Geophysical Research Abstracts, Vol. 8, 05808, 2006
SRef-ID: 1607-7962/gra/EGU06-A-05808

Ground deformation patterns imaged from joint use of GPS and InSAR data at Mt. Etna volcano during 2001-2003

A. Bonforte, F. Guglielmino, M. Palano, G. Puglisi

Istituto Nazionale di Geofisica e Vulcanologia - Sezione di Catania, P.za Roma, 2, 95123 Catania, Italy

After the end of the July-August 2001 flank eruption, no significant magmatic activity at the summit craters of the Mt. Etna volcano was detected until the night of October 26th 2002, when a new eruption took place both on the southern and northern flanks of the volcano. This eruption was heralded by a seismic swarm (more than 300 shocks) affecting the upper part of the volcano. During the first hours of the eruption a 1.5-km-long fracture field opened on the upper southern flank of the volcano at 2700 - 2800 m a.s.l., re-marking the fracture system opened during the 2001 eruption. In the following hours, a 7-km-long fracture field roughly striking from N20°E to N45°E, opened, on the northern flank of the volcano, at elevations between 3050 and 1850 m a.s.l.. Here, the eruption onset was accompanied by significant displacements along the Pernicana fault. On the northern flank of the volcano the eruption stopped on November 4th 2002; on the southern flank the volcanic activity continued until January 28th 2003. In order to investigate the dynamics of Mt. Etna, we present data collected from GPS surveys between September 2001 and July 2003. During this period, three GPS surveys were carried out. In particular, we analyse the 2001-2002 and 2002-2003 intervals, in order to study the pre-eruptive period and the entire 2002-2003 eruption. In order to study the same period investigated by GPS, radar images taken over Mt. Etna by the ERS-2 satellite were selected. GPS data were inverted by using classical optimization techniques (Simplex and/or Least Square Algorithms) and by adopting point pressure and planar dislocation models. The expected ground deformation pattern was calculated on a grid covering the volcano and then projected along the LOS, in order to compare the fringes calculated from the model with those observed by the SAR sensor. In this way, we use GPS results for indirectly validating the interferograms;

on the other hand, the comparison of the synthetic interferograms with the observed ones allows us to validate and refine the modelled sources. The coupled InSAR and GPS approach to Mt. Etna volcano, allows us to determine in great detail the evolution of the ground deformation pattern affecting the volcano edifice during the September 2001 - July 2003 time interval.