

Activity Report 2025 – Task Forces / Coordination Committees

Project title: **Deformation and magmatic processes from the lithosphere to the surface: integrated multidisciplinary approaches**

Project no.: **2021-TF2**

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1. Highlights of recent ILP Task Force work/results

The efforts during this fifth year of activity of the TF II were mostly devoted:

- 1) to improve the international collaboration on volcanotectonics in the framework of several researches carried out by the various teams in different continents. The employed methodologies comprised structural geology, stratigraphy, geomorphology, petrography, volcanology and geophysics, as well as numerical and analogue modelling. Results have been published in 80 peer reviewed papers, see the complete list of publications on the website dedicated to this TF II: www.ilptaskforce2.unimib.it;
- 2) To prepare and submit international projects for possible funding;
- 3) To disseminate our findings and reinforce the researchers' network, also by organizing various sessions at international congresses as specified below;
- 4) To organize international schools devoted to young researchers.

2. Presence at international meetings/workshops (this year)

- EGU 2025, Volcanic processes: tectonics, deformation, geodesy, unrest. Conv.: Heap, Acocella, Ágústsdóttir, Albino, Jonsson, Pinel.
- EGU 2025, Studying Active Faults from the Near-Surface to Seismogenic Depth: Innovations and Challenges in Seismotectonics and Active Tectonics, Conv.: Bonali, De Nardis, Kastelic, Presti, Alania.
- EGU 2025 Deciphering complex earthquake swarms and seismic sequences in tectonic and volcanic regions, Conv.: Lanza, Maccaferri, Passarelli, Petersen.

3. Important publications of ILP Task Force members (max. five)

- ❖ Bosa, A. R., Bejar, G., Waite, G. P., Mock, J. C., Pineda, A., & Anderson, J. F. (2025). Dynamics of rain-triggered lahars and destructive power inferred from seismo-acoustic arrays and time-lapse camera correlation at Volcán de Fuego, Guatemala. *Natural Hazards*, 121(3), 3431-3472.
- ❖ Gudmundsson, A. (2025). Multiple dikes make eruptions easy. *Journal of Volcanology and Geothermal Research*, 460, 108284.
- ❖ Isken, M. P., Karstens, J., Nomikou, P., Parks, M. M., Drouin, V., Rivalta, E., ... & Berndt, C. (2025). Volcanic crisis reveals coupled magma system at Santorini and Kolumbo. *Nature*, 645(8082), 939-945.

- ❖ Luppino, A., Bonali, F. L., Gudmundsson, A., & Tibaldi, A. (2025). Effects of pre-existing fractures on dike propagation: new insights from field data and numerical modelling. *Journal of Structural Geology*, 105563.
- ❖ Tibaldi, A., Luppino, A., De Beni, E., Corti, N., Cantarero, M., Mariotto, F. P., & Bonali, F. L. (2025). Effects of lateral dyke propagation and pre-existing fractures on shallow deformation: Data from the Etna 1947 eruption and analogue models. *Journal of Volcanology and Geothermal Research*, 108349.

4. New contacts (this year)

Dr. Damien Lemarchand, Université de Strasbourg, ITES, France.

Dr. S. Brando, Dept. Earth and Environmental Sciences, University of Milan Bicocca, Italy.

Dr. Rafiq Safarov, Department "Modern Geodynamics and Space Geodesy", Institute of Geology and Geophysics, Republic of Azerbaijan.

Dr. David Svanadze, TSU M. Nodia Institute of Geophysics, Tbilisi, Georgia.

Dr. Gilda Currenti, National Institute of Geophysics and Volcanology (INGV), Italy.

Dr. Clara Jodry, Université de Strasbourg, ITES, France.

Prof. Athanas S. Macheyeke, University of Dodoma, Tanzania.

5. Usage of ILP funding (this year)

The funds have been used for reimbursement of mission expenses of young researchers and PhD students related to scientific research, congress participation, and an international school.

In detail, the ILP funds for research have been employed to contribute to carry out geological, volcanological and structural field work on Mt Etna (Italy), in the Northern Volcanic Rift Zone of Iceland, and at Bromo caldera (Indonesia). The remaining funds have been used for training activities at the: "International School on Drone and VR for Volcano-Tectonic Studies at Etna", held from 29 September to 3 October 2025, at Nicolosi (CT), Italy (see: <https://etnadronevr.unimib.it/partners-2/>).

