Meteorological Priorities in Support of a Volcanic Ash Strategy (2010-11)

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Introduction

- ICAO IAVW and VAAC Overview

- Dispersion modelling

- Satellite applications for VA identification

- Operational integrated VA observation networks

- Future VA products

- National and International Coordination.

ICAO IAVW

- London VAAC is the ICAO IAVW designated centre for **volcanic eruptions** in the North-East Atlantic

- **Iceland** falls within this area of responsibility (IMO is the SVO)

- **ICAO Annex 3** *briefly* describes the responsibilities of a VAAC to include:

- Production of **advisories** detailing the spatial dispersion of VA

- **Running** (and/or **utilisation of** output from) NWP dispersion models

- **Monitoring of** observational data, especially satellite imagery for the presence of VA

- **NOT** VA concentration or OBS networks
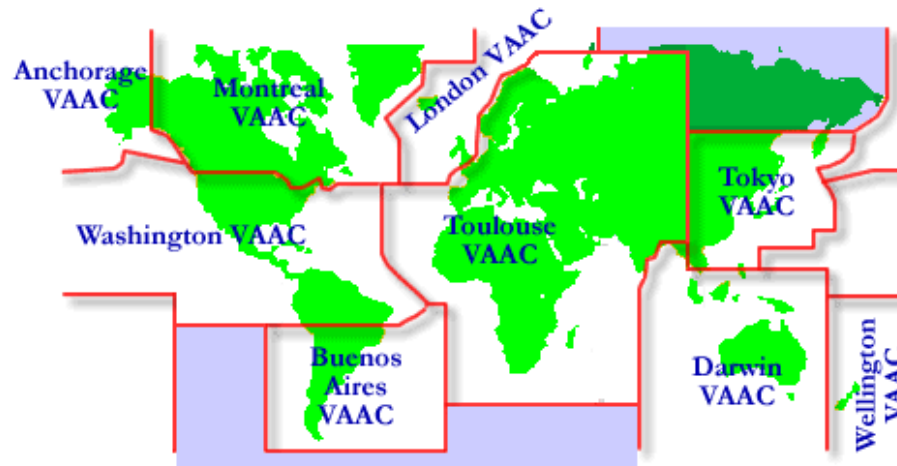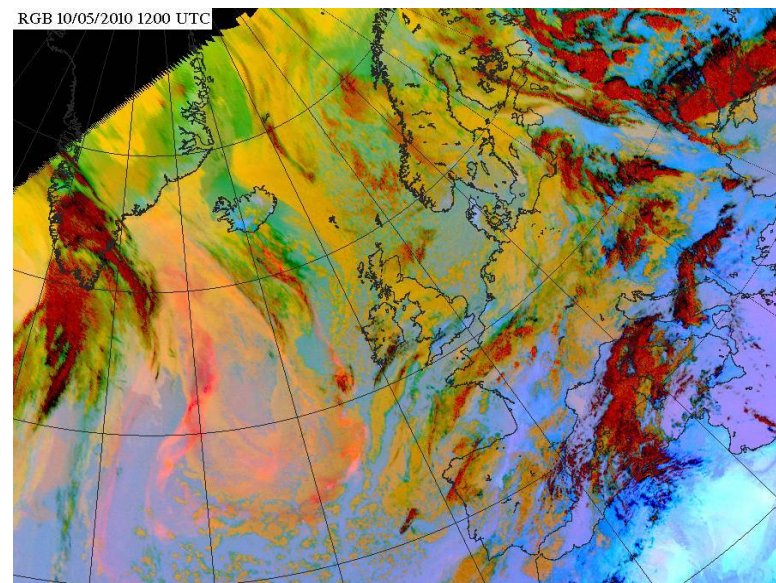
VAAC Advisory Process

