

# **H<sub>2</sub>O, CO<sub>2</sub>, and S contents of basaltic andesite magmas at Rabaul Caldera Complex, Papua New Guinea**

MELINA HÖHN, BRENDAN MCCORMICK KILBRIDE  
AND MARGARET E. HARTLEY

University of Manchester

Presenting Author: [melina.hohn@postgrad.manchester.ac.uk](mailto:melina.hohn@postgrad.manchester.ac.uk)

The Rabaul Caldera Complex (RCC) has historically been the most active volcano in Papua New Guinea. Rabaul is capable of large volume, high intensity caldera-forming eruptions and lower intensity but more frequent intra-caldera eruptions. All eruptions pose a significant risk to nearby populations [1,2].

Among the most striking but also least investigated features of the RCC are persistent and prodigious gas emissions, even between eruptions [3,4]. It is unknown why Rabaul is such a strong emitter of volcanic gases. The few studies investigating volcanic degassing at Rabaul are mostly limited to satellite-based observations of SO<sub>2</sub> emissions [3,4], although few studies of melt inclusions indicate that magmatic volatiles play a key control on the dynamics and strength of volcanic eruptions as well as the eruption style at the RCC [5,6].

The main goal of this research is to discover how the composition, abundance, and origin of volatiles varies between magmas feeding eruptions of different styles, from different vents, and from different intervals in the caldera cycle of Rabaul. We present EMP and SIMS measurements of major/minor elements and the pre-eruptive volatile contents (H<sub>2</sub>O, CO<sub>2</sub>, S, Cl) of plagioclase-, pyroxene-, and olivine-hosted melt inclusions, in the products of the 2014 eruption of Tavurvur, Rabaul's most recently active vent. We use our new data alongside previous studies of the 1994 [5] and 2006 [6] eruptions to build a time series describing the composition and evolution of Rabaul magmas during the current phase of activity. We reconstruct volatile budgets and fluxes for the 2014 activity and, by comparing petrological and geochemical data with satellite observations of SO<sub>2</sub> emissions, we aim to assess different scenarios of eruption triggering (e.g., rapid onset degassing versus accumulation of an excess vapour phase before eruption).

## *References:*

- [1] Patia H et al. (2017), *J Volcanol Geotherm Res* 345:200-217
- [2] Fabbro G et al. (2020), *J Volcanol Geotherm Res* 393:106810
- [3] McCormick B et al. (2012), *Geochem Geophys Geosys* 13:Q3008
- [4] Carn S et al. (2017), *Sci Rep* 7:44095
- [5] Roggensack K et al. (1996), *Science* 273:490-493
- [6] Bouvet de Maisonneuve C et al. (2015), *Geol Soc London Spec Publ* 442:17-39