



Non Linear analysis of the total magnetic field data measured at Popocatepetl volcano

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Around the world, the assumed active Volcanoes has been extensive monitored by means of several techniques, as GPS equipment in order to search important slope changes, surface temperature, volcanic tremors, camera films, changes in gravity or magnetic fields, among others. In particular the Popocatepetl Volcano, situated near to the cities of Mexico and Puebla, has been monitored from around 20 years ago. The monitored systems were increased and continuously surveyed at the end of 1994 when important fumaroles occurred. The data series of total magnetic field recovered each minute at the Tlamacas site (in the volcanic edifice), since 1997 to the end of 2004 was studied in the sense of Higuchi fractal dimension and power spectral methods. Some windowing were tested to the series in order to find changes in the characteristic scale, and not evidences were found. For that, both data series were analyzed one corresponding to Tlamacas and the other one to Teoloyucan magnetic observatory (Cifuentes, 2009) situated around 100 km away from the Popocatepetl. The result of this study shows some kind of correlation between the both series analyzed, and in some periods the linear correlation coefficient is near to one. After that, fractal quadratic differences between series were computed, some periods where these differences could be assigned to local magnetic changes linked to the volcanic activity. We can identify higher differences when some kind of activity is observed at Popocatepetl, as fumaroles, dome creation or seismic tremors. A comparison made between these features allows suppose that some kind of relationship exists between them.