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Improvements on Near Real Time Detection of Volcanic Ash Emissions for Emergency Monitoring with Limited Satellite Bands

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Quantifying volcanic ash emissions syn-eruptively is an important task for the global aviation community. However, due to the near real time nature of volcano monitoring, many parameters important for accurate ash mass estimates cannot be obtained easily. Previous studies highlight the surface temperature, the refractive index of the ash and the cloud top temperature as most crucial of these values. Even when estimating those parameters best possible, uncertainties associated with the ash masses remain high, especially when the satellite data is only available in the traditional 10.8 and 12.0 μm bands. To counteract this limitation, we developed a quantitative comparison between the ash extents in satellite and model data. The main aspect is to manually define the cloud edge based on the available satellite data as well as other knowledge like pilot reports or ground-based observations. This manual aspect, although subjective to the experience of the observer, can show a significant improvement as it provides the ability to highlight ash that otherwise would be obscured by meteorological clouds or, by passing over different surfaces with unaccounted temperatures, might be lost entirely and thus remains undetectable for an automated satellite approach. We show comparisons to Volcanic Ash Transport and Dispersion models and outline a quantitative match as well as percentages of overestimates based on satellite or dispersion model data which can be converted into a level of reliability for near real time volcano monitoring.