Geophysical Research Abstracts, Vol. 7, 08181, 2005
SRef-ID: 1607-7962/gra/EGU05-A-08181

Feedback processes between volcanism and flank slip at Mt. Etna (Italy) during the 2002-2003 eruption

T.R. Walter (1), V. Acocella (2), M. Neri (3), and F. Amelung (1)

(1) Marine Geology and Geophysics, RSMAS - University of Miami, FL 33149, USA, (2) Dip. Scienze Geologiche Roma Tre, Roma, Italy, (3) Istituto Nazionale di Geofisica e Vulcanologia, 95123 Catania, Italy

The 2002-2003 Etna eruption and the associated displacement of the volcano's east flank provided a unique possibility to study the feedback mechanism between volcanism and flank slip. An earthquake swarm, fault reactivation and new surface ruptures at the volcanoes east flank predated the eruption. An area of about 200-400 km2 slid eastward (block 1). The eruption occurred through fissures at the N-Rift and the S-Rifts. This eruption, in turn, was followed by further fault dislocations and destabilization of a greater part of the eastern volcano flank, involving a slipped area of 350-700 km2 (blocks 1 and 2). Further seismic swarms and surface ruptures occurred, and the final dislocated flank implicated 700-1000 km2 (blocks 1, 2, and 3). Here we investigate the interaction between magmatic activity, seismicity and surface fracturing for the 2002-2003 Etna eruption. In numerical models we simulate the main volcano-tectonic events and calculate the resulting change in the static stress field. The models suggest that the events at Mt. Etna are the consequence of a feedback process consisting of (1) the pre-eruptive accumulation of magma and inflation of the volcano, (2) inducing the incipient slip of the blocks 1 and 2 on the E flank, (3) enhancing the eruption and (4) triggering the generalized slip of the E flank involving all three blocks. Understanding the precise modalities of this feedback mechanism may help to foresee coming active phases at Mt. Etna, which is crucial in minimizing volcanic and seismic hazard on the highly populated eastern volcano flank.