab Workshop August 2022
    b. GeoArray Workshop, Oct 8
    c. ML/AI Virtual Workshop August 2023

SZNet

PLANNED ACTIVITIES	YEAR 1	YEAR 2	YEAR 3	YEAR 4
Overall Coordination				
In Person Coordination Meetings	X		X	
Quarterly Virtual Coordination Meetings	X	X	X	X
Mission 1: Compare Observations of Subduction Zones				
Topical In Person Workshops	Legacy Data		Geohazard Predictability and Prediction	
International Virtual Webinars	X	X	X	X
Legacy Data Ingestion & Data Portal	X	X	X	X
Mission 2: Cooperation to Consistently Instrument Critical Subduction Zones				
Mission 2 Topical In Person Workshops		Ocean Floor Lab Capabilities		Geological Field Data
Mission 3: Develop & Nurture International & Diverse Early Career Scientists				
Cascadia Field School	X			
Chilean Field School		X		
Chilean Pilot Project			X	
Cascadia Pilot Project				X
Student Exchanges	X	X	X	X
Milestones				
	Launch of coordinating committee & initiation of activities	Launch of data portal	Execution of major in-person workshop that aligns plans	Submission of coordinated deployment proposals

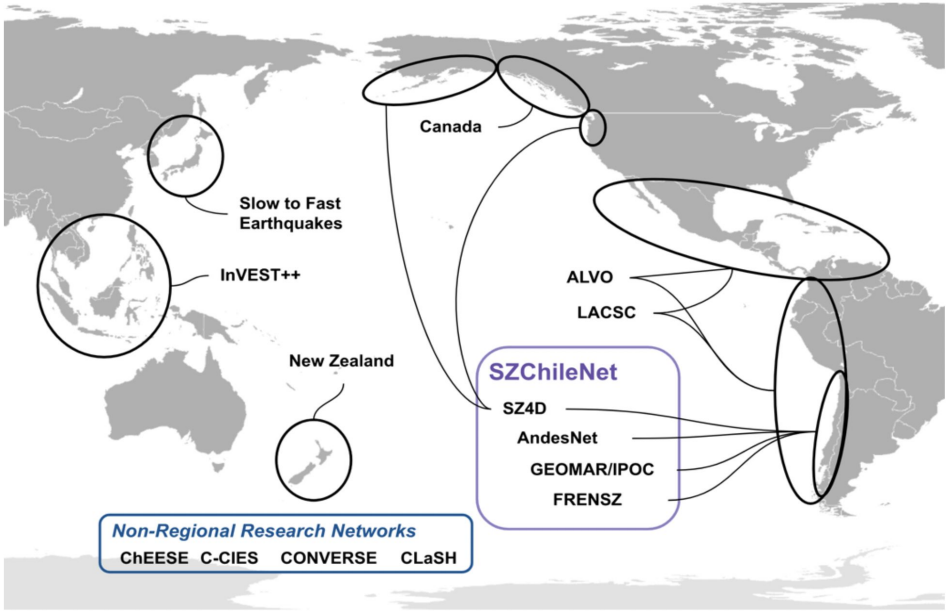
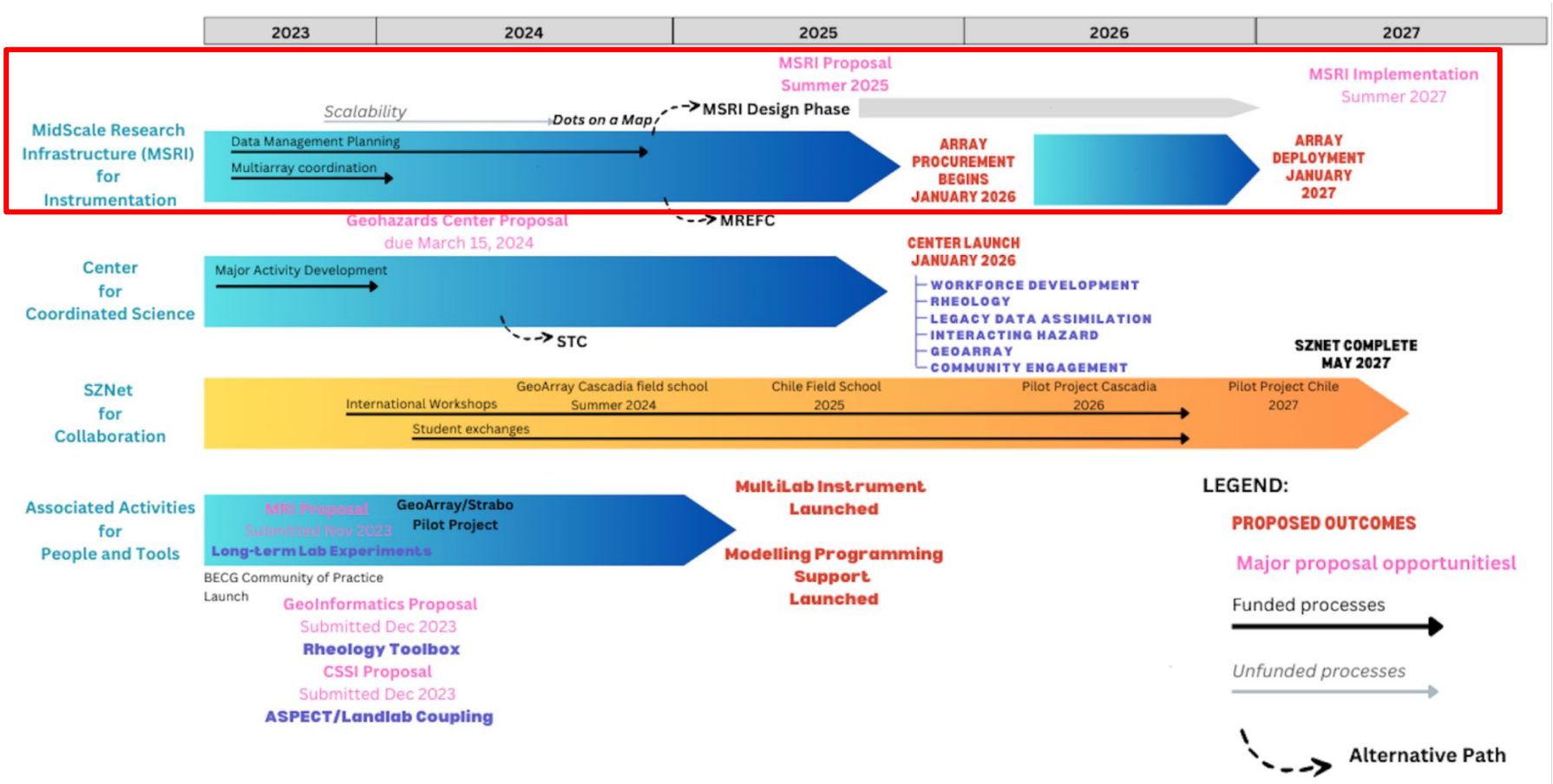


