

Eyjafjallajökull eruption: Update to 2010-05-12



Volcanic Plume analysis

In the frame of the collaboration between the Italian Istituto Nazionale di Geofisica e Vulcanologia (INGV) and the Norwegian Institute of Air Research (NILU) within the FP7 project SAFER "Services and Applications For Emergency Response" and the ESA Data User Element SAVAA "Support to Aviation for Volcanic Ash Avoidance", we illustrate below an update of the preliminary analysis of volcanic plume emitted from the Eyjafjallajökull volcano starting from April 14th 2010.

Product 1: volcanic plume ash loading

Figure 1 shows the detection of the volcanic ash cloud (represented in red colour) using the thermal infrared images acquired by the MODIS-TERRA on May 7th at 12:35 UTC (figure 1, A) and on May 8th at 13:20 UTC (figure 1, B). Data have been elaborated using the BTM technique to discriminate the volcanic cloud from weather clouds. In figure 1A the ash cloud extends about 600 km toward SSE and its maximum elevation has been estimated about 6-7 km. In figure 1B the plume extends about 500 km towards SE and then it changes its direction towards SW, its maximum elevation has been estimated around 8-9 km. A second ash cloud has been identified westward close to Greenland. The Table below summarizes the retrieved eruption parameters.

Date and Time (UTC)	Ash mass loading (kt)	Altitude (km)	Area (km ²)
7-05-2010 12:35	-----	6-7	20000
8-5-2010 13:20	345 ± 138	8-9	190000

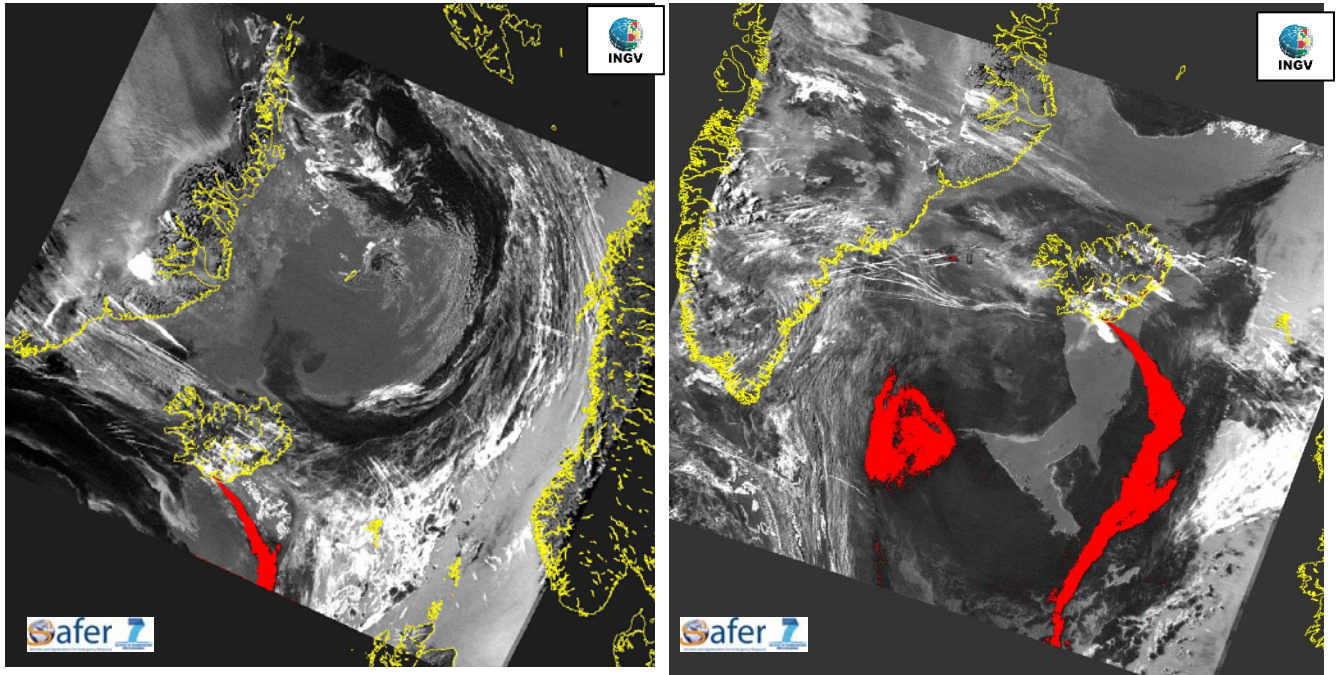
Figure 2 shows a preliminary estimation of the volcanic ash mass (top left plate), of the Aerosol Optical Depth at 0.55 μm (top right plate) and of the particle effective radius (bottom plate) using the thermal infrared images acquired by the MODIS-TERRA on May 8th at 13:20 UTC. The retrievals have been carried out considering the WMO Keflavikurflugvöllur station (Iceland) atmospheric profiles and andesite volcanic ash optical properties. This analysis has been developed by INGV. (We acknowledge NASA/GSFC, MODIS Rapid Response, for the availability of MODIS data).

