



Tuesday, 20 April 2010

Eruption of volcano in Iceland

Iceland, April 2010

Part 5: Update 20 April 2010

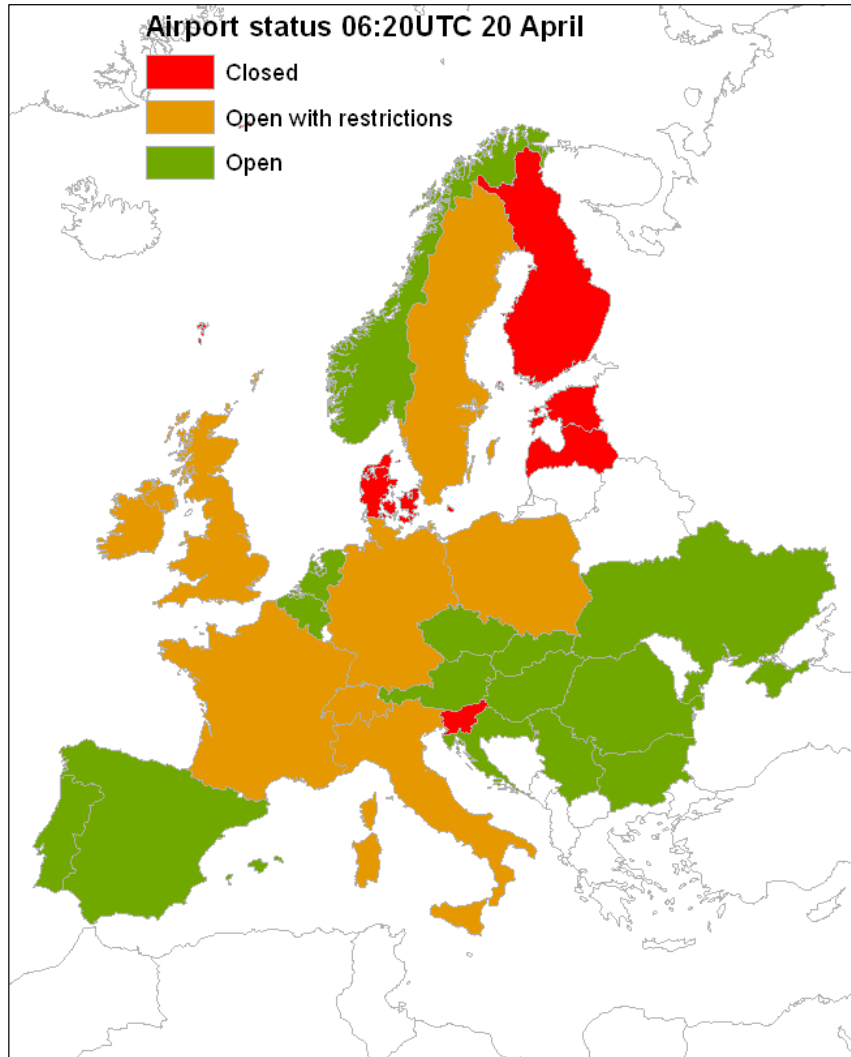
Executive Summary

Air traffic has been reopened in many European countries even if in some countries (UK) most of the airspace is still closed.

The VAAC bulletin still maintains the Red alert for the next 12 hours but the red zone is smaller thinner than in previous days but enlarges to Canada.

Situation

According to Island Met Office, in the morning of 19 April seismic tremors indicated that lava flow might have begun in Eyjafjallajökull. They also indicate that at 08:05 the ash cloud reached a height of 4 km, which is less than in recent days. This would suggest that water inflow at the crater is decreasing and that the ash producing phase should change into a phase of lava flow. This was the reason for more optimistic bulletin issued yesterday by VAAC who indicated an eruption “virtually ceased”. This morning’s bulletin however reported that the eruption restarted again.



The satellite image below shows the ash plume as of 19 April 2010, as seen from MODIS optical satellite imagery (daily mosaic of images available 19 April). The volcano area is cloudy but on the channel, between UK and France traces of the plume (the dark marron areas) are clearly visible.