Figure 4. Geographic distribution of focus areas of partner networks. Some networks, such as ChEESE, C-CIES, CONVERSE and CLaSH, do not have a geographic focus.

(PIs: Brodsky, Carter) - $1,999,834
AccelNet-Implementation: SZNet - A Coordinated Global Effort to Understand Subduction Geohazards

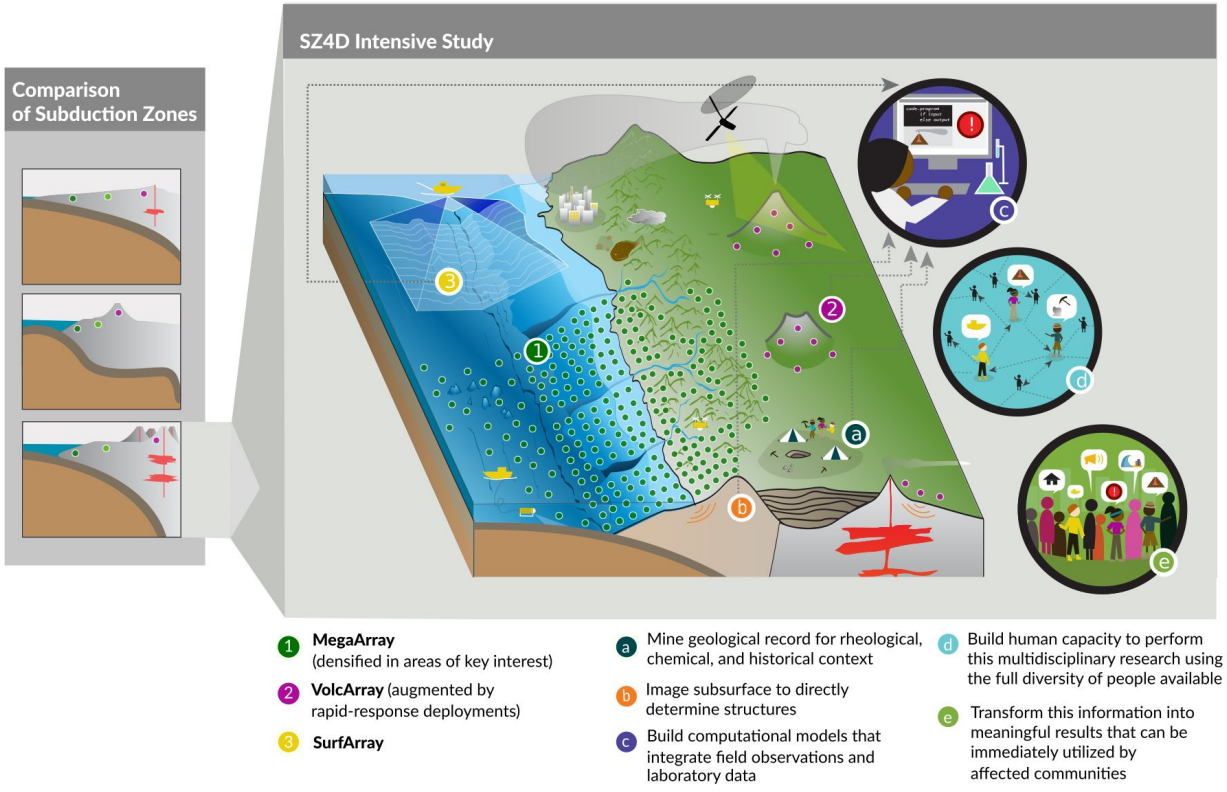
SZ4D: Future Plans



Components of instrumentation most relevant to marine seismic community

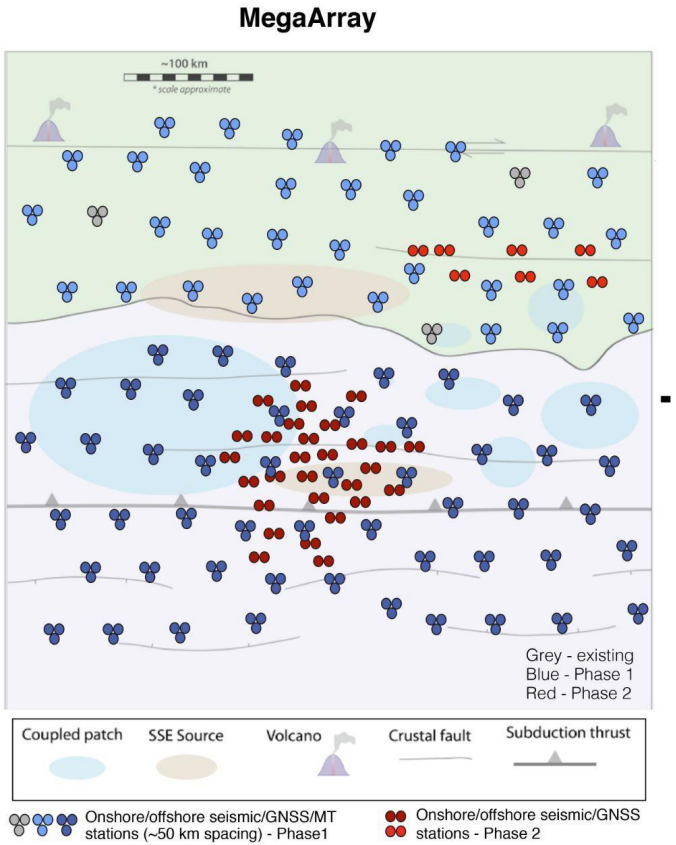
Observational arrays: MultiArray

- MegaArray
  - Seafloor seismic & geodetic
- VolcArray
- SurfArray
  - Bathymetric mapping



