

THE SEISMIC ALERT SYSTEM OF MEXICO (SASMEX)

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Recently, an agreement to interconnect the *Sistema de Alerta Sísmica* (SAS) and the *Sistema de Alerta Sísmica de Oaxaca* (SASO) has been signed by the Oaxaca and the Mexico City governments with the Mexican Federal Civil Protection Agency to join the SAS serving Mexico City area with the SASO to provide an enhanced EEW service. Supported with the earthquake early warning algorithms developed for Oaxaca, and available communication and computer modern facilities, this network brings the opportunity to mitigate the dangerous risk of this natural hazard in Mexican populations. We also aim to add to this purpose the efforts of other states governments with seismic vulnerability.

After the Mexico City experience suffered by the earthquake M8.1 of “Caleta de Campos” Michoacan in 1985, and aware of the seismic danger latent in the “Guerrero Gap”, Government Authorities of Mexico City (GAMC) promoted the development and operation of the public EEWs (SAS) with the objective to mitigate a new possible seismic disaster in this City, based on 12 seismic sensors installed on the Guerrero Coast. This technological achievement started experimentally its service in August 1991, with a reduced number of warning stations in basic education schools of the National Secretariat of Public Education (SEP) and in the Mexico City subway metropolitan transport (METRO). Two years later, GAMC with the valuable support of the Valley of Mexico Radiobroadcasters Civil Association, opened the SAS to the general public as a social contribution, broadcasting the alert signal. Until March of 2009, the SAS has registered more than 2043 earthquakes with magnitudes between 3.0 and 7.3 and has emitted 65 anticipated warning advices: 52 qualified as moderated, and 13 as strong. The SAS warning time opportunity average has been 60 s; the original SAS algorithm to forecast magnitude uses two S-P period and its efficient performance takes advantage of the more than 320 km between the seismic danger in the coast with typical focal depth of 40km and the Mexico City users. The algorithm performance has been object of continuous improvement. However, as the SAS seismic sensors coverage is deployed mainly over part of the Guerrero coast, the important seismic activity occurring in other bordering seismic-active regions requires to consider expanding the SAS sensors coverage. Also, currently other efforts aimed to reach more seismic vulnerable users in the urban area of the Mexico City are conducted, i.e., we are testing and evaluating available commercial radio broadcast and receiving equipment used to

warn natural hazard dangers, to reduce the overall costs to warn better efficiently to the Mexico City population.

Strong earthquakes that hit Oaxaca in 1999 moved the interest of the Oaxaca Government to exploit the SAS technology and promoted the SASO development, with 36 seismic sensors. The SASO services started in November of 2003 and to June of 2007, it has registered 186 earthquakes between 3.0 and 6.0, and has emitted 8 warning advices: 5 as moderated and 3 as strong. Due to the seismic danger distribution in the Oaxaca State, the SASO applies 3 different algorithms to estimate the magnitude forecast. In the coast line SASO uses the same criteria as SAS, whereas for the north and center regions, dominant period, maximum acceleration and energy during S-P period, if this process takes no more than 3 seconds, it uses the regression method. When S-P time results greater than 3 seconds, as in the case of deeper seismic events, SASO uses a third criteria, which analyses the first 3 seconds of the vertical seismic acceleration to define the dominant period observed in one frequency band. This last option was designed and calibrated between 2002 and 2003, uses Support Vector Machines method to classify seismic magnitudes to maximize the seismic warning time in Oaxaca City. Unfortunately, due to financial support delays, the Oaxaca System has not been in operation continuously.