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# Modelling Volcanic Melt Inclusions and Gas Compositions and Periodicities from Fluid Mechanical and Petrological Experiments

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We forward model volcanic gas fluxes, compositions and melt inclusion compositions from models of magma rheology, flow, volatile behaviours and phase equilibria. As magma ascends towards the Earth's surface, it experiences several orders of magnitude of depressurisation. This causes drastic changes in volatile solubilities and phase relationships. Importantly, near the surface, extensive degassing of water drives crystallisation of the melt and increases the buoyancy and viscosity of the magma. At high vesicularities, gas escapes via permeable flow through the porous magma.

Total volatile inventories can be estimated from melt inclusions. Reliable models of volatile solubilities (Dixon, 1997; Witham et al., this session) and phase relationships (Di Carlo et al., 2006) are available. Magma rheology is derived by considering the melt viscosity (Giordano et al., 2008) and adding the effect of bubbles (Llewellin et al., 2002) and crystals (Mueller et al., 2010). We couple these with models of conduit flow (Huppert & Hallworth, 2007; Beckett et al., this session) and permeability development in order to predict the time-dependent fluxes and compositions of volcanic gases emitted from persistently degassing volcanoes. Compositional arrays (volatile content and major element chemistry) of melt inclusions are also predicted. These melt inclusion and gas emission predictions are compared to observations at Stromboli, Italy and Masaya, Nicaragua.

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