## **ENGLISH**

#### Title

Relationship between circulation of hydrothermal fluids and fault zones in active volcanic settings (Campi Flegrei and Ischia Island, southern Italy)

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#### **Research proposal**

The study of the relationship between hydrothermal fluid circulation and fault zones and highly fractured zones in active volcanic areas is fundamental for the characterization of the risk and the predisposing conditions for possible phreatic or hydrothermal explosions. Fluid circulation is strongly influenced by rock permeability. The presence of highly fractured zones, such as those associated with fault zones, can represent a preferential path for fluid circulation by localizing permeability in specific rock volumes. However, this property is counterbalanced by the self-sealing phenomenon that, especially in volcanic contexts, tends to decrease the secondary permeability over time and favor the migration of fluids in alternative paths and/or lead to critical overpressure conditions. Studying this last case is particularly important to limit the risks associated with active hydrothermal areas. The research project employs a multidisciplinary approach that primarily encompasses structural geology, geochemistry, and geophysics. These studies will include (i) the definition of the volcano-tectonic setting of key degassing areas through structural surveys of faults and fractures; construction of detailed maps (ii) of the CO2 flux and definition of the Diffuse Degassing Structures (DDS) (iii) of the hydrothermalized areas with different mineralizations (also through the use of drones) (iv) of the



thermal anomalies and (v) of the spontaneous potential. A further study will concern the analysis of thin sections of the fault rocks that will serve to characterize the mineralizations associated with self-sealing and to evaluate the secondary porosity. Finally, this research also includes the characterization of the geomechanical properties of the fault zones, hydrothermalized rocks and undeformed host rock through in-situ and laboratory measurements. The main aim of this multidisciplinary approach is therefore the reconstruction of the geometry of the fault zones in active volcanic contexts (Campi Flegrei and Ischia Island) and the definition of models for the circulation of fluids along these fault zones.

## **Research Plan**

## l° year

- Bibliographic study of the volcano-tectonic settings of Campi Flegrei and Ischia Island and their hydrothermal systems, identification of key areas to investigate.
- Structural, geochemical, geophysical and geomechanical surveys (Campi Flegrei)
- Structural, geochemical, geophysical and geomechanical surveys (Ischia Island)

# ll° year

- Structural, geochemical, geophysical and geomechanical surveys (Campi Flegrei)
- Structural, geochemical, geophysical and geomechanical surveys (Ischia Island)
- Construction of structural maps, CO2 flux and spontaneous potential for the identified areas.



• Structural analysis of the collected data.

#### III° year

- Period abroad (to be defined) at a laboratory for analogical modeling of fault zones.
- Modelling of the geometries of the analysed fault zones and construction of conceptual models for the fluid circulation.
- Drafting of thesis.