

Report on Research Activities at ERI from 2016/5/31 to 2016/07/02

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The study conducted in this short-term visit investigated the processes and the observations involved in the propagation and arrest of propagating magma-filled dikes. Understanding the mechanisms controlling dike propagation has always been a central issue in volcano physics; and a related issue of great interest but poorly investigated so far is dike arrest.

At this purpose, we aim at compared different cases of modeled dike intrusion mainly occurred in Japanese volcanoes and at Etna volcano. The main goal of the study has been to analyze deformation pattern and seismicity mechanisms during intrusions both at Etna and Japanese volcanoes with the aim of highlighting and reinforcing common aspects helpful to constrain the dike propagation, and mainly to discriminate about the arrest process conditions.

During the visit at ERI I was hosted by Prof. Yosuke Aoki with whom I discussed and shared different aspects of this research topic. In the project Eleonora Rivalta (GFZ Potsdam) also collaborated with me and Y. Aoki, and we shared different drafts of the ongoing study and also we together had several meetings via Skype between ERI and GZF.

In the study we considered and analyzed the geometrical parameters of different lateral dikes modeled from ground deformation measurements. We also took into consideration the seismic energy released during the dike propagation. For the different cases of modeled dikes we estimated the driving magma overpressure and the energy release rate within the assumption of the linear elastic fracture mechanics. We looked into the relation between fracture energy and seismic energy release. Then we also investigated in the available energy mechanical energy to be released through the dike opening and propagation.

During the visit I gave two presentations; one for the Volcano Physics task, on 06/01/2016 with title: *"Recent eruptive activity and source mechanisms during lava fountains inferred through the new borehole dilatometers network installed at Etna volcano"*, and a second one for the Department in the 'Friday Seminar', on 03/06/2016 with title: *"Etna volcano : a very active natural laboratory for observing and studying eruptive processes"*.

During the final part of the short visit further wide issues started to be discussed, and they could become other themes of common interest to continue this fruitful collaboration. As example cases, common interest topics are :

- sources inferred by high precision continuous deformation measurements (such as strainmeter and tilt) during the explosive events to compare the behavior of Etna and Sakurajima in the explosive phases.
- gas emission and magma budget during eruptions at Etna and Asama volcano. At both volcanoes it was observed that the volume of magma involved in degassing is much more than volume changes of magma, on the basis of ground deformation (Bonaccorso et al., *GRL* 2011; Kazahaya et al. *JGR*, 2015).

Moreover, these arguments and the opportunity of actively continue my collaboration with prof. Aoki and ERI are well in agreement with the contents of the Agreement of Academic Exchange recently (May 2016) signed between University of Tokyo and Istituto Nazionale di Geofisica e Vulcanologia, in which it is supported the exchange of researchers and the collaborative research.

This visit at ERI has been greatly stimulating and positive. We had a very fruitful starting in the proposed project, and I hope that in the next months we will complete and submit in a well-known international journal a paper concerning the main results of this research, which was undertaken at ERI during my short-term visit here.

I also wish to thank the International Office for the precious and assistance and for organizing nice international lunches, during which I met several ERI staff.