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Magnetic signals related with magmatic processes at Popocatepetl Volcano (Mexico) during the 2012 eruptive and tectonic activity

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The magnetic signal at Popocatepetl has been monitored in real time since 1997 (Martin-Del Pozzo et al., 2002). Two Geometrics total intensity magnetic stations were installed at 4000 masl on the northern and southwestern flanks of the volcano which transmit via radiomodem to the Institute of Geophysics at the National University of Mexico, UNAM (Fig 1). The data from these stations is then processed with that of the Teoloyucan base station (weighted differences) to subtract the signals not related with the volcano.

Ash eruptions at Popocatepetl began in 1994 and have continued to this day (July 6, 2012). In 1996, crater domes began to form that have been partly ejected though explosions. More than 30 domes have formed subsequently in the crater. Previously, magma ascent into the crater had been correlated with negative magnetic anomalies and seismic harmonic tremor episodes as well as decreasing pH in the springs near the volcano, 6 ± 3 days before the visible confirmation of the crater dome (Martin-Del Pozzo et al., 2006). In some cases, ascent was associated with composite anomalies up to one month before extrusion (Martin-Del Pozzo et al., 2003). However, during 2012, formation of several small domes was preceded by -1.5 to 5.5 nT only one to 2 days before. The longer-lasting positive anomalies related to cooling of the lava under the Curie point and its resultant magnetization which have been recorded in some of the earlier episodes of dome growth were not detected in 2012. This was probably related to disruption by explosions and both local and regional tectonic earthquakes which affected the area. The magnetic signature reflects both the thermoremanent and the piezomagnetic-tectonic processes. Strong positive peaks have also been correlated with volcanotectonic earthquakes as well as with regional earthquakes during 2012.

References

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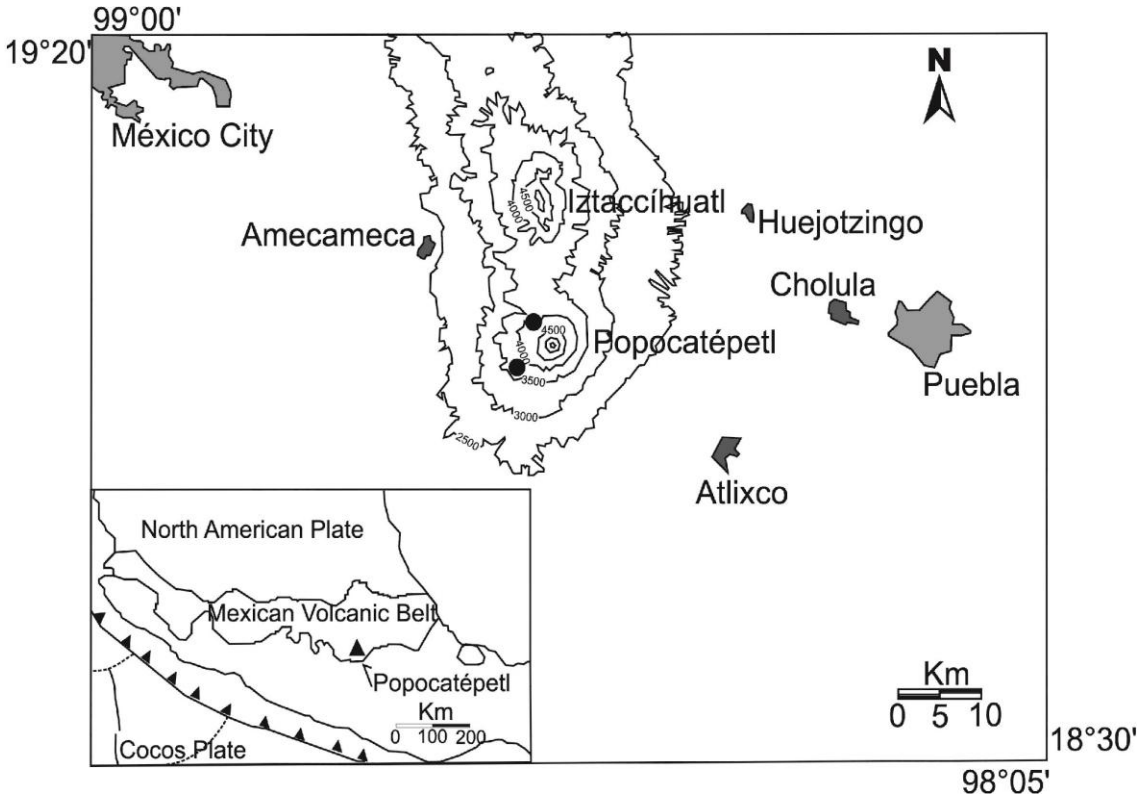

Fig 1. Popocatepetl Volcano showing location of the two magnetics stations on the cone. The Teoloyucan base station is to the north of Mexico City.