**Theoretical constraints on conditions that allow water influx into eruptive conduits during volcanic eruptions**

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Explosive volcanic eruptions that involve external water tend to produce deposits with ballistically ejected blocks, base surge bedforms, a high percentage of lithic debris, and fine-grained, variably vesiculated juvenile fragments. These characteristics are commonly attributed to discrete steam explosions generated by fuel-coolant interactions. Here I use theoretical considerations of conduit flow and rock mechanics to suggest that low conduit pressure, rather than water influx per se, may be largely responsible for these features. Water will enter an eruptive conduit only when conduit pressure is lower than that of the surrounding water system. Numerical models of conduit flow during sustained pyroclastic eruptions indicate that, if the conduit is cylindrical, its internal pressure should be well below hydrostatic at depths above the point where magma fragments into pyroclasts. Thus one might expect groundwater to enter the conduit during sustained pyroclastic eruptions, even in cases where no surface water exists. However extensive experience in the drilling industry indicates that the walls of deep (>1 km) cylindrical openings begin to fail when their internal pressure drops toward hydrostatic. Thus sustained, stable eruptions are almost certainly not fed by cylindrical conduits, but by conduits whose geometry adjusts (by collapse or by wall flexure) to keep internal pressure high. As pressure wanes near the end of an eruptive pulse, the conduit wall may either close off before its pressure drops below hydrostatic; or fail locally, temporarily blocking the vent with lithic debris, and slowing magma-ascent rates sufficiently to allow bubbles to escape from juvenile clasts. Pressure increases below the blockage then expel the lithic and dense juvenile debris in discrete explosions.