Community Seismic Network in the Apaneca-Ilamatepec-Coatepeque Volcanic Complex in El Salvador

Navin Thapa[1*], Thomas H. W. Goebel[1], Sadia Marium Rinty[1], Susana Delgado[2], Diego Figueroa[2], Josue Estrada[2], Adonay Martinez[2], Jaqueline Rivera[3], William Mejia[4], Benancio Henriquez-Miranda[2]

[1]CERI, University of Memphis, Memphis, USA; [2]National University of El Salvador, Santa Ana, El Salvador;

[3]Ministerio de Medio Ambiente y Recursos Naturales, El Salvador, [4] Ministerio de Education, El Salvador

*presenting author: nthapa@memphis.edu

1. BACKGROUND

The Apaneca-Ilamatepec-Coatepeque volcanic complex in El Salvador is situated in the Central American Volcanic Front, which is a chain of volcanoes stretching over 1000 km from Guatemala to Costa Rica. This volcanic chain is associated with the process of subduction, where the relatively young lithosphere of the Cocos Plate is being pushed beneath the Caribbean Plate **(Figure 2)**. This region has witnessed volcanic eruptions over the past few centuries, with the most recent one occurring on October 1, 2005. Before this eruption, there was an increased level of seismic activity in the area, including a ML4.8 event of March 2005 **(Figure 3)**. The proximity of subduction zone, active volcanoes, and on-shore faults present a formidable challenge for population centers in the region. Consequently, it is crucial to collect and analyze data on seismic events to enhance the understanding of volcanic and seismic hazards in the area.

We deployed seven three-component raspberry shake instruments and associated four broadband stations of Servicio Nacional de Estudios Territoriales (SNET), El Salvador in our network known as **Community seismic network in the Santa Ana Volcanic Complex in El Salvador (Figure 1).** The network was deployed across the volcanic complex in fall 2024 and captured several prolific swarms in December 2023 and January 2024 **(Figure 4)**. This poster presents the process of deploying and creating a seismic catalog, as well as producing a first 1D velocity model of the area **(Figure 6)**.

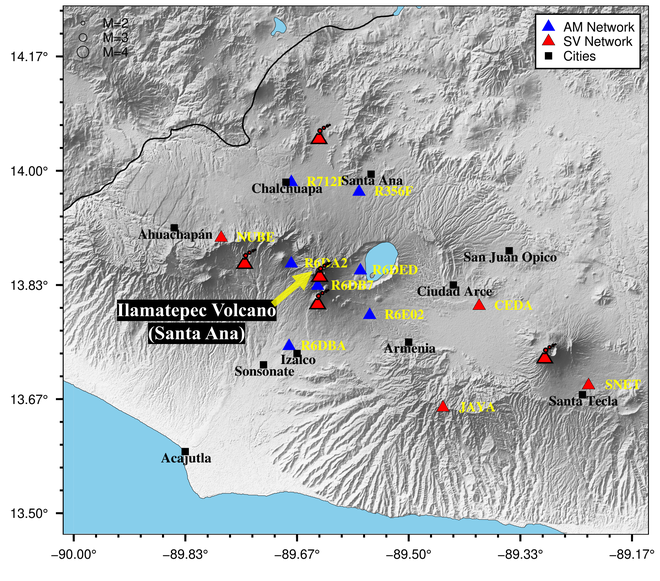

Figure 1: Map of Community seismic network in the Apaneca-Ilamatepec-Coatepeque Volcanic Complex in El Salvador blue triangle represent Raspberry Shake sensor and red triangle represent Trillium Compact seismometer.

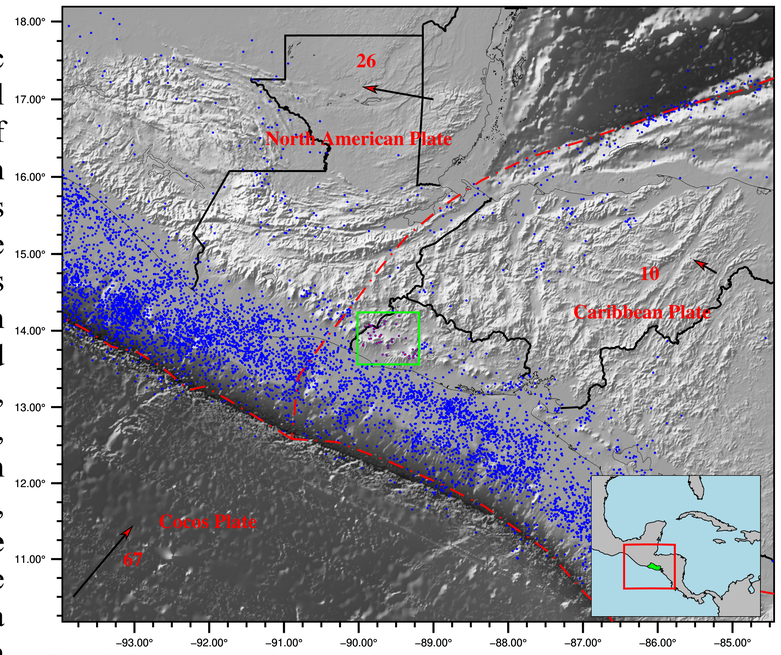

Figure 2: Seismotectonic of the area where green rectangle is our network span (Plate velocity, mm/year (DeMets, 2001).

