Radar volcano monitoring system in Iceland

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Weather radars are valuable instruments in monitoring explosive volcanic eruptions. Temporal variations in the eruption strength can be monitored as well as variations in plume and ash dispersal. Radar reflectivity of a volcanic plume is related to ice and water droplet concentrations and size distribution as well as type, shape, amount and the grain size distribution of ash.

The Icelandic Meteorological Office (IMO) owns and operates four radars that can be utilized for volcano monitoring. A fixed position 250 kW C-band weather radar was installed in 1991 in SW-Iceland close to Keflavík International Airport, and upgraded to a doppler radar in 2010. In cooperation with the International Civil Aviation Organization (ICAO), IMO has recently invested in two mobile X-band radars and one fixed position C-band radar. The fixed position 250 kW doppler C-band weather radar was installed in April 2012 at Fljótsdalsheiði, E-Iceland, and in June 2012 and February 2013 IMO received two mobile 65 kW dual-polarization doppler X-band radars.Explosive volcanic eruptions in Iceland during the past 23 years were monitored by the Keflavík radar: Hekla 1991, Gjálp 1996, Grímsvötn 1998, Hekla 2000, Grímsvötn 2004, Eyjafjallajökull 2010 and Grímsvötn 2011. Additionally, the 2011 eruption was mointored by a mobile X-band radar on loan from the Italian Civil Protection Authorities.

Detailed technical information is presented on the four radars with examples of the information acquired during previous eruptions. This expanded network of radars is expected to give valuable information on future volcanic eruptions in Iceland.