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# Investigating explosive basaltic activity by the study of magma permeability and 3-D vesicle textures in the erupted products

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In the last few years explosive basaltic activity has gained increasing attention because of its frequency and hazard implications. This attention has led to more-intensive monitoring of active processes and reconstruction of the dynamics and style of activity. In this study we conducted a detailed investigation of the textures of pyroclastic materials erupted from Stromboli volcano between the end of 2004 and May 2006. A series of X-ray computed tomographic experiments and lattice Boltzmann permeability simulations were performed on scoria and pumice clasts in order to unravel the relation between the nature of vesiculation in the erupted products and the dynamics of gas transport in basaltic conduits. We find that scoriae from the normal, daily Strombolian explosions are characterized by power-law vesicle volume distributions that can be ascribed to combined vesicle coalescence and multiple/continuous vesicle nucleation events in the shallower conduit. These two combined modes of degassing are capable of generating a network of large, interconnected vesicles spanning the whole volume of magma under investigation. Such vesicles represent percolation channels for gas transport through magma at persistently degassing volcanoes. They are present in almost all studied scoria clasts from normal Strombolian explosions, lacking in pumice products discharged during paroxysmal activity. These observations, together with the exponential vesicle volume distributions and lower permeability values exhibited by pumice in comparison to scoria, suggest that the efficiency of degassing in the magma reservoir feeding a paroxysmal explosion is reduced just before the event, on a timescale of minutes to hours. Similar features have been found in volcanic products from other basaltic volcanoes characterized by variable eruptive intensity (for example Etna, Southern Italy, and Villarrica, Chile) indicating that basaltic systems appear to follow a common degassing procedure.