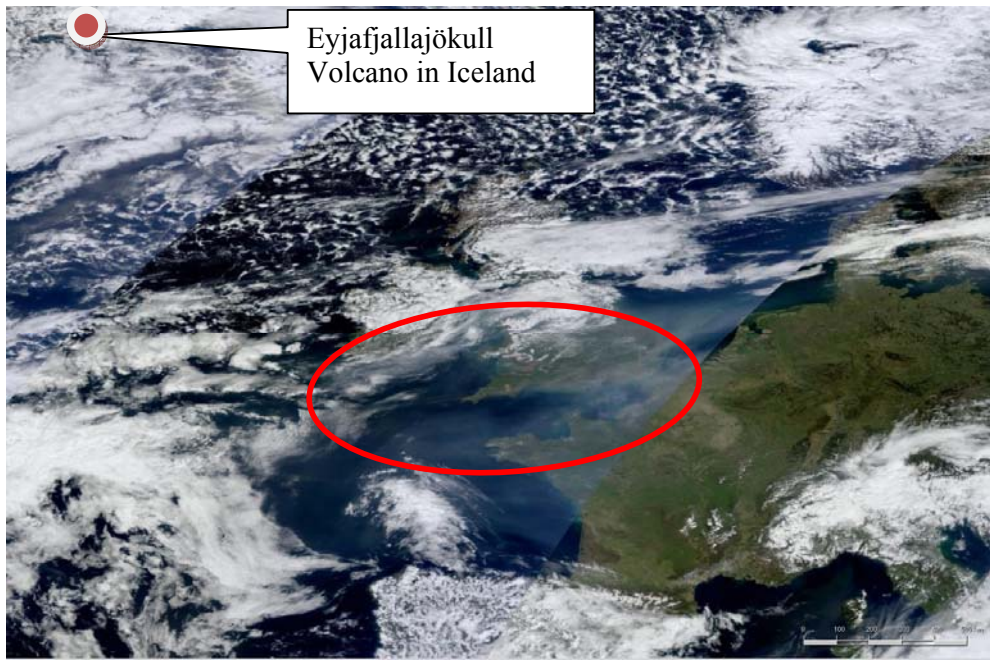


Figure 1. MODIS AQUA Satellite image of 19 April 2010, showing the plume of the volcano.

EUMETSAT Ash plume observations

EUMETSAT provides a real-time satellite based ash monitoring product. “Ash” is an RGB composite based upon infrared channel data from the Meteosat Second Generation satellite. It is designed to detect ash and sulphur dioxide (SO₂) from volcanic eruptions which can be used for the provision of warnings to aviation authorities.

Reference: <http://oiswww.eumetsat.org/IPPS/html/MSG/RGB/ASH/index.htm>

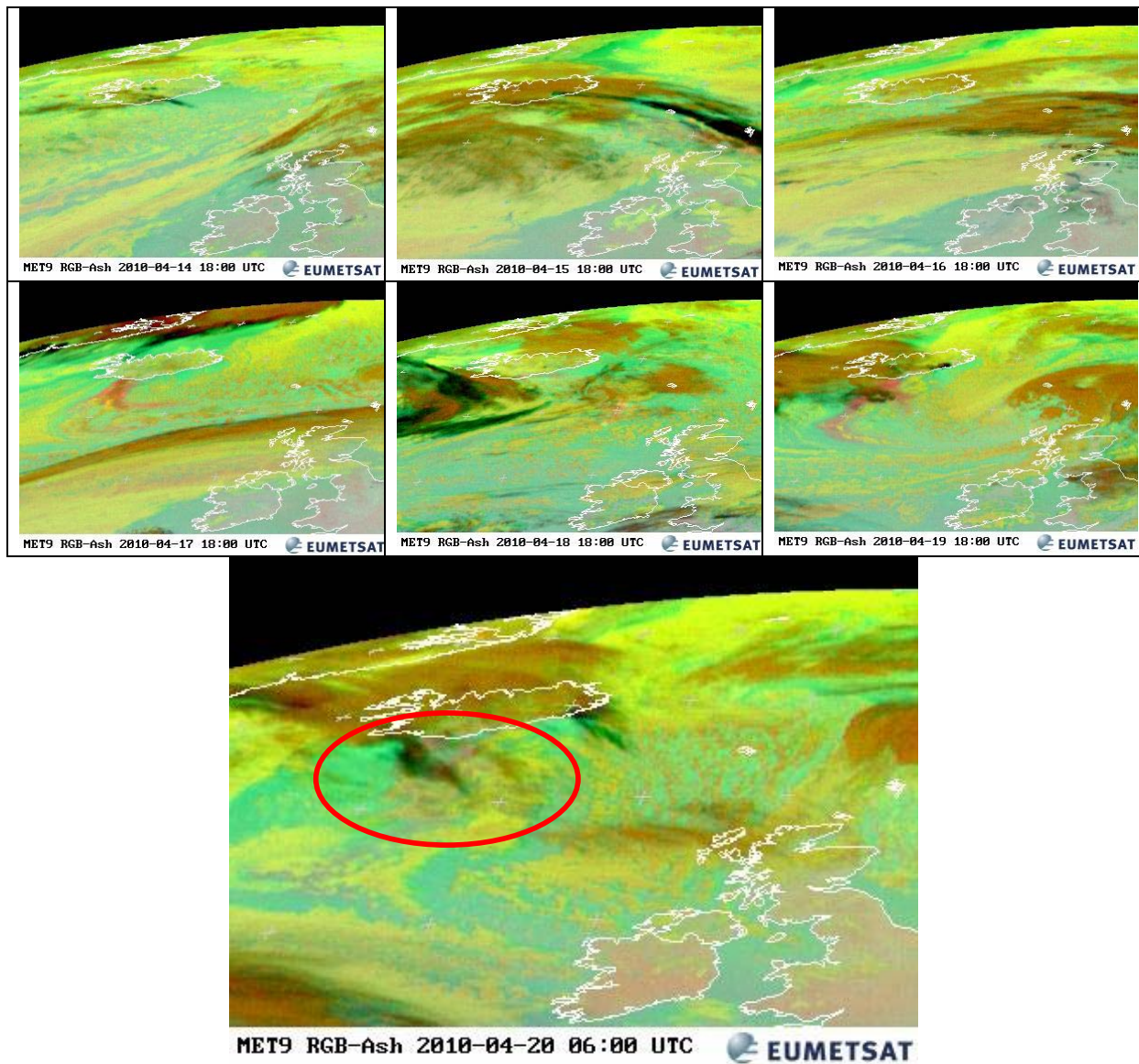


Figure 2. Ash observations by EUMETSAT (animation on <http://www.eumetsat.int>)

The latest image of EUMETSAT (20/4/2010 06:00 UTC) still shows considerable ash production from the volcano in Island. The image also shows another plume on the right of the position of the Eyjafjallajökull volcano but it is not yet clear if this is another plume or simply a meteorological activity. However it originates from the coast.

