

# ANNALS OF GEOPHYSICS

## PREFACE

### **NEW ANALYTICAL TECHNIQUES FOR UNDERSTANDING VOLCANIC SYSTEMS, FROM MAGMA GENERATION TO THE EMPLACEMENT OF VOLCANIC PRODUCTS**

The development of new bi- and tri-dimensional (2D, 3D) analytical techniques of volcanic materials represents a new frontier in the world of modern volcanology. These advances not only offer important and reliable information on, e.g., magma vesiculation, degassing, and crystallization processes but can also shed light on the transport and sedimentation processes in volcanic flows (e.g. pyroclastic density currents, volcanic clouds). Hence, these novel approaches have the potential to contribute both to the understanding of eruption dynamics towards volcanic hazard quantification.

In this special issue, vol. 61, Supplement to No. 6, 2018, of Annals of Geophysics, we present 4 contributions focused on the application of both 2D and 3D analytical techniques, addressing the following main topics:

- A X-Ray microtomography morphological and textural analyses on volcanic particles in order to study how particle shape is influenced by their internal structures;
- A new freeware tool, PARTical Shape ANalyzer (PARTISAN), for 2D morphometric analysis, to study and archive results of particle shape analyses, opening the way towards an inter-group effort for a standardized 2D description of particle shape;
- Textural and chemical characterization of crustal xenoliths embedded in lavas by combining different analytical techniques (XRF, SEM-EDS, two-dimensional observation and 3D imaging by Synchrotron X-ray microtomography) to provide information on the lithology of the volcano basement and the process occurring during magma ascent;
- A multi-technique approach (Field emission-Scanning Electron Microscopy, Electron Microprobe Analysis, X-ray power diffraction and 3D imaging by X-ray micro-tomography) for understanding the formation mechanism of accretionary lapilli.

We thank and congratulate all of the contributors for their valuable contributions, which show the potential of new emerging technologies in the understanding of volcanic processes.

**Daniela MELE**

*Dipartimento di Scienze della Terra e Geoambientali, Università degli Studi di Bari "Aldo Moro", Bari, Italy*

**Fabio DIOGUARDI**

*British Geological Survey, The Lyell Centre, Edinburgh, United Kingdom*

**Mattia de' MICHELI VITTURI**

*Istituto Nazionale di Geofisica e Vulcanologia, Sezione di Pisa, Pisa, Italy*