SESSION 21- Insights into Fluid-Rock Interaction Phenomena in Hydrothermal and Deep Fluid Ascent Systems

Conveners
Paola Cusano, Istituto Nazionale di Geofisica e Vulcanologia – Osservatorio Vesuviano, Naples, Italy
Paolo Madonia, Istituto Nazionale di Geofisica e Vulcanologia – Osservatorio Etneo, Catania, Italy
Simona Petrosino, Istituto Nazionale di Geofisica e Vulcanologia – Osservatorio Vesuviano, Naples, Italy

Session Description

Fluid circulation within the crust, in contexts such as hydrothermal systems, groundwater circulation, and deep gas ascent, may be controlled by several factors like inner pressure or temperature variations induced by internal heat or stress changes. In their pathways, the moving fluids interact with the surrounding rocks in different tectonic and geological contexts, and then can be ejected through various surface manifestations, such as mud volcanoes, fumaroles, bubbling pools, etc. Understanding the dynamics of the processes driven by the interactions between the circulating fluids and the surrounding solid structures is necessary to characterize the behavior of those systems and the transition mechanisms among stationary state, anomalous phases and eventual paroxysms. Moreover, the link among the fluid flow towards the surface, the emission and the environment changes, can shed light on how the ecosystem respond to extreme conditions. Understanding these phenomena requires ad hoc investigation, seismological/multiparametric monitoring, physicochemical modelling. Seismological/interdisciplinary studies allow to quantify the relationship between the triggering phenomena and the parameters observable at the surface. High-quality data collected over several years of monitoring or during focused surveys provide the opportunity to reveal significant seismological, geophysical and geochemical processes at diverse spatial and temporal scales. Identifying changes in the status of the system permits to indicate which parameters better evidence the system evolution and to detect possible paroxysm precursors. This session is addressed to those contributions focusing on fluid–rock coupling in systems characterized by surface manifestations of deep-origin fluids, with possible implications for geohazards. Possible topics can be:

- seismological/multidisciplinary study to reconstruct the deep fluid ascent engine dynamics and the surroundings stratigraphic structure;

- cyclicities in seismological parameters linked to hydrological, meteorological and tidal factors acting on the emission source;

- the processes that form mud volcanos and drive material migration to the surface;

- outcomes from long-term seismological/multidisciplinary monitoring and spot-survey;

- the interplay between the regional/local seismicity and surficial fluid activity, as manifestation of crustal dynamics;

- the impact of gas emissions (CO2, CH4, etc.) on ecosystems and climate, with implications for multi-hazards.

Contributions from innovative approaches are encouraged.