SZ4D Implementation Report Fig. ES-1

MegaArray



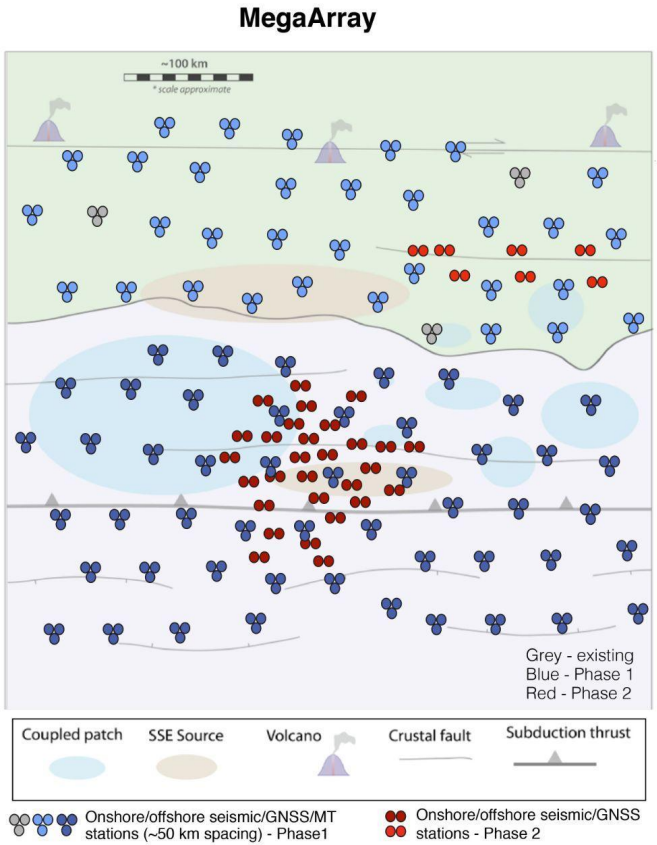
Phase 1: Backbone imaging and characterization of subduction zone behavior, *leveraging existing data*

- Exploring opportunity to use local ship
- Current costing/design based on existing OBS capabilities

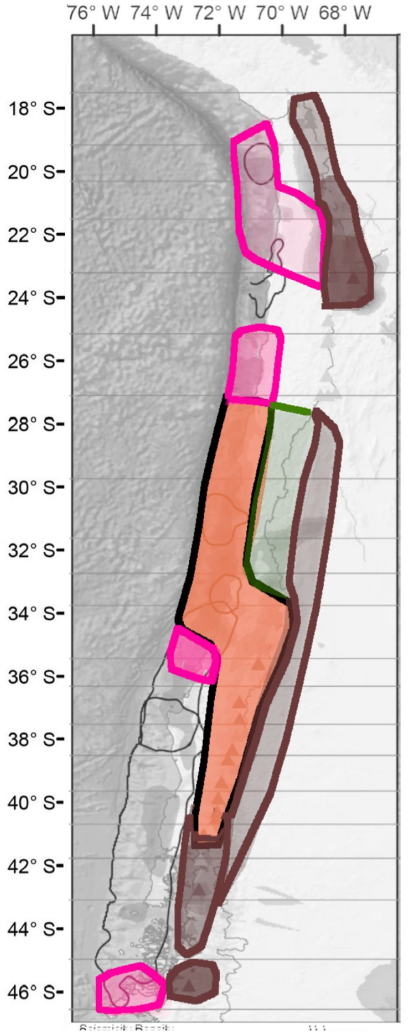
Phase 2: Detailed characterization of areas of interest informed by Phase 1

