Automating a Volcanic Ash Forecast System with Improved Visualization Tools for Increasing Public Accessibility – final report

The Alaska Volcano Observatory (AVO) was formed in 1988, and uses federal, state, and university resources to monitor and study Alaska's hazardous volcanoes, to predict and record eruptive activity, and to mitigate volcanic hazards to life and property. AVO is a joint program of the University of Alaska Fairbanks (UAF), the US Geological Survey, and the Alaska Division of Geological and Geophysical Surveys. Volcanic ash transport and dispersion (VATD) models are instrumental tools used at AVO for predicting ash cloud trajectories, and are used to help divert aircraft and prepare population centers for potential ash fallout. In 2006, the College of Engineering and Mines (CEM) at UAF received a Unidata Equipment Award to help broaden the scope and accessibility of VATD forecasts for both AVO personnel directly involved with volcano monitoring, and the public who may be directly impacted or are simply generally interested in the volcanic activity in the North Pacific and around the world.

An essential requirement for producing accurate volcanic ash forecasts is ready access to numerical weather prediction (NWP) data which provides the dominant advective component in VATD models. The Local Data Manager (LDM) software is used to capture and store several different regional and global data sets including GFS, NOGAPS, NAM and WRF. Unidata decoder software is then used to convert the GRIB data into the required netCDF format for use with the VATD model. Puff, one of a few different VATD models used around the world, is then used to generate ash forecasts based on several characteristics of the eruption including duration, maximum height, plume shape, and ash composition.

Equipment Purchased

Prior to the equipment grant, VATD forecasts were primarily produced manually, and in a reactive manner when an eruption was imminent or on-going. The grant to UAF was used to purchase a new 2.66-GHz quad-processor server with 2 TB RAID 5 storage running GNU/Linux with CentOS. The new hardware is used to automatically produce VATD forecasts every three hours for all potentially active volcanoes in the North Pacific and other select regions of the world. (AVO is only tasked with monitoring North Pacific volcanoes, however.) In addition, forecasts are produced using several different NWP data sets and for potential eruptions of various magnitudes. Over 250 unique simulations can be performed per hour, which are used to generate the separate forecasts. A 30-day archive of all simulations is possible, allowing for post-event analysis for future VATD model development.

Implementation

A preliminary publicly-accessible, web-based interface to the automatically generated forecast data has been developed, and work continues on expanding the interface capabilities and range of forecast data available. The current development interface can be seen at http://puff.images.alaska.edu. A Google Maps API is used to easily select the region and volcano of interest, or simply browse around to see the current world-wide volcanic activity. The current forecast can be seen by clicking on any volcano icon. Future improvements to the interface will allow for a choice of 2D or 3D visualization of the forecast data using both the Integrated Data Viewer (IDV), Google Earth, and NASA World Wind. In addition to numerically computing all the forecasts, the new hardware is already generating netCDF and KML files for use with these visualization tools.

Dr. Peter Webley, post-doc at UAF working with AVO, demonstrated many aspects of this new system at the 2006 AGU Fall Meeting in San Francisco, giving a presentation in the Earth Science Informatics session (Eos Trans. AGU 87(52): Fall Meet. Supl. Abst. IN43A-0899). The web site was also featured

in *Science* magazine's NetWatch in July 2006 (vol. 313, p. 417).