INTERNATIONAL AIRWAYS VOLCANO WATCH OPERATIONS GROUP 
(IAVWOPSG) 

SIXTH MEETING 
Dakar, Senegal, 19 to 23 September 2011 

Agenda Item 5: Operation of the IAVW 
5.1: Implementation of the IAVW, including the IAVW management reports 

REPORT ON THE ACTIVITIES OF THE BUENOS AIRES VAAC 
DURING CORDÓN CAULLE’S VOLCANIC ERUPTION, JUNE–JULY, 2011 

(Presented by Argentina) 

EVENTS 

On June 3rd, 2011 the Buenos Aires Volcanic Ash Advisory Center (BA VAAC) received a report from the Servicio Nacional de Geología y Minería de Chile (SENFAGEOMIN) informing a yellow code had been set to volcán Puyehue in view of certain geological patterns that indicated the potentiality of an eruption in the short term. The next day, BA VAAC received the following SIGMET issued by Puerto Montt FIR: 

SCTE SIGMET 01 VALID 041855/050055 OBS ASH DATE/TIME: 04/18:35 UTC. OBS ASH CLOUD: PUERTO MONTT FIR LAN074 VA ERUPTION MT PUYEHUE CORDON CAULLE S4030 W07212 VA CLD OBS AT 18:35 UTC TOP ETI FL350 MOV SE. A THIN LINE OF GAS/STEAM AND ASH CAN BE SEEN THROUGH LOW LEVEL CLOUDS MOVING REAPIDLY WEST. 

BA VAAC was also able to detect the ash cloud in GOES-12 satellite imagery. 

Immediately after, it was run the HYbrid Single Particle Lagrangian Integrated Trajectory (HYSPLIT) volcanic ash dispersion model to forecast the motion and dispersion of the volcanic ash cloud. It also commenced the issuance of the correspondent Volcanic Ash Advisories (VAA) containing the resulting expected VA positions in T+6, T+12 and T+18 hours. 

As a usual procedure, VAAAs are sent to the Aeronautical Authority (ANAC) communication facilities for its transmission via AFTN and AMHS to the Meteorological Watch Offices (MWOs) in charge of the issuing of the VA SIGMET reports; also to ACCs, to ATSSs, and to the Notam Offices (NOFs) which held the responsibility to the issuance of the ASHTAM reports; within the BA-VAAC area or responsibility. The VAA message is also transmitted to the associated VAACs and all others concerned. 

On June 4th, winds aloft from West-norwest moved the volcanic ash to the East-southeast, over the argentinean province of Río Negro, causing the closure of San Carlos de Bariloche’s airport. 

(5 pages) 
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Later on, it was informed Cordón Caulle (Lat. 40.52 S; Long. 72.20 W; Chile) was responsible for the eruptions.

Sunday, June 5th: a teleconference was held among the Aviation Authority (ANAC – Administración Nacional de Aviación Civil-), aircraft operators and the National Meteorological Service of Argentina (NMS). The head of the NMS’ Aeronautical Meteorology Dept. made a complete briefing of the event up to that date and joint coordinated actions were taken as a result.

Monday, June 6th: the Crisis committee held its first meeting in the afternoon. It was confirmed by representatives of the Ministry of Defence, the Ministry of Tourism; the Ministry of Transport; the ANAC; the NMS and aircraft operators (Aerolíneas Argentinas, LAN Argentina, Austral Líneas Aéreas and LADE-Líneas Aéreas del Estado.

The Crisis committee decided the cancellation of flights as of 10:00 p.m. local time that day up to 08:00 a.m. next day, in accordance to the forecasts provided by the BA VAAC. As forecasted, the volcanic ashes covered a vast area which included: 12 Argentinean provinces (Neuquén, Mendoza, La Pampa, Córdoba, Santiago del Estero, Chaco, Formosa, Corrientes, Misiones, Santa Fe, Entre Ríos and Buenos Aires) it also affected Uruguay, Southern Brazil and Southern Paraguay. The volcanic ash cloud continue its movement during the night affecting the main international airports of Argentina (Ezeiza, Aeroparque Jorge Newbery, San Fernando, etc.) causing their closure and the subsequent cancellation of all flights at Buenos Aires Air Terminal. Flights to Southern and Central Argentina had been cancelled already.

June, 7th: The situation persisted. Flights towards the North and Central Patagonia were kept cancelled but those at Buenos Aires Terminal were resumed due to a short period of improvement. However, later that day the NMS alerted the Crisis committee on a new probable displacement of the volcanic ash cloud towards Buenos Aires Terminal that same night.

