Exploring Vulcano Island: from chrono-stratigraphy to hazard assessment and risk management associated with Vulcanian and phreatic eruptions

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Name of financially responsible person: *Federico Di Traglia*

Summary
Since the last eruption occurred in 1888-90, which was taken as a worldwide reference for the Vulcanian eruptive style, the Island of Vulcano (Aeolian Islands, Southern Italy) has experienced periods of quiescence and unrest, marked by increased degassing accompanied by seismic activity, deformations, and slope instability. This post-conference excursion will focus on the processes involved in assessing the volcanic hazard and managing the risk of the island. It will show how the investigation and the analysis of exposed tephra layers and lavas has enabled the reconstruction of recent eruptive activity in terms of dynamics and chronology associated to Vulcanian and phreatic eruptions of La Fossa (situated within the La Fossa Caldera) and Vulcanello (on the northern caldera rim), punctuated by occasional sub-Plinian events. During the fieldtrip, we will explore remarkable outcrops that have facilitated the reconstruction of deposit sedimentology as well as eruption chronology. In particular, we will examine the variability of the erupted products associate with the different eruptive styles as well as the interplay between the volcanic activity from the two intra-calderic volcanoes recorded by stacked deposits within the tephra successions. The volcaniclastic sequences will also enable the study of the relationship between eruptive activity and material erosion and redeposition phenomena. During the field trip, special attention will be given to the recent unrest crisis (2021-2023), predominantly encompassing fumarolic emissions and diffuse degassing, and on the instability phenomena occurring at the La Fossa cone. The potential impact on the exposed community is intricately linked to the eruptive events, as well as to the erosional processes, propagation of debris flows and floods, and continuous landscape evolution. Field analysis will be used to discuss the selection of hazard scenarios and the assessment of the associated risk. Attention will be devoted to investigating land use practices on the island, with specific emphasis on assessing the vulnerability and exposure of the built environment in relation both to residential areas and tourism infrastructure. Some key aspects of island evacuation will be also discussed. Given the recent 2021-2023 unrest crisis, the first half day of the program will be organized with talks from Italian Civil Protection and scientific community focused on reconstructing monitoring data and crisis management of the last emergency.

Dates
24 through 28 June 2025

Additional logistic information
24 June, 11.00 am: Departure of the transfer (bus) from Catania airport (CTA) to the port of Milazzo. From there hydrofoil to Vulcano island where all participants meet in the late afternoon.
28 June, 8.00 am: Departure from Vulcano (hydrofoil), transfer to Catania Airport
Flights to Catania and Catania to Geneva to be booked individually.

Start and end locality
Island of Vulcano, Aeolian Islands (Lipari Municipality)

Program (detailed per day)

- First day (24/06/2025): arrival on the island
- Second day (25/06/2025):
  - Morning:
    → introduction to the program of the field trip and to overall view of the volcanic system
    → presentations and discussion on the 2021-2023 crisis:
    - Risk management, territorial planning, crisis management
    - Geochemical monitoring
    - Geophysical monitoring
    - Space-borne ground deformation
  - Afternoon: La Fossa eruptive activity (15-19th century) - Crater area (bomb field, crater observations, fumarolic field observations, trench 1888-90, E-SE sections)
- Third day (26/06/2025):
  - Morning: Vulcano Porto built environment (discussion on exposure and vulnerability) and visit to the COA-Vulcano and the INGV Carapezza Centre
  - Afternoon: La Fossa eruptive activity (10th-14th century) - Palizzi Valley (observations of tephra deposits, pyroclastic density currents, lahars, lava flows)
- Fourth day (27/06/2025):
  - Morning: Vulcanello (observations of lava flows as well as interaction of Vulcanello and La Fossa system)
  - Afternoon: observations from the boat (instability of La Fossa cone), wine tasting and dinner in Gelso, return to Vulcano Porto by bus.
- Fifth day (28/06/2025): Departure from the island