- Exploring how new technologies could address science needs

MegaArray

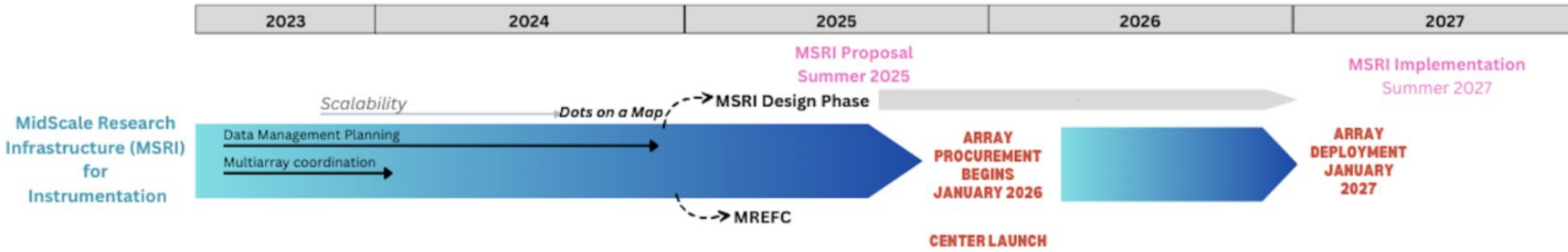


Current effort to adapt “notional” arrays to real geography



Outcome of AndesNet [2023]

