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An Improved Operational Volcanic Ash Dispersion Modelling System for the Wellington VAAC

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The Meteorological Service of New Zealand's (MetService's) responsibilities as a Volcanic Ash Advisory Centre (VAAC) require the operational use of volcanic ash dispersion and transport models to provide guidance for issuing Volcanic Ash Advisories in the event of volcanic eruptions.
The operational volcanic ash dispersion modelling system currently in use at MetService is based on the PUFF model (Searcy et al., 1998) driven by GFS NWP data. This system possesses several shortcomings, most notably the lack of quantitative concentration output for quantitative comparison with satellite observations, no accounting for wet deposition of ash and the use of low resolution NWP input from a single model.
To overcome these shortcomings, a new modelling system has been developed, built around the HYSPLIT model (developed by NOAA's Air Resources Laboratory) driven with NWP from three different models: IFS, GFS and WRF. Eruption parameters (duration, plume height and mass eruption rate) are provided from a set of defaults, spanning a range of eruption sizes, for each volcano—at present taken from the USGS eruption parameter database (Mastin et al., 2009)—until observations of the eruption become available to specify these. The system is operated through a web interface which allows simulations to be triggered by forecasters simply and quickly and also provides graphical output of mass loading. Further visualization is provided through integration with IBL's Visual Weather product which allows easy comparison with satellite observations as well as the editing and publishing of Volcanic Ash Advisories and Volcanic Ash Graphics.
Early results indicate that in general, differences between ash dispersion forecasts from the two global models are slight in comparison to the differences between the global models and the limited area WRF. A number of eruption case studies will be presented, demonstrating the multi-model/multi-parameter ensemble output and assessment of model performance against observations.