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The 1631 A.D. eruption of Mt. Vesuvius: a multidisciplinary approach for investigating the dynamics and the timescales of the feeding system

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In the framework of the SMEEGOL project (historical Sources, Mineral microanalysis, Experimental pEtrology and numerical modellinG to unravel the precursor phenomena Of voLcanic eruptions: the case of the neapolitan volcanoes), our aim is to investigate pre-eruptive magmatic processes and their timescales, and eruptive dynamics of eruptions occurred in historical time in the Neapolitan area (Campi Flegrei caldera, Ischia island and Somma-Vesuvius volcano). The obtained results will be also processed by using a statistical approach to investigate recurrence time of the phenomena and their relationships with the type and scale of the selected volcanic events. One of the eruptions selected for these purposes is the 1631 A.D. eruption, one of the most violent and destructive event in the recent history of Mt. Vesuvius.

The aims of SMEEGOL project will be achieved through stratigraphic survey and sampling on representative proximal to medial/distal stratigraphic sections, sedimentological and textural studies, geochemical investigations, experimental petrology, numerical modeling and historical reconstruction. These latter, based on new and already available historical sources, would provide a detailed knowledge of the sequence of events shortly preceding the eruption, yielding information on the temporal evolution of volcanic unrest.

Here we present preliminary results obtained by performing a sampling campaign on the summit and on the slopes of Mt. Somma, sedimentological and textural analyses, Sr and Nd isotopic investigations on minerals and residual glass, as well as chemical analysis of residual glass and melt inclusions trapped in minerals. An attempt to constrain the timescales of magma chamber processes and to identify the possibly involved different magmatic environments has been done by characterizing feldspar and clinopyroxene zoning patterns.

The results will be integrated with literature data to perform experiments that will reproduce micro-scale magma chamber processes at realistic pre-eruptive conditions. Furthermore, numerical modelling will be used to simulate processes occurring in the plumbing system. We will also use the abundance and lithological variability of lithic fragments through the stratigraphic sequence to better investigate the effects of cratering vs magma chamber roof collapse during the eruption.