

# ***Interactive comment on* “A multi-purpose, multi-rotor drone system for long range and high-altitude volcanic gas plume measurements” by Bo Galle et al.**

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Summary (please see the attached pdf supplement for full review with specific comments)

This article describes a small, electric-powered multi-rotor drone and several payloads that were used for volcanic gas sensing and sampling at volcanoes in Papua New Guinea between 2016-2019. The authors focus on technical descriptions of the payloads (DOAS, multi-GAS, a denuder system, and gas-bag collection system) and modifications that were made to the drone platform to improve its endurance. This contribution appears to serve as a technical companion paper to (Liu et al., 2020), who discuss

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the volcanologic significance of the obtained gas composition and emission rate results from the 2019 campaign.

Some of the payloads used in the experiments have been described previously (e.g. the DOAS system, denuder system, and 'Sunkist' instrument; Rüdiger et al., 2018), but the manuscript does include descriptions of a new multi-GAS unit developed by Chalmers U. that includes the innovative integration of a mini anemometer to obtain windspeeds, as well as a plume sampling unit for collecting bagged samples for posterior carbon-isotope analysis. To me, the most novel aspect of the manuscript is the presentation and analysis of the two methods for determining plume speed; most of the other instruments and techniques have been in use for some time. Accurately determining plume speeds is critical for determining volcanic gas emission rates, and the instrument and methods comparison shown here are helpful for addressing this important issue.

The technical emphasis of the manuscript is appropriate for Atmospheric Measurement Techniques and the operational 'lessons learned' will be valuable and of interest to the volcanic gas community. The manuscript is generally well-written and structured but there are some items that need to be addressed prior to publication. Broadly, my main concerns (documented below) are that the manuscript is too vague in places, and that supporting data are incomplete, contain mistakes, or are not available in an open repository. The scientific value of the collected gas measurements are hardly discussed (perhaps a little more effort could be made here, or would it overlap too much with Liu et al.?), therefore I feel that the technical contribution must be significant and substantive to warrant publication. These issues compromise the study's impact and value in its present form but should not be too difficult to remedy. The article will be appropriate for publication in AMT after these issues and the comments below are resolved. I hope that these comments are helpful.

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Please also note the supplement to this comment:

<https://amt.copernicus.org/preprints/amt-2020-452/amt-2020-452-RC1-supplement.pdf>

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Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2020-452, 2020.

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