

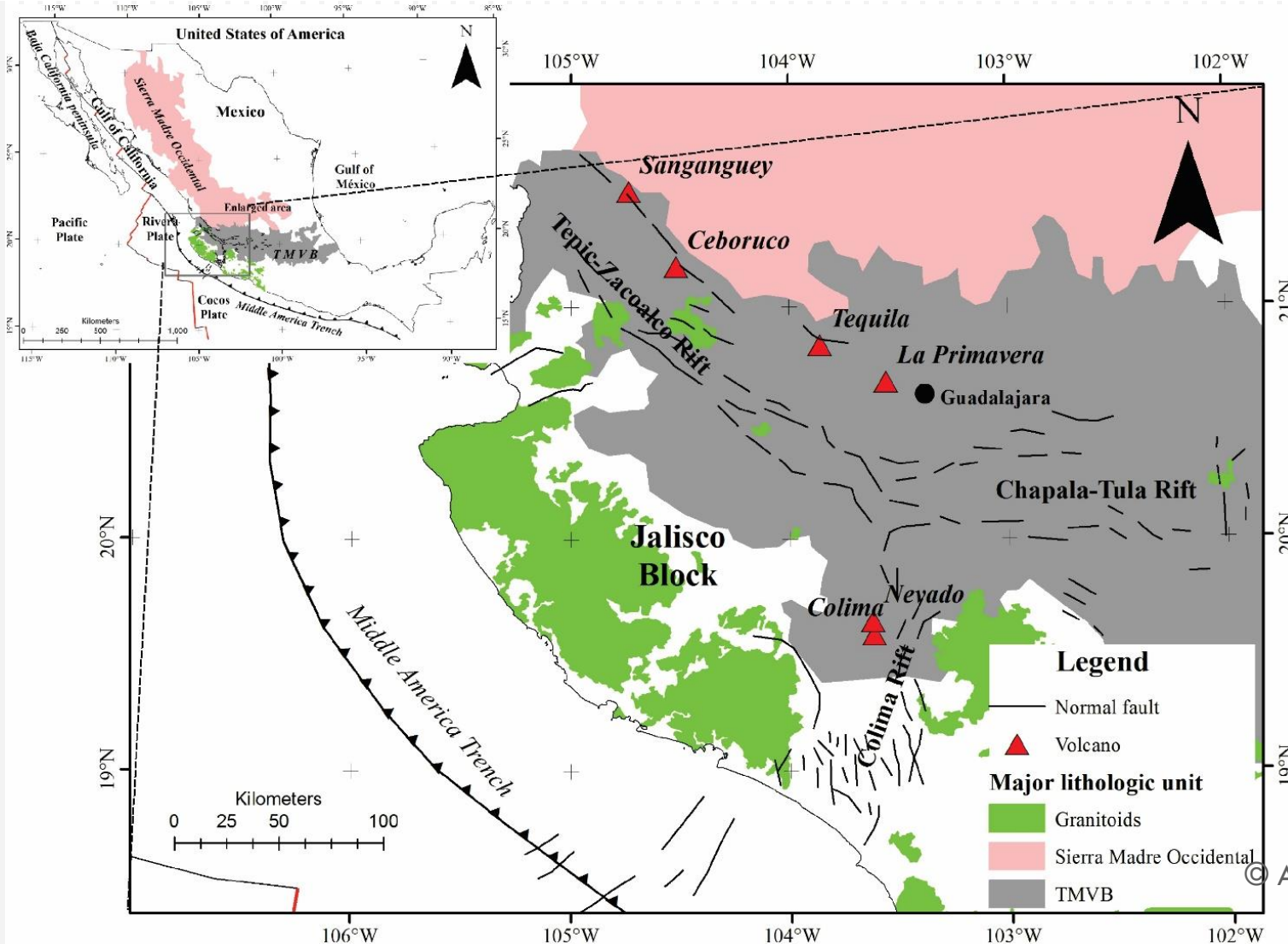


THE SEISMIC NETWORK OF ZAPOPAN: EVALUATING THE LOCAL SEISMICITY OF THE WESTERN GUADALAJARA METROPOLITAN ZONE



Tectonic Setting

2



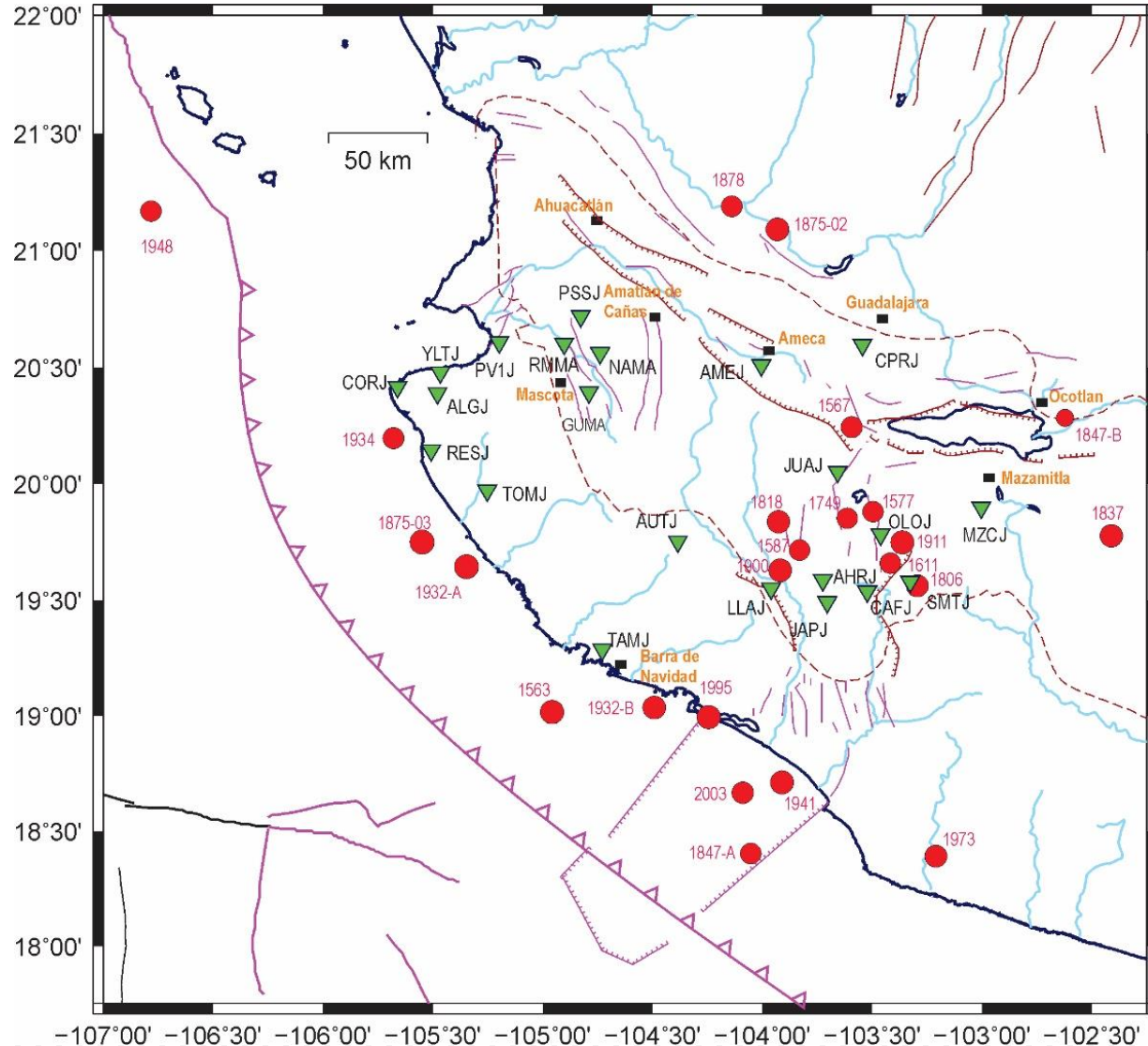
Western Mexico is one of the most seismically active regions in the country; this region includes the states of Jalisco, Colima, and Nayarit. The Jalisco Block (JB) is a tectonic unit limited by the rift zones of Colima (CoR), Tepic-Zacoalco (TZR) and Chapala (CR) and the subduction zone along the Middle American Trench (MAT).

Our study area is located at the end of the TZR in the Guadalajara Metropolitan Zone (GMZ). Currently, the GMZ is the second most populated city in Mexico. In this scenario, the La Primavera Caldera is located in the western part of GMZ, within the Zapopan Municipality.



