

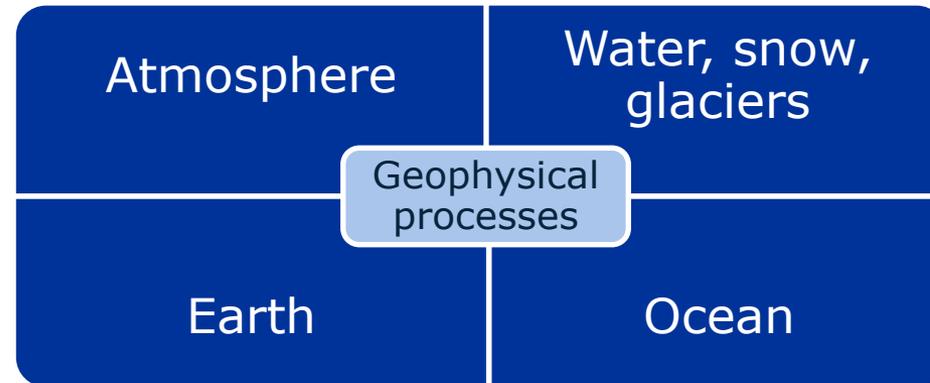
Photo:
B. Pálmason



Eldgos í Eyjafjallajökli – hlutverk Veðurstofu Íslands

Sigrún Karlsdóttir, Guðrún Nína Petersen, Halldór Björnsson,
Halldór Pétursson, Hróbjartur Þorsteinsson, Kristín Vogfjörð og
Þórður Arason

Tasks of the Icelandic Meteorological Office



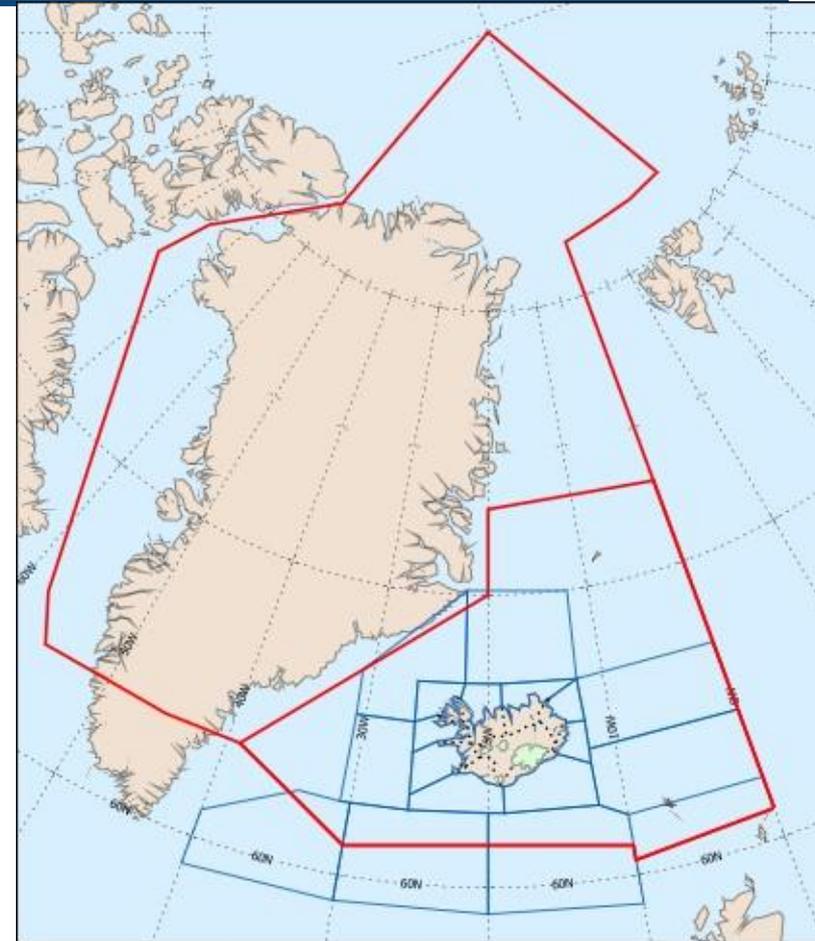
Responsibilities:

- ▶ Monitoring, forecasting and issuance of warnings in the field of
 - ▲ Meteorology
 - ▲ Seismology and volcanic activities
 - ▲ Glaciology
 - ▲ Hydrology
 - ▲ Risk assesment of natural hazards, e.g. floods and avalanches, etc.

Meteorological monitoring and forecast

- ▶ IMO monitors and issues forecast for
 - ▲ land and sea
 - ▲ large airspace

- ▶ IMO is a State Volcano Observatory
 - ▲ Pre - eruption activity
 - ▲ Eruption monitoring
 - ▲ Airborne volcanic ash

