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Broadband seismic and geodesic deployment in Volcan de Fuego, Colima, in central Mexico

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Volcan de Fuego (3860 m elevation) in Jalisco and Colima, Mexico is the most active volcano in Mexico and has been under continuous monitoring by the Colima Volcano Observatory since 1989. This large strato-volcano has undergone high explosive activity ranging from small to large explosive events, periodic dome growth and destructive phases, intense fumarole activity and degassing during the last decade. The current eruptive activity generates a wide array of seismic signals including micro-seismicity, long period signals, volcano tectonic events and tremor. The current activity and its location poses a significant threat to adjacent cities including Ciudad Guzmán, Colima, and may other smaller communities. This situation presents a great challenge and unique opportunity for geoscientist to study the magmatic processes with a multidisciplinary approach. In this work we present the developing phase and implementation of a recently installed multi-parametric network deployed at close proximity to the Volcan de Fuego to investigate the seismicity and deformation associated with its explosions, degassing and its dome constructive-destructive phases.

This new permanent observational network consists of 5 stations, each one equipped with a Nanometrics 120 s Trillium seismometer, Trimble NetR9 GPS receiver, MiniDOAS gas detection system and complementary photographic and meteorological data. These stations are located around the volcano at 2.2-2.4 km radial distance from the crater. This new observational capability together with the permanent short-period network operated by the Colima Volcano Observatory was designed to provide a wide azimuthal coverage of the volcano and is most suitable for earthquake location. Its close proximity to the crater allows for excellent signal to noise ratio, a detailed discrimination of the magmatic generated seismic signals and the determination of the seismic source mechanisms. The GPS based deformation network provides a continuous deformation record that will provide a much-needed continuous time series for proper magmatic source modeling and will validate other satellite geodetic observations.