Seismicity Background

3



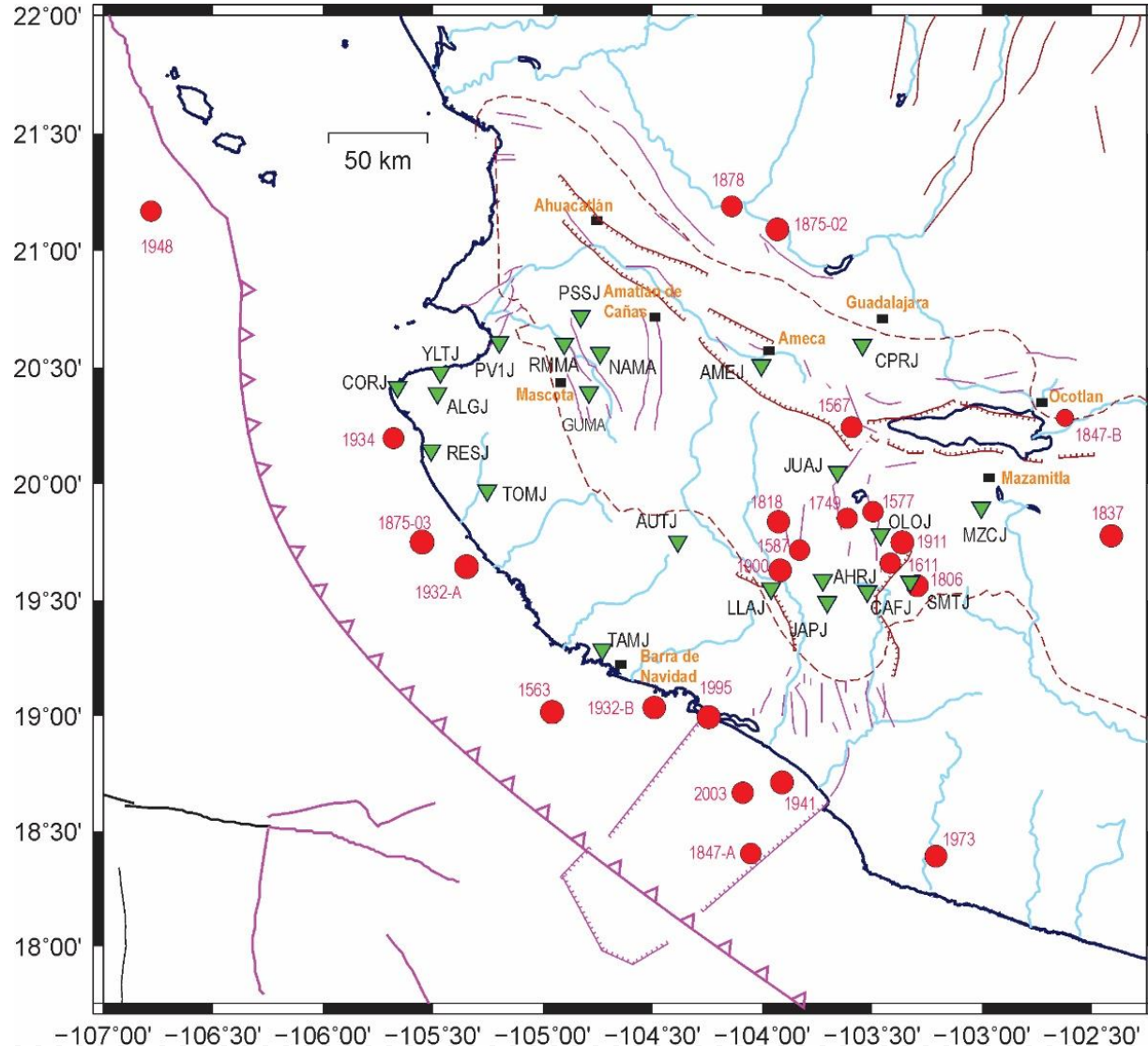
- The Jalisco region has experienced more than 20 destructive earthquakes of magnitude greater or equal to 7.0 with epicenters along the coast and inland, historical macroseismic data for the region date back to 1544 (Núñez-Cornú, 2011). Núñez-Cornú et al. (2018) reported that in the past 474 years, there were at least 22 major earthquakes