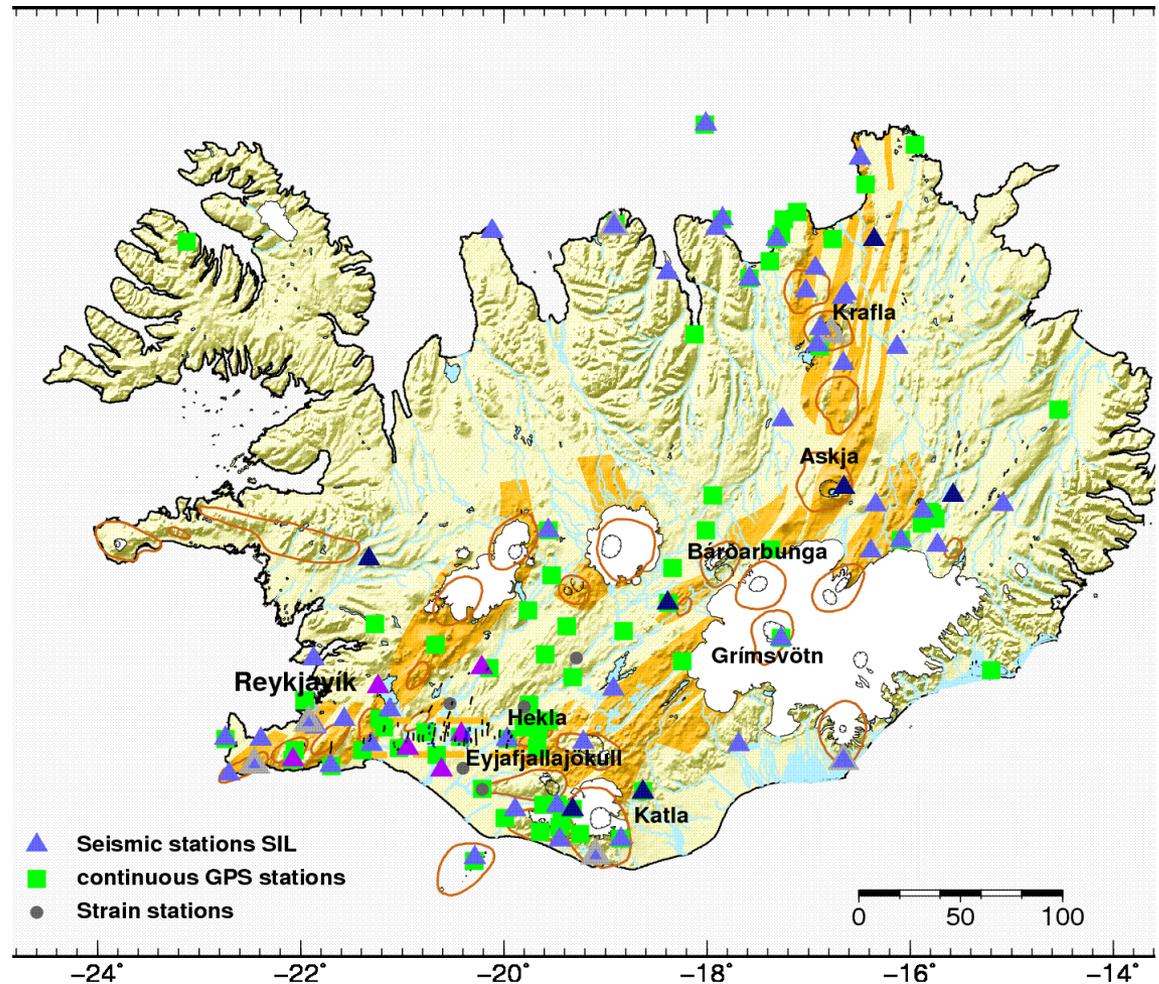


Source term monitoring with emphasis on volcanic activity

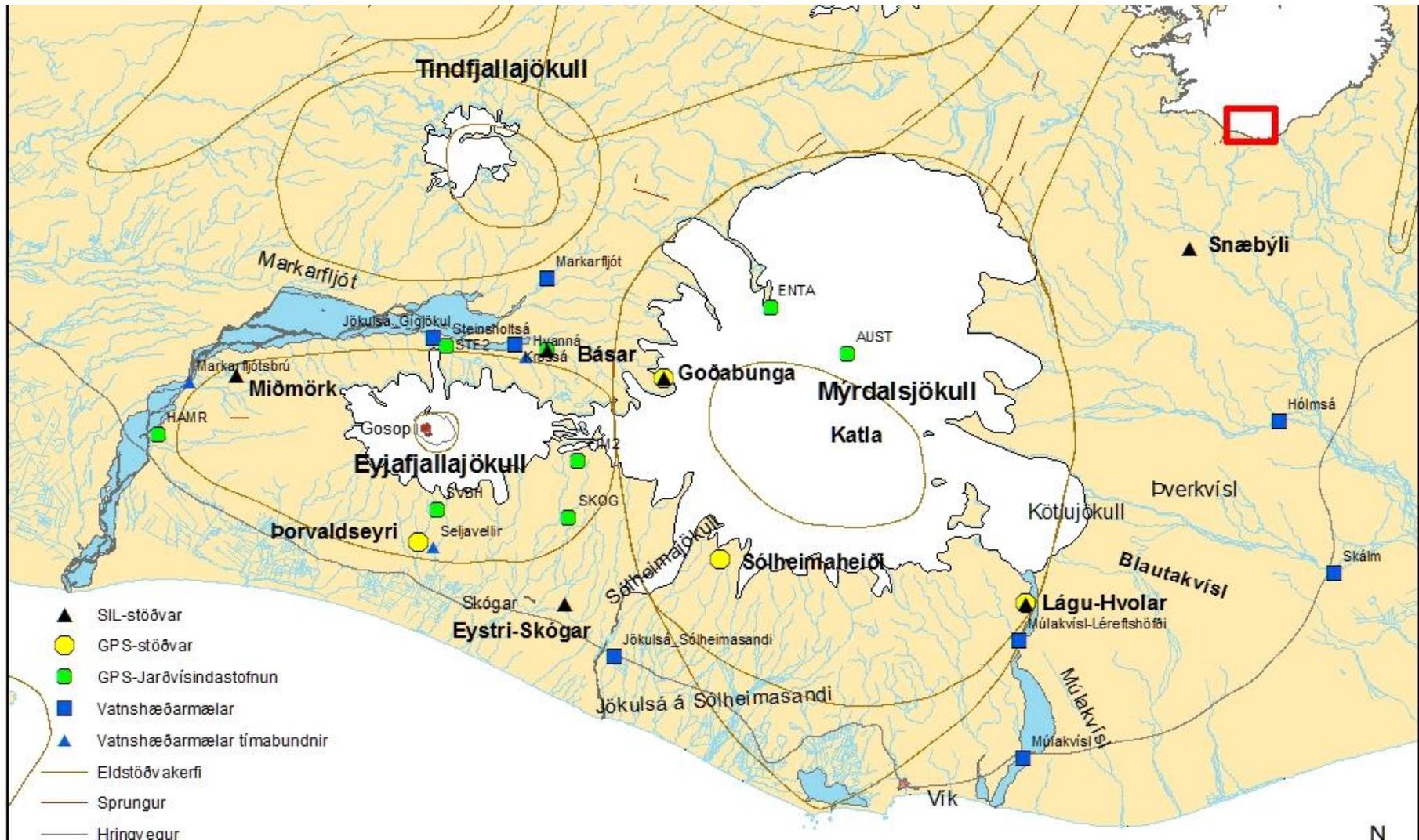
- ▶ Earth science
 - ▲ Seismic monitoring (SIL network)
 - ▲ GPS measurements
 - ▲ Strain measurements
- ▶ Hydrology
 - ▲ Water level gauges
 - ▲ Heat and conductivity measurements
 - ▲ **Show early signs of volcanic activity under the ice caps.**
- ▶ Atmosphere