Volcano Ash Advisory (London VAAC)

The London Volcanic Ash Advisory Centre (VAAC), at the UK Met Office, provides 6 hourly updates of the risk to aviation, which is the basis for decisions on closing airspace.

On 20 April 2010 6:00 UTC, the aviation colour code remains Red. The image below indicates the affected areas. The information is updated on the following website: <http://www.metoffice.gov.uk/aviation/vaac/>. The VAAC report of 20 April 06:00 UTC states:

573
FVXX01 EGRR 200525
VA ADVISORY
DTG: 20100420/0600Z
VAAC: LONDON
VOLCANO: EYJAFJALLAJOKULL 1702-02
PSN: N6338 W01937
AREA: ICELAND
SUMMIT ELEV: 1666M
ADVISORY NR: 2010/025
INFO SOURCE: ICELAND MET OFFICE
AVIATION COLOUR CODE: RED
ERUPTION DETAILS: ERUPTION CONTINUING TO AROUND 4000M WITH LAVA
VISIBLE IN THE CRATER

RMK: NO SIG ASH ABOVE FL350, AND FROM 20/1800Z NO SIG ASH ABOVE FL200
NXT ADVISORY: 20100420/1200Z=

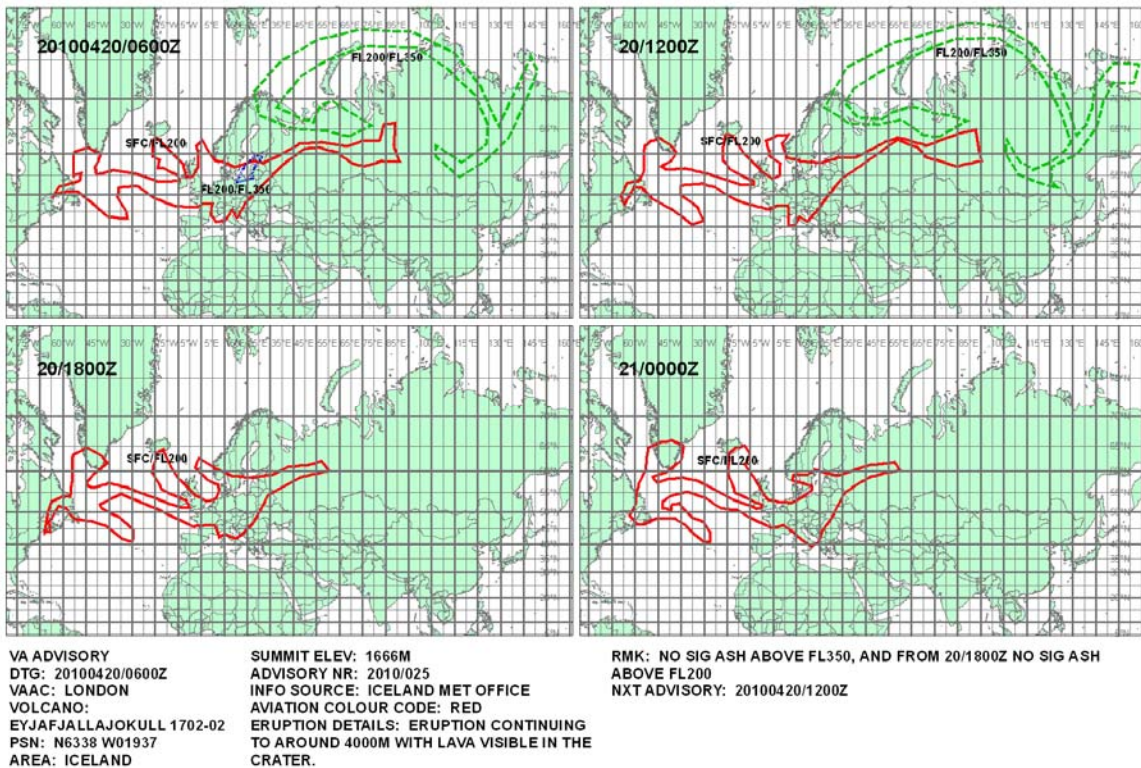
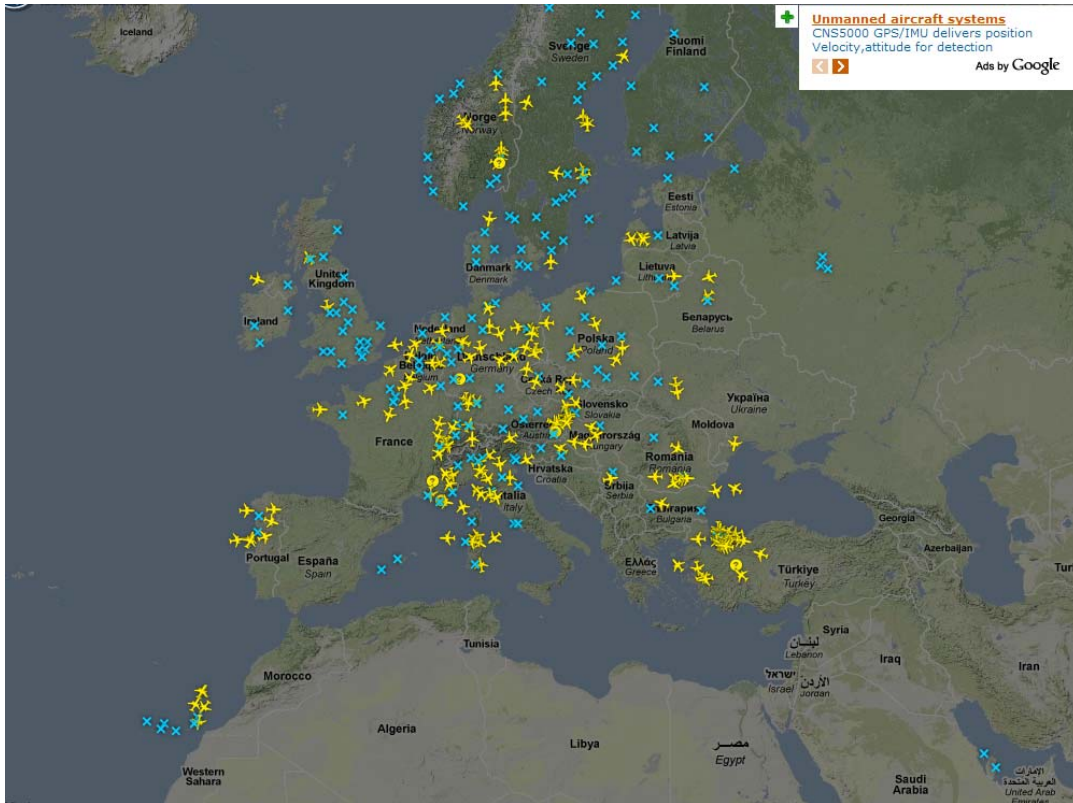


