Planning the **Modeling Collaboratory for Subduction Zone Science (MCS)**

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ACES meeting 2018
Awaji Island, Japan

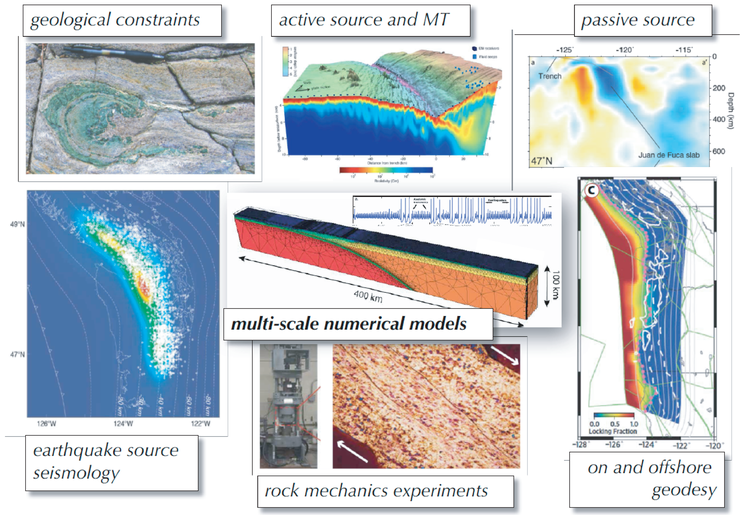
Scope

This new, US-NSF funded Research Collaboration Network (RCN) is to plan the *Modeling Collaboratory for Subduction Zone Science* within the SZ4D plan (McGuire, Plank et al., 2017), and to explore the science questions centered around **developing physical models of short to long-term deformation associated with the megathrust and arc volcano systems, including and up to rupture and eruption.**

The **fully open and collaborative** MCS will integrate the constraints from global subduction zone observatories as well as field and laboratory work into a physics-based, systems-level modeling framework that allows analysis of earthquake and volcano generating processes in subduction zones, including the decadal scale forecasting of hazard and interpretation of transients.

Data-integrative modeling collaboratory for subduction zone science

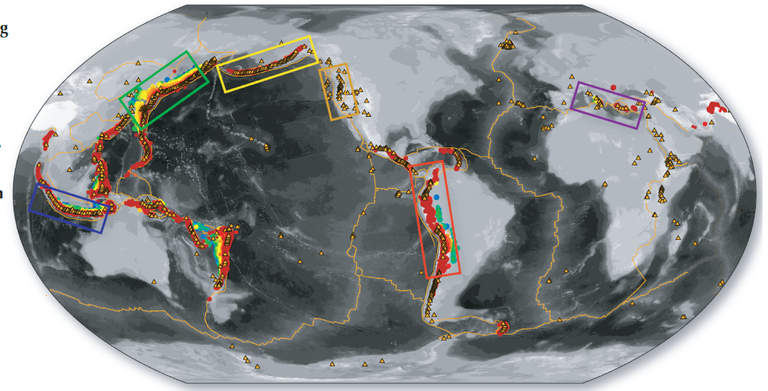
The MCS should be capable of capturing physico-chemical processes bridging convection, fractionation, tectonics, megathrust dynamics, and volcano dynamics while assimilating comprehensive datasets for improved hazard assessment. Center figure is from Tong & Lavier (2016), figures illustrating constraints (top left, clockwise) are modified from: W. Behr (pers. comm., 11/2017), Naif et al. (2015), Hawley et al. (2016), Schmalzle et al. (2014), Proctor & Hirth (2015), and Gomberg et al. (2010).



Applying and testing model frameworks across different

- tectonic settings
- stages of seismic & volcanic cycles

Providing an integrative platform for open science



Observatories

- Sumatra
- Japan
- Aleutians
- Cascadia
- South America
- Mediterranean

Steering Committee

Kyle Anderson (USGS Menlo Park)
Thorsten Becker (PI, UT Austin)
Mark Behn (Boston College)
Magali Billen (UC Davis)
Chuck Connor (U South Florida)
Allison Duvall (U Washington)
Eric Dunham (Stanford)
Helge Gonnermann (Rice)
Kaj Johnson (Indiana U)
Amanda Thomas (U Oregon)
Ikuko Wada (U Minnesota)

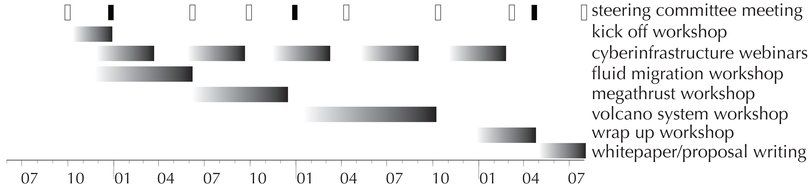
RCN objectives

The ambitious goal of establishing an MCS requires developing new tools, integration of modeling efforts, evaluating approaches for crossing spatio-temporal scales, and identifying the knowledge gaps that limit our understanding of the multiphysics processes related to subduction zone hazards.

This RCN will enable the discussion of possible pathways for establishing an MCS through a number of efforts, including a series of targeted, in-person workshops and a webinar series on cyberinfrastructure needs and capabilities.

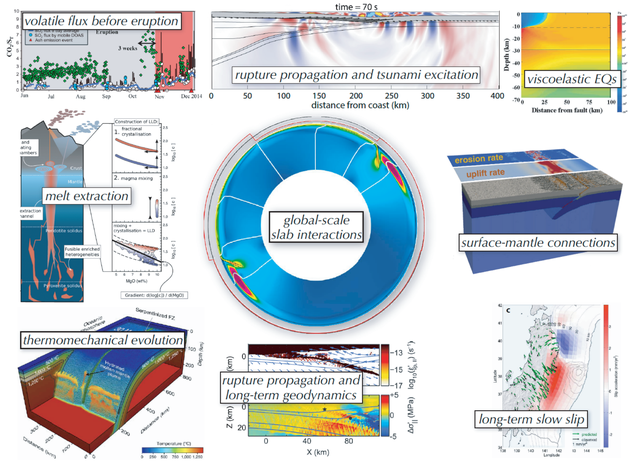
We will proceed in partnership with our international colleagues (e.g. Japan post-K hazards & monitoring, European EPOS, ...) and other community centers such as SCEC and CIG, **and invite participation!**

Project timeline



Coupled physics of earthquakes and volcanoes

Potentially deterministic processes such as volatile flux variations before eruption (top left; deMoor et al., 2016) and long-term, slow slip before rupture (bottom right; Mavrommatis et al., 2014) need to be better understood within physics-based models that account for system interactions. From top, center, Kozdon & Dunham (2014), Takeuchi & Fialko (2012), Ueda et al. (2015), van Dinther et al. (2014b), Manea et al. (2014), Shorttle et al. (2016), and Gerault et al. (2012).



Model building block interactions to be explored in our workshops

Figures from (top left, clockwise): Abers et al. (2017), Gonnermann & Manga (2005), Shorttle et al. (2016), Grove et al. (2012), Jadamec & Billen (2010), Kozdon & Dunham (2013); background: Hyndman & Peacock (2003).