with $M > 7.0$ in the Jalisco region not all due to the subduction process.

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Seismicity Background

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Historical Earthquakes with $M > 7$

- 1567
- 1577
- 1818
- 1875
- 1878

Seismic Swarms

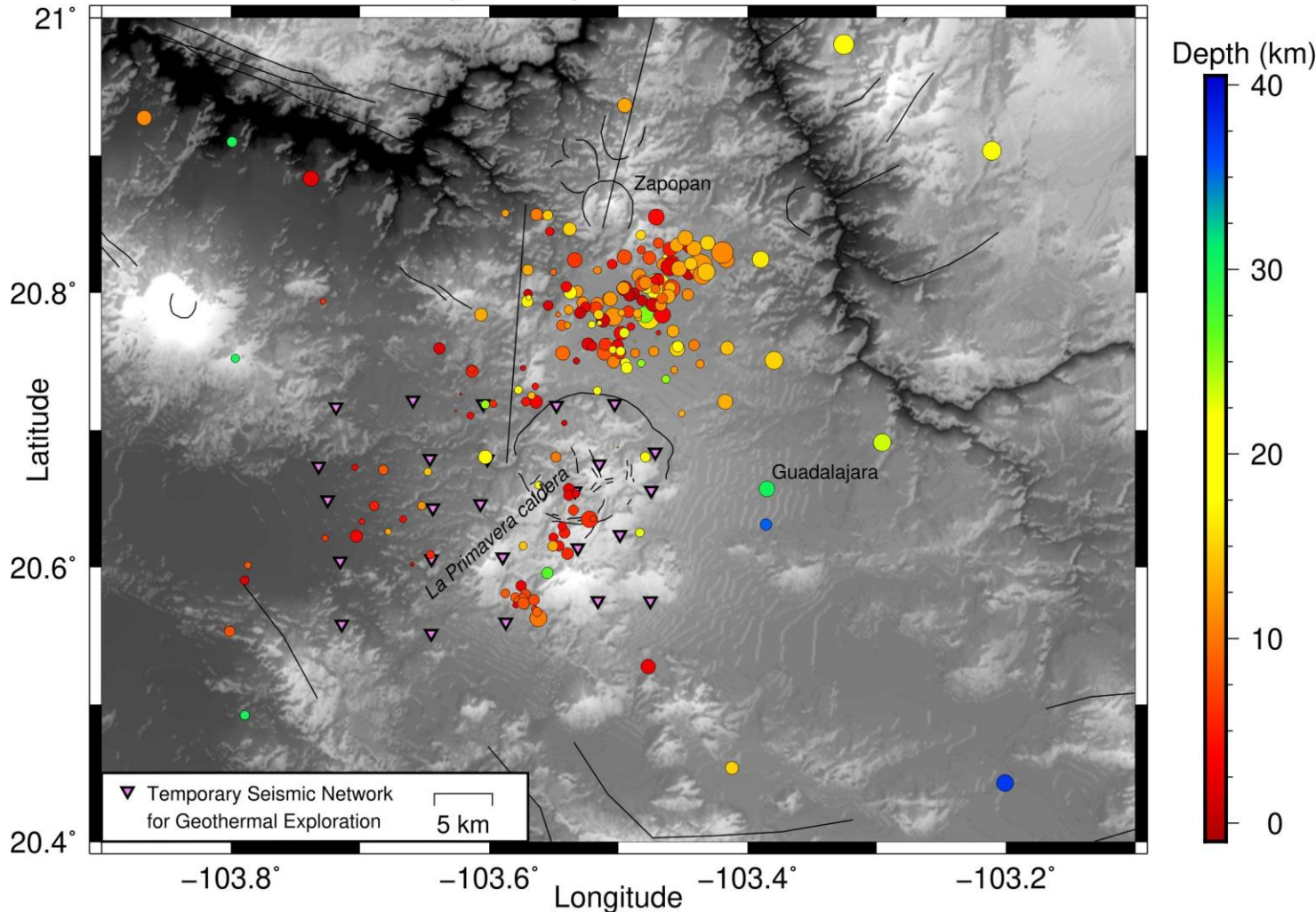
- 1685 – 1687
- 1770 – 1771
- 1806
- 1844
- 1912
- 2015 - 2016

