INSIGHTS INTO THE 2017-2018 AMBAE ERUPTION

P.BANI[1]*, Y.MOUSSALLAM[1], E.MEDARD[1], E.ROSE-KOGA[1], K.KOGA[1], P.J.GAUTHIER[1], S.CARN[2], A.AIUPPA[3], D.COPPOLA[4], D.TARI[5], I.BANI[5], M.BENBAKKAR[1], M.VOYARD[6], B.J.SCOTT[7], E.GARAEBITI[5], M.LARDY[8]

[1]LMV, UCA, Aubière, France (*philipson.bani@ird.fr)
[2]Dep. Geol. Min. Eng. Sci., Mich. Tech. Univ., Houghton USA.
[3]Dipartimento DiSTeM, Università di Palermo, Italy.
[4]Università degli Studi di Torino, Dip. Sci. Terr., Torino, Italy.
[5]Vanuatu Met. Geohazards Dep., L. Highway, Port Vila, Vanuatu.
[6]Institut Chim.de Clermont-Fd, Campus Univ. Cézeaux, France.
[7]GNS Science, Waikato, New Zealand.
[8]IRD Nouvelle Calédonie, BPA5, 98848, Nouméa Cedex.

In 2017-2018, Ambae volcano, in the Vanuatu archipelago, went through an unprecedented strong eruption. It commenced as a basaltic-type eruption with lava flow, strombolian activity and intermittent lava fountaining. The activity then progressively increased in intensity and transitioned into more explosive manifestations that injected magmatic volatiles into the stratosphere at its most intense period. The eruption went through 4 distinct phases separated by relatively calm episodes. The magmatic source that sustained the entire eruptive activity is of basaltic to basaltic-trachy-andesite composition with the onset eruptive products being relatively evolved. The cumulative SO_2 mass obtained from satellite recording is ~3.2 Tg, placing Ambae among the top 6 largest eruption in terms of SO_2 loading in the last 40 years. Combining with gas composition, we estimate that 52.6 Tg of H_2O, 11.5 Tg of CO_2, 0.2 Tg of H_2S and 1 kt of H_2 were injected into the atmosphere by the Ambae 2017-2018 eruption. Melt inclusion data indicate pre-eruptive sulfur content of around 700 ppm in Ambae magma source and that at least 90% of this content was outgassed at the surface, implying a degassing of 0.8 km^3 of basaltic magma. A pre-eruptive temperatures of ~1140 °C was obtained using geothermometry models whilst geobarometry and volatile saturation melt inclusion data suggest that most of the magma resided in a reservoir at ~ 0.5-3 km depth with magma originating from ~14 km depth. Diffusion modeling along embayments and microlite number density yield magma ascent rate of at least 10 m/s [1]. The crater lake water chemistry has shown strong fluctuations over the eruption period, leading to a spectacular color change to red, a process that is possibly link to iron oxidation as already observed in 2006 [2].

[1] Moussallam et al. (under review). [2] Bani et al. (2009) J. Volcanol, Geotherm. Res., 188, 347-357.