The Seismic Network of Zapopan: Evaluating the local seismicity of the western Guadalajara Metropolitan Zone

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The Municipality of Zapopan, Jalisco, is located west of the Guadalajara Metropolitan Zone at the intersection of three rift zones: Tepic-Zacoalco, Chapala-Tula, and Colima. The importance of this region lies in the recent population growth that it has experienced in a few years. This growth has been supported by the development in commercial and service activities, and mainly in industry and technology, being ranked as the second-most populous city in Mexico, behind the federal capital.

The western region of the Guadalajara Metropolitan Zone (GMZ) has numerous fault systems where, historically, there have been significant earthquakes and seismic swarms such as those that occurred in 1685-1687, 1875, 1932, 1995 and 2002, showing similar characteristics. Besides, it is in this region where the Caldera de la Primavera is located, a rhyolitic volcanic caldera that continues presenting seismic and geothermal activity.

Recently, in the years 2015 and 2016, new seismic swarms occurred and were recorded instrumentally for the first time by the Jalisco Seismic and Accelerometric Network (RESAJ). The two seismic sequences took place in two alignments in the same direction as the Colima rift. These epicenters suggest the existence of two almost parallel normal faults, and that would be forming the Graben of Zapopan. Due to the length of these faults, 16 km for the east fault, and 28 km for the west fault, earthquakes of magnitudes 6.2 - 6.5 could be generated.

In the framework of the CeMIEGeo P-24 project (SENER-CONACyT), we continue studying the seismicity of this region with the deployment of 25 seismic stations in the vicinity of La Caldera de la Primavera. This study revealed the high seismicity that was taking place in the area of Zapopan, Tesistán Valley, and La Caldera de la Primavera.

Based on these new studies and the knowledge of the seismic history of the region, a collaboration agreement has been established between the Research Group UDG-CA-276 SisVOc and Civil Protection of the Municipality of Zapopan for the installation of a local seismic network that will allow to define tectonic and structurally the fault systems of the region and mitigate the possible effects of the local seismicity in the population. Since May 2019, three Obsidian 8X seismic stations with Lennartz 1Hz LE3D and Episensor sensors and two accelerometers installed
in the city have been operating, constituting the Zapopan Seismic and Accelerometric Network (RESAZ). The RESAZ operates together with the nearest stations of the RESAJ. In this work, we present the first results of the seismicity analysis recorded in Zapopan.