



Pressurization vs. flushing in the modelling of volcanic gases at basaltic volcanoes

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When modelling the composition of chemical gases released at basaltic volcanoes, two end-member processes can be quantitatively constrained by means of thermochemical techniques: closed-system magma degassing or, alternatively, the ascent of gas-bubbles, separated from the reservoir melt at some depth and flushing through the surrounding melt up to surface. In the first scenario, the ascent of volatile-rich (bubbles+melt) magmas from the reservoir is followed by gas/melt separation and fast ascent of the gas phase without any further re-equilibration with the residual melt filling the shallower conduit system. The features of this mechanism must be realized within the lumped approximation inherent in any thermochemical modeling. On the other hand, gas mixing upon addition of gas bubbles rising from a deeper reservoir can give almost identical gas compositions, but returns different (over)pressures, including the zero overpressure of eruptions that are driven by the free-surface expansion at 0.1 MPa of a magma flushed by an amount of gas largely exceeding the original total volatile contents. Whatever between the two end-member hypotheses, we will show how the chemical signal is expected to evolve, particularly in terms of compositional ratios, and which interpretative ambiguities, as well as clues, can generate.