June, 8th: the NMS held four meetings with the Crisis committee, in view of the new wind patterns and forecasts that anticipated a new movement of the ash cloud towards Buenos Aires Terminal as of 00:00 UTC June 9th . The ash cloud covered the area at 03:00 UTC that day affecting 7 Argentinean provinces (Neuquén, Rio Negro, La Pampa, central-western Córdoba, central-south Santa Fe, Entre Ríos, and Buenos Aires) as well as Uruguay and Southern Brazil. The event caused the cancellations of flights and closure of airports until Friday, June 10th midday, when flights operations were resumed partially. That day the volcanic ash plume moved to the East along the Southern Atlantic Ocean and towards Toulouse VAAC’s area of responsibility. Previous coordinations had been held with Toulouse VAAC for its monitoring.

Friday, June 10th: The Crisis committee held a new meeting during which it was informed that Buenos Aires Terminal and Central Argentina could be affected again by the ash cloud during the whole weekend, until Sunday 12th. A teleconference was held with ICAO’s South American Regional Office representatives informing the events.

Sunday, June 12th: a follow-up teleconference was held among the NMS, the ANAC and the aircraft operators during which it was pointed out the accuracy of the forecast issued the previous Friday. In the afternoon, the Crisis committee met again to get a precise view of the next volcanic ash crossing over Buenos Aires.

Monday, June 13th: the volcanic ash affected Buenos Aires Air Terminal since early in the morning with airports’ closures and cancelled flights. The Crisis committee met that afternoon at Aerolíneas Argentinas’ headquarters.
In view of the situation, after every model run, a complete meteorological briefing was held with the MWOs’ forecasters and with the Ezeiza’s Aeronautical Meteorological Office in order to maximize the service provided to civil aviation authorities and airlines representatives at their respective airports.

On June 14th, the volcanic ash covered Northern Patagonia, the Central and Eastern region of Argentina, including the provinces of Santa Fe and Entre Ríos, and Uruguay. All operations were cancelled in the mentioned area, including the closure of Ezeiza airport (until 18:00 hours) and Jorge Newbery’s airport (until the next day).

The Crisis committee met at the ANAC headquarters that afternoon, discussions were arisen on a concentration numerical model used by London VAAC similar, it was said, to the model GOL and TAM airlines get from a private provider. Representatives from the Ministry of Defence held a joint meeting with the NMS’ Director on this matter latter that night.

June 15th: during the Crisis committee meeting the MNS provides a briefing on the evolution of the volcanic ash cloud in view of a rainy period expected at Buenos Aires Terminal. In that occasion, the airline companies represented requested details on the FALL3D dispersion and concentration model under research at the NMS, and run on experimental basis.

June 16th, NMS’ headquarters, 09:30 hours: a complete briefing on the FALL3D dispersion and concentration model was delivered to the airline companies by the team of meteorologists conducting its research and development. Airline representatives committed to provide a post-flight written report to their companies after every operation under low ash concentration conditions with copy to the NMS’s FALL3D researchers.

June 17th: during a new Crisis committee meeting LAN Argentina provided a report on the VA samples taken from an Airbus 320 that flew under volcanic ash conditions. The flight took place on June 5th (one day after the first eruption) departing from Bahía Blanca at 15:00UTC to Buenos Aires (attached to this document).

As of June 18th the FALL3D numerical model products are published via an ftp:// site twice a day (see details below), making clear it is provided as a test and on experimental basis.

Even though minor eruptions continued not surpassing the 3000 metres high, there were two meteorological synoptic episodes during which the ash cloud got trapped between FL120 and FL080. It was due to the subsidence provoked by two strong post frontal anticyclones of central value 1030 hPa deep into the atmosphere up to 700hPa. The situation caused the closure of all the airports at Buenos Aires Terminal and southern Uruguay two times during a 48 hours period each (on June 24th-25th and on July 1st-2nd) as a result of the ash suspended in the air and the light deposition.

June 30th: the Crisis committee was called by the Ministry of Defence, it was decided the NMS published on its web site www.smn.gov.ar in addition to the VAAs and VAGs, the FALL3D experimental model outputs.

