Source Parameter Sensitivity in Volcanic Ash Transport Models: A Case Study of the Sakurajima Volcano, Japan using the WRF Model

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Introduction

Sakurajima is an active volcano in Kyushu, Japan. Emissions such as ash and sulphur dioxide are known to impact lives and livelihood and improvements in the modelling are important for acute crises and long-term planning [1, 2]. Here, a set of source parameters (composition, eruption rate, duration) were determined using observational data and a series of high-resolution modelling cases were carried out to test the model sensitivity.

Observations and Modelling

The Sakurajima Observatory employs a high-resolution network of 59 tephrameters in the Kagoshima prefecture [3]. A database with characteristics for every eruption is maintained by the Japanese Meteorological Agency. The WRF model is an atmospheric model with “online” chemistry calculations. Interactions between emissions and the atmosphere and fine-scale meteorological circulation are resolved in real time, leading to more accurate predictions [2]. Here we use 2 domains, with the finest (δx=500 m) centred over the Kagoshima prefecture.

Preliminary Results and Conclusions

All source parameters affect the final distribution of volcanic emissions, but the plume height and grain size distribution were seen to have considerable impact. The model does not currently include ash aggregation, so an increase in the duration or eruptive rate led to an approximately linear response. Low-resolution simulations are widely used due to the limited computational time required, but results indicate that high-resolution simulations with accurate source parameters can increase fidelity of results and should be considered, especially for long-term planning.

[1] Shinkura et al. (1999*) J. Epidemiol*. **9**, 344-349. [2] Stuefer et al. (2013) *Geosci. Model Dev*. **6**, 457-468. [3] Tajima et al. (2015) *Nippon Koei Technical Forum,* **23**, 39-46.