

How does the preservation of tephra fallout deposits evolve in time?

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Context

Although contemporaneous eruptions can be characterized using modern remote sensing methods, the majority eruptions in the evolution of volcanic systems are only preserved in the geological record. For those eruptions, the quantification of eruption source parameters, which are critical parameters to constrain the eruptive histories of volcanic systems and to predict the hazard and risk of future eruptions, rely uniquely on the field mapping of tephra fallout deposits. Dedicated field-based methods developed to quantify eruption dynamics (e.g., plume height, mass eruption rate, volume, duration) rely on the assumption that these deposits are pristine, but field evidences demonstrate how they are subject to secondary reworking (i.e., compaction, aeolian and rain erosion). We therefore still lack a quantitative estimate on how much eruption source parameters inferred from their old tephra fallout deposits might differ from their true values.

Objectives and Methods

This project aims at providing an evidence-based reference on the evolution of key parameters of tephra deposits (e.g., thickness, density, grain-size) through time starting from the pristine deposit of the 2021 Tajogaite eruption in La Palma. The objectives are to:

- Re-visit outcrops and provide a longitudinal characterization of the deposit through time;
- Constrain changes in measured parameters and their influence on the estimation of eruption source parameters using field-based methods in physical volcanology;
- Complement field-based observations from lessons learnt from numerical models (e.g., inversion).

Literature

- Bonadonna, C., et al., 2022. Physical Characterization of Long-Lasting Hybrid Eruptions: The 2021 Tajogaite Eruption of Cumbre Vieja (La Palma, Canary Islands). *JGR Solid Earth* 127.
- Blong, R., et al., 2017. Preservation of thin tephra. *Journal of Applied Volcanology* 6, 10.
- Cutler, N.A., Streeter, R.T., Dugmore, A.J., Sear, E.R., 2021. How do the grain size characteristics of a tephra deposit change over time? *Bull Volcanol* 83, 45.



The tephra fallout deposit 2021 Tajogaite eruption at various distances from the vent.

Sites WEB

<https://www.unige.ch/sciences/terre/en/research/physical-volcanology-and-geological-risk/>

Choice of orientation : Geological Risks