 - ▲ ~220 weather stations (~120 automatic and ~100 manned stations)
 - ▲ Weather radar
 - ▲ Direct and indirect plume measurements
 - ▲ lightning sensors
 - ▲ radiosondes
 - ▲ SO₂ measurements

Geophysical monitoring network

- ▶ ~60 seismic stations
- ▶ ~70 GPS stations
 - ▲ ~25 ISGPS
 - ▲ ~45 other institutes
- ▶ 6 strainmeter stations

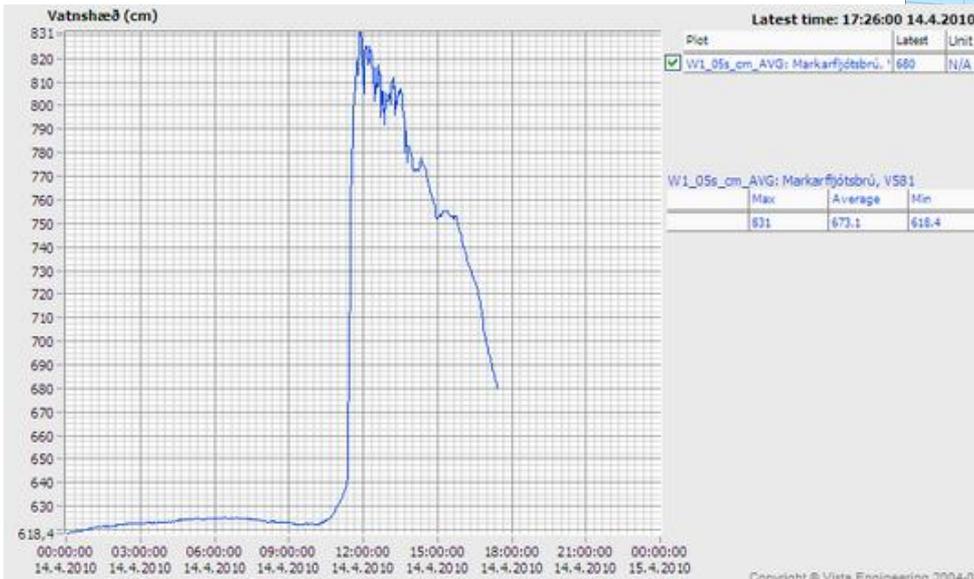
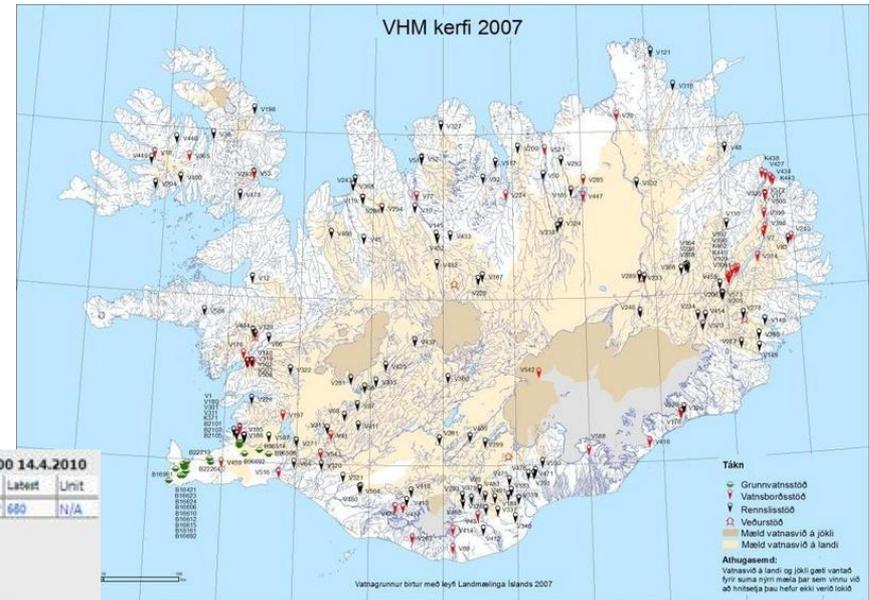


