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Geometry and kinematics of the fault systems controlling the unstable flank of Etna volcano (Sicily)

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An updated tectonic framework of Etna unstable flank is defined as a result of multidisciplinary analyses carried out through the integration of geological and geophysical data. The different typologies of datasets have been analyzed and correlated in order to constrain geometry and kinematics of the fault systems controlling the unstable flank of Etna volcano and to better understand their complex relationship. In particular, we have defined as the main structural elements the following four fault systems: Pernicana, Ragalna, Tremestieri-Trecastagni and Timpe. Slip-rates and kinematics have been estimated on both long- and short-terms, respectively, from geological and seismotectonic/geodetic data. Data integration has allowed to define five kinematic domains in the sliding flank of Etna: (i) the NE block, bordered by the Pernicana fault and characterised by the highest deformation velocities; ground velocity progressively diminishes toward South, with a clockwise rotation of the vectors defining (ii) the block embracing the central part of the Timpe system; (iii) the Giarre wedge; (iv) the Medium-East block, bounded by the S. Tecla and Trecastagni faults; (v) the SE block bordered, by the hidden Belpasso-Ognina tectonic lineament. The dynamics of these blocks is given by discontinuous movements: sudden short-term accelerations related to the magma intrusion are superimposed to a quite constant mid-term ESE-wards sliding. The proposed comprehensive model of the unstable flank provides the basic input parameters for applying analytical models to flank dynamics at Etna volcano.