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Seismicity Background

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Seismicity: 3 Sept 2017 – 1 Dic 2018.



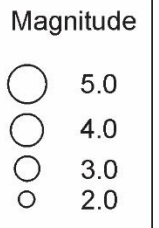
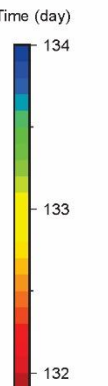
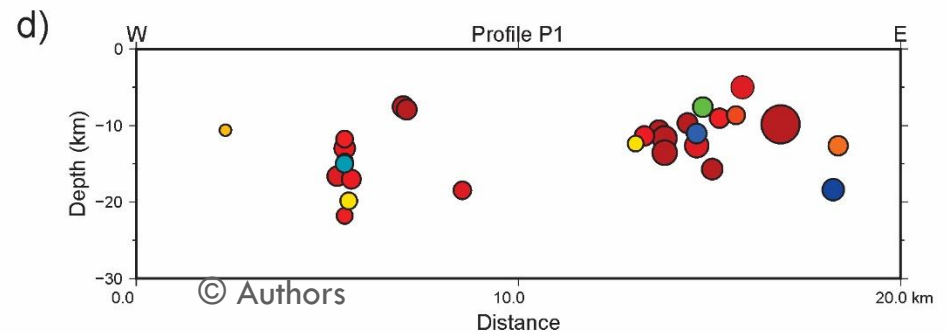
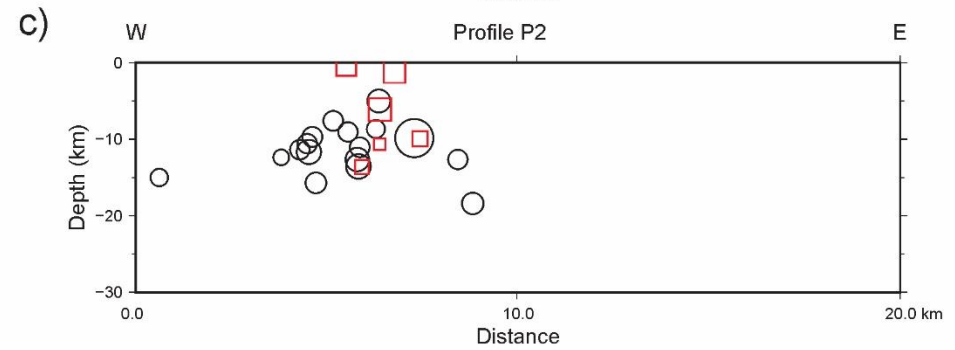
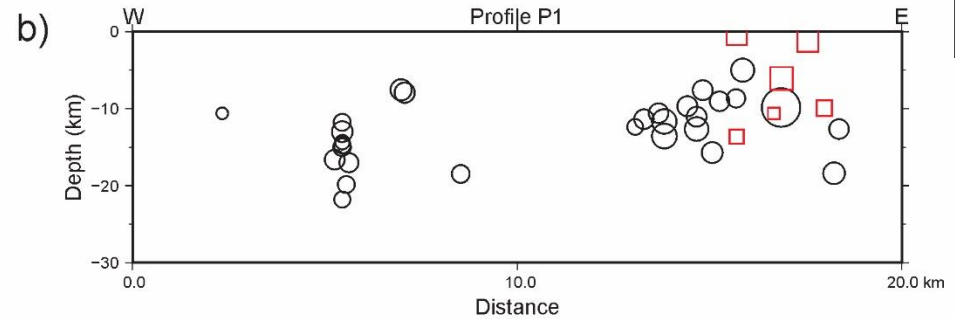
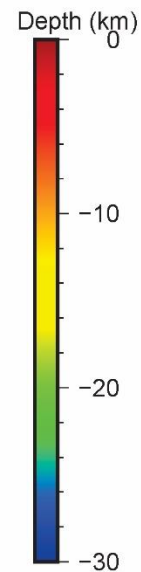
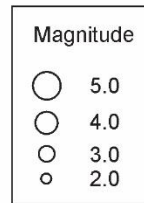
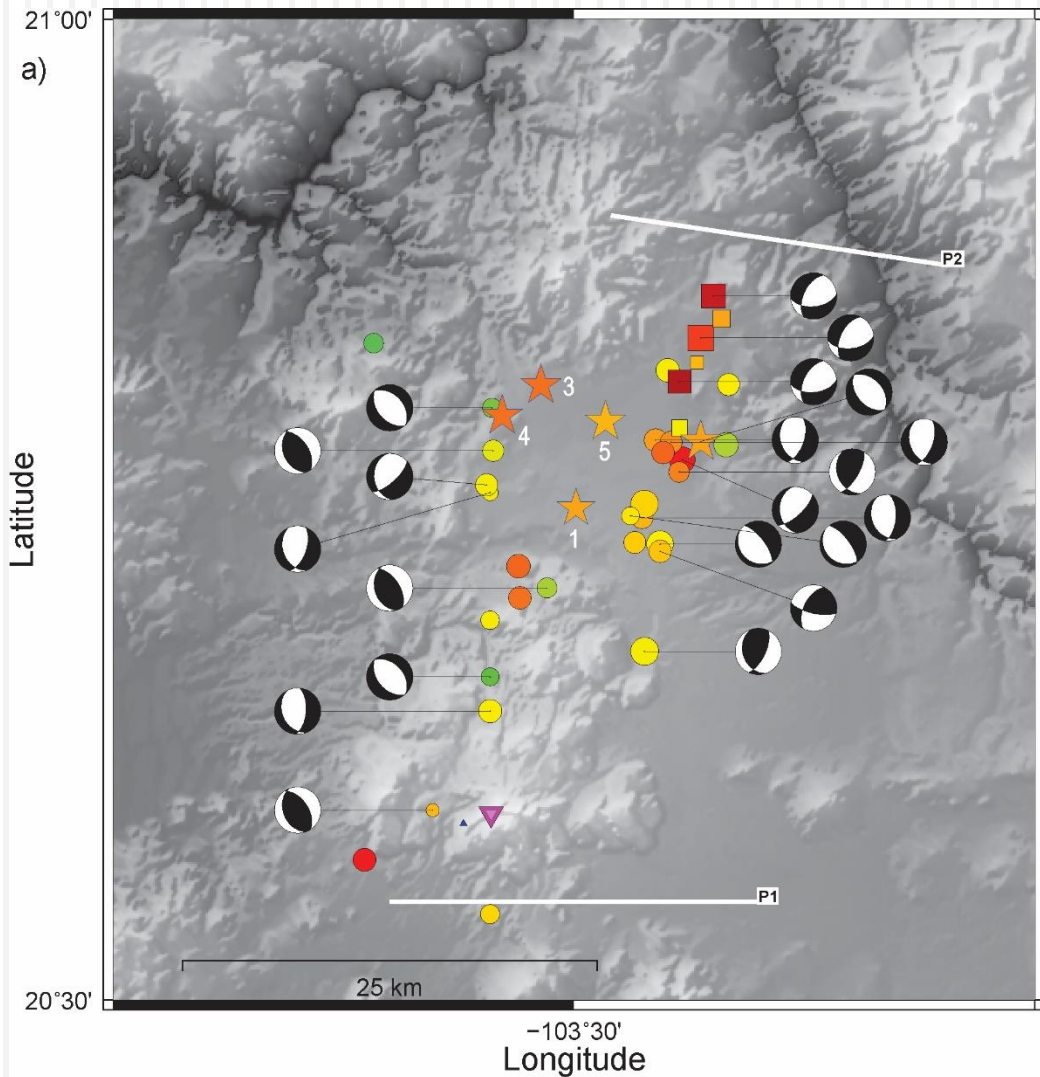
During the CeMIEGeo P-24 project, a temporary seismic network was installed in the Sierra de La Primavera and surrounding areas and consisted of 25 stations distributed with an average distance of 2 to 3 km between each. This shows the seismicity recorded (207 events) in the Zapopan area from September 2017 to January 2018 with magnitudes between 0.5 and 3.8.

