Contribution ID: **267** Type: **invited talk**

Bubble coalescence in magmas: Insight from in-situ high temperature tomography

Wednesday, 18 September 2013 15:15 (30 minutes)

The possibility of gas to be removed from magma during its rise to the surface decreases the probability of an explosive volcanic eruption to occur. In this respect, bubble coalescence and the achievement of a permeable network play a pivotal role in favoring magma degassing and limiting the explosivity of eruptions. Significant growth and interaction between bubbles occur in natural volcanic systems during ascent of the magma to the surface. To simulate bubble growth in the laboratory we forced gas exsolution by heating natural glassy magmas at atmospheric pressure. We performed real-time, 3D, and high temperature measurements of bubble nucleation and growth using laser-heated, synchrotron-based X-ray tomographic microscopy at the TOMCAT beamline of PSI. The experiments were performed from room temperature up to 1300 K on two different types of crystal-free rhyolitic samples: a vesicle-free and an obsidian containing pre-existing vesicles. We constrained in-situ the main textural variations (bubble volumes, size distributions, shapes, and bulk textures) during the nucleation and growth of bubbles in these highly viscous systems, and tracked the evolution of parameters such as viscosity and overpressure in the foaming samples, which are essential to retrieve information on the processes preceding an eruption from the interpretation of the textures observed in eruptive products. The microstructural features of the starting material, nominally the presence of initial vesicles, strongly influence the dynamics of bubble coalescence. The presence of bubbles in the starting material tends to limit coalescence therefore increasing the possibility of bubble overpressure to develop. A possible implication of these experiments is that volcanic systems where magma is volatile saturated already in the subvolcanic reservoir may have a higher tendency to feed explosive volcanic eruptions.

Primary author: Prof. ULMER, Peter (Department of Earth Sciences / ETH Zurich)

Co-authors: Dr MARONE, Federica (SYN-PSI); FIFE, Julie Louise (Paul Scherrer Institut); Dr MADER, Kevin (Paul Scherrer Institut); Prof. CARICCHI, Luca (Department of Mineralogy, University of Geneva); Mr PISTONE, Mattia (ETH - Zurich)

Presenter: Prof. ULMER, Peter (Department of Earth Sciences / ETH Zurich)

Session Classification: Plenary session