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Near-realtime monitoring of the 2014 Holuhraun volcanic plume, its composition and dispersion.

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The ongoing effusive eruption in the Holuhraun, Iceland emits a very high concentration of volcanic gases and along with a release of metals this constitues the main threat from the eruption to the health and safety in Iceland. The atmospheric monitoring of the volcanic plume utilizes many different instruments and systems including both in-situ measurements and remote sensing.

Cameras, satellites and radars have been the most useful real-time monitoring tools. Two visible light cameras with different perspectives were deployed soon after increased unrest started in Bárðarbunga on 16 August 2014. Infrared cameras were installed, first during a field campaign and later as longer term monitoring devices. The sulfur-rich plume is qualitatively monitored using BTD technique on two wavelength filters on the infrared camera.

The eruption plume is, in certain atmospheric conditions, visible on a C-band operational radar in east Iceland. An X-band mobile radar was moved within about 25 km of the eruption site, providing higher resolution radar imagery, but due to the remote location was removed before the onset of harsh winter contitions.
Several polar-orbiting satellites pass Iceland daily. High-resolution imagery is available from the MODIS instruments on NASA Aqua and Terra satellites as well as from the AVHRR instruments on NOAA's and EUMETSAT's satellites. Other satellites with specific instruments useful for tracking gases also provide valuable information, although not all in near-real time. Eumetsat SEVIRI instruments on geostationary satellites provide the highest temporal resolution – but low spatial resolution.

Gas emissions from the fissure, the plume dispersion and down-wind ground-level SO_2 concentrations have been monitored throughout the eruption. The network of ground-based air-quality monitors was enhanced after the onset of the eruption and as of writing, consists of 21 online monitors as well as 27 handheld monitors positioned with key personel from Icelandic Civil Protection Authorities. Samples of rainwater and snow are also collected and analyzed for acidity and chemical composition.

The SO_2 emission rate has been measured since the start of the eruption using DOASes. Three scanning DOASes capable of streaming data in near real-time were installed less than 15 km from the fissure. Long-distance traverses with a car-mounted DOAS are made along the ring road down-wind from the eruption as well as near-source traverses when conditions allow. The plume composition is measured by FTIR, MultiGAS, DOAS and filter packs when conditions allow.

Forecasting of the volcanic gas dispersion has developed rapidly since the onset of the eruption. CALPUFF dispersion model was set up in early September and the forecast duty meteorologists produce gas dispersion forecasts twice a day and issue both a text forecast as well as a foreacast map indicating where levels of ground concentration fo SO_2 might exceed health limits.