Figure 3. London VAAC alert area (20 April to 21 April). Colours indicate the flight level: red (lowest) under 20000 feet, green below 35000 feet. There is no significant ash risk above 35000 feet.

Airspace status



The above image, generated at 8:40 indicates the restarting of the flight activity in large part of Europe including north of UK with 2 flights.

More detailed information can be found in Eurocontrol (<http://www.eurocontrol.int/>), this is the last bulletin on airspace availability.

Volcanic eruption of Icelandic volcano: Eyjafjallajokul.

Airspace availability:

(Aerodromes geographically located within these airspaces if closed will be unavailable):

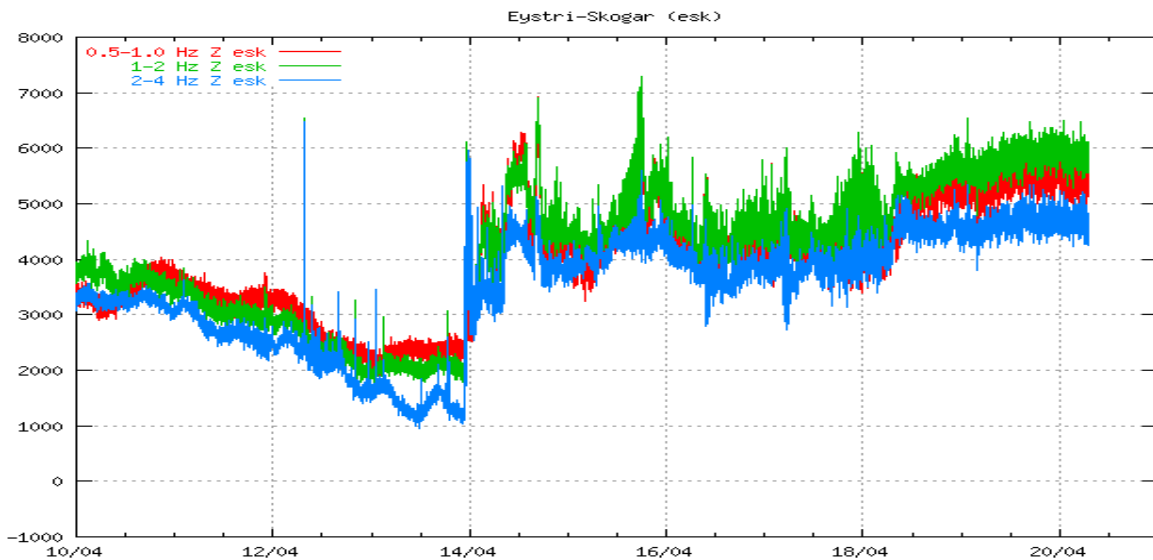
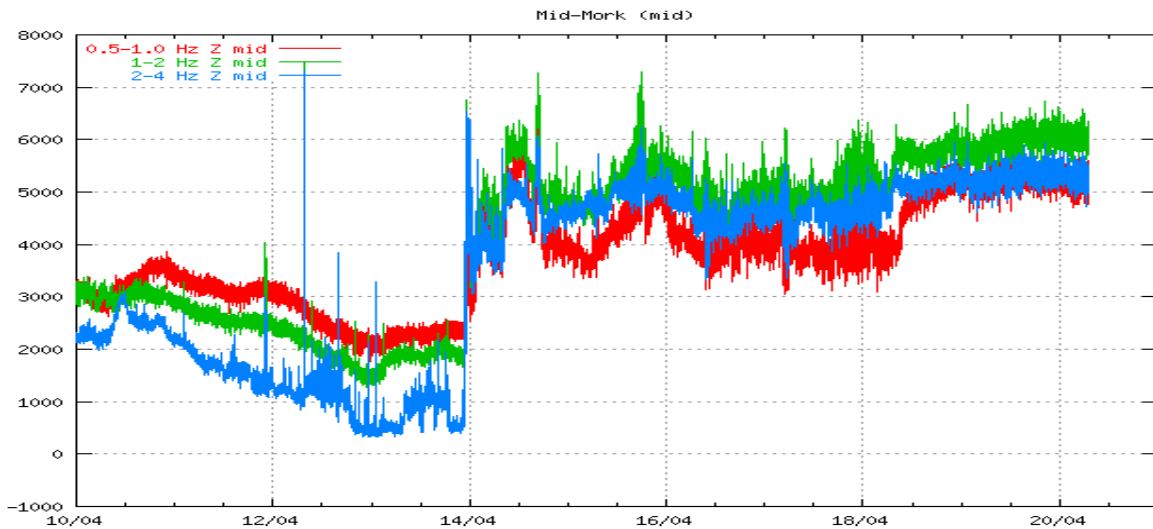
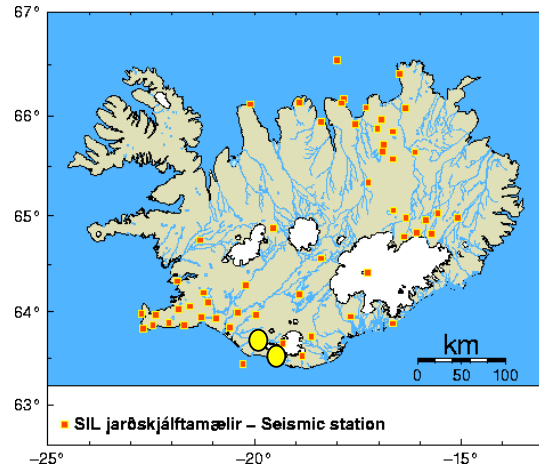
EB Belgium - closed until 20-0600z open after 0600z 50% reduced rates
 EDGG - 20-1200 closed below FL200 seeNotams
 EDUU open
 EDWW 20-1200 closed below FL245 see Notams
 EDMM 20-1200 closed below FL200 see Notams
 ED Germany all airports - see relevant NOTAMS
 EDYY Maastricht - closed until 0600z,
 EE Estonia - closed 20-1200z, available above FL200
 EF Finland - closed 20-1500z for flights above FL 355 contact the FMP
 EG London FIR closed below FL 200 -1200z,
 EG Scottish FIR/UIR closed 20-0600Z, THE SCOTTISH FIR/UIR OUTSIDE OF THE CONTAMINATED AREA WILL OPEN AT 0600Z
 FLIGHTS INTENDING TO OPERATE IN THE LONDON AND SCOTTISH UIR'S ABOVE FL200 THAT ARE STILL CAUGHT IN ZERO RATES SHOULD CONTACT UKFMP TO BE EXCLUDED UKFMP ++441489612416
 EH Netherlands - open , Operators must refer to NOTAMS
 EISN - closed below FL205 until 20-0000z
