



## **Monitoring the volcanic eruption in Grímsvötn, November 2004.**

**S. S. Jakobsdóttir** for the IMO group

Geophysical Monitoring Section, Iceland Meteorological Office, [ssj@vedur.is](mailto:ssj@vedur.is)

At 20:10 UTC on November 1st 2004, when it was clear that an eruption was about to begin in the Grímsvötn subglacial volcano in Vatnajökull, Iceland, a new phase was entered: The monitoring of the eruption. The real-time monitoring of the eruption was a co-operation between the geophysical monitoring group and the meteorologists at IMO. After giving a warning to the National Civil Protection, the Air Traffic Control Center and co-operating scientists at the Institute of Earth Sciences, the task was on one hand to locate the eruption with reasonable precision within the ice cap and on the other it was to estimate the trajectory and dispersal of the ash plume in order to issue precise warnings to the aviation authorities. At the time of the eruption, weather conditions were very bad, thus preventing visual observations of the eruption. The only knowledge of the eruption was through observations of seismicity. The eruption was known to be near the Grímsfjall nunatak, in a region where ice thickness varied between almost 0 and 250 m depending on the exact location. Analysis of seismic waveforms suggested that the eruption was either close to or slightly south of the nunatak, which forms the southern rim of the caldera. Other observations suggested a location in the northern part of the caldera. Ice thickness at the eruption site is decisive for the time it takes the eruption to melt through the surface and the ash plume to rise into the atmosphere. Additionally ice thickness determines the amount of water that can be produced. The first trace of the ash plume was seen on a weather radar at 22:50 UTC, confirming the claimed eruption. The intensity of the eruption was monitored in real-time by the height of the volcanic plume, as determined by weather radar and volcanic tremor measurements. In addition, the occurrence of lightning coincided with the highest elevation of the plume (see abstract: "Volcanogenic lightning during the Grímsvötn 2004 subglacial eruption"). The eruption lasted for 4-5 days. It was most energetic the first 36 hours, but decreased steadily after that. The plume was last seen on

the radar on the morning of November 3rd. At midday on November 6th, only tremor from the ongoing jökulhlaup was visible. An overflight of Grímsvötn on November 7th confirmed that the eruption had ended.