Geophysical monitoring networks around Eyjafjallajökull and Katla



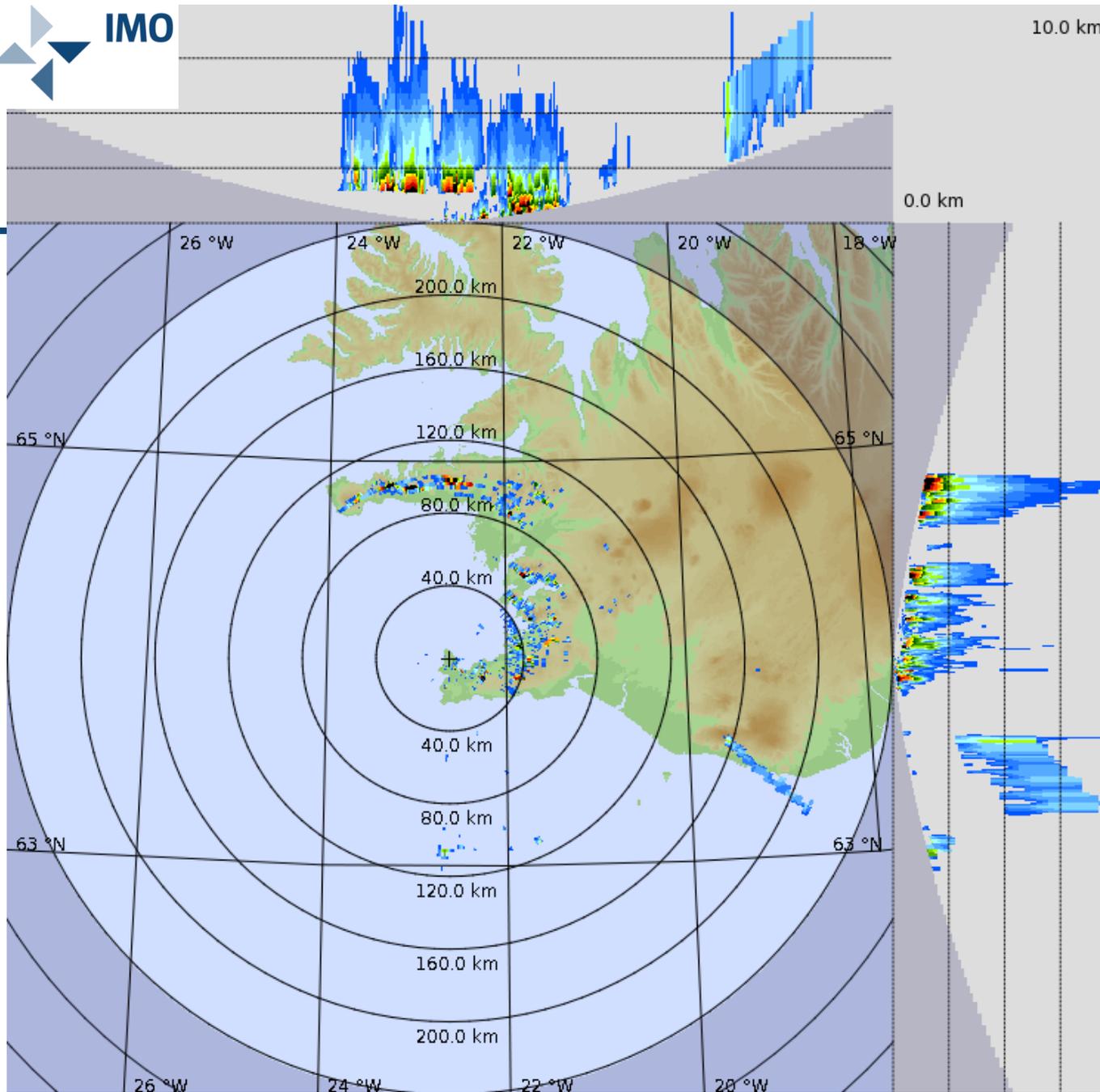
Hydrological monitoring network

- ▶ ~160 water level gauges and electrical conductivity meters
- ▶ Important in the monitoring of volcanic activity
 - ▲ show early signs of volcanic activity under ice caps.