 EIDW - closed until 1200z
 EK Denmark - closed 20-0600z, upto FL355. 0600-1200 closed upto F210
 EN Bodo - open
 EN Oslo - open
 EN Stavanger - closed below FL200 until 20-1200z
 (for details call +4775542900)
 ESMM Malmo - closed 20-1200z, for flights above FL355 contact FMP
 ESGTMA closed 20-0800

ESOS open north of 60n until 20 1200
ESOS closed south of 60n until 20 1200
EV Latvia - closed below FL200 until 20-0600- notam A0109/10
EP Poland - see latest notam A2309/10
LB Bulgaria - open new notam A0506/10 refer
LD Croatia - open
LE Spain - open
LFMM Marseille- open
LFEE Reims - closed up to FL205 until 20-1200, open FL210 and above
LFFF Paris - closed up to FL205 until 20-1000z, for available routes refer to Notam A2325/10
LFRR Brest- closed up to FL205 until 20-1000, open FL210 and above
LFBB Bordeaux- open, except LFBLM sectors FL145-195 closed until 20-1200z
LH Hungary - open see notams
LI Italy Milan - closed up to FL195 21-0000z, except for domestic flights please see notam A2178/10
LI Italy Padova - closed up to FL195 21-0000z
LIRP, LIRQ aerodromes closed until 20-0000z
LJ Slovenia - closed -0600
LK Czech Republic - open, Notam A0452/10 refers
LO Austria - open over the entire FIR see notam
LR Romania - open Notam A0756/10 refers
LS Zurich- closed up to FL200 20-0600z
LS Zurich from 20-0600 below FL245 50% capacity above FL245 normal capacity
LS Geneva- closed up to FL200 20-0600z
LS Geneva from 20-0600 below FL245 50% capacity above FL245 normal capacity
LY Serbia - open
LZBB Bratislava - open Notam A0642/10 refers
E-part open (Vamog-Supak) notam C0631/10
UKLV - open
UKOV - open
UKFV - open
UKDV - ope

