



## **Abundant SO<sub>2</sub> release from the 2014 Holuhraun eruption (Bárðarbunga, Iceland) and its impact on human health**

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The ongoing eruption in Holuhraun is significantly rich in gases and its prolonged duration probably makes it one of the largest natural source of SO<sub>2</sub> in Iceland since the Laki eruption in 1783-84. Since its beginning, on the 31st of August 2014, the eruption has been releasing into the atmosphere an amount of SO<sub>2</sub> at a rate of 400 kg/s with peaks larger than 1,000 kg/s. This quantity already exceeds the SO<sub>2</sub> fluxes coming from some well-known degassing volcanoes, such as Masaya (Nicaragua) and Etna (Italy); and it is comparable with the prolonged degassing event at Miyakejima volcano (Japan) in 2000-2004.

Low injection velocities and a predominant buoyant style at the source imply quite low plume heights which have been in average between 2-3 km and never exceeded 5 km above sea level. This fact, together with the high SO<sub>2</sub> fluxes, is the reason for the high SO<sub>2</sub> concentrations measured at ground level all over Iceland in the last months.

The air quality monitoring network, operated by the Environment Agency of Iceland (EAI), has been improved and extended since the beginning of the eruption to allow for a near-real time coverage of SO<sub>2</sub> measurements across most of the country. Since then, high values have been recorded in many inhabited locations more than 100 km far from the eruption site. For example on October 26th values up to 21,000 µg/m<sup>3</sup> were measured in Höfn in the South-East of Iceland, while in the North the town of Akureyri experienced concentrations higher than 2,000 µg/m<sup>3</sup> for about 10 hours on October 31st.

Due to the large variability in wind direction and wind speed, typical for the Icelandic meteorology, almost every town has been affected by the gas cloud and many locations have exceeded the health safety limit of 350 µg/m<sup>3</sup> per hour more than 20 times.

Such prolonged exposure and acute short-lived concentrations of SO<sub>2</sub> can have adverse effects on human health especially in individuals with underlying pulmonary diseases. In Iceland the Chief Epidemiologist at the Directorate of Health (DoH) is responsible for monitoring the health effects of volcanic activities but yet no severe health effects have been noted due to the SO<sub>2</sub> contamination. In addition Civil Protection together with UST, DoH and IMO, has been very active in providing information and recommendations to the public through their websites, official communications and open face-to-face meetings.

Here an overview of SO<sub>2</sub> ground concentration time series along the duration of the eruption and an evaluation of the potential long-term impact on human health is shown and discussed.