Timeline for the Equipment and Arrays

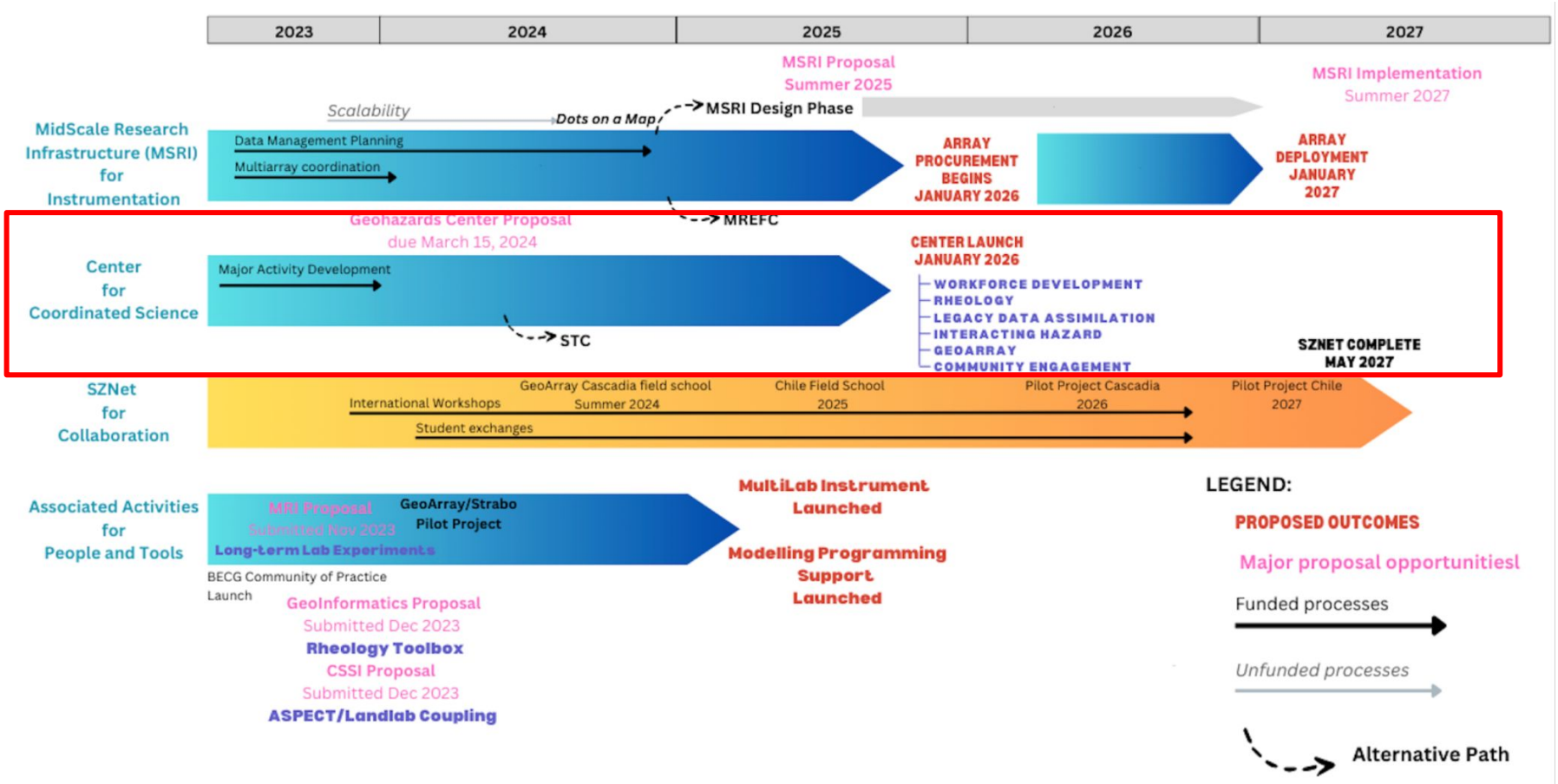


Current plan: NSF Mid-Scale Research-2 Implementation ($20-100M)

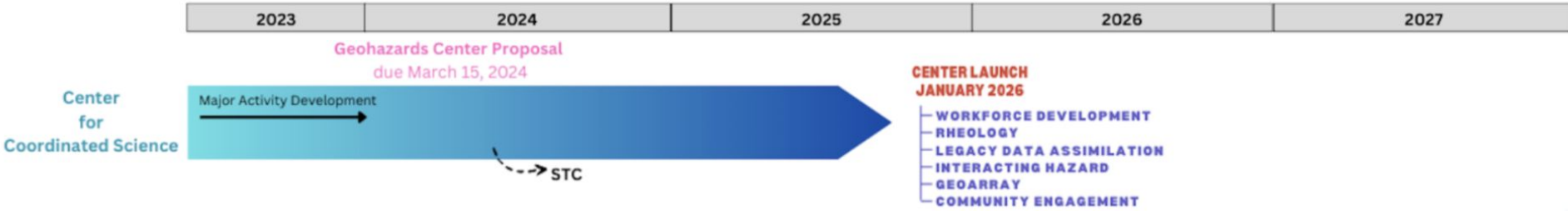
- Can fund equipment but not research
- Planning: Management, Multiarray, Scalability
- Alternatives

1) MSRI-1 Design - <$4M to design array configuration and new technology
2) MREFC - Major Research Equipment and Facility Construction (>$100M)

