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The effect of decompression and water content on the degassing pattern of trachytic magmas

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Rapid decompression of magma is an important trigger for magma fragmentation and explosive eruptions, acting primarily in two possible ways: drop of the confining pressure, with consequent acceleration of magma, or development of bubble overpressure. In this regard, it is important to improve the investigation on degassing processes in magmas, as a crucial key for understanding fragmentation mechanisms and eruption behavior of different magmas.
This study investigated the influence of the physical state of a trachytic magma (volatile content, bubble content and shape) and of the decompression style (rapid, one-step, multi-step, dP/dt) on the degassing process. We performed isothermal decompression experiments with a shock-tube apparatus at T= 750-850°C, in the liquid state. Hydrous homogeneous glasses (H_2O = 0,35 wt%, 0,5 wt%, 1,77 wt%) were decompressed from starting undersaturated conditions (P 22Mpa – 6 Mpa) to oversaturated pressure conditions and then to ambient pressure.
Textural features of the degassed samples were related to the style of decompression (eg., decompression rates, annealing time) and to the initial water content (H_2O = 0,35 wt%, 0,5wt%, 1,77wt%). Compared to literature for different melt composition, the results showed good consistency. Further, we observed heterogeneous distributions of bubble populations leading to variable bubble number densities, with both likely associated to diffusive-degassing.
The results presented here stem from a successful feasibility study. Future thorough investigation of the different degassing styles of trachytes via vesiculation and water diffusivity as well as their influence on the rheology of magmas in the conduit will follow.