Available Measurements of the event

Seismic Stations around the volcano

The Iceland geophysical institute provides live [seismic monitoring](#) of the volcano. The plots shown below, obtained in the locations indicated in yellow dots in the map on the side indicates a great change in the signals on 14 April. The peaks are corresponding to major eruptions. It is also evident that on the 18 April there is a marked change in the pattern of the signals which could indicate a change from eruption to lava flow. The monitoring of these signals is performed in all volcanoes in Iceland and is connected with a national Early Warning System.



Aerosol LIDAR (Light Detection and Ranging) measurements of the Volcanic cloud.

LIDAR is an active optical measurement technique in which a laser light is fired into the atmosphere and the light scattered backwards by objects along the beam path (clouds, and aerosols) measured with a collecting telescope to construct a vertical profile of aerosol backscattering.

European Aerosol Lidars are research instruments, co-ordinated by EARLINET¹ (European Aerosol Research Lidar NETwork), and funded by EARLINET-ASOS (European Aerosol Research Lidar Network - Advanced Sustainable Observation System) an FP6 IIA project, running from March 2006 to March 2011. The JRC operates an aerosol Lidar and is an EARLINET partner, although the JRC instrument was not operating due to a technical problem.

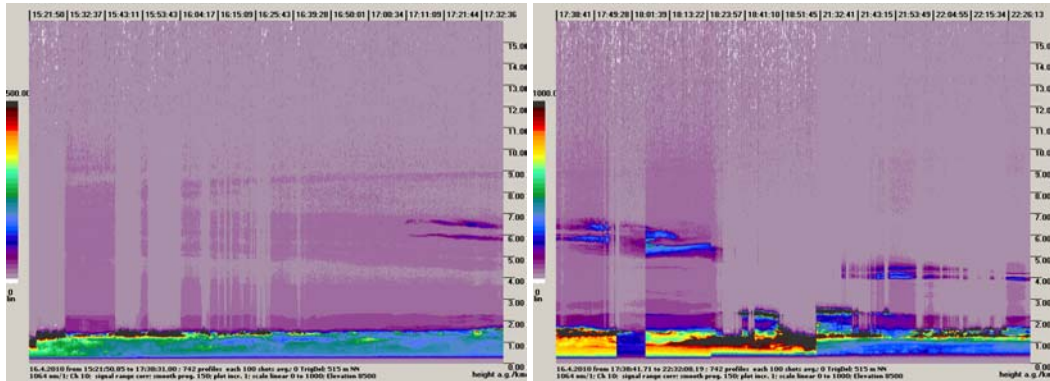


EARLINET Lidar sites are able to produce preliminary near real-time “quick-look” images of observations, including the volcanic cloud are named, as are on-line ceilometers and on-line non-EARLINET Lidar. Images are available from <http://www.meteo.physik.uni-muenchen.de/~stlidar/quicklooks/European-quicklooks.html>.²

¹EARLINET is co-ordinated by Dr.ssa Gelsomina Pappalardo, CNR – Istituto di Metodologie per l’Analisi Ambientale (CNR-IMAA), Contrada S. Loja, I-85050 Tito Scalo (Potenza) pappalardo@imaa.cnr.it.

² From Dr. Volker Freudenthaler, Meteorologisches Institut der Universität München, Theresienstraße 37, D-80333 München, volker.freudenthaler@meteo.physik.uni-muenchen.de

The EARLINET Lidars and the simpler cloud resolving Ceilometers of EARLINET partners, began to look for the evidence of Volcanic ash on Thursday 15th April. A first possible sighting was made at Cabauw in the Netherlands from 19.00 on the 15th of a thin layer at 10 km was visible. Definite observations from Chilbolton (1.5-3.5km) and Leipzig, Hamburg, Paliseau and Zurich who all observed ash initially at 5-6 km at various times during the 16th, descending to 2.5 – 3km during the night of 16th /17th The same feature was seen in Munich on 17th as shown below.



Lidar backscatter at 1064 nm measured at Maisach, Munich between 15.21 and 23.59 on 17th April. The Volcanic cloud is visible as the two narrow purple and blue strands, first seen at 17.00 at circa 6 and 6.5 km which descend during the evening to circa 4km. The coloured band at the base of the image is the signal from aerosols and cloud (black) in the planetary boundary layer (the lowest 1500m circa, in these figures)³.