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Seismicity Background. Seismic Swarms

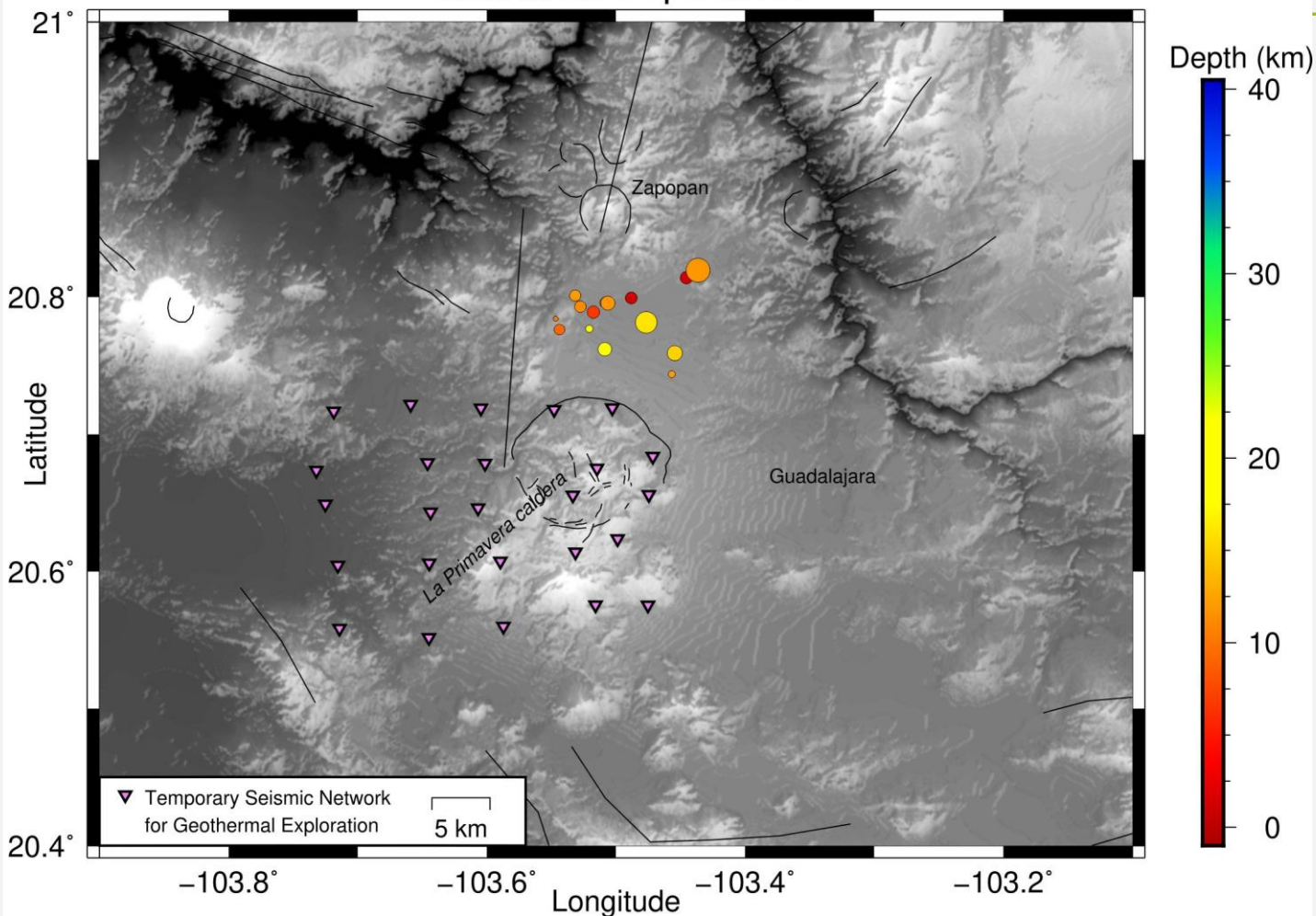
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Seismicity Background. Seismic Swarms

7

Swarm 26 Sept 2017.



Within the seismic study carried out in the P-24 project, two seismic swarms occurred during September 2017 and December 2017 with numerous events indicating that it is an area of high seismic activity (Quinteros-Cartaya et al. in preparation). More geophysical and geological studies are necessary to confirm these tectonic structures.

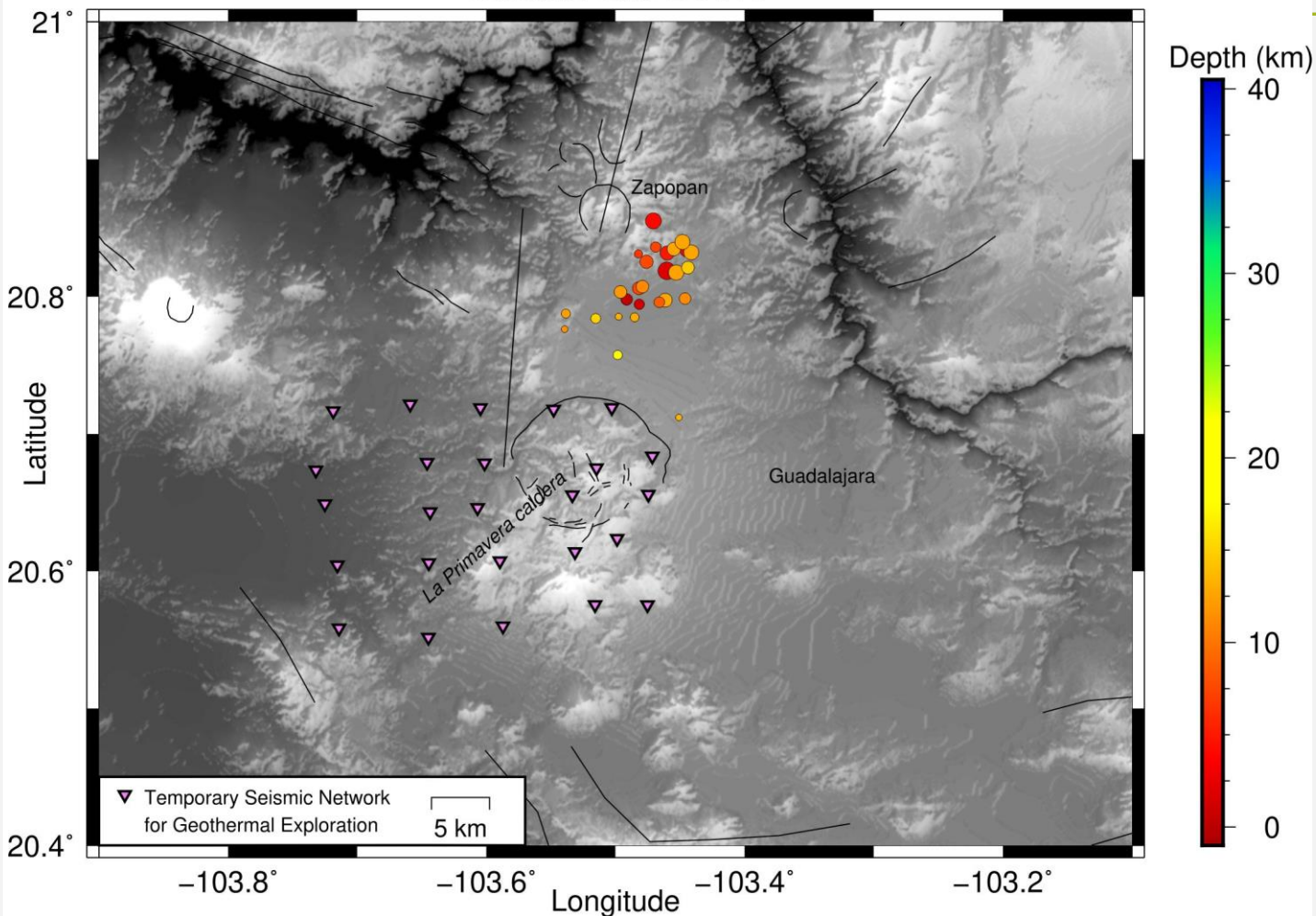
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Seismicity Background. Seismic Swarms

