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## Volcanic degassing along the enigmatic South Sandwich volcanic arc

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The South Sandwich Islands (SSI) are a chain of active volcanoes in the Southern Ocean and remain one of the most remote and enigmatic island arcs on Earth. The relatively recent development of the SSI over the past 20 million years has been closely linked with the formation of the Drake Passage, making this one of the youngest known volcanic arcs and therefore one of the most critical for understanding the early stages of arc geochemical evolution. Recent volcanic eruptions in the SSI have had significant impacts on local terrestrial and marine ecosystems, including some of the largest penguin colonies ever observed, through tephra deposition and from sustained volcanic degassing. Rare cloud-free satellite images over the last two decades have indicated that the summit of Mt Michael (Saunders) hosts a sustained lava lake, but until now these observations have not been ground-truthed by in-situ measurements. Long-term persistent passive outgassing at many of these volcanoes, even between eruptive phases, suggests that the SSI volcanic arc could be a significant source of volatiles to our atmosphere, and yet we lack any constraints on the degassing budgets of this volcanic arc. Here, we present novel measurements of gas chemistry, aerosol composition, and carbon isotope signature from along the South Sandwich Island arc. By combining ground-based measurements of SO<sub>2</sub> flux with in-situ samples of plume composition using Unoccupied Aerial Systems (UAS), we present multi-species volatile fluxes for the major along-arc degassing sources. Further, by evaluating the carbon to sulfur ratio (C/S<sub>T</sub>) and carbon isotope composition in emitted gases together with petrological constraints from erupted tephra, we aim to test the hypothesis that carbon is supplied to the SSI by subduction of oceanic carbonated serpentinite, and thus contribute to our understanding of carbon recycling at subduction zones.