6. Activities planned for 2026

This Task Force will come to an end this year, but our contribution to ILP activities will be prolonged thanks to the launch of a new Task Force for 2026-2030, already approved. In 2026 we will reinforce the network by expanding the classical activities like researches in the field in various continents, lab work, and participation at sessions at international and national congresses, also in view of the new topics. The next Task Force, in fact, will be devoted to: "Volcanotectonic processes and new technologies: lithosphere interactions from depth to the surface", with an effort to integrate the various traditional disciplines with innovative disciplines and technologies, such as advanced remote-sensing platforms and sensors, Virtual Reality, machine learning and Artificial Intelligence.

Appendixes:

Pictures of activities in 2025 in the following pages



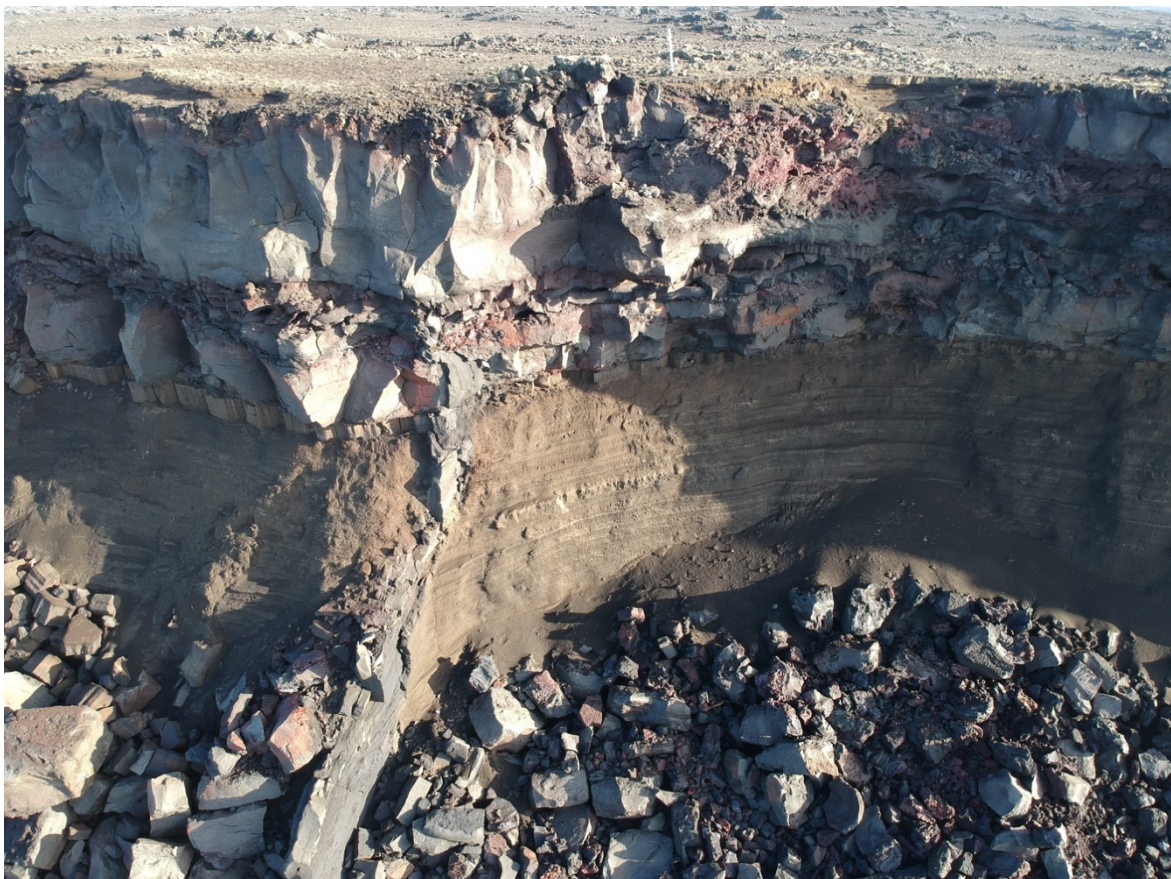
Drone image of normal faults and fissures produced by underlying dikes, Northern Volcanic Zone, Iceland.



Dilation amount of volcanotectonic fissures can be directly measured by drone.



Approaching a sub-glacial volcanic ridge by 4x4 cars with students, Iceland.



Feeder dike exceptionally exposed along the coast of the Reykjanes peninsula (Iceland) associated with the Younger Stampar eruption (1210–1240 CE).



“International School on Drone and VR for Volcano-Tectonic Studies at Etna”, 29 September - 3 October 2025, Italy.



“International School on Drone and VR for Volcano-Tectonic Studies at Etna”, 29 September - 3 October 2025, Italy.



Drone image of the Bromo caldera in Indonesia, Java Island, one of the most dangerous volcanoes; note the villages on the left side, built on the caldera's rim. In the background, Semeru volcano, which produced a pyroclastic flow in November 2025.