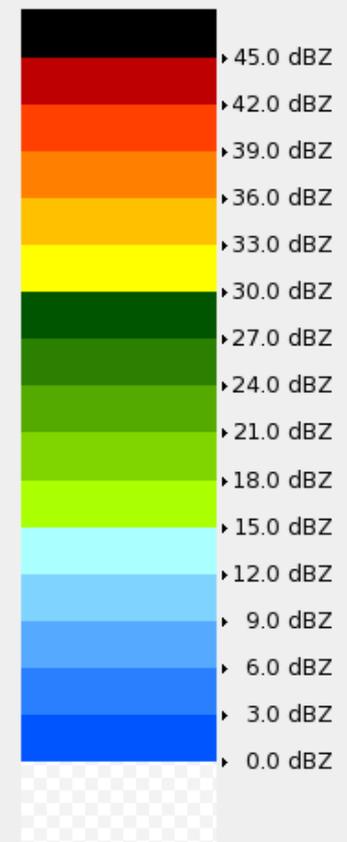
Plume height information

- ▶ Plume height estimation is currently the most important real-time input data into dispersion models.
- ▶ Primary instrument is a single C-band Doppler weather radar located in Keflavik, surveillance flights and pilot reports (PiReps), and other methods include theodolite estimation.
- ▶ Web-cams
- ▶ Satellite images
- ▶ Some difficulties
 - ▲ Inconvenient positioning of radar.
 - ▲ Cloudy conditions obscure observations incl. radar.
 - ▲ Interaction with wind is poorly understood → hard to extract a meaningful top height.
 - ▲ Dry ash has low reflectivity