Product 2: forecast of ash dispersion

Figure 3 shows forecasting maps of ash concentration obtained using the dispersal code VOL-CALPUFF (Barsotti et al. 2008, JGR) for a continuous eruption occurring at Eyjafjallajökull Volcano. The volume rendering representation shows the displacement of ash in a 3D domain extending between 0 – 18000 m a.s.l. at European scale; the vertical resolution is equal to 2000m. The horizontal domain covers a 4000km x3500km area. The VOL-CALPUFF model uses GTOPO30 data for terrain elevation and LULC data for land coverage. GFS weather forecasting data with a resolution of 0.5° and each three hours are used for the simulations. The three snapshots of figure 3 (A, B and C) show different time steps of ash cloud evolution on May 11st 2010 at 12:00, 18:00, 23:00 UTC. Figure 1A, 1B and 1C show, for each time, the total ash columnar content (in t/km²) in the large figure and, below that, two smaller figures showing the areas interested by two threshold values of ash concentration equal to 10⁻⁵ g/m³ (blue area on the left) and 2x10⁻⁴ g/m³ (green area on the right) at the corresponding time.

Product 3: modelling of Plume dispersion

See the ESA SAVAA project web site: <http://savaa.nilu.no/>



A

B

Figure 1

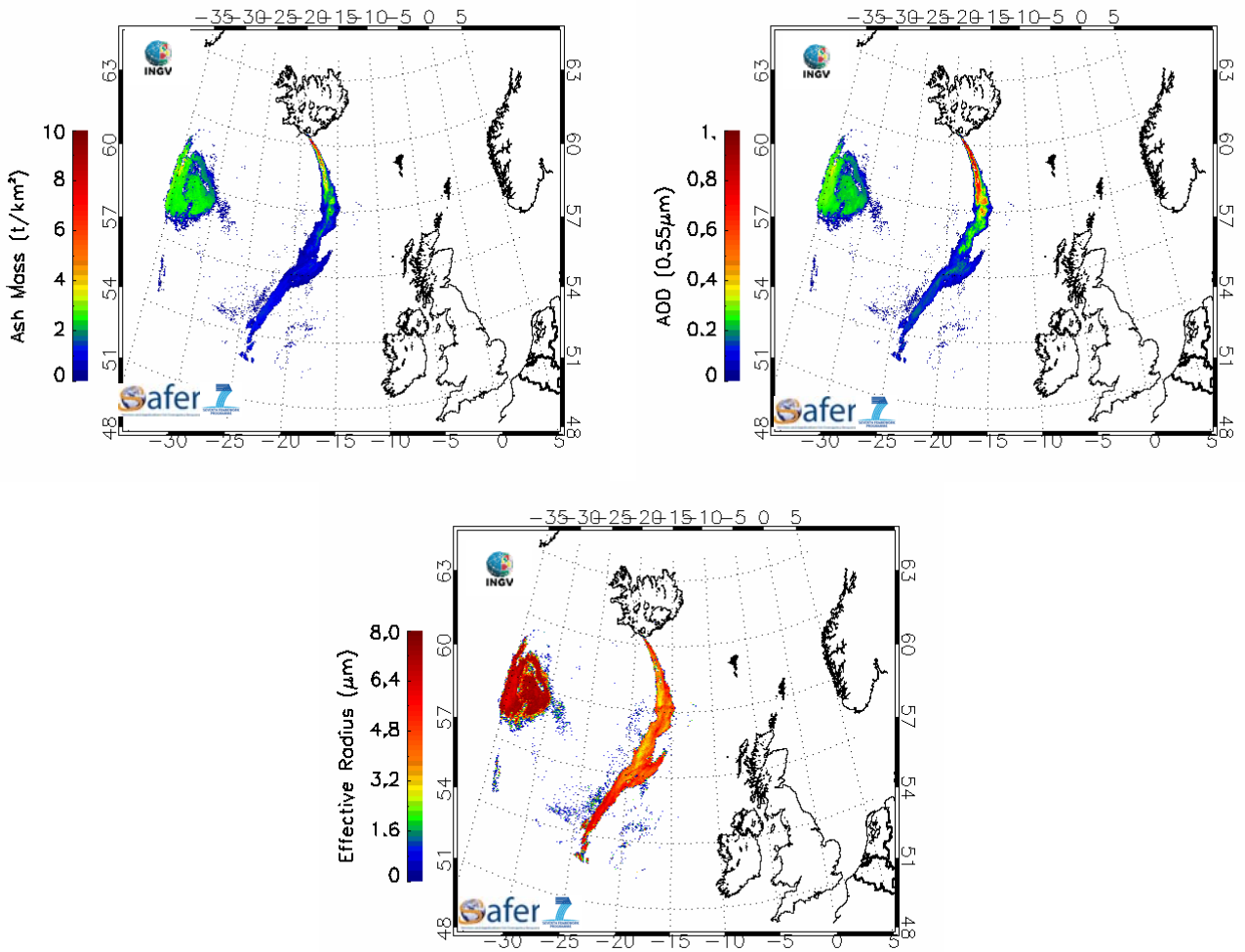
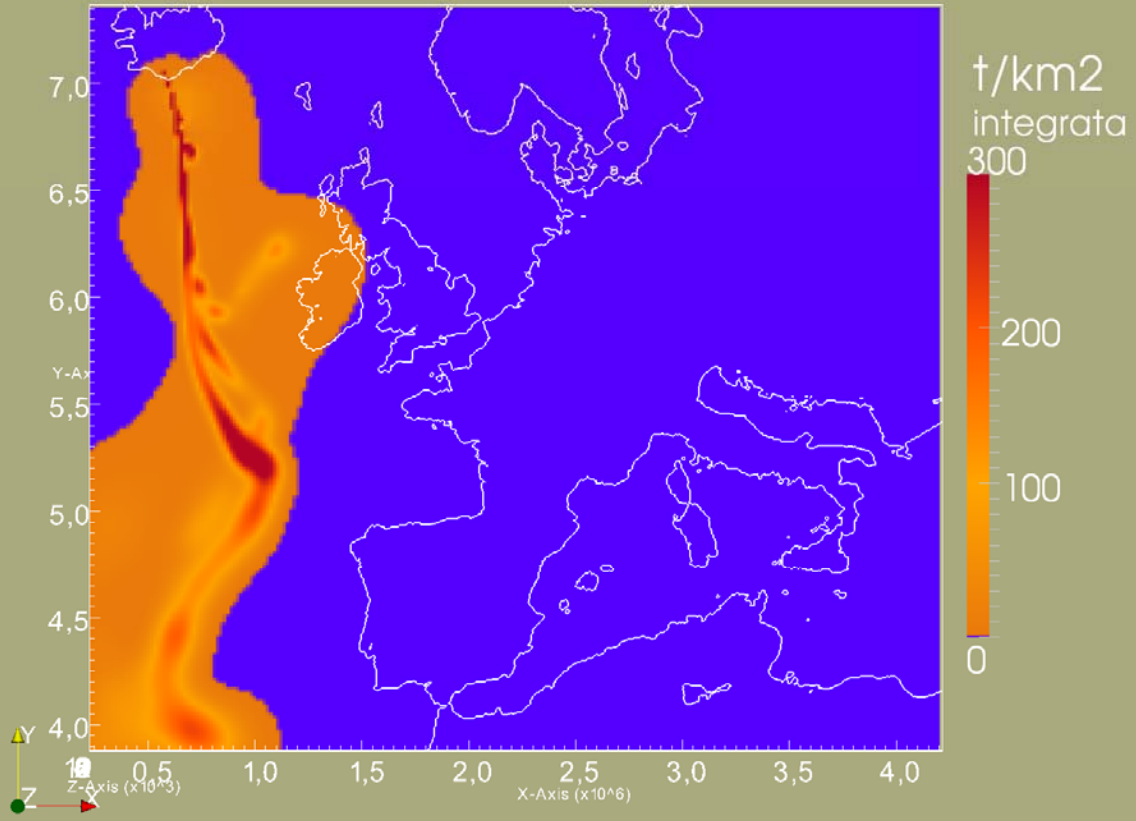
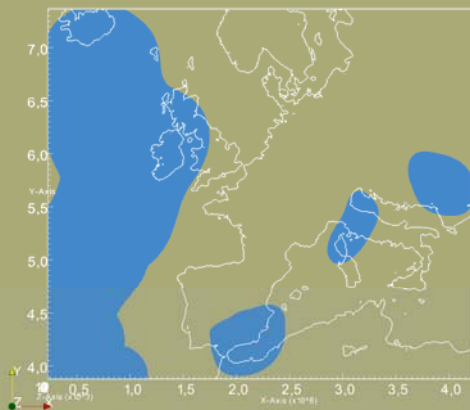


