

Study of Seismic Activity at Ceboruco Volcano, Mexico

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Many societies and their economies endure the disastrous consequences of destructive volcanic eruptions. The Ceboruco stratovolcano (2,280 m.a.s.l.) is located in Nayarit, Mexico, at the west of the Mexican volcanic belt and towards the Sierra de San Pedro southeast, which is a key communication point for coast of Jalisco and Nayarit and the northwest of Mexico. Its last eruptive activity was in 1875, and during the following five years it presents superficial activity such as vapor emissions, ash falls, and riodacitic composition lava flows along the southeast side. Although surface activity has been restricted to fumaroles near the summit, Ceboruco exhibits regular seismic unrest characterized by both low frequency seismic events and volcano-tectonic earthquakes. The seismicity at Ceboruco is currently monitored with a three-component short-period seismograph station, located in the south flank and within 2 km from the summit. We use data recorded from March 2003 to July 2008 at the CEBN triaxial short period digital station. We classified them according waveform characteristics of the east-west horizontal component. We obtained four groups: impulsive arrivals, extended coda, bobbin form, and wave package amplitude modulation earthquakes. The extended coda is the group with more earthquakes and present durations of 50 seconds. Using the moving particle technique, we read the P and S wave arrival times and estimate azimuth arrivals. A P-wave velocity of 3.0 km/s was used to locate the earthquakes, most of the hypocenters are below the volcanic edifice within a circular perimeter of 5 km of radius and its depths are calculated relative to the CEBN elevation as follows. The impulsive arrivals earthquakes present hypocenters between 0 and 1 km while the other groups between 0 and 4 km. The epicenters show similar directions as the tectonic structures of the area (Tepic-Zacoalco Graben and regional faults). Results suggest fluid activity inside the volcanic building that could be related to fumes on the volcano. We conclude that the Ceboruco volcano is active. Therefore, it should be continuously monitored due to the risk that represent to the surrounding communities and economic activities. Since March 2012 we installed four seismic stations, each includes a digital acquisition system TAURUS of Nanometrix and a Lennartz 3D lite (1Hz) seismometer. Batteries are change and data collected monthly. We use the data to establish the average seismic activity rate; we also aim to corroborate previous studies that showed four families of seismic events; and to localize and make preliminary evaluations of the events.