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Reply

Reply to Kern, C. The Difficulty of Measuring the Absorption of Scattered Sunlight by H_2O and CO_2 in Volcanic Plumes: A Comment on Pering, et al. "A Novel and Inexpensive Method for Measuring Volcanic Plume Water Fluxes at High Temporal Resolution", *Remote Sens.* 2017, 9, 146

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Response to the Comment

We would like to thank our colleague, Christoph Kern, for his comment [1] on our recent paper [2], which provides a valuable adjunct to that published piece. In the comment, Kern details the difficulty of measuring water vapour in volcanic plumes at relatively low altitudes, especially considering the importance of in-plume scattering effects [2]. In particular, Kern [1] suggests that our image-based assessments of plume water amounts at Vulcano Island and Mt. Etna may in fact be more related to in-plume scattering, rather than in-plume water vapour column amounts. This said, we would respectfully argue, that as per the work of others, e.g., [3,4], that an empirical relationship between water and measured in-plume scattering can be established, from which trends in flux data can be determined, provided that sufficiently regular calibrations are performed. This was indeed the key message of the article, and in our case calibration was employed. As Kern remarks, the high ambient concentrations of CO_2 and H_2O in volcanic plumes do present key challenges to remote sensing of these species in volcano plumes. One key mitigating step is to measure plumes at higher altitude, where the overlying atmospheric column of these species will be reduced. Indeed, the possibility of measuring plume water vapour in this scenario has recently been rather elegantly demonstrated, in the case of Sabancaya volcano in Peru, one of the highest sources of volcanic degassing on the planet [5].

Conflicts of Interest: The authors declare that there is no conflict of interest.

References

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