Figure 2

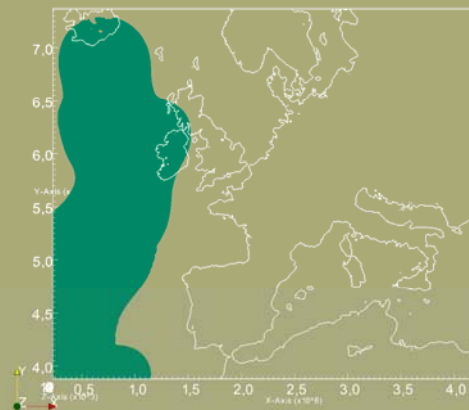
A



20100511 12 UTC

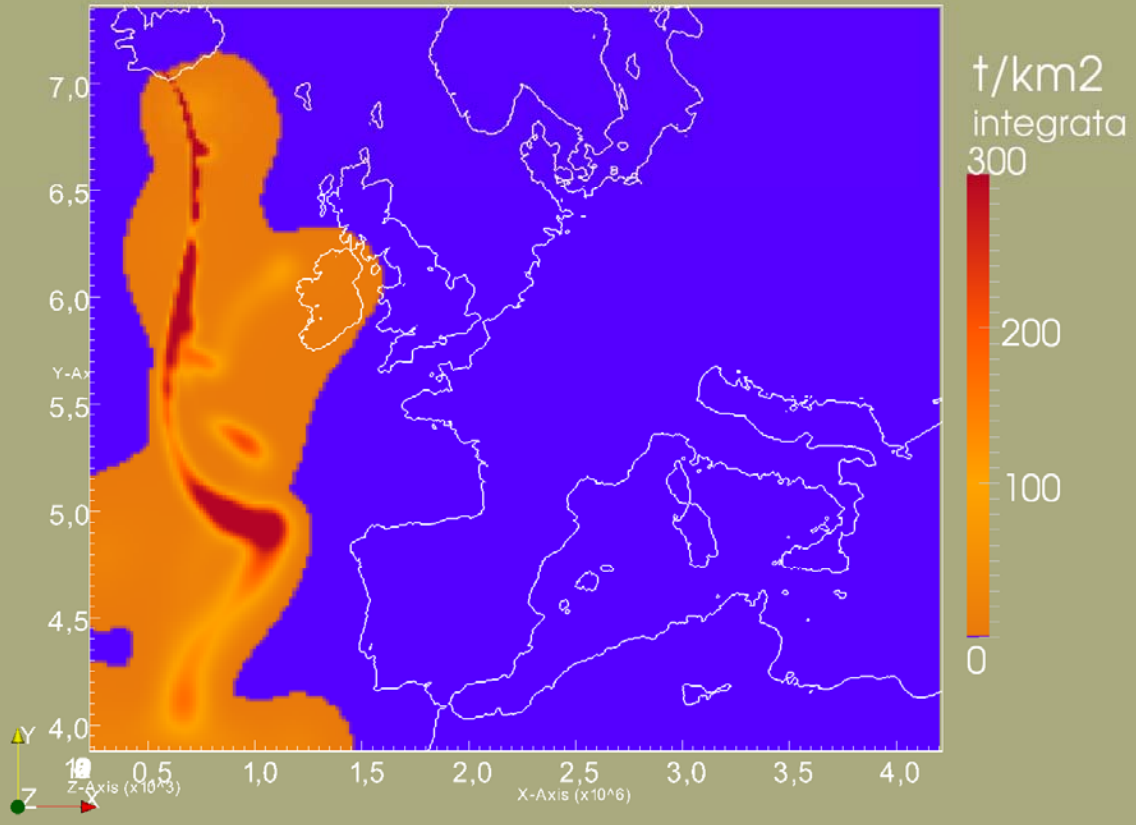


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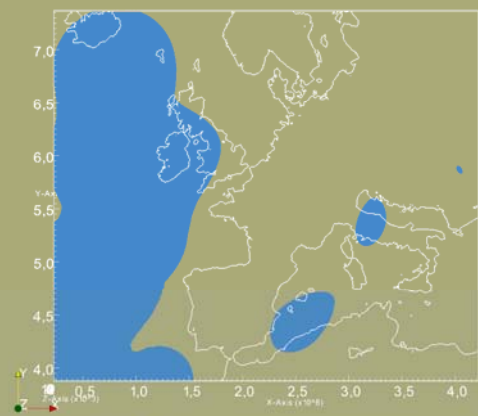


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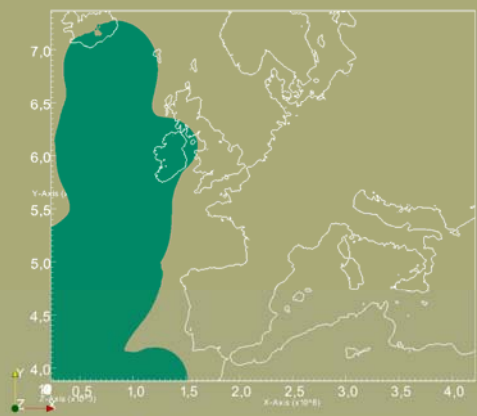
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20100511 18 UTC