NAME model output

NAME model initialisation

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Forecaster
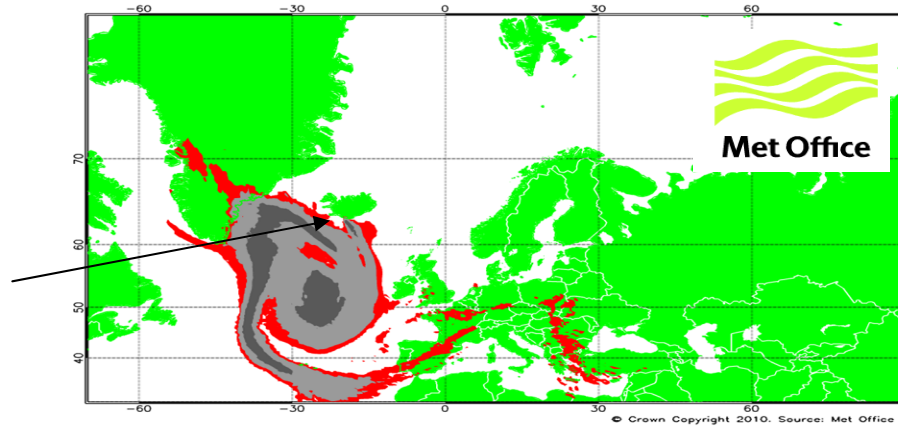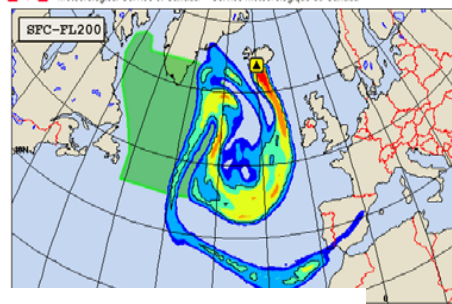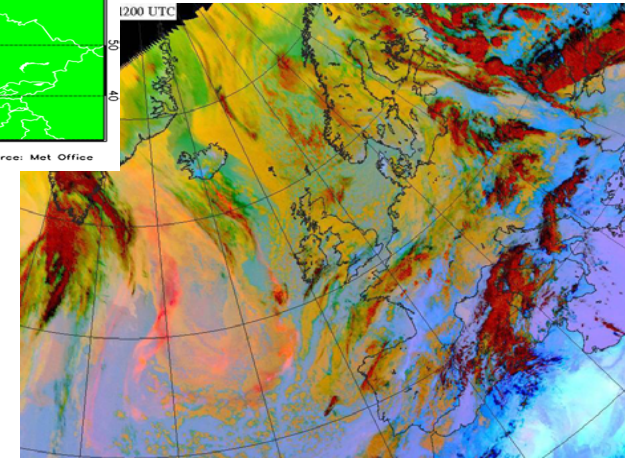
Other models (courtesy VAAC Montreal)

