



Seismic properties of magmatic processes at laboratory scale: Effects of crystallization and bubble nucleation

Barbara Tripoli, Benoit Cordonnier, and Peter Ulmer

Institute of Geochemistry and Petrology, ETH Zürich, Switzerland (barbara.tripoli@erdw.ethz.ch)

Seismic tomography of potentially hazardous volcanoes is a prime tool to assess the dimensions of magmatic reservoirs and possible magmatic ascent. Magma rheology and volcanic eruptive style are to a first order controlled by processes occurring in the conduit or in the chamber, such as crystallization and bubble exsolution. Seismic velocities are strongly affected by these processes (Carrichi et al, 2009) but the only few constrained measurements don't allow yet to establish a link between seismic tomography and the textural state of the volcanic system. Elastic parameters of vapor-saturated, partially molten systems are thus providing fundamental information for the identification of such reservoirs under active and seemingly dormant volcanoes.

We investigated a chemically simplified melt analogous to andesite and trachyte, in the system $\text{CaO-Na}_2\text{O-Al}_2\text{O}_3\text{-SiO}_2\text{-H}_2\text{O-CO}_2$ (Picard et al, 2011), which undergoes plagioclase crystallization and bubble exsolution. Using a Paterson-type internally-heated gas pressure apparatus, we measured the ultrasonic velocities at a constant pressure of 250 MPa and at a frequency of 0.1 MHz. Samples have been first heated at 850 °C for 30 minutes. Subsequently, the temperature has been decreased to 650 °C at a rate of 0.5 or 0.1 °C/min and velocities were recorded every 45 minutes. In order to characterize the microstructure evolution, series of cold-seal experiments at identical pressure conditions but with rapid-quenching at each of the recorded temperatures have been undertaken. We will present new experimental results that clarify the dependence of the seismic velocities on the evolution of microstructures (bubble and crystal-size distribution) as well as the evolution of composition (melt and crystals).

REFERENCES

- Caricchi, L., Burlini, L., and Ulmer, P. (2009) Propagation of P and S-waves in magmas with different crystal contents: insights into the crystallinity of magmatic reservoirs. *Journal of Volcanology and Geothermal Research*, 178, 740-750.
- Picard D., Arbaret L., Pichavant M., Champallier R. and Launeau P. (2011). Rheology and microstructure of experimentally deformed plagioclase suspensions, *Geology*, 39, 747-750.