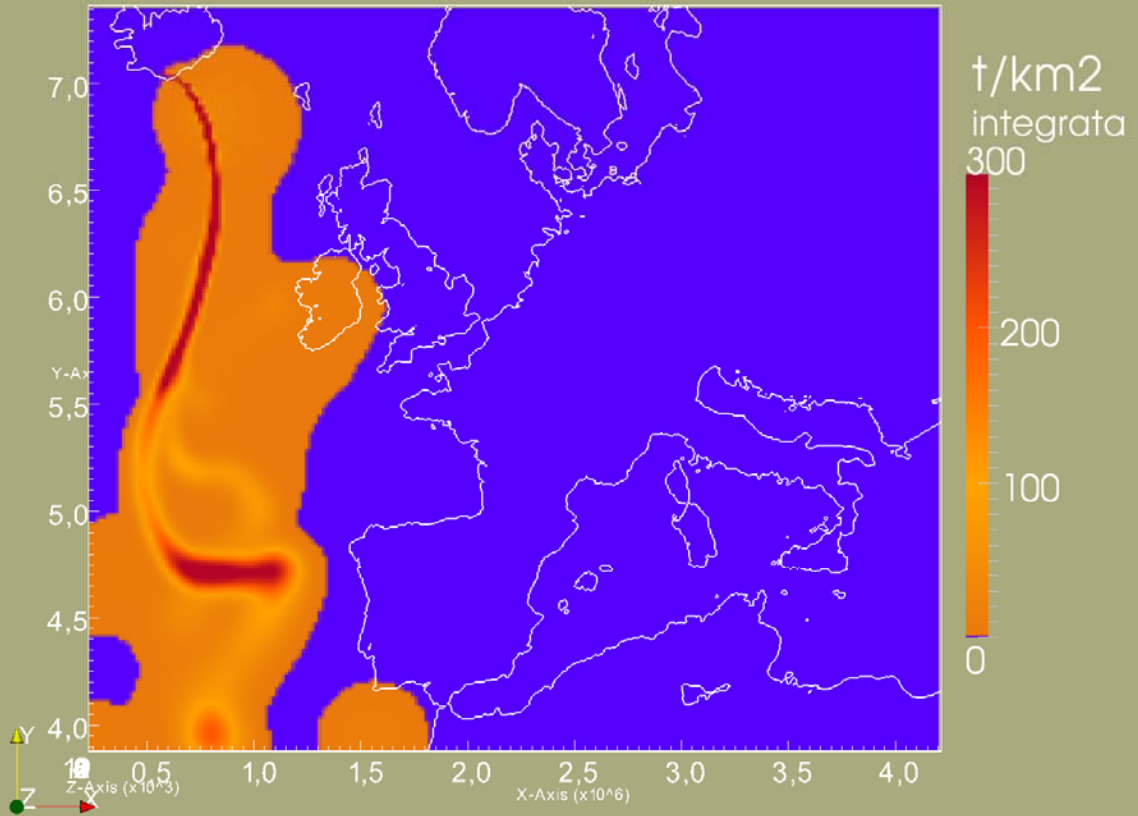


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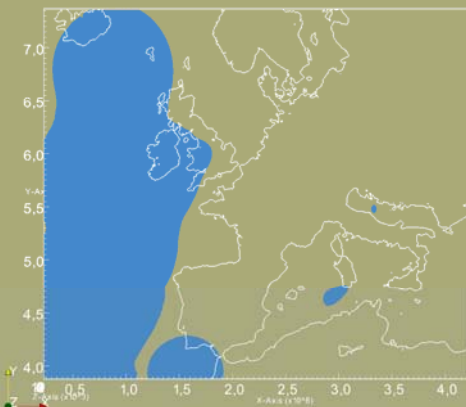


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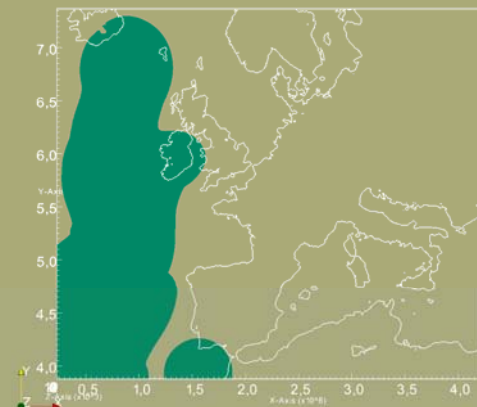
C



20100511 23 UTC



20100511 23 UTC



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Figure 3