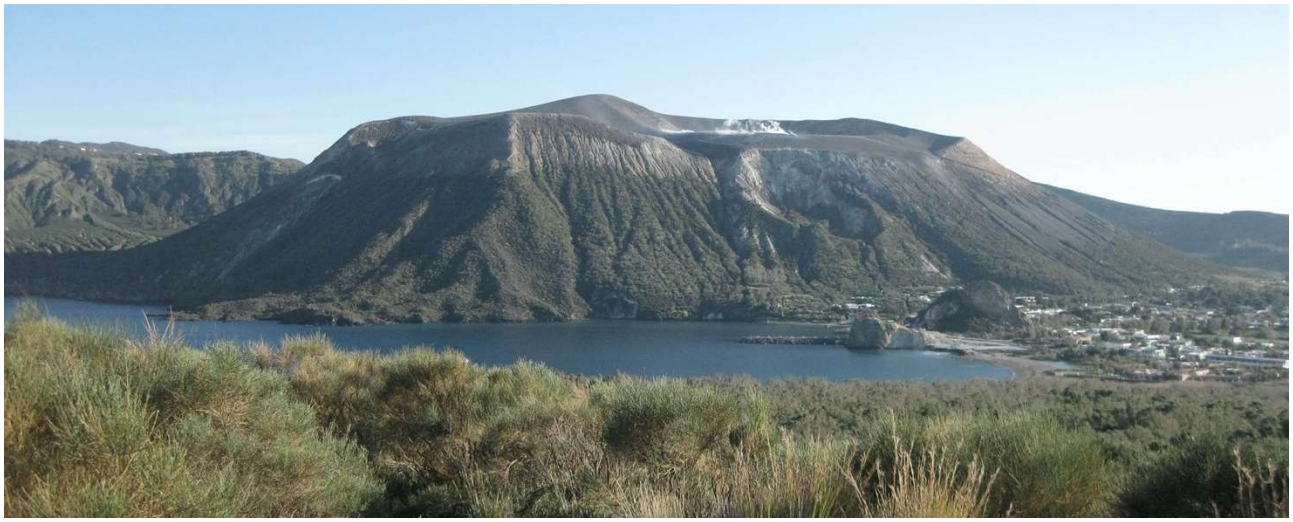
Level of fitness
Light to medium (mostly road and beach outcrops but some walking over uneven terrain might be required, including the climb to the crater, with 380 m of altitude difference and a maximum slope gradient of 25°)

Required equipment
Light hiking gears, hats or other sun protection, sun cream and after-sun products

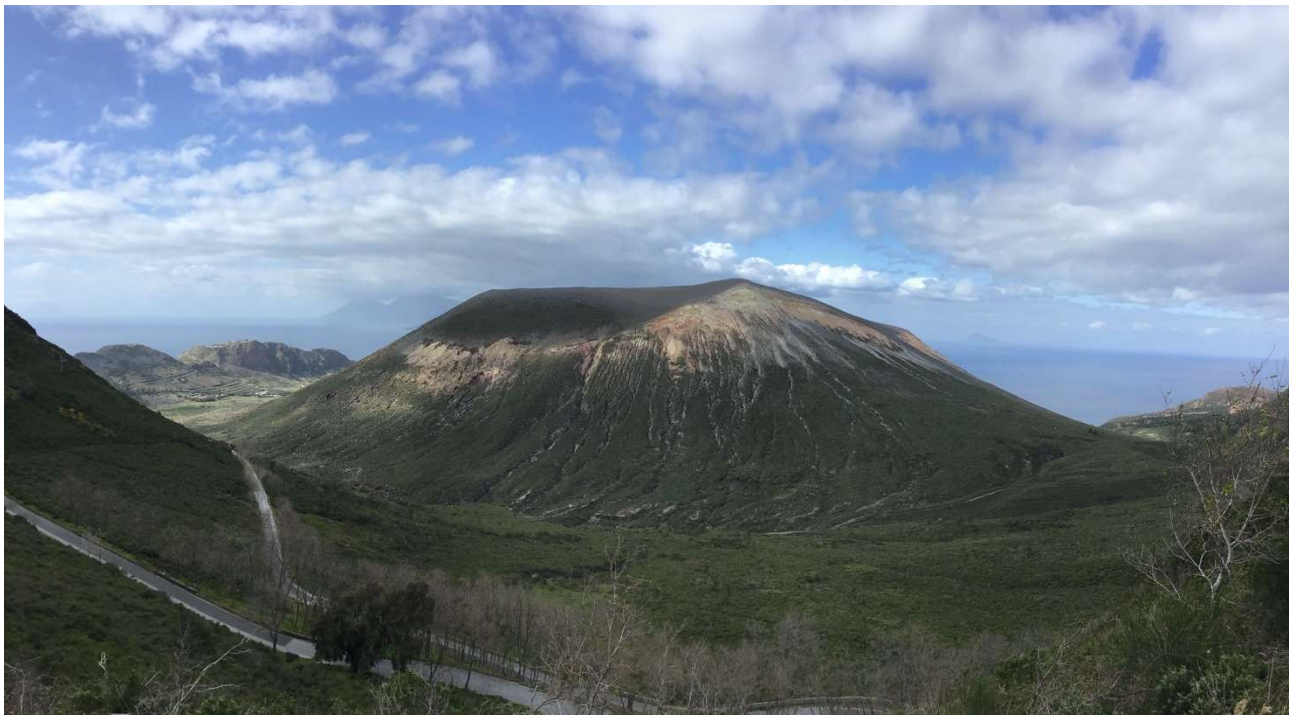
Accommodation (name, type of rooms)
Hotel Conti
Double rooms

