Geophysical Research Abstracts
Vol. 21, EGU2019-992, 2019
EGU General Assembly 2019

The emplacement of a clastogenic lava flow: a rheological perspective

Alessandro Frontoni (1), Alessandro Vona (1), Guido Giordano (1), Marco Viccaro (2,3), and Claudia Romano (1)

(1) Dipartimento di Scienze, Università degli Studi Roma Tre, L.go San Leonardo Murialdo 1, 00146 Roma, Italy (alessandro.frontoni@uniroma3.it), (2) Dipartimento di Scienze Biologiche Geologiche e Ambientali, Università di Catania, Corso Italia 57, 95129 Catania, Italy, (3) Istituto Nazionale di Geofisica e Vulcanologia – Sezione di Catania, Osservatorio Etneo, Piazza Roma 2, 95125, Catania, Italy

On the 18^{th} May 2016 Mount Etna has been the scenario of a strong explosive eruption from the crater Voragine, which produced a vigorous lava fountaining episode. Following the filling of the summit craters Voragine and Bocca Nuova by the ejected pyroclasts, a clastogenic lava overflowed from the western rim of the crater, flowing down on the western volcano flank and stopping at about 2000 m a.s.l. The rheological behaviour of this clastogenic lava flow has been described performing a suite of high-temperature (1050 to 1100 ˚C), uniaxial deformation experiments (strain rate 10^{-4} s^{-1}) on selected natural samples (i.e., crystal- and vesicle-bearing) collected both in the crater area (loose scoriae samples) and along the lava flow (channel and lateral levees). The lava flow was also sampled at its front for what regards either the flow core or autobreccia clasts. Though textural analyses show different crystal contents, a progressive change in the rheological behaviour has been recognized in agreement with the progressive increase in the vesicle content, which shows a maximum value for pyroclasts (56%) and varies from the inner part (18%) to the upper part (25%), reaching a minimum value in the intermediate portion (10%) of the lava flow.

Preliminary rheological results, obtained at 3 different experimental temperatures and constant strain rate of 10^{-4} s^{-1}, show that samples deform within the brittle regime at 1050˚C, independently from their textural features and the portion of the lava flow in which they were collected. In contrast, with minor T increase (50 ˚C), samples with high vesicle content maintain their brittle behaviour, whereas in denser samples the ductile deformation dominates.

Combined textural and rheological data confirm field observations of the 2016 clastogenic lava flow. A marked decreasing in vesicle content from the pyroclasts to the overflowing zone due to sintering and compaction promoted lava viscous flow. Subsequently, the down flow porosity increase favoured the brittle behaviour and autobreccia formation.