# Eyjafjallajökull 2010

## - The activity of the eruption plume during the first 2 weeks

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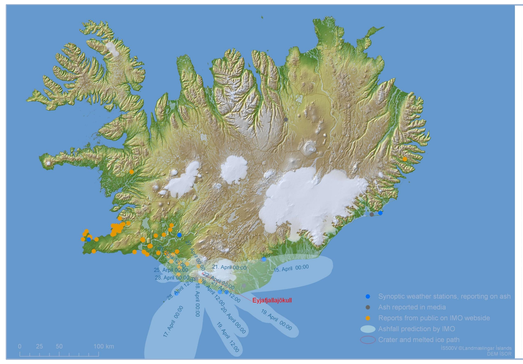
On 14 April 2010 an eruption started in Eyjafjallajökull, in southern Iceland. This was an explosive eruption in the top cauldron, beneath the glacier.

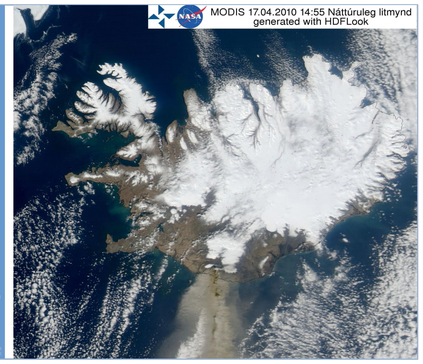
### Phase I: 14-17 April 2010

Radar measurements of the plume show top height of 9.5 km height (~31.000 ft) on the first day of the eruption. During the next days, 15-17 April, the plume reached 5-7 km height but occasionally shooting up to about 8 km height. The plume was quite active and the ash produced very fine. The emission rates of ash and tephra were estimated as 750 tons/sec and a number of lightning were detected.
The upper-level winds over Iceland were strong, NW 40-50 m/s and the emitted ash was advected southeastward toward northwestern Europe which caused major disruption in air traffic.

### Phase II: 18-26 April 2010

The eruption changed phase on 18 April. There was a reduced net output from the volcano, lava production of 10-30 tons/sec and ash and tephra production of less than 10 tons/sec. The height of the plume was estimated at 3-5 km.




## Ash fallout predictions

Ash fallout predictions were made for the areas in the vicinity of the volcano. These predictions were made using VORIS (***VO**lcanic **R**isk **I**nformation **S**ystem*). The VORIS model assumes that the transport of the particles is controlled by wind advection, diffusion due to atmospheric turbulence and the settling velocity of the particles. These predictions are made for the area within a 500 km radius from the eruption site and identify regions where ash fallout thickness may exceed 1 mm.

## Information on ash fallout is collected from different sources:

- Synoptic weather stations report ash fallout, measured thickness and collected samples.
- Reports on ash fallout from the public. An internet web registration form was made public and advertised. In 6 days 95 reports were made on the ash fallout. Most of the reported ash was outside of the predicted ash fallout area and less than the predicted limit of 1 mm thick.
- Reported information on ash fallout from the media.

Reported ash fallout and satellite images have been used to make quality checks on the predicted ash fallout.

Figure 1:The eruption at it's peak 17 April.

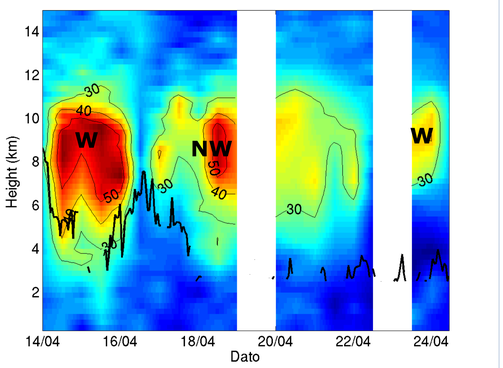
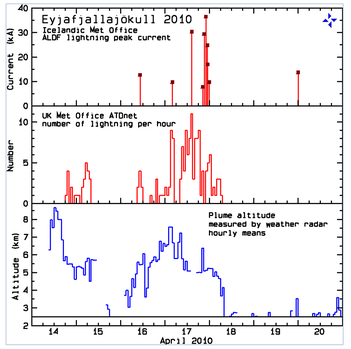



Figure 3: The windspeed (m/s) from radiosondes at Keflavík airport and the altitude of the plume (km) from radar measurements.



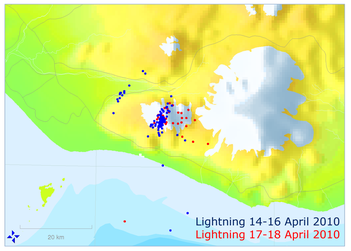




Figure 2: The lightning activity and the plume height during the first week of the eruption, 14-20 April 2010.
Top: The lightning current (kA), the number of located lightning around the volcano and the altitude of the plume (km) measured by a weather radar at a distance of 160 km. Due to the distance and mountain ranges between the volcano and the radar, it could not detect the plume when below 2.5 km altitude over sea level.
Bottom left: A map of located lighting. The located lightning 14-16 April are shown in blue and 17-18 April in red.
Bottom right: The eruption plume on 17 April when there was severe ash fall in the area south of the volcano.


## Plume activity and lightning

The lightning activity in the volcanic plume shows similar behaviour as observed in subglacial eruptions in Iceland in 1996, 1998 and 2004. The correlation between lightning activity and the intensity of the eruption is good, as indicated by the height of the eruption plume. The timestamps of photos of lightning often don't fit with recorded times of lightning. This discrepancy may give some valuable constraints on the detection efficiencies of the location systems.

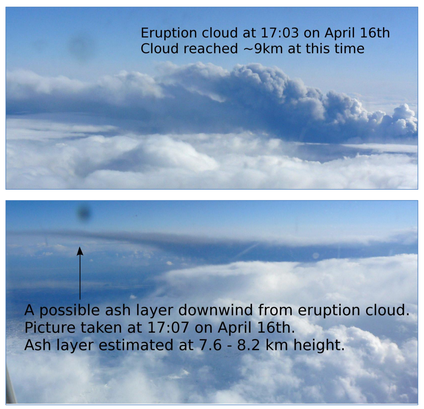



Figure 4: The plume during Phase I, extending up to ~9 km on 16 April.

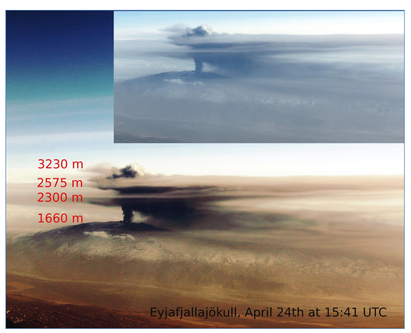



Figure 5: The plume during Phase II, here extending up to ~3.5km on 23 April.
Inset: original photo.

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References
Felpeto, A.; Martí, J.; Ortiz, R. (2007) Automatic GIS-based system for volcanic hazard assessment. J. Volcanol. Geotherm. Res., 166:106-116

Photos
Figure 1: Matthew J. Roberts, Figure 2: Sigmar Jónsson, Figure 4: Halldór Björnsson, Figure 5: Magnús Tumi Guðmundsson

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