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Operational Ash Dispersion Modeling in Google Earth™ and Google Maps™.

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Abstract
Virtual Globes have become widely used for visualization in the scientific environment. They have become a tool for displaying two/three dimensional geophysical data operationally and retrospectively. There are over 100 active volcanoes in the North Pacific (NOPAC) region, most of which are located in uninhabited areas. The region is remote and vast (5,000 km by 2,500 km) but sparsely populated. These volcanoes erupt many times per year, from 1975 – 2006 there were over 100 separate volcanic ash clouds reaching at least 20,000 ft and ejecting ash to a range of altitudes and jeopardising aircraft safety. The Alaska Volcano Observatory (AVO) operationally monitors these volcanoes and is a joint program of the United States Geological Survey (USGS), the Geophysical Institute of the University of Alaska Fairbanks (UAF/GI), and the State of Alaska Division of Geological and Geophysical Surveys (ADGGS).

Puff is a three dimensional dispersion model used at AVO and is primarily designed for forecasting volcanic ash dispersion. Model simulations place hypothetical particles of various sizes above a selected volcano and track particle movement in a gridded wind field. Numerical weather prediction (NWP) model wind fields are used for real-time operational predictions and re-analysis wind fields for post event analysis. The model uses information such as event duration, size of ash plume and start time (from satellite or seismic data) to predict the movement of the ash cloud released. Puff allows the analyst to track a set number of particles, giving the location in space and time. In the recent past, Puff has been displayed as two dimensional maps of ash location, color coded by altitude and relative ash concentration. This is a useful tool for operational analysis but does not take full advantage of the three dimensional nature of the data. Here we show operational Puff predictions in three dimensions within Google Earth™, both as iso-surfaces and particles, and study past eruptions to illustrate the capabilites that the Virtual Globes can provide. In addition, we show the opportunity that Google Maps™ provides in displaying Puff operational predictions via an API web interface without any additional application and how radiosonde data actual and NWP vertical profiles can be displayed in Google Earth™ and Google Maps™ for assisting in determining volcanic ash cloud heights. Information on the Puff Dispersion Model can be accessed at http://puff.images.alaska.edu along with the Google Maps™ API and examples of the Puff predictions displayed within Google Earth™.

Topic or Session Area: Virtual Globes

Technical Requirements: Laptop/PC with Internet connection, Google Earth™ and FireFox web Browser