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A MODEL FOR THE JULY 2001 FLANK ERUPTION AT MT. ETNA (SICILY) FROM GPS AND DINSAR DATA

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The July - August 2001 Mt Etna eruption, one of the most important lateral eruptive events in the last 30 years, was characterized by an unusual eruptive style, with lava flow emissions at different altitudes along a complex fracture system. A seismic swarm dated the dyke emplacement on July 12th, while the first vents opened on July 17th. The eruption has been studied using the DInSAR technique and static and kinematic GPS measurements, made by INGV-CT, on geodetic network.
At the beginning of 2001, ERS-2 gyroscopes had serious mechanical problems making the generation of SAR interferograms impossible. A back-up attitude control system was activated and tuned by the ESA-ESRIN staff, and in June 2001, the interferometric capability of ERS-2 was partially recovered making possible to process some interferometric pairs.
In the same period, several GPS surveys were carried out on the eruptive area. The GPS data allowed monitoring of the eruption, in near real time, and obtaining a well-constrained model of the ground deformation sources, by accurate post processing and inversions of data set. By exploiting the opportunity that GPS data and InSAR interferograms are available for the same volcanic episode we validate and improved a first model obtained by inverting only the 3-D GPS data by using the more continuous spatial information provided by suitable interferograms.
The resulting modeled structural framework is quite complex and characterized by one pressurizing and some dislocation sources. A deep volume, in the basement beneath

the W flank of the volcano, was progressively pressurizing before the eruption and quickly depressurizing during and eruption. The combined effects of the intrusion of a N-S shallow dyke and the strike motion of a secondary NNW-SSE trending planar source strongly affects the ground deformation pattern on all GPS and DInSAR measurements encompassing the eruption. Finally, a dramatic acceleration of the dynamic of the detachment surface allowing the E flank sliding of the volcano, well known by previous GPS data inversions, is required to assess the final model.