Satellite imagery

16/0600Z

SFC/FL200

FL200/FL350

FL350/FL550

London VAAC Advisory
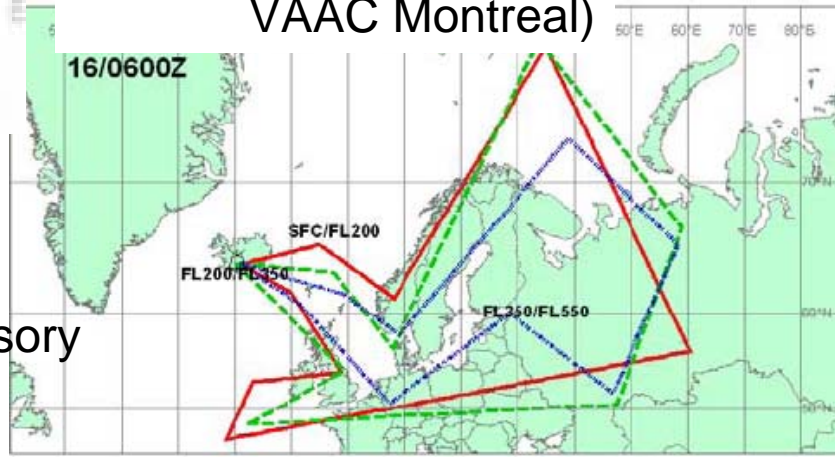
OBS

NAME dispersion model Initialisation

- Volcano characteristics

- Height, diameter and time variance of eruptive column
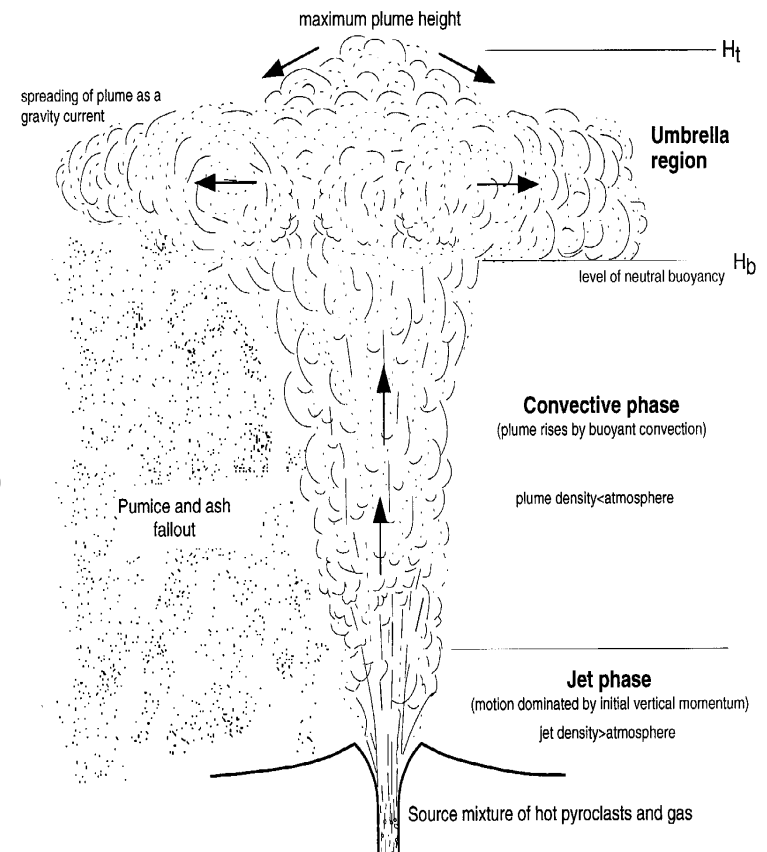
- Ash release rate

- Ash particle size and density

- State volcano observatory (IMO)

- Met Office MoU with IMO

- New IMO mobile dual polarisation Doppler radar

- UAV and dropsonde research.

maximum plume height

H_t

spreading of plume as a gravity current

Umbrella region

H_b
level of neutral buoyancy

Convective phase
(plume rises by buoyant convection)