On July 27th, a meeting was hold in order to thoroughly analyze the work performed during the Cordón Caulle event. The meeting was attended by the Director of the NMS, Dr Héctor Horacio Ciappesoni, the Services Manager, the Aeronautical meteorology staff, and representatives from the Meteorological Wacht Offices (MWOs) Aeroparque, Ezeiza, San Fernando and El Palomar (all located in the Buenos Aires Air Terminal area), representatives from the BA VAAC and meteorological observers from Ezeiza and Aeroparque meteorological stations. The conclusion reached a very positive result not only on the work performed by the areas involved but also as an exchange of synergy and brainstorming among the
parties. The results contributed to enhance coordinations and work criteria to offer better products to the Crisis Committee and all aeronautical users.

PRODUCTS

The NMS possess a BA VAAC section in its Internet web site www.smn.gov.ar to concentrate all general related information (operational and informative) of interest to users.

Also, and to satisfy as much as possible the aviation industry’s requirements the NMS made available a public file server –ftp account- at ftp://ftp.smn.gov.ar. This ftp account facilitates the rapid/direct access of all Airline operators concerned to the following products (User names and Passwords are provided):

FALL3D model output (on experimental basis, please see “Numerical models”, below):
User: modexp_ceniza
Password: vm_ceniza

VAAs, VA reports issued by SERNAGEOMIN, VA SIGMETs, and HYSPLIT VA dispersion model graphics (available since June 8th):
User: vaac-bue
Password:chaiten2008_

NUMERICAL MODELS

HYSPLIT model:

Since 1991, the BA VAAC runs on operational basis the HYbrid Single Particle Lagrangian Integrated Trajectory (HYSPLIT) volcanic ash dispersion model via the web page interface provided by the Air Resources Laboratory (NOAA) at www.arl.noaa.gov/ready/ash/conc.htm. It has been chosen for its accuracy, for it is based on a numerical meteorological model with new model outputs 4 (four) times per day.

As of March 2009, a new version of the HYSPLIT volcanic ash dispersion model is run autonomously at the SMN. It is better adapted to the characteristics of the region by using a local version of the ETA meteorological numerical model used at the SMN since 2004. The ETA SMN model has also allowed enhancing the grid resolution and provides a better representation of the topography as well. The new HYSPLIT version provides also the option of being run using the GFS (Global Forecast System, NCEP) numerical model. It is not used operationally for it is based on only 2 (two) ETA’s numerical model runs per day.

FALL 3D model:

The BA VAAC capacity was also improved with the installation of the FALL 3D model by Dr. Arnau Folch, (Barcelona Supercomputing Center) in joint work with local meteorologists. The FALL 3D is an Eulerian dispersion and concentration model for volcanic ash clouds that can be run on global models (GFS) or local mesoscale models (WRF or ETA). The model allows the study of ash concentration in the atmosphere, of ground load and deposition thickness.

At the present time, the FALL 3D model is run both on the NMS’s ETA and WRF. This model runs on experimental basis and non-operationally in both cases and at the NMS’ facilities.
As said, the dispersion model is also run on the WRF-ARW (Weather Research and Forecasting - Advanced Research) meteorological model which provides the initial and boundary conditions.

The experimental results of the FALL 3D run on the WRF local mesoscale model can be found at the Asociación Geológica Argentina site (Costa et al., 2006, Folch et al. 2008, Folch et al. 2011):

http://www.disasterscharter.org/web/charter/activation_details?p_r_p_1415474252_assetId=ACT-365

This research is conducted in the frame of a joint project between the Servicio de Hidrografía Naval (SHN) and the Servicio Meteorológico Nacional (SMN) of Argentina known as “Aplicaciones de modelos numéricos de última generación, en el ámbito del Servicio Meteorológico Nacional para el pronóstico del tiempo, estudios de vulnerabilidad del medio ambiente e impacto socioeconómico” PIDDEF (PROGRAMA DE INVESTIGACIÓN Y DESARROLLO PARA LA DEFENSA) 41/10.

Also, in collaboration with the Grupo de Recursos Geológicos y geotérmicos del Instituto de Energía No Convencional (INENCO y GEONORTE) from the Universidad Nacional de Salta-CONICET, the Comisión Nacional de Actividades Espaciales (CONAE) and the Barcelona Supercomputing Center (BSC) the project is known as CYTED-410-RT392 CENIZAS.

REFERENCES


THE PRESENT ACTIVITIES´ REPORT INCLUDES

1. Report provided by LAN Argentina containing a study on the VA samples taken from one of its aircrafts´ turbine.
2. Model run outputs examples;
3. BA VAAs and VAGs,
4. FALL3D/WRF-ARW model application (Folch et al.,2008) ash dispersion forecast for Cordón Caulles´ eruption (.ppt presentation).

ACTION BY THE IAVWOPSG

The IAVWOPSG is invited to note the information in this paper.

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