ABOVE: Aerial-based Observations of Volcanic Emissions, Papua New Guinea

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Proximal volcanic gas measurements using instrumented Unmanned Aerial Systems (UAS) enable innovative aerial experiments that are changing the way we sample volcanic emissions. ABOVE is an internationally collaborative endeavour through the Deep Carbon Observatory to determine the carbon flux and isotopic signature of two strong but uncharacterised emission sources in Papua New Guinea (PNG) using novel UAS technology. The project targets Manam and Rabaul volcanoes, both among the top ten highest global SO_2 emitters from satellite observations yet challenging to measure and monitor from the ground. A large-scale field deployment in May 2019 will acquire beyond-visual-line-of-sight aerial measurements using multiple airborne UAS, together with simultaneous ground-based installations and satellite observations.

Here, we present molar gas compositions, carbon isotopic characteristics, halogen speciation and volatile fluxes for both Rabaul and Manam. We evaluate consensus best practices for aerial gas measurements, and identify critical targets for future technological and scientific development in this field. Ultimately, these data will refine our global estimate of volcanic carbon outgassing and provide critical insight into the genesis of emitted volatiles, and thus carbon recycling, through the Papua New Guinea subduction zone.