The observations have continued, the cloud was seen in Poland and Romania on 18th but not Bulgaria. Bad weather in S Italy and Greece on 18th-19th has prevented observations. On the 19th April the DLR Falcon atmospheric research plane has begun a campaign of overflights of the German and Dutch EARLINET stations making atmospheric measurements. Such results have demonstrated that Lidar observations from the EARLINET network can have a very important operational value in constraining the VAAC model forecast. A summary (on which this report is based) of the EARLINET data has been supplied to WMO and the VAAC and the data are also now being provided to the London VAAC to support their model analysis.

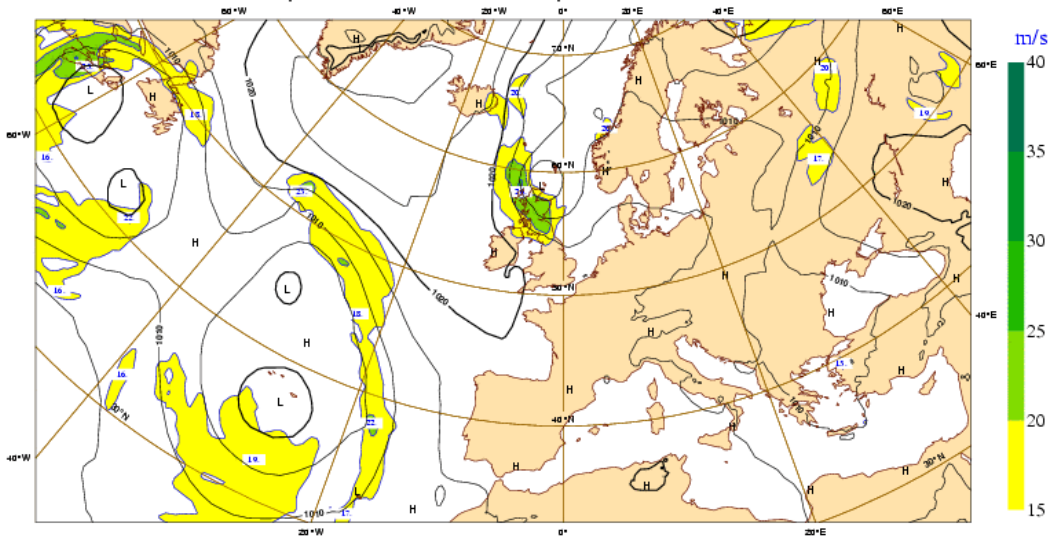
³ From Dr. Volker Freudenthaler, Meteorologisches Institut der Universität München, Theresienstraße 37, D-80333 München, volker.freudenthaler@meteo.physik.uni-muenchen.de

Potential evolution of the event

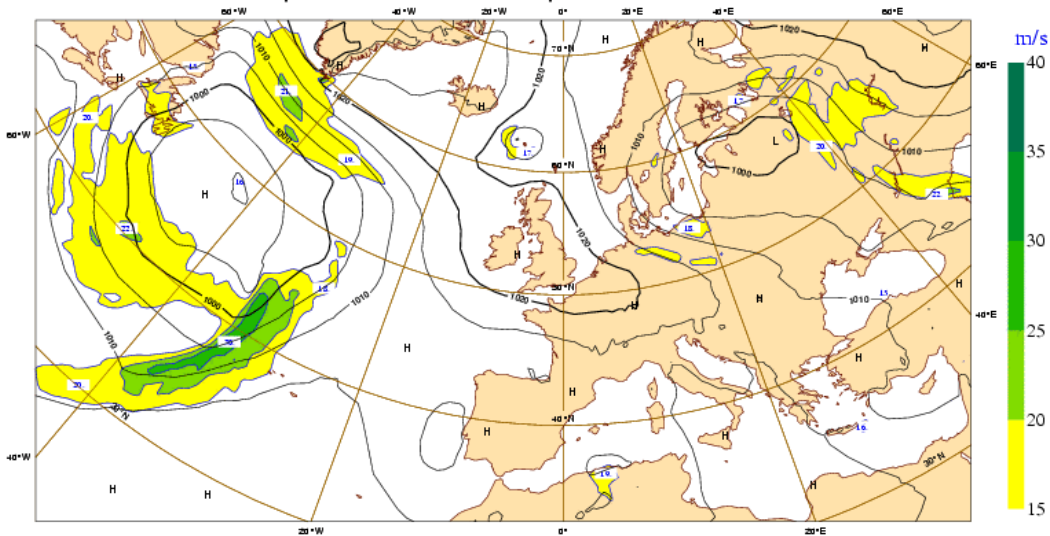
The evolution of a dispersion event depends primarily on the emissions characteristics and intensity. Ashes are normally emitted during the explosive part of an eruption but its duration does not coincide with the duration of the latter. Unfortunately no prediction is possible on the time scale of the event.

If the emission intensity (the amount of mass released per unit time by the volcano) will continue at the levels of the past days, the present weather prediction indicates that up until the 24 of April the persistence of a westerly flow would bring ashes over the European continent. More detail calculations like those provided by VAAC will determine the concentration levels and the relevance to aviation. Changes in the circulation pattern seem to appear after the 25 of April that would bring any air mass released over island to the north western Atlantic. Such forecast could however be affected by a certain level of uncertainty, and it should be confirmed in the coming days.