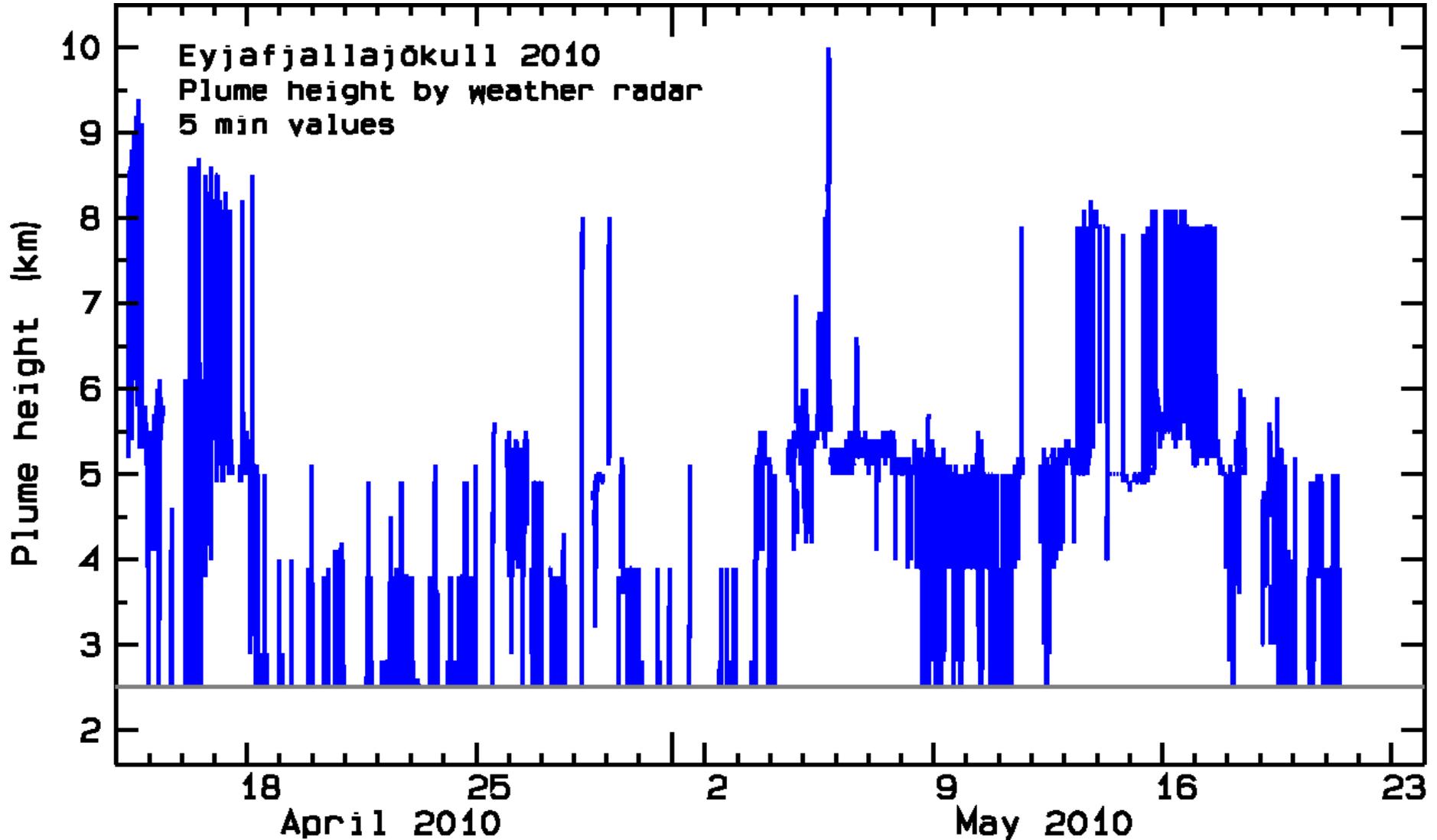
Info Layer Navigate

MAX (dBZ)
19:00 / 05-May-2010
Keflavik

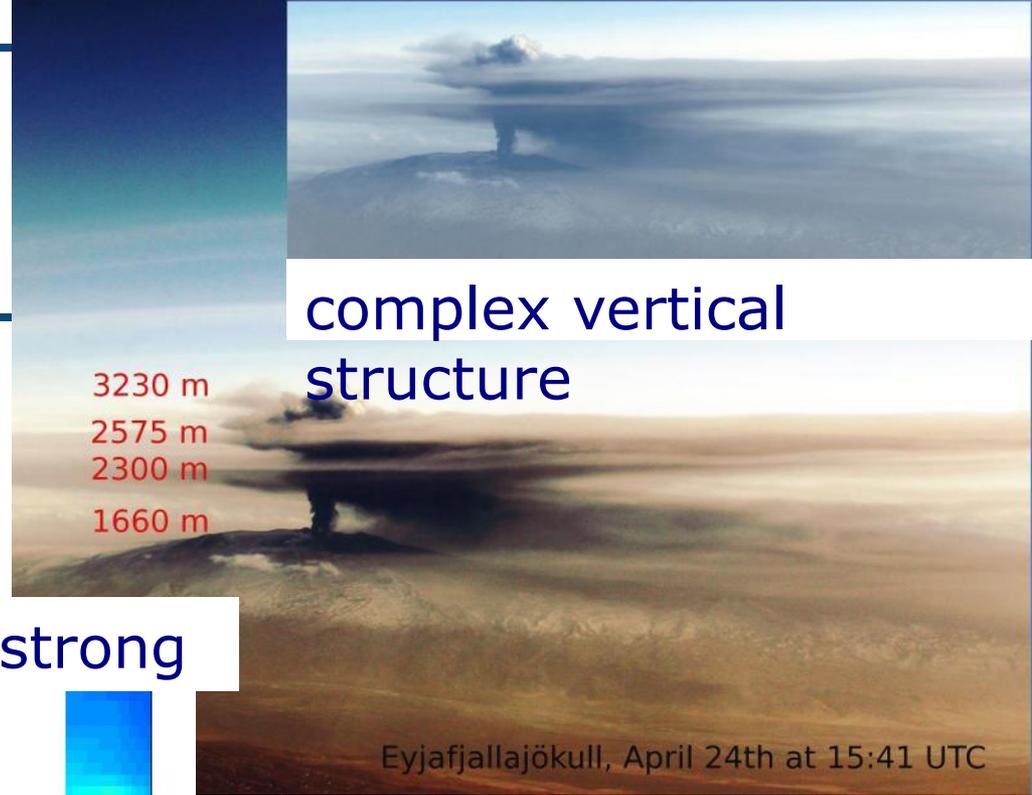


Pdf File: 240km.max
Clutter Filter: None
Time sampling:50
PRF: 1200 Hz
Range: 240 km
Height: 0.000 kmto 10.000 km
Hor Res: 0.800 km/pixel
Vert Res: 0.067 km/pixel
Data: Radar Data
Rainbow® SELEX-SI