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Swarm Dic 2017.



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Seismicity Background

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- Recently, different studies of seismic swarms have occurred in the study area.
 - ▣ The previous figure shows the relocations of the seismic sequences of December 2015 and May 2016 with two apparent alignments with direction NS to W of GMZ with lengths of 10 km (West) and 16 km (East), being able to generate ML events up to 6.2 and 6.5, respectively.
 - ▣ The proposed focal mechanism is predominantly normal, suggesting the existence of Graben de Zapopan.
 - ▣ P-24 Project established the region continues being seismically active, so more geophysical and geological studies are necessary to confirm these tectonic structures.

The Seismic Network of Zapopan (RESAZ)

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- At the end of 2016, the Agreement between the Municipality of Zapopan and the Research Group CA-UDG-276 *Centro de Sismología y Volcanología de Occidente (SisVOc)* was signed.
- Objective: Install seismic stations and monitor the geophysical parameters of the active tectonic structures to characterize the focal mechanisms of seismicity, refine the locations of events that occur within the Municipality and associate it with the active structures.
- The data will be available for Zapopan Civil Defense to mitigate and reduce risk and vulnerability in the municipality.

The Seismic Network of Zapopan (RESAZ)

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- At the beginning of 2018, the resources for the acquisition of the seismic and accelerometric stations begin to arrive.
- In April and May 2018, the sheds that house the seismic stations begin to be built in the unpopulated regions of Zapopan, and ABZJ is installed.
- By 2019, the five stations are entirely installed, and at the end of 2019, the telemetry is connected.

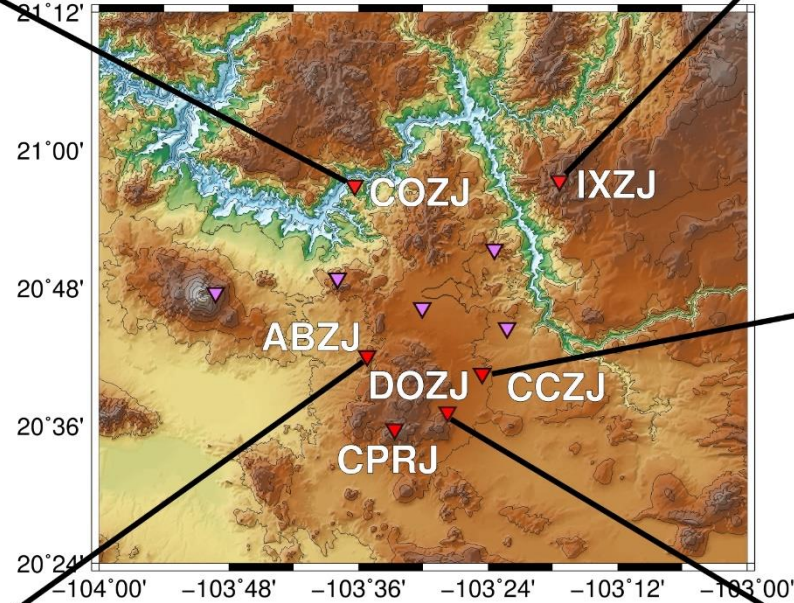
The Seismic Network of Zapopan (RESAZ)

COZJ



IXZJ

Deployment map of the Seismic Network of Zapopan (RESAZ) and CPRJ from RESAJ. Red triangles denote seismic and accelerometric stations installed in the first stage, and purple ones will be installed in the second stage.



