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Episodic slow slip events and seaward flank motion at Mt. Etna volcano (Italy): insight from 12 years of continuous GPS observations

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Evidences of flank instability has been documented at Mt. Etna volcano since the early 1980s. In particular, GPS and InSAR measurements as well as geostructural data have concurred in identifying a near continuous seaward motion of a large sector of Mt. Etna eastern flank (e.g. Palano, 2016). Such an unstable sector is delimited by the "NE Rift - Pernicana fault" and by the "S Rift - Mascalucia-Tremestieri fault", respectively on its NW and SW half, while the presence of compressional structures (e.g. folds) has recently been observed at the toe of the continental margin, on the Etnean offshore (Gross et al., 2015). In addition, a prominent ESE lineament with prevailing right-lateral transpressive kinematics, located northward of Catania Canyon and considered as the off-shore prolongation of the Mascalucia-Tremestieri fault, has recently been discovered (Gross et al., 2015). The definition of the basal sliding surface is widely debated and a number of different models have been proposed in the last 3 decades: i) a shallow ($\sim$1.5 km) slip surface with a listric geometry located beneath the volcanic pile of Mt. Etna; ii) an approximately 5-km-deep sub-horizontal décollement occurring in quaternary sedimentary units; iii) alternating or contemporaneous movements on both shallow and deep slip surfaces; iv) a décollement surface located at a depth ranging from 1 to 4 km bsl.

The establishment of continuous GPS networks (managed by different Institute and agencies as ISPRA, INGV, Topcon) has allowed detecting, since mid-2006, some aseismic slow slip events (SSE) from the daily-based time series of stations installed on the lower part of the unstable flank. At Mt. Etna, SSEs have probably been going on for a long time, but they have not been recognized because the campaign measurements carried out yearly since 2001 provide a broad snapshot that showed a fairly constant rate of motion of the flank. Here, taking advantage of the availability of a large dataset of continuous GPS observations, we provide a catalog of SSEs times as well as the spatial distribution of modelled slip on a décollement surface.

References:
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