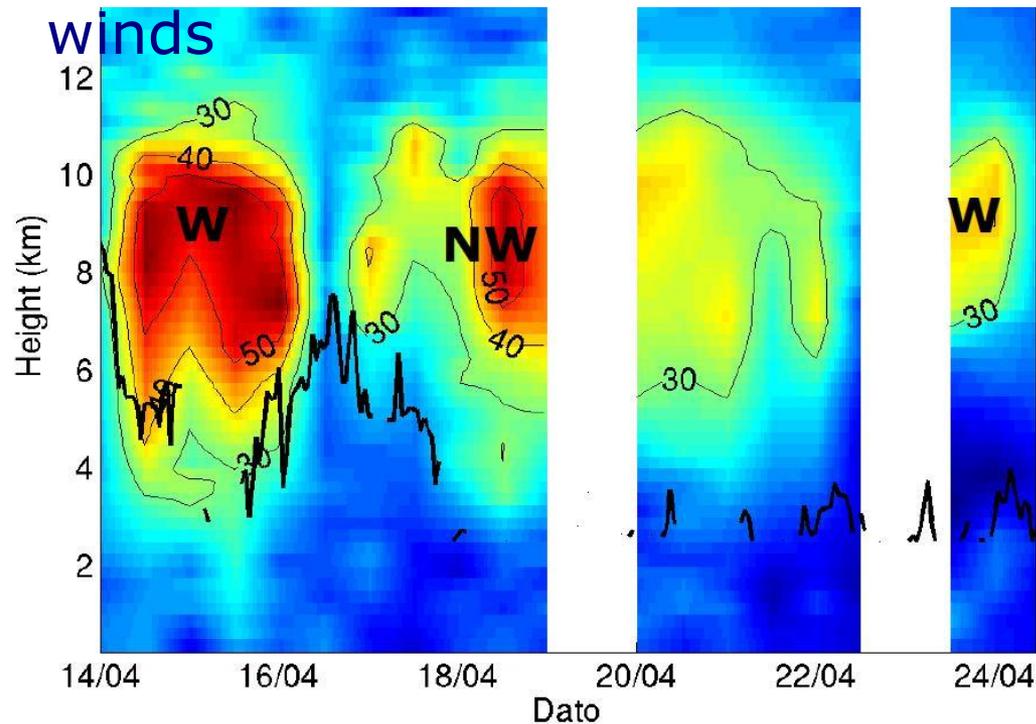
Plume height during eruption



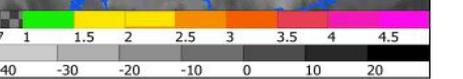
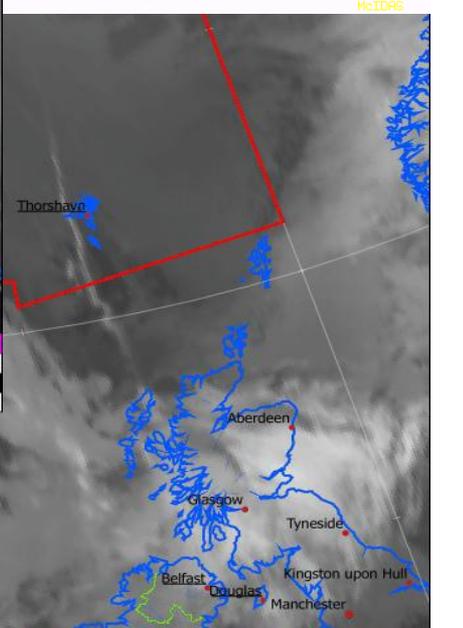
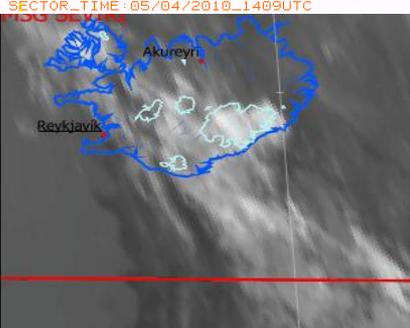
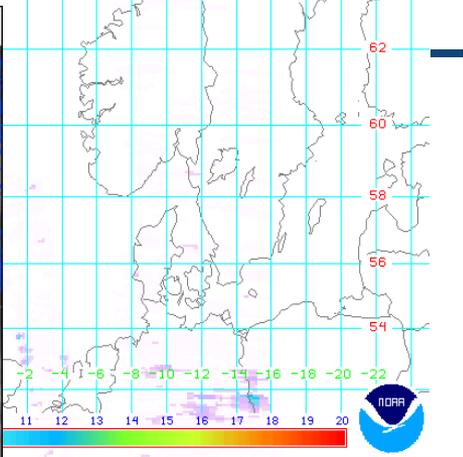
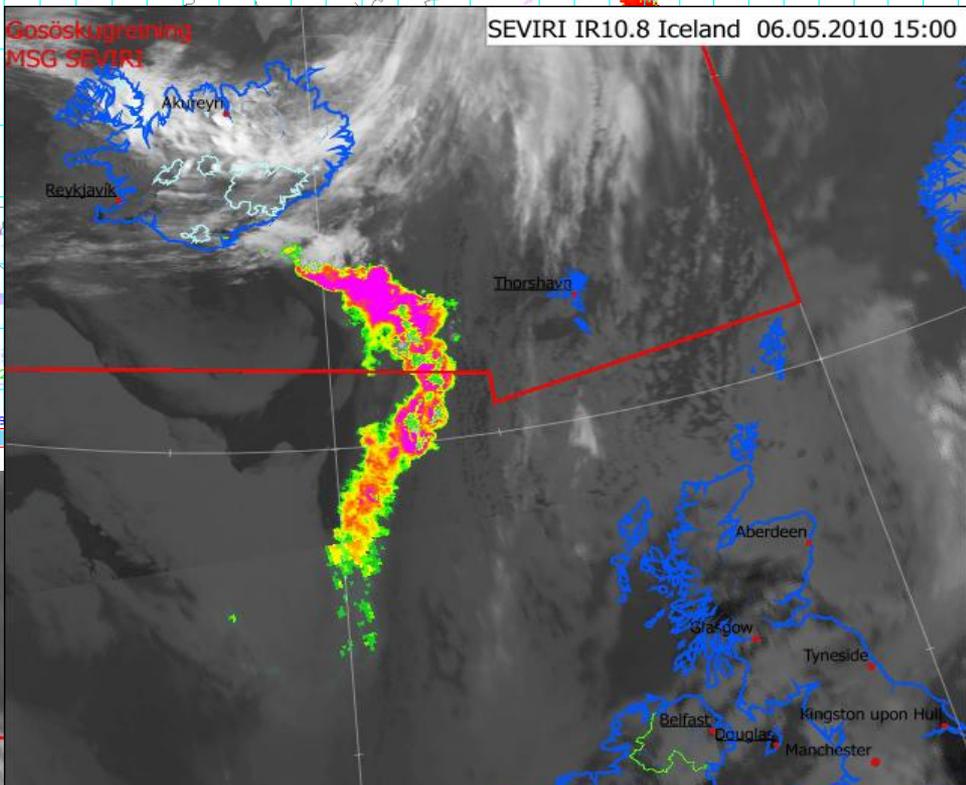
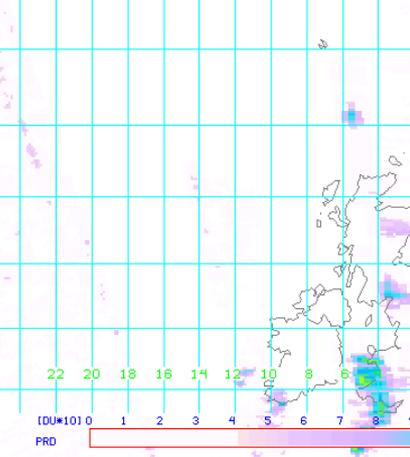
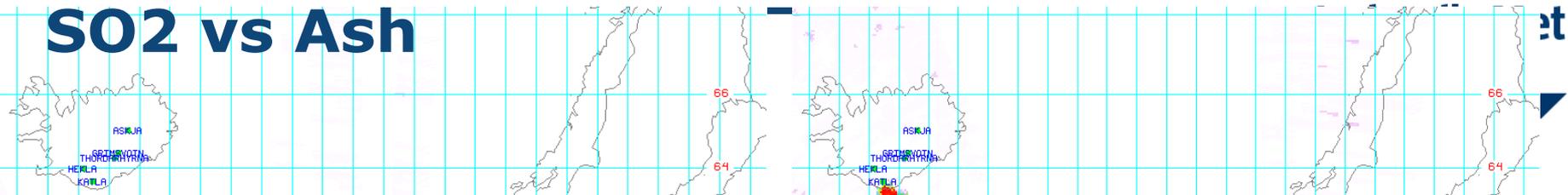
IMO researchers are looking carefully at the plume.



