



Activity Report 2024 – Task Forces / Coordination Committees

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

Project no.: **2021-TF2**

PIs: **Alessandro Tibaldi, University of Milan Bicocca (Italy)**

Agust Gudmundsson, Royal Holloway University of London (UK)

Greg Waite, Michigan Technological University (USA)

1. Highlights of recent ILP Task Force work/results

The efforts during this fourth 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 approaches were synergistic, in order to integrate different methodologies comprising field geological, geomorphological and geophysical data with numerical and analogue modelling. Results have been published in 74 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, including as examples: PNRR Call: HaMMon-EQ Merging data and AI for improving Seismic Risk assessment and Management in populated areas; EarthTelescope 2024 INGV Call: DeepRise; Marie Skłodowska-Curie Actions Doctoral Networks Call: HORIZON-MSCA-2024 – IteraVision.

3) To disseminate our findings and reinforce the researchers network; we organized various sessions at international congresses as specified below.

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

- EGU 2024, Understanding the nature of earthquake swarms and earthquake sequences with complex patterns in tectonic and volcanic regions. Conv. Passarelli, Cesca, Lanza, Maccaferri, Mesimeri.

- EGU 2024, Hydrothermal alteration in volcanic settings, Conv. Kushnir, Harnett, Villeneuve, Walter.

- EGU 2024, Volcanic processes: tectonics, deformation, geodesy, unrest. Conv. Heap, Acocella, Pinel, Jonsson, Agustsdottir, Drymoni, Davis.

- EGU 2024, Volcanic processes: tectonics, deformation, geodesy, unrest. Conv. Heap, Acocella, Pinel, Jonsson, Agustsdottir, Drymoni, Davis.

- EGU 2024, Studying active faults from the near-surface to seismogenic depth: an open challenge in seismotectonics, Conv. Ferrarini, Bonali, Kastelic, De Nardis, Alania.

- EGU 2024, Navigating the Digital Earth: Advancements in Earth Systems and Geophysical Inference, Conv. Zahirovic, Piana Agostinetti, Vérard, Zhang, Du, Li.

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

1) Clunes, M., Browning, J., Cortez, J., Cembrano, J., Marquardt, C., Kavanagh, J. L., & Gudmundsson, A. (2024). Stresses induced by magma chamber pressurization

altered by mechanical layering and layer dip. *Journal of Geophysical Research: Solid Earth*, 129(5), e2023JB027760.

2) Hornby, A. J., Ayris, P. M., Damby, D. E., Diplas, S., Eychenne, J., Kendrick, J. E., C. Cimarelli, U. Kueppers, B. Scheu, J. Utley, & D. B. Dingwell (2024). Nanoscale silicate melt textures determine volcanic ash surface chemistry. *Nature Communications*, 15(1), 531.

3) Patten, C. G. C., Hector, S., Kiliyas, S., Ulrich, M., Peillod, A., Beranoaguirre, A., P. Nomikou, E. Eiche, & Kolb, J. (2024). Transfer of sulfur and chalcophile metals via sulfide-volatile compound drops in the Christiana-Santorini-Kolumbo volcanic field. *Nature Communications*, 15(1), 4968.

4) Bosa, A. R., Bejar, G., Waite, G. P., Mock, J. C., Pineda, A., & Anderson, J. F. (2024). 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*, 1-42.

5) Pedicini, M., Bonali, F. L., Corti, N., & Tibaldi, A. (2024). Rift structure and development: The Krafla Fissure Swarm (Northern Iceland). *Journal of Structural Geology*, 105332.

4. New contacts (this year)

Prof. G. P. De Pascal, University of Iceland, Faculty of Earth Sciences, Iceland.

Prof. N. P. Agostinetti, Dept. Earth and Environmental Sciences, University of Milan Bicocca, Italy.

Prof. F. Kadirov, Department "Modern Geodynamics and Space Geodesy", Institute of Geology and Geophysics, Republic of Azerbaijan.

Dr A. Villa, University of Milan Bicocca, Italy.

Prof. J. Browning, Department of Mining Engineering, Pontificia Universidad Católica, Santiago, Chile.

Dr B. Ahadov, NASA Jet Propulsion Laboratory, USA.

Dr M. M. C. Carafa, Istituto Nazionale di Geofisica e Vulcanologia (INGV), Italy.

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 carry out geological, volcanological and structural field work on Mt Etna (Italy) and in the Northern Volcanic Rift Zone of Iceland. Other ILP funds have been used to help young researchers to cover the inscription fee and abstract fee of the EGU 2024 congress of Wien. The remaining funds have been used for training activities at an international geological-geophysical field school hold in October 2024 in the Caucasus in Azerbaijan, under the umbrella of ILP (www.ilptaskforce2.unimib.it) and of NATO SfP activities (<https://shamkirproject.unimib.it/>).

6. Activities planned for 2025

Plans for 2025 include researches in the field in various continents, lab work, and participation at sessions at international and national congresses. Both outdoor and lab works will be related to different approaches and methodologies, trying to be as synergic as possible. In particular it is expected to work at different scales and geodynamic settings, comprising reverse and transcurrent settings, as well as rift zones. At least two sessions will be organized at EGU, and possibly other congresses.