SZ4D: Future Plans



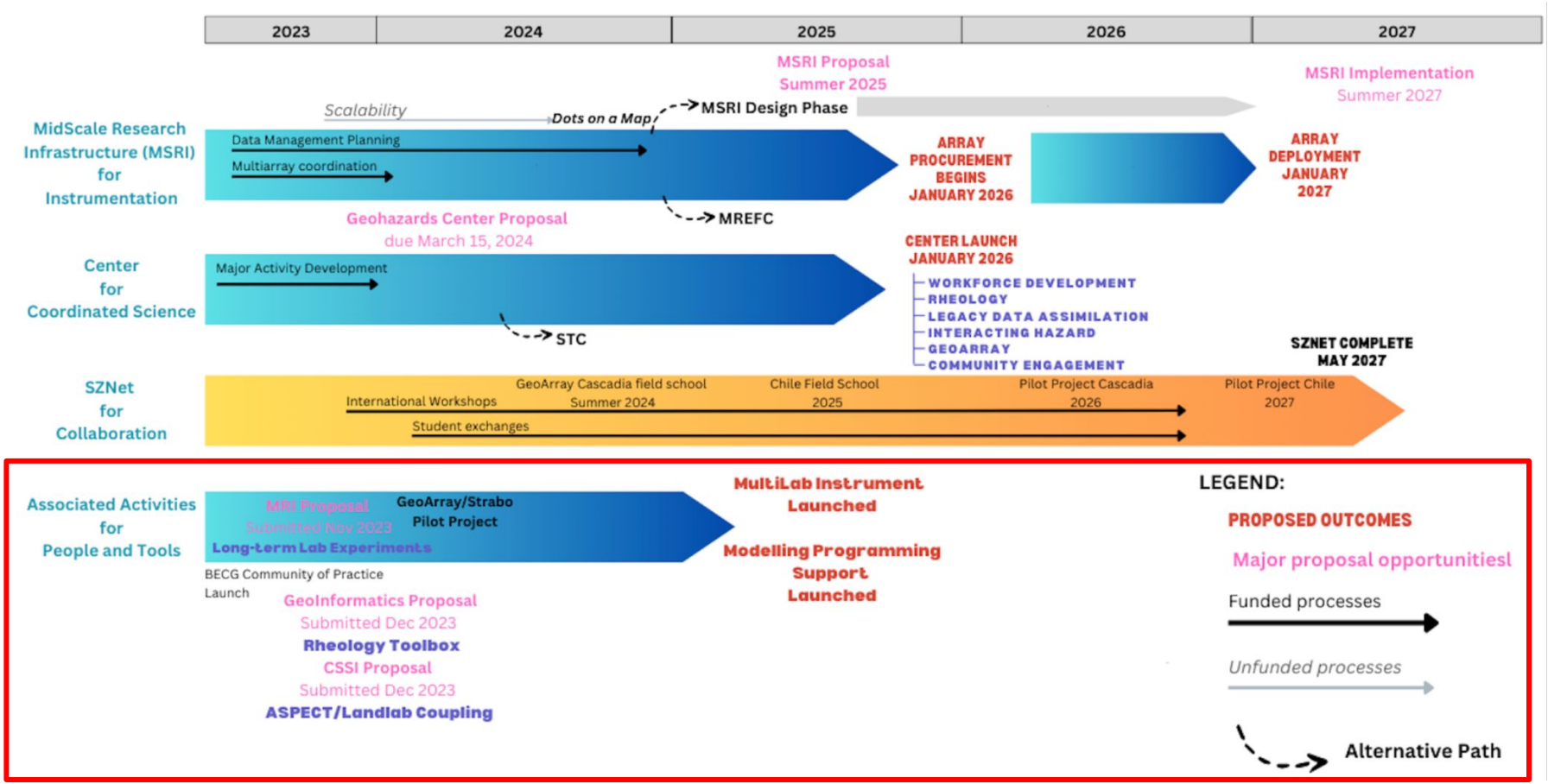
Timeline for Center



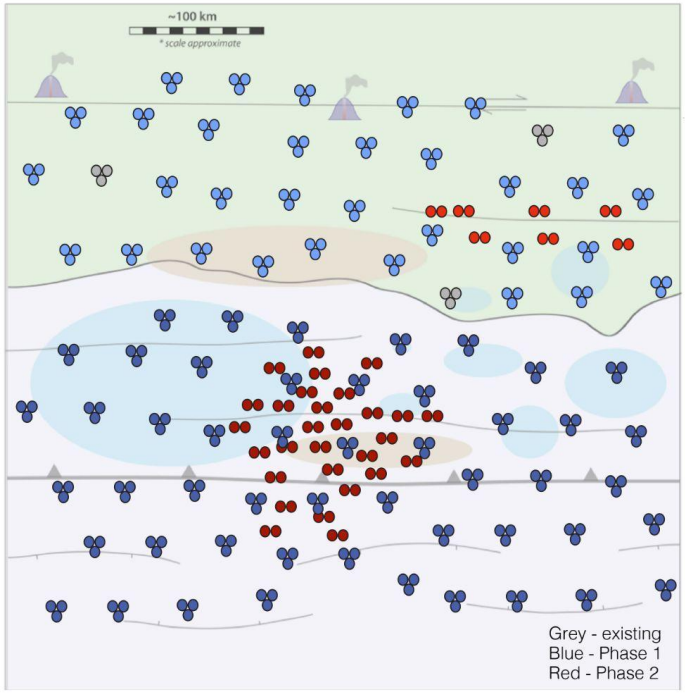
Current plan: NSF Track II Geohazards Center ($3 Million/yr over 5 years)

- Alternative: Science and Technology Center ($5M/yr over 5 years, no deadline)
- Main Pillars for Center
  1) Interacting Hazards
  2) Multidisciplinary Rheology
  3) Data Assimilation
  4) Geo-Array
  5) Workforce Development & Community Engagement