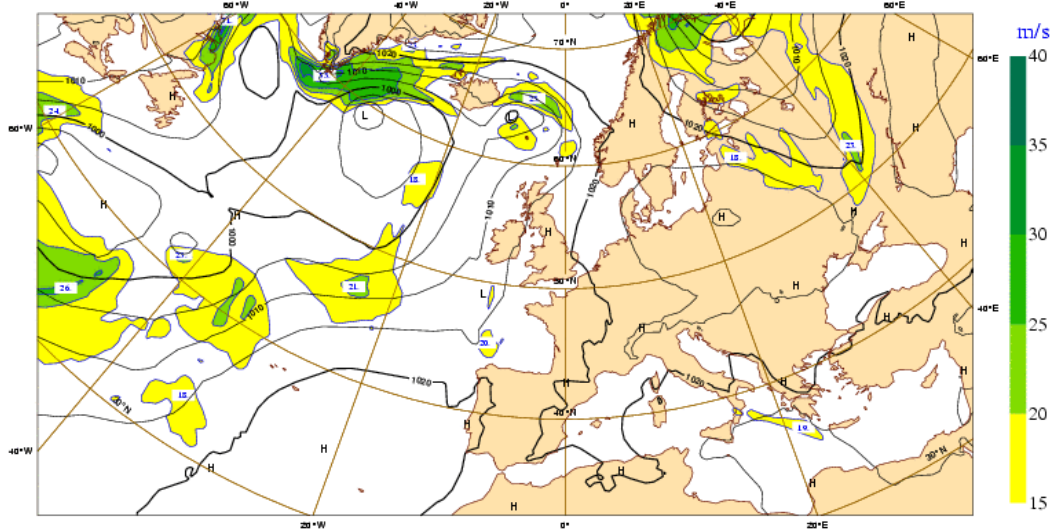
Tuesday 20 April 2010 00UTC ©ECMWF Analysis t+000 VT: Tuesday 20 April 2010 00UTC
Surface: Mean sea level pressure / 850-hPa wind speed



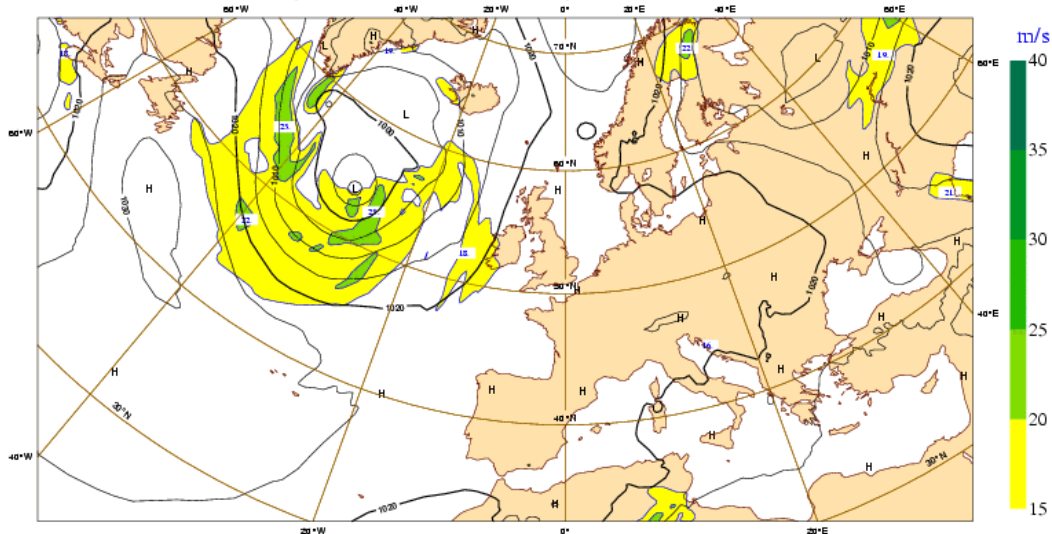
Tuesday 20 April 2010 00UTC ©ECMWF Forecast t+048 VT: Thursday 22 April 2010 00UTC
Surface: Mean sea level pressure / 850-hPa wind speed



Tuesday 20 April 2010 00UTC ©ECMWF Forecast t+120 VT: Sunday 25 April 2010 00UTC
Surface: Mean sea level pressure / 850-hPa wind speed



Tuesday 20 April 2010 00UTC ©ECMWF Forecast t+240 VT: Friday 30 April 2010 00UTC
Surface: Mean sea level pressure / 850-hPa wind speed



The images above are obtained from the ECMWF (European Centre for Medium-Range Weather Forecasts)⁴

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http://www.ecmwf.int/products/forecasts/d/charts/medium/deterministic/msl_uv850_z500!Wind%20850%20and%20mslp!240!Europe!pop!od!oper!public_plots!2010042000!!/

References

- London Volcano Ash Advisories: <http://www.metoffice.gov.uk/aviation/vaac>
- Icelandic Met Office: <http://en.vedur.is/>
- GDACS: <http://www.gdacs.org/volcanoes/iceland.asp>
- Global Volcanism Program: <http://www.volcano.si.edu/reports/usgs/#eyjafjol>
- Earlinet: <http://www.earlinet.org/>
- FlightRadar: <http://flightradar24.com/>
- Eumetsat: <http://www.eumetsat.int/Home/index.htm>
- ECMWF: <http://www.ecmwf.int/products>