Number of participants
20

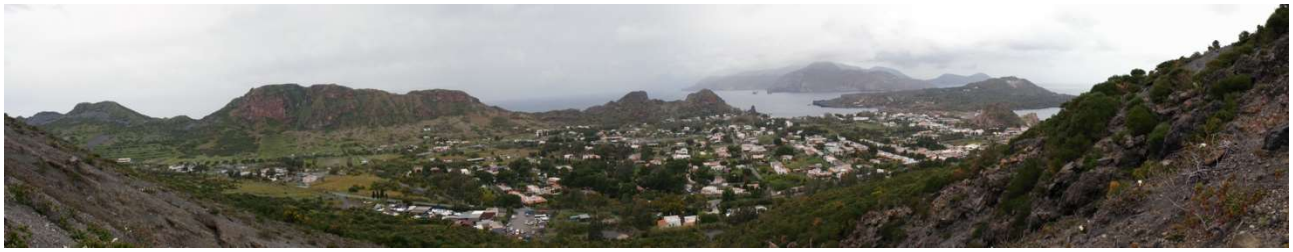
Expected costs (and what is included/excluded)
550 €, including transportation (round trip from Catania airport to the port of Milazzo, hydrofoil Milazzo-Vulcano-Milazzo, transport on the island), hotel accommodation (double rooms) including breakfast and dinner + one dinner/wine tasting in a restaurant, packed lunch.



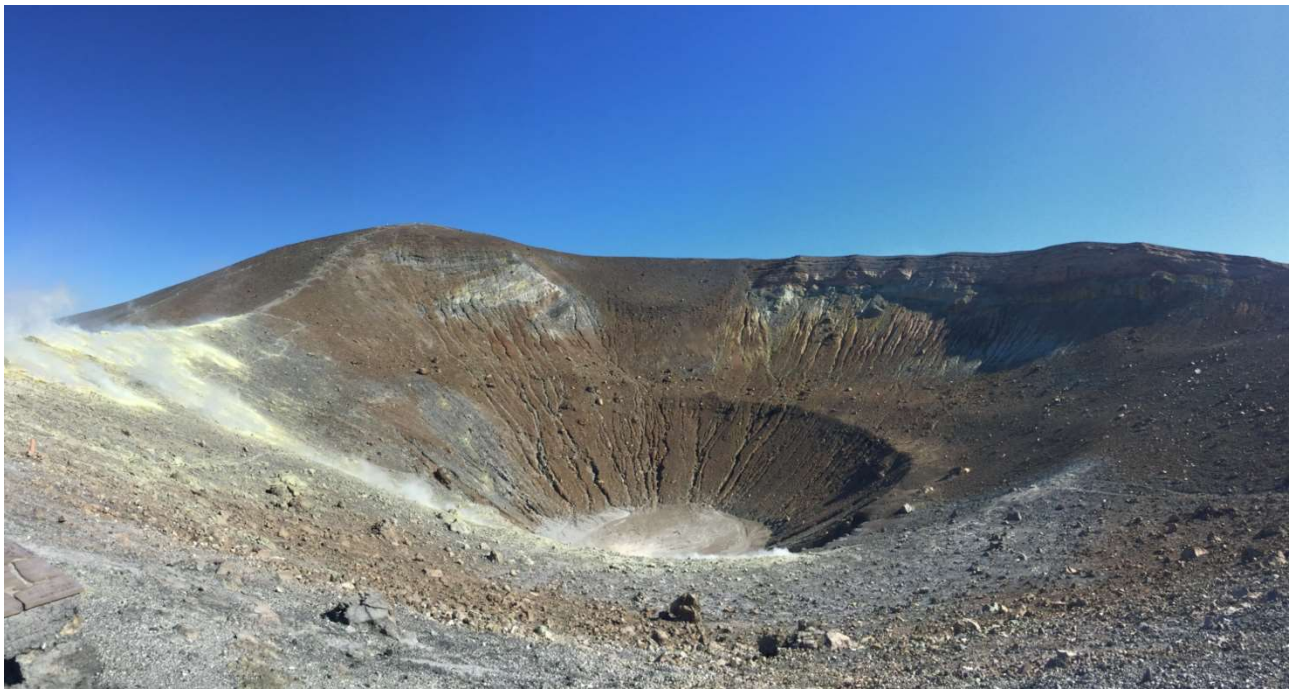
La Fossa cone viewed from the North (from Vulcanello) [photo: F. Di Traglia]