SZ4D: Future Plans



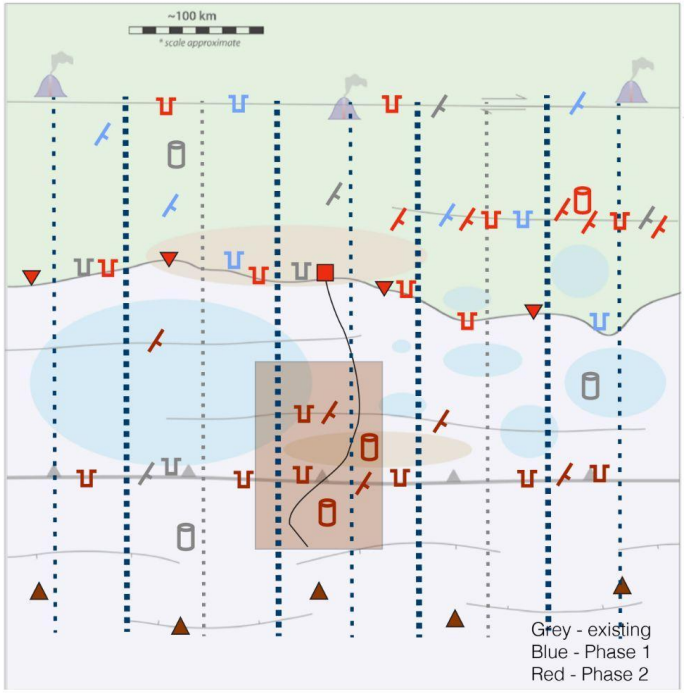
MegaArray



Onshore/offshore seismic/GNSS/MT stations (~50 km spacing) - Phase1

Onshore/offshore seismic/GNSS stations - Phase 2

Geological & Geophysical Studies



Passive/active seismic, MT profiles (20 km instrument spacing)

New/existing seismic reflection profiles

3D seismic reflection/CSEM

Deep ocean buoy system

Coastal tide gauge

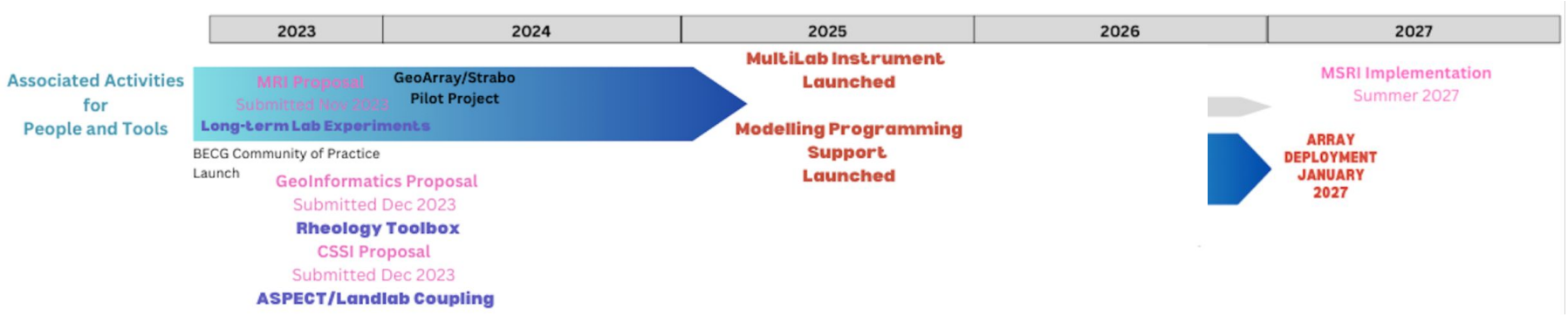
New/existing field mapping

New/existing paleoseismology

New/existing cores/samples borehole observattories

DAS

Other activities



- Many aspects of SZ4D science cannot be included in infrastructure proposal or GeoHazards Center proposal
- PI-led science to core programs can leverage SZ4D Implementation plan and connect to science community through SZ4D office/community
    - Example: several community proposals under development for Chile, Cascadia and Alaska that would address SZ4D science

Connect with us!

- Sign up for newsletter, follow us on twitter, **talk to us**
- Volunteer for committees
- AGU Townhall: Weds 6:30-7:30 pm, Marriott Marquis Hotel - SoMa Room (there will be food!)

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Questions?
Suggestions?


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