

# Rupture and Fault Zone Observatory Current Summary - v. 3/30/2021

## Overview

The Rupture and Fault Zone Observatory (RuFZO) is a proposed observatory for a community-scale experiment to capture in-situ rupture and near-fault zone properties via a range of geophysical sensors. The design and implementation of RuFZO will evolve through a series of proposal stages, community workshops, and virtual meetings. The primary observational goals are:

1. High resolution imaging of the very near-fault zone (<2km) structure to sufficiently characterize the complexities and damage zones, including at depth.
2. Make fundamental near-fault observations if and when a large earthquake occurs, as well as capturing the preparation process in the 1-2 years prior.
3. Observe post-seismic near-fault processes of previous earthquakes.

Dense linear arrays of seismic and geodetic sensors would be installed in about 45 targeted locations (Focus Area Arrays) on the Southern San Andreas, San Jacinto and Elsinor faults as seen in Figure 1. Each array of weak and strong motion sensors would have increasing density towards the fault, along with additional observations such as cameras, LiDAR, laser-distance monuments, and strainmeters (some covered through separate proposals). To characterize the fault structure in each Focus Area Array, a Nodal Survey campaign of 30 day deployments of dense (25-50 meter spacing) geophones will be conducted, and these well-constrained field exercises used to introduce early career geophysics professionals and community colleges in the planning and execution of this common technique. Incorporating early career researchers into the implementation of RuFZO will be supported along with training and hands-on experiences for students, researchers, and local communities.

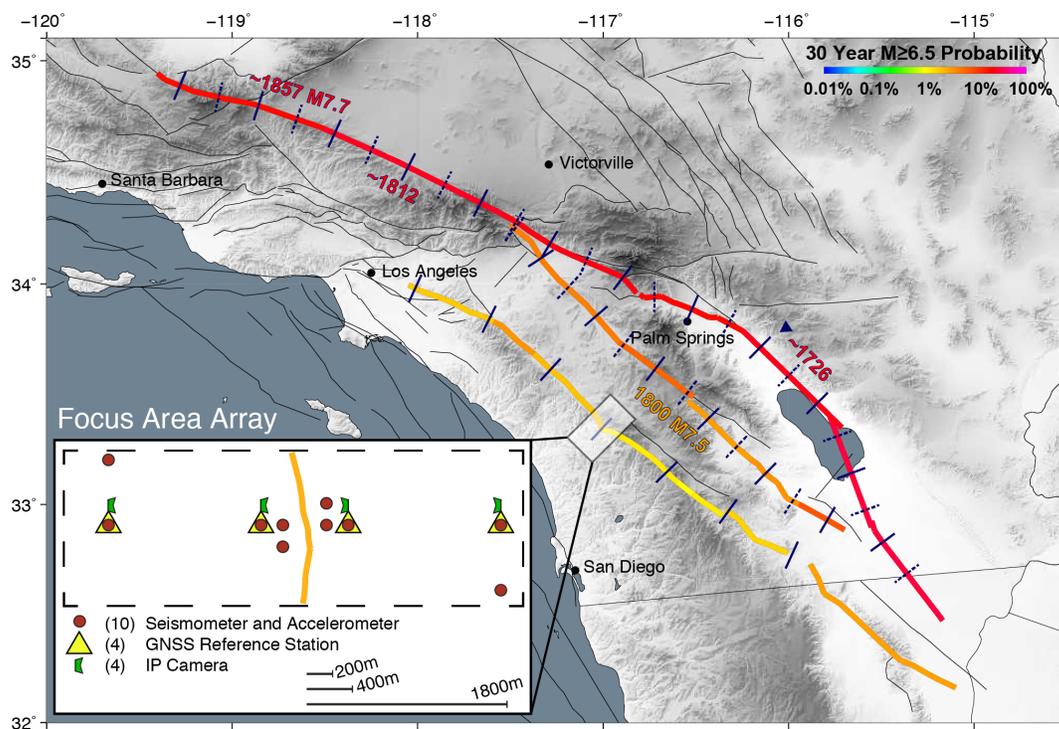


Figure 1. Potential locations of the Focus Area Arrays along the fault system shown as dotted lines perpendicular to the fault. Inset shows an example layout of installed sensors.

**Roles, Timeline, and Budget - Notional**

IRIS is the lead in the proposal response to the NSF MSRI Track 2 solicitation, in collaboration with SCEC and UNAVCO. The proposal timeline required a preliminary proposal by March 5th, and, if invited, a full proposal by September 20th, 2021. A community online workshop related to the RuFZO is planned for April 2021 with a follow-on online workshop in late Summer 2021. The duration of the project would be 9 years with a disposition plan coordinated with the Southern California Seismic Network to continue real-time monitoring, subject to available funding. This is envisioned as a tapering reliance on NSF funding and increasing reliance on other agency support over a 2-3 year period. The project duration and transition are notional at this stage, and will be refined as part of the community discussion and proposal preparation.

The current RuFZO proposed budget is ~\$50M over five years under MSRI, with an additional four years totalling ~\$10M that allow for completion of Nodal Surveys and operations. Within the MSRI period 37% is for equipment, 17% is for installation, 31% for operations, 6% for management and 9% for training. In the period following MSRI, 80% is for operations.

Start of Project Feb 1 2023						Total by Award Period	
Observatory Implementation Estimates						MSRI2	\$46,241,360
Deploy schedule				Equipment PO		EAR	\$11,315,179
Proj. Year	Focus Arrays	Nodal Sur.	Arrays in op.	Focus Arrays	Nodal Equip.	Yearly Total	
Y1			0	10	100	\$7,827,054	
Y2	10	5	10	18		\$12,210,205	
Y3	10	5	20	18	100	\$12,828,009	
Y4	10	10	30			\$6,402,742	
Y5	15	10	45			\$6,973,350	
Y6		10	45			\$3,426,969	
Y7		5	45			\$3,350,795	
Y8			45			\$3,004,910	
Y9			45			\$1,532,504	

*\*Operational costs would begin transitioning from NSF in Year 8 and end in Year 9.*

**Potential Outcomes**

- High-quality data will be collected via collocated instruments and made publicly available for science right away, allowing a research community to thrive around the near-fault focus area before a large earthquake is captured.
- The RuFZO will strengthen the earthquake source research community and build stronger connections between communities of IRIS-SCEC-UNAVCO (eventually EarthScope Consortium-SCEC).
- The EarthScope program demonstrated that successful community-scale programs like the RuFZO can lead to additional complementary funding of focused PI-led projects.
- Final disposition of the RuFZO can follow examples such as the N4 network in the Lower 48 U.S., where state/federal or industry/utility support for sustained monitoring observations related to hazards can continue to benefit research science.
- The project (and solicitation) address a need to train and experience new professionals in facility operation, planning, and management.