Weather Radars of the Icelandic Meteorological Office

Þórður Arason, November 2022

The Icelandic Meteorological Office operates five weather radars, that can be used for monitoring volcanic plumes. Currently, the institute is in the process of renewing and expanding the radar network with state-of-the-art C-band Leonardo Meteor 735CDP10 dual polarity radars.

Status of the Radars

Location of the current weather radars in Iceland is shown in Figure 1, and the real-time status of our radar system is shown on our web-site with detailed information on each radar:

http://brunnur.vedur.is/radar/status/

Typical beam width of the new C-band radars is just below 1°, and a scan consists of 10-20 angular elevations from the horizontal. For each elevation angle the radar makes one revolution with measurements every 1° of azimuth. For each direction the radar makes measurements of up to 20 moments, typically for every 250 m range steps to the maximum range.

The radar scans are transferred to our headquarters in Reykjavík where they are processed and made available in real-time to our staff, sent to Eumetnet-Opera, and made available to the public.

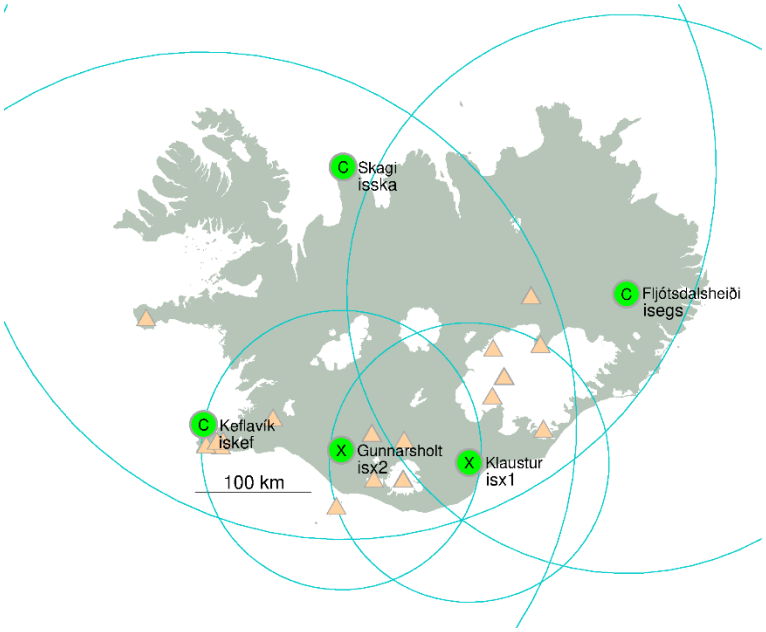

Figure 1. Location of the mobile X-band and fixed location C-band weather radars as of November 2022. Maximum range of the radars is indicated by the large circles and a selection of volcanoes by the triangles.

Vespa

The operational Vespa-system (Volcanic Eruptive Source Parameter Assessment) provides plume height estimates during volcanic eruptions.

http://brunnur.vedur.is/radar/vespa/

The Vespa system provides automatic real-time estimates of the maximum height of plumes above volcanoes based on measurements from the weather radar system. Furthermore, mean plume heights are estimated every 10 min and the hourly mass flow rate estimated. During non-volcanic times the system gives height estimates of meteorological precipitating clouds over volcanoes.

Open Access to Radar Data

Radar data images can be accessed at:

http://brunnur.vedur.is/myndir/listi/#radar

The radar data include files in a HDF5-format of reflectivity data (dBZ) for a whole scan, usually every 5 min. The data format is according to the ODIM V2.3 standard, and information and the data can be retrieved from our web-site:

http://brunnur.vedur.is/radar/data.html

The data files are compressed with size of about 0.6-1.3 Mb each; expanded each scan requires typically 10-15 Mb.

Figure 2 shows our radar data retrieval during the past year.

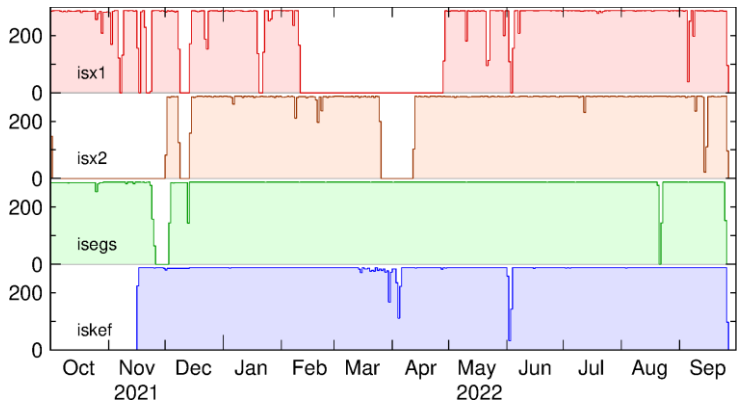

Figure 2. Data retrievals from four radars from October 2021 to September 2022, prior to the installation at Skagi (isska). The graph shows number of scans per day, and as the radars are all scanning every 5 min, we can retrieve up to 288 scans per day from each. Some of the gaps seen in this figure were intentional.

Renewal and Expansion of the Radar System

Renewal of the Icelandic radar system began in 2021 when our old Ericsson single polarity Keflavík radar (iskef) was replaced by a state-of-the-art Leonardo Meteor 735CDP10 dual polarity radar. This fall a new radar of the same type was installed in N-Iceland at Skagi (isska), and in 2023 a new one will be installed in E-Iceland at Bjólfur (isbjo). The plan is to install new same type radars in the NW, NE and SW in the years 2024-2027, see Figure 3.

When this renewal project is finished, all Icelandic volcanoes will be monitored, and most of them by a few radars from various directions.

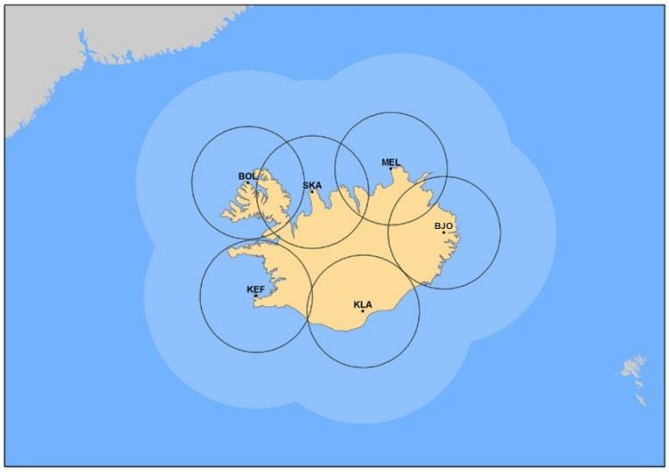

Figure 3. Future plan for Iceland of six state-of-the-art fixed location C-band weather radars. The Ielandic Meteorological Office aims to finish the installations by 2027. The circles show radius of 120 km where the radar data is of prime quality, and the shaded circles 240 km, a typical maximum range.