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INTEGRATED SATELLITE OBSERVATIONS OF VOLCANIC ERUPTIONS

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ABSTRACT

Observations of volcanoes from space are a critical component of volcano monitoring, but we lack quantitative integrated models to interpret them. The atmospheric sulfur yields of eruptions are variable and not well correlated with eruption magnitude and for many eruptions the volume of erupted material is much greater than the subsurface volume change inferred from ground displacements. Up to now, these observations have been treated independently, but they are fundamentally linked. If magmas are vapour-saturated before eruption, bubbles cause the magma to become more compressible, resulting in muted ground displacements. The bubbles contain the sulfur-bearing vapour injected into the atmosphere during eruptions. In this talk I will present a model framework that allows the inferred volume change of the reservoir and the sulfur mass loading to be predicted as a function of reservoir depth and the magma's oxidation state and volatile content, which is consistent with the array of natural data.

Recently published as:

McCormick Kilbride, B. et al., Observing eruptions of gas-rich compressible magmas from space. Nat. Commun. 7, 13744 doi: 10.1038/ncomms13744 (2016).