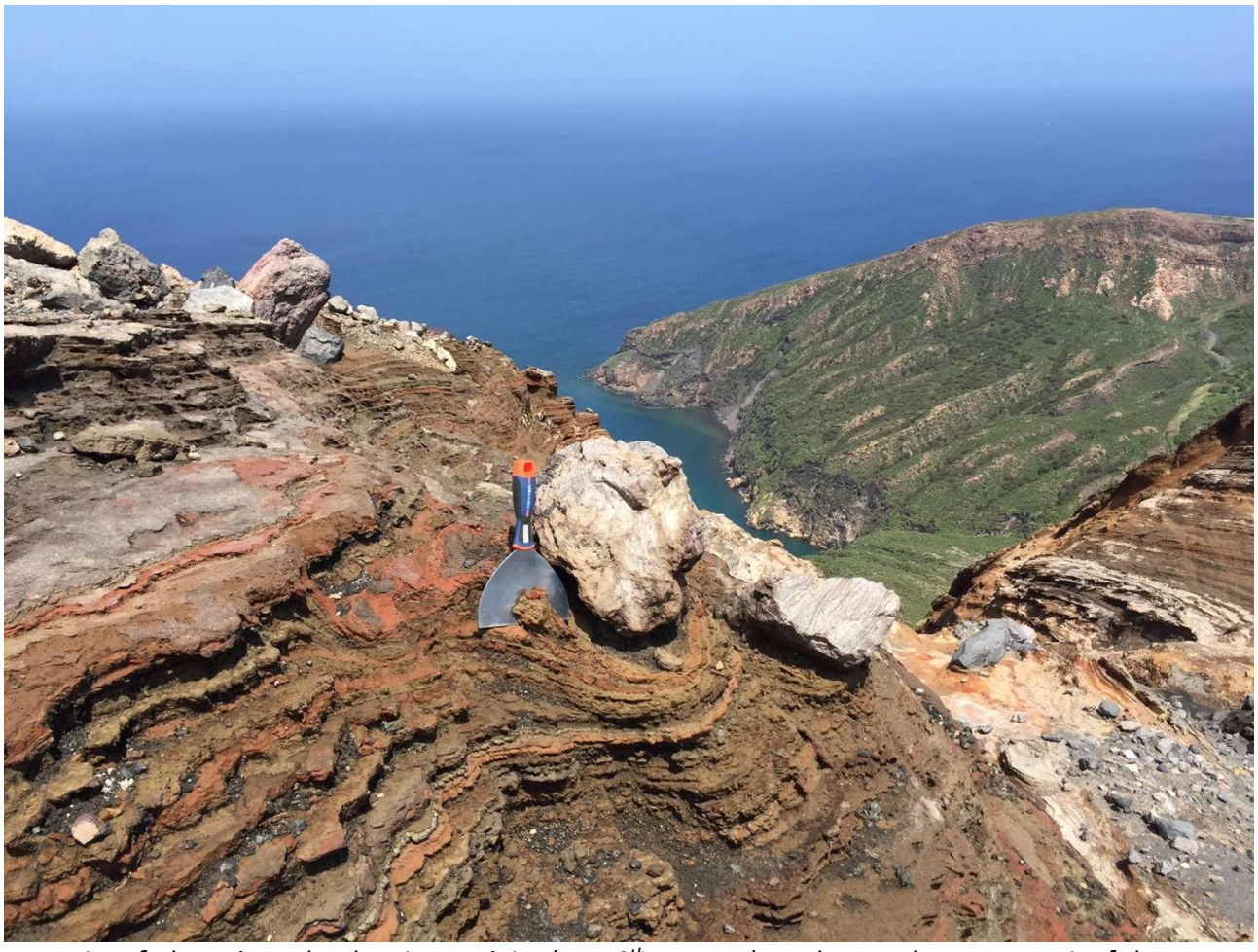
La Fossa cone viewed from the South, showing the Palizzi valley [photo: F. Di Traglia]



