



First gas flux measurements of conduit permeability decrease prior to Strombolian eruption at Stromboli volcano (Italy)

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Strombolian eruptions can be described in terms of growth, coalescence, and rise of a gas pocket (aka slug) bursting at the surface of a vent. This model overlooks that the transition to explosive regimes is mostly controlled by the permeability in the upper part of a volcanic conduit. We report here on the first gas flux measurements of Strombolian explosions from a vent that exhibited a significant decrease of passive degassing tens of second prior to the onset of the explosion. This particular explosive activity took place during the July 2014 lava overflows, when the magma level inside the conduit rose up to the crater terrace. The amount of gas that accumulated before the eruption is incredibly similar to the amount of gas ejected during the explosion. This similarity suggests a mechanism of decrease of the shallow conduit permeability and a subsequent accumulation of gas behind a cap of cold magma. The accumulated gas is then released when the over-pressure can open a leak on the cap of cold magma. Our unprecedented results offer key and novel insights into the explosive degassing dynamics within the shallow conduit systems of this open-vent volcano and probably at many other basaltic volcanoes.