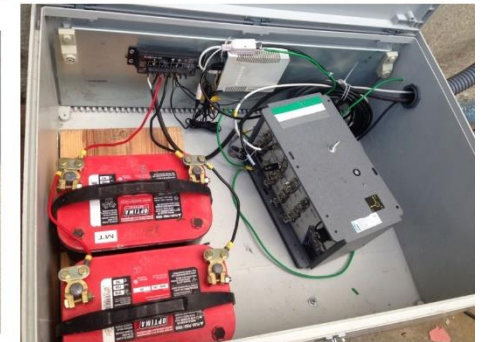
CCZJ



ABZJ



DOZJ



The Jalisco Seismic Network of Zapopan (RESAZ)

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□ Data Acquisition Systems

■ ABZJ, IXZJ & COZJ

- Obsidian Digitizer 8X (Kinematics)
- Episensor sensor at 200 sps
- Lennartz LE3D sensor at 100 sps

■ DOZJ & CCZJ

- Obsidian Digitizer 4X (Kinematics) with internal accelerometer at 200 sps

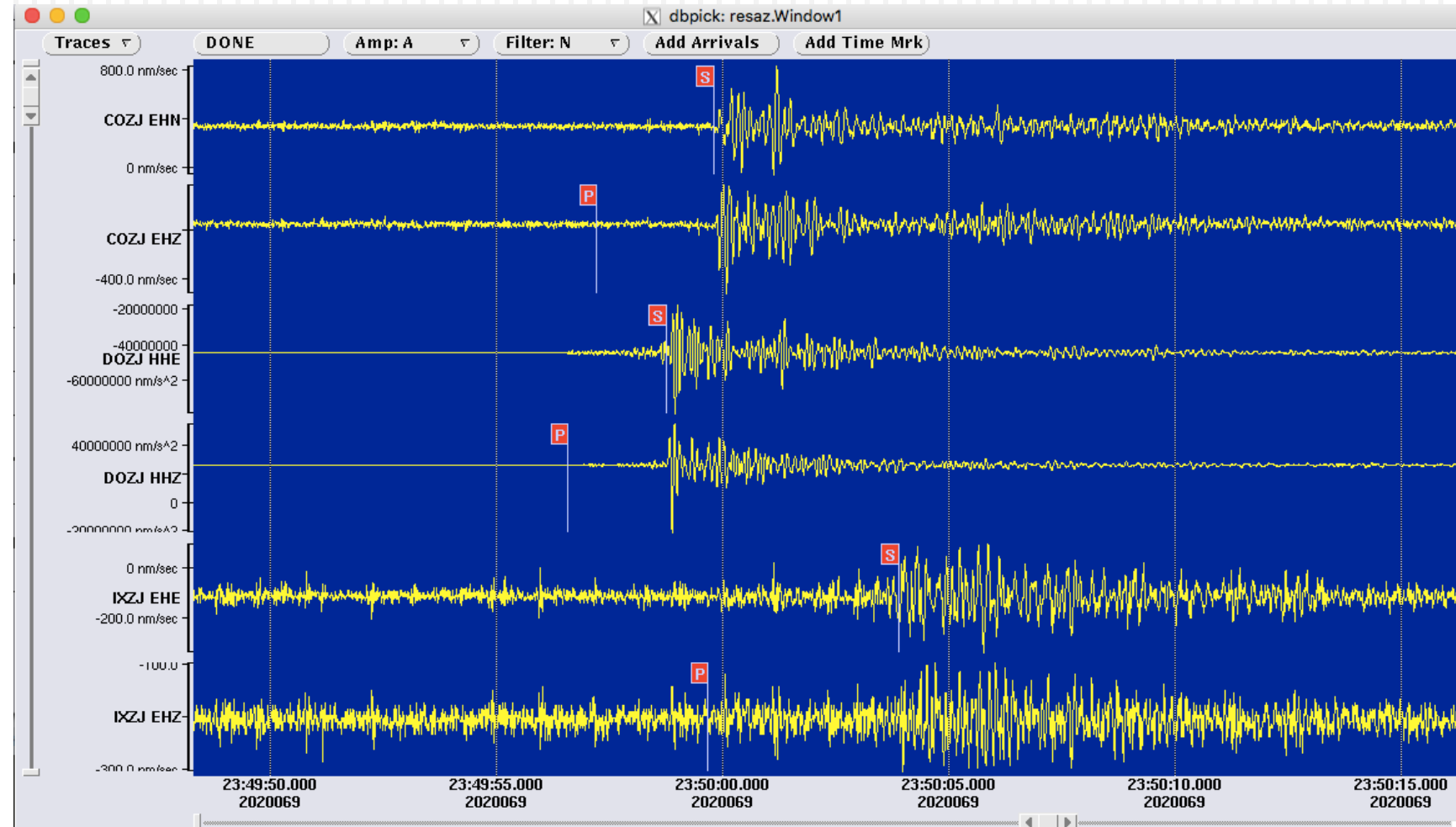
The Jalisco Seismic Network of Zapopan (RESAZ)

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□ Earthquake recorded by RESAZ stations

□ Location

- 09/03/2020 (069)
- 23:49:54.28 (GMT)
- (20.7463°, -103.5748°)
- 10.62 km
- M_L 3.9



Work in progress

Station
review and
data
extraction

Deployment
fo the last
station of the
first stage
and second
stage stations

Calibration
of the
automatic
system of
data
acquisition
and event
location
(ANTELOPE)

Detection of
errors
derived from
the
installation
(power and
telemetry
failures)

Installation of
the
acquisition
system at the
Civil
Protection
headquarters
in Zapopan



Thanks a lot!