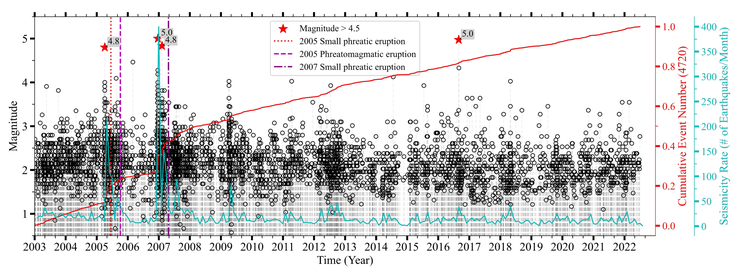

Figure 3: Seismicity in the area recorded by SNET, event showing since 2003.

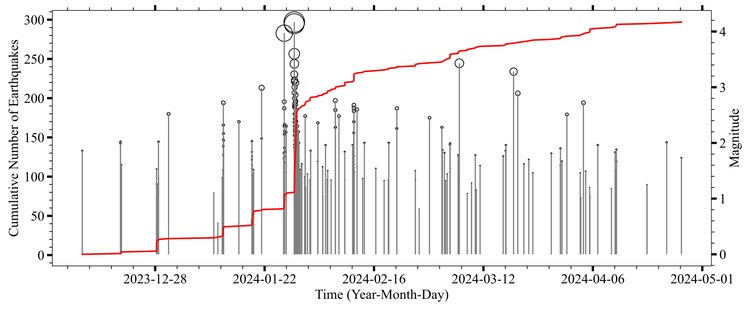

Figure 4: Seismicity after Community seismic network in the Apaneca-Ilamatepec-Coatepeque Volcanic Complex in El Salvador started recording.

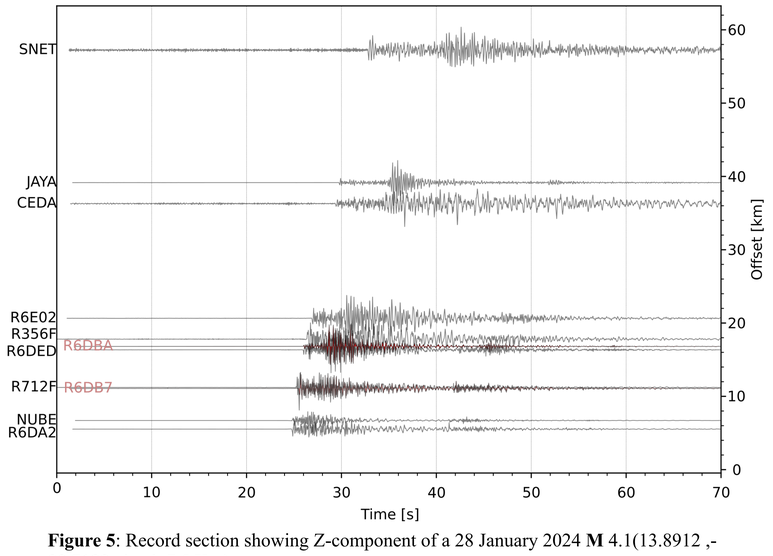

Figure 5: Record section showing Z-component of a 28 January 2024 **M** 4.1(13.8912 ,-89.7188, depth 7.5 Km).

2. VELOCITY MODEL, LOCATION & RELOCATION

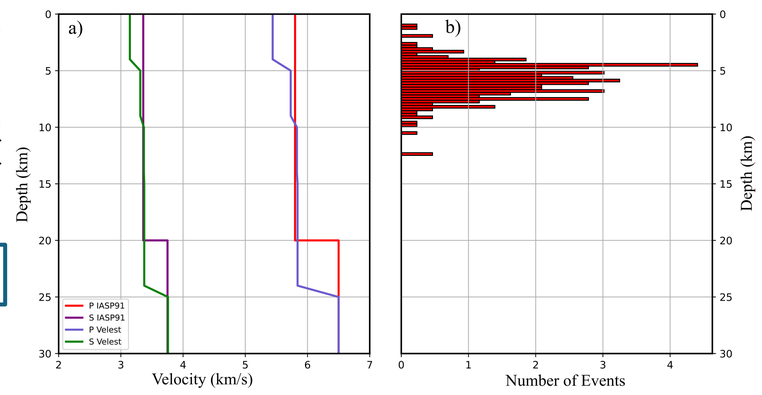

Figure 6: a) Minimum 1D velocity models (P-wave and S-wave) with station corrections estimated using Velest (Kissling et. al. 1995) b) Depth distribution of hypocenter locations of earthquakes for estimated velocity model.