plume height modulated by strong winds



SO2 vs Ash



Ash resuspension – possible problem



On June 4-5th, ash suspension was serious and a SIGMET was issued. Measurements and modelling development ongoing.

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- ▶ IMO informes London VAAC every 3 hr, and more frequently if needed about:
 - ▲ Plume height
 - ▲ Plume activity (height and variation in height)
 - ▲ Color/shade of the plume
 - ▲ lightning activity
 - ▲ seismic and hydrological activity
 - ▲ surface and upper air observations (e.g. PIREP)
 - ▶ Discussions between the forecasters of IMO and London VAAC about the situation.

Next steps to improve monitoring of ash plumes

- ▶ ICAO has agreed to invest in and deploy portable high frequency dual polarization Doppler radar for accurate plume height measurements and potential assessment of the mass transport; timescale 7-8 months.
- ▶ PM10 ash sensor network being investigated.
- ▶ Lidar for airborne ash measurements at Keflavik airport, on loan from UK, arrives in October.
- ▶ Ash concentration measurements from a piston plane in cooperation with Icelandair.
- ▶ Portable radiosonde station for atmospheric conditions at eruption site – on loan from UK.
- ▶ SO₂ measurements at eruption site in cooperation with NOVAC (Differential Optical Absorbtion Spectrometer, DOAS).
- ▶ NAME dispersion model will be made available for IMO.

Other activities that aim to improve the monitoring of volcanic activity in Iceland

▶ Geophysics

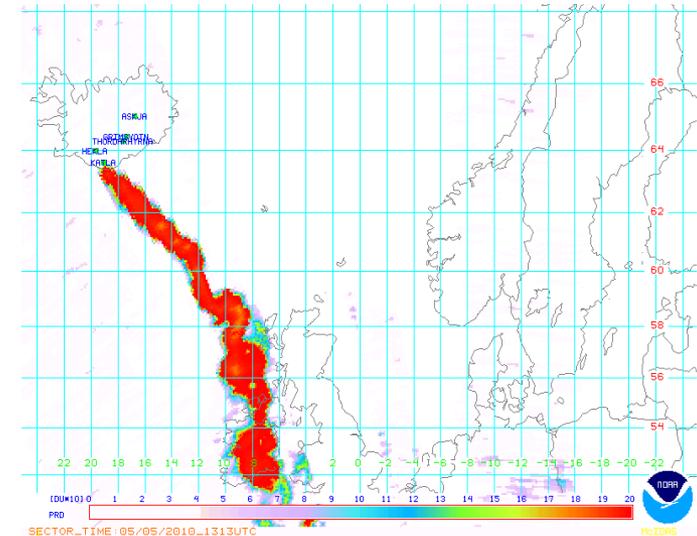
- ▲ Expanded seismic and GPS networks (future possibilities of EPOS)
- ▲ Borehole strainmeter measurements
- ▲ Research activity to improve understanding of the volcanic behavior

▶ Hydrology

- ▲ Improved heat and conductivity measurements
- ▲ Denser network of water level gauges around glacial volcanoes

▶ Atmosphere

- ▲ Gas emission monitoring and modelling
- ▲ New C-band radar in NA- Iceland to cover volcanoes in N- and A-Iceland
- ▲ Drop-sondes for inside plume conditions or 50-100 km downwind
- ▲ Network of visible and/or IR cameras



Thank you

Photo: Þ.M. Pétursson

