9.5

Volcanic ash coordination tool (VACT)

Dennis M. Rodgers[1] and Greg Pratt
NOAA Research – Forecast Systems Laboratory
Boulder, Colorado

and

Jeffrey M. Osiensky
National Weather Service – Alaska Aviation Weather Unit
Anchorage, Alaska

1. INTRODUCTION

Volcanic eruption plumes and subsequent airborne ash clouds from North Pacific volcanoes are a serious hazard to aviation. There are over 100 active volcanoes in the North Pacific region. This region contains 20% of the world's active volcanoes. Approximately 200 flights per day traverse the region carrying 20,000 passengers and 6000 tons of cargo. North Pacific volcanoes spew ash to flight levels four to five times per year, on average. Drifting ash clouds have caused delays in flight operations and substantial damage to aircraft.

The Alaska Interagency Operating Plan for Volcanic Ash Episodes (USGS 2004) provides an overview of multiple agency integrated operational response to volcanic ash episodes. The document describes the specific roles and responsibilities of the Federal Aviation Administration (FAA); the Alaska Volcano Observatory (AVO - jointly operated by the U.S. Geological Survey, University of Alaska, and Alaska state government), and the National Weather Service (NWS). The plan covers Alaska and the adjacent U. S. airspace Flight Information Region (FIR). The interagency plan defines the communications links and operational actions necessary for a cohesive, well coordinated response to volcanic ash episodes. That integrated response involves data collection and processing, information management and coordination, and distribution and dissemination. It is essential that agencies relaying information about the occurrence of volcanic ash and its forecasted trajectory produce and disseminate consistent messages.

2. VOLCANIC ASH COORDINATION TOOL (VACT)

The Anchorage Volcanic Ash Advisory Center (VAAC; co-located with the Anchorage NWS Alaska Aviation Weather Unit), the AVO, and the Anchorage Air Route Traffic Control Center, Center Weather Service Unit (CWSU) are working with NOAA's Forecast Systems Laboratory (FSL) to develop requirements for a meteorological display and communications system to facilitate real-time collaboration in creating and disseminating volcanic ash advisories. Enabling the VAAC, AVO, and CWSU to simultaneously view identical displays, share specialized data, and collaborate in real-time will help these agencies create fully consistent advisories.

[1] *Corresponding author address:* Dennis M. Rodgers, NOAA/OAR/FSL FS5, 325 Broadway, Boulder, CO 80305-3328; email: dennis.m.rodgers@noaa.gov

To address the cooperating agencies' requirements, an interactive meteorological workstation, referred to as the Volcanic Ash Coordination Tool (VACT), is being developed by FSL and tested in operational settings in Alaska. An initial build of the system was installed in Spring, 2003, at the Anchorage VAAC, AVO, and CWSU. The VACT is an extension of FSL's FX-Collaborate system, which was initially developed with NOAA funding. FX-Collaborate (FXC) is an exploratory development project started in 1998 to study architectural issues involved in implementing collaboration and distributed databases. FSL's approach has been to develop an operational prototype system that would assist FSL developers in exploring these issues while simultaneously collecting information from users about what constitutes an effective collaborative system (FSL 2004).

The system has been developed using Java's Remote Method Invocation to emulate many capabilities in the NWS's Advanced Weather Interactive Processing System (AWIPS), while enabling remote users to synchronize their displays for effective collaboration. In addition, FXC includes interactive capabilities such as drawing/annotation tools and a chatroom, and allows sharing of local datasets between sites. Communication may be over a private network or the Internet; if the latter, Web pages can be shared and annotated.

A unique feature of VACT is that it can accommodate the interaction of forecasters at different locations, enabling collaborative decision making. When connected (via the Internet or local network) to a NWS AWIPS server, VACT allows the display of selected AWIPS data and imagery over which graphics may be created, manipulated, and viewed by remotely located collaboration participants. Although the AWIPS database is the primary and most extensive source of data, VACT can also obtain data in image form from web servers and integrate data from other sources, including locally run ash dispersion models. VACT provides shared situational awareness to the three primary participants which have differing data streams, networks, and display systems.

2.1 VACT Build 1

The initial installation of VACT provided a workstation tailored for use in Alaska Region, including map backgrounds and product suite centered on Alaska. Several major issues were addressed on this initial installation concerning bandwidth limitations and firewall issues. Having satisfied operational requirements and constraints of installing an experimental system in operational environments, feedback was then solicited from users to further define requirements for specialized capabilities.

2.2 VACT Build 2

Based on user feedback from the initial delivery, numerous enhancements to the system have occurred. Expanded satellite image displays and enhancements and custom geographic sectors and map backgrounds were developed. The ability to display NWS Alaska Region polar orbiter images at full resolution is another feature of VACT. Further enhancements include the capability to run the PUFF numerical volcanic ash tracking model (Searcy et al 1998) on VACT, creating output displays which can then be combined with meteorological graphics and satellite imagery. Additionally, an on-screen interrogation of volcano information was created utilizing the mouse cursor. This "mouse-over" sampling of volcano locations provides volcano name, Smithsonian number, elevation, latitude/longitude, last known eruption date, and whether or not it is seismically monitored. Future enhancements will include the creation of graphic advisory preparation tools. Application of the VACT to volcanic ash advisory and warning preparation and interagency coordination will be explored in a planned quasi-operational evaluation during the upcoming year.