plume density<atmosphere

Pumice and ash fallout

Jet phase
(motion dominated by initial vertical momentum)
jet density>atmosphere

Source mixture of hot pyroclasts and gas

NAME dispersion model Development

- Improvements to definition of eruptive source term

- Analysis of historic eruptions/ash encounters

- Evaluation of inversion modelling and data assimilation processes

- Climatological studies to better quantify risks

- Evaluation of peak and mean predictability

- Inclusion of other chemicals in VA plume

- Recommendations for operational implementation.
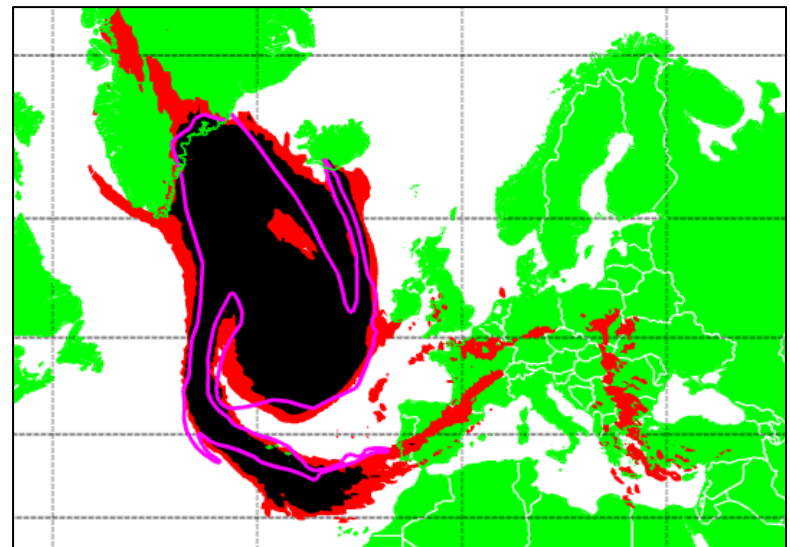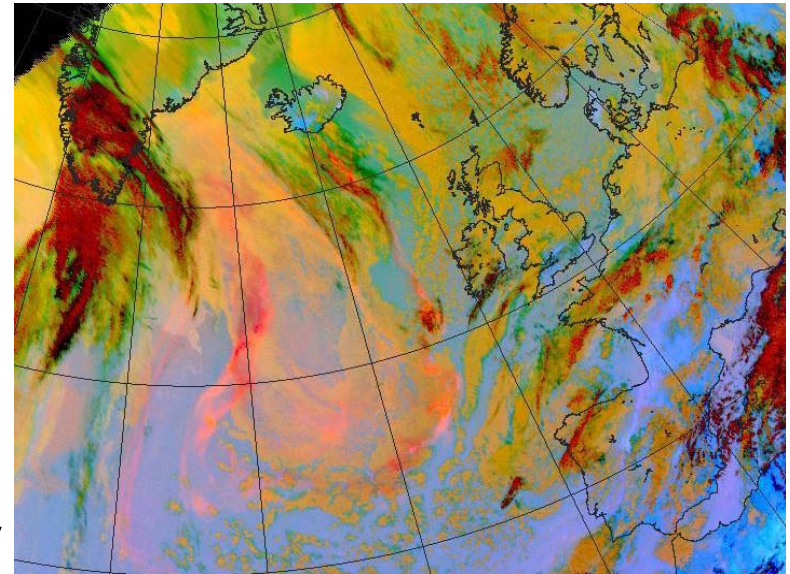
Satellite Applications Development

- MSG

- Use of third infrared channel at 8.6microns wavelength to reduce number of VA false alarms

- Use of radiative transfer model to improve VA detection

- Optimal quantitative parameters estimation techniques for ash top height, ash column amount and ash particle size

- Improvements to volcanic plume gas products e.g. SO2

- Polar orbiters

- High resolution RGB VA products

- Applications of MODIS, VIIRS and CALYPSO products.

RGB 10/05/2010 1200 UTC
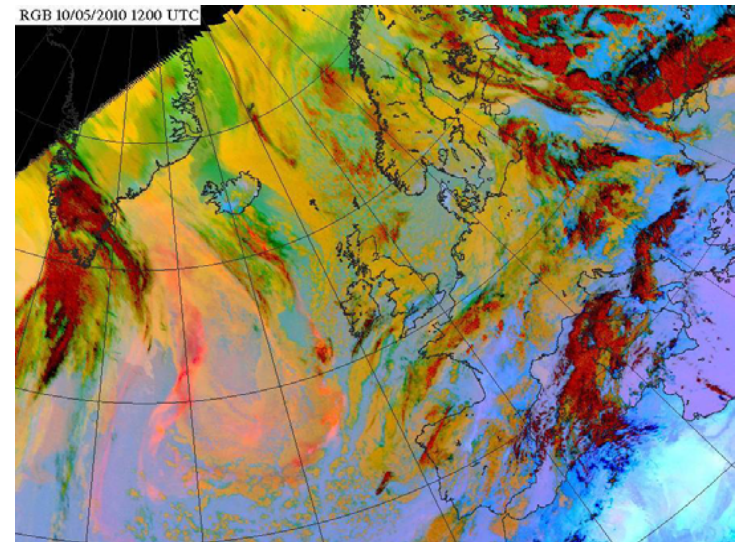
Operational Integrated VA Observation Networks