For more on:
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Deployment of Raspberry Shake seismometer R6DED station on plastic case with thermal insulation inside on well coupled tile surface.

Deployment team of Raspberry Shake seismometer R6DED station At Fe y Alegría School, Close to Coatepeque Caldera Lake, El Salvador

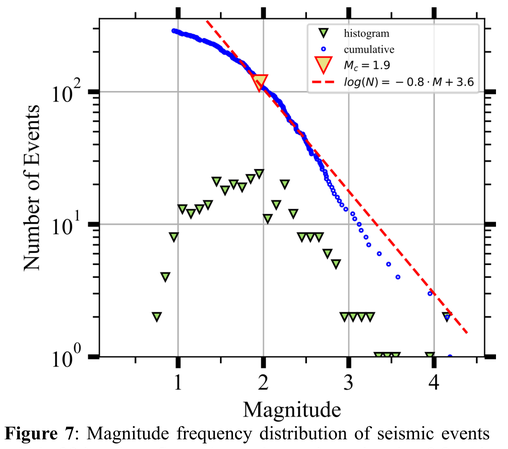

Figure 7: Magnitude frequency distribution of seismic events within 30 km from Santa Ana volcano shows b-value 0.8 with Magnitude of completeness of 1.9.

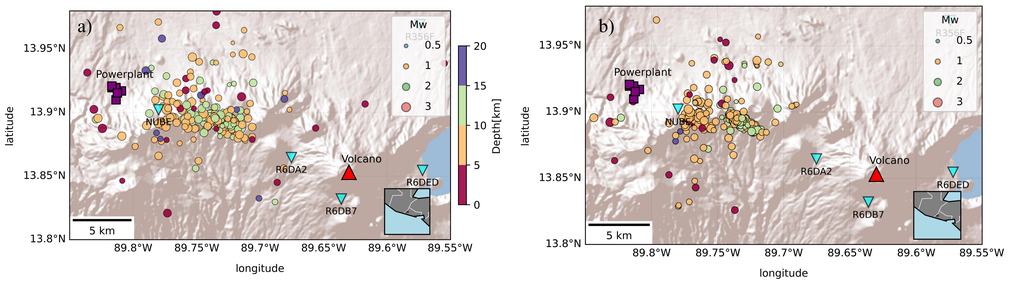

Figure 8: a) Location of event using NonLinLoc (Lomax etl al., 2009), b) relocation using cross-correlation algorithm GrowClust (Trugman & Shearer, 2017).

3. FUTURE RESEARCH

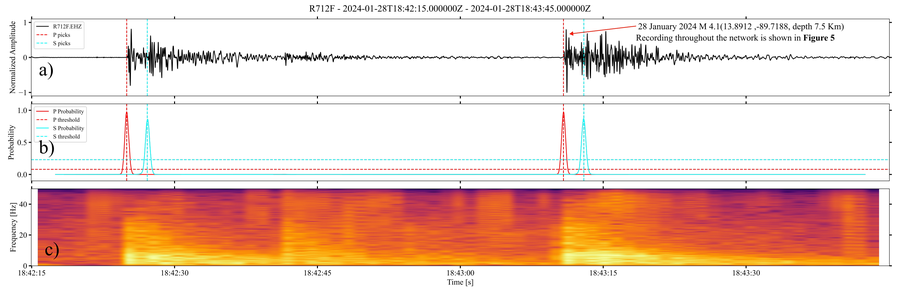

Figure 9: a) Raw waveform of Z component of event recorded at Raspberry Shake R712F station, b) probability of phases (P-blue, S-cyan) picking using PhaseNet algorithm (Zhu and Beroza, 2019) and c) spectrogram

1. Improve event detection with machine learning.
2. Is there a connection between the Santa-Ana-Izalco magmatic systems?
3. What is the role of swarms in the Cordillera de Apaneca?

4. References

DeMets, C. (2001). A new estimate for present-day Cocos-Caribbean plate motion: Implications for slip along the Central American volcanic arc. *Geophysical research letters*, *28*(21), 4043-4046.

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