This evaluation will be conducted in the operational settings of the three participating agencies and will involve realistic eruption and response scenarios.

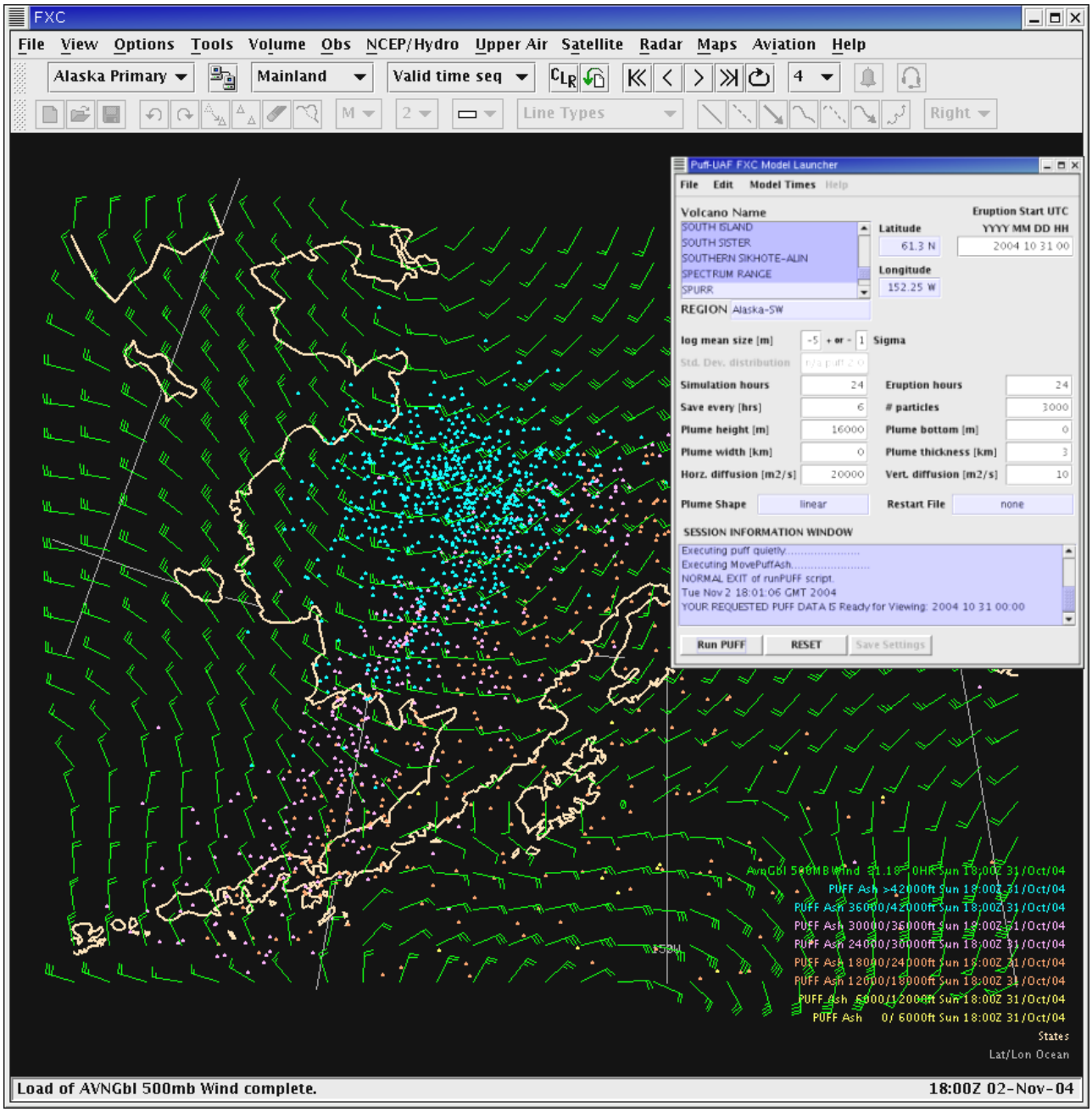

Figure 1 VACT displaying PUFF ash plume dispersion output from a hypothetical eruption combined with AVNGBL 500 mb winds.

3. ACKNOWLEDGMENTS

This work is in response to requirements and funding by the FAA Aviation Weather Research Program and the NWS. The views expressed are those of the authors and do not necessarily represent the official policy or position of the FAA or NWS.

4. REFERENCES

FSL 2004: *FX-Collaborate*. NOAA Research - Forecast Systems Laboratory, 325 Broadway, Boulder CO 80305. [Available online at: http://www-sdd.fsl.noaa.gov/~fxa/FXC/

Searcy C., K. Dean, and W. Stringer, 1998: *PUFF: A lagrangian trajectory volcanic ash tracking model*. Journal of Volcanology and Geothermal Research (80) 1-16. [Available online at: http://pafc.arh.noaa.gov/puff/jvgr/puffpaper.html

USGS 2004: *Alaska Interagency Operating Plan for Volcanic Ash Episodes.* Copies available from U.S. Geological Survey, Alaska Volcano Observatory, 4200 University Drive, Anchorage, AK 99508. 33pp.