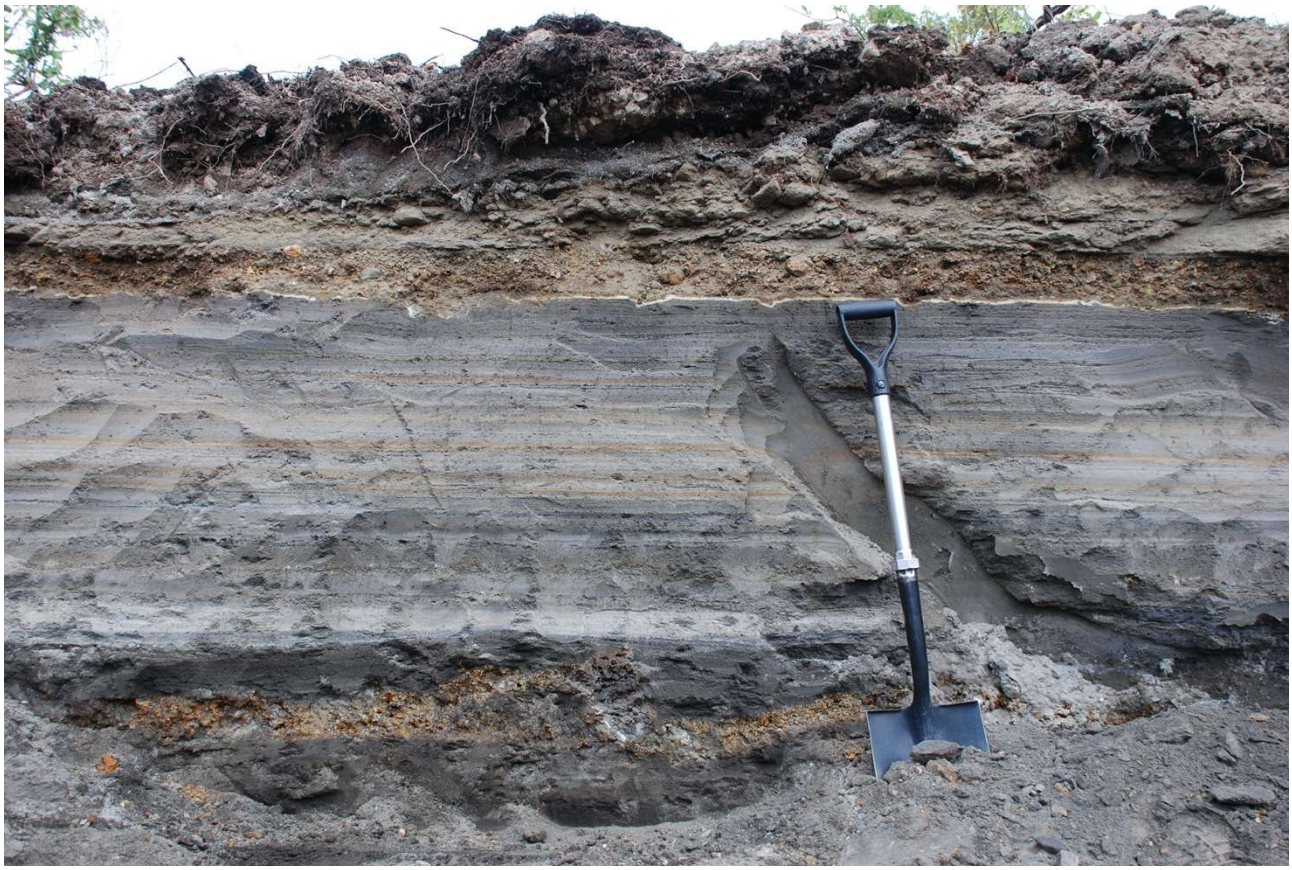
View of the Vulcano Porto village from the La Fossa cone [photo: F. Di Traglia]



La Fossa cone crater [photo: F. Di Traglia]



Deposits of phreatic and Vulcanian activity (15-19th century) on the Northern crater rim [photo: F. Di Traglia]



Deposits of Vulcanian, sub-Plinian, and phreatic activity (10^{th}-14^{th} century) [photo: M. Pistolesi]