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# Simulating intracrater ash recycling during mid-intensity explosive activity: high temperature laboratory experiments on natural basaltic ash

Claudia D'Oriano (1), Massimo Pompilio (1), Antonella Bertagnini (1), Raffaello Cioni (2,1), and Michel Pichavant (3)

(1) Istituto Nazionale di Geofisica e Vulcanologia, Pisa, Pisa, Italy (pompilio@pi.ingv.it), (2) Dip.to Scienze Terra, Via Trentino 51, 09127 Cagliari, Italy, (3) Institut des Sciences de la Terre d'Orleans, UMR 6113, 1A Rue de la Ferollerie, Orleans Cedex 2, France.

Direct observations of mid-intensity eruptions, in which a huge amount of ash is generated, indicate that ash recycling is quite common. The recognition of juvenile vs. recycled fragments is not straightforward, and no unequivocal, widely accepted criteria exist to support this. The presence of recycled glassy fragments can hide primary magmatic information, introducing bias in the interpretations of the ongoing magmatic and volcanic activity. High temperature experiments were performed at atmospheric pressure on natural samples to investigate the effects of reheating on morphology, texture and composition of volcanic ash. Experiments simulate the transformation of juvenile glassy fragments that, falling into the crater or in the upper part of the conduit, are recycled by following explosions. Textural and compositional modifications obtained in laboratory are compared with similar features observed in natural samples in order to identify some main general criteria to be used for the discrimination of recycled material.

Experiments were carried out on tephra produced during Strombolian activity, fire fountains and continuous ash emission at Etna, Stromboli and Vesuvius. Coarse glassy clasts were crushed in a nylon mortar in order to create an artificial ash, and then sieved to select the size interval of 1-0.71 mm. Ash shards were put in a sealed or open quartz tube, in order to prevent or to reproduce effects of air oxidation. The tube was suspended in a HT furnace at INGV-Pisa and kept at different temperatures (up to to 1110°C) for increasing time (0.5-12 hours). Preliminary experiments were also performed under gas flux conditions. Optical and electron microscope observations indicate that high temperature and exposure to the air induce large modifications on clast surface, ranging from change in color, to incipient plastic deformation till complete sintering. Significant change in color of clasts is strictly related to the presence of air, irrespective of temperature while sintering is favored by the high temperature and low fO2. Re-heating promotes nucleation and growth of crystals in the groundmass and associated change of glass composition, sometimes accompanied by growth and coalescence of vesicles in the size of 10-50 $\mu$m and cracking of the external surface.