- Basic underpinning infrastructure

- Standardisation and availability

- Ground-based

- LIDAR

- RADAR

- ATD Lightning Detection

- Airborne

- Research Aircraft

- Unmanned Airborne Vehicles

- Aerosol sondes

LIDAR output

Chilbolton 1.5 micron Doppler Lidar
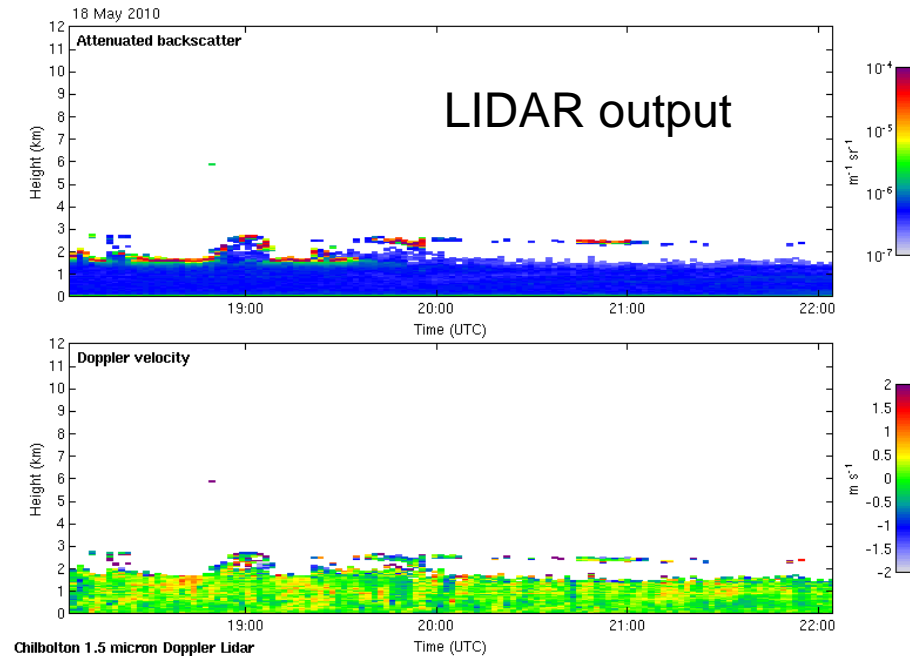
Picture from DLR Falcon

Future Met Office VA Products

- Multiple vertical layers of forecast VA concentration

- Shorter VA forecast time steps

- Development of products which sample uncertainty in the volcanology and meteorology to enable better-informed risk assessments

- Medium range scenario planning charts

- User requirements, consultation and education

- Underlying transparent, peer reviewed science.

National and International Coordination

- Ongoing discussions with CAA, airlines and engine manufacturers

- Member of European Aviation Crisis Coordination Cell (EACCC)

- Met Office leading EUTMETNET involvement in proposed VA related FP7 CSA with focus on enhancing European VA observation coordination

- Enhanced VA research flight coordination with DLR and DWD

- Daily VAAC tele-conferences with European NMS during significant European VA episodes

- Member of WMO VA Scientific Advisory Group

- Member of ICAO VA Task Force

- Attendance at numerous VA related meetings and workshops – see some of you in Iceland next week for the Eyja conference!