Geophysical Research Abstracts
Vol. 17, EGU2015-15899, 2015
EGU General Assembly 2015

Contrasting gas compositions and fluxes produced by the Holuhraun 2014/2015 eruption and the Fimmvörðuháls 2010 eruption, Iceland

Mike Burton (1), Evgenia Ilyinskaya (2), Alessandro La Spina (1), Giuseppe Salerno (1), Baldur Bergsson (3,4), Amy Donovan (5), Sara Barsotti (3), and Melissa Pfeffer (3)

(1) Istituto Nazionale di Geofisica e Vulcanologia, Italy, (2) British Geological Survey, Edinburgh, United Kingdom, (3) Icelandic Meteorological Office, Reykjavík, Iceland, (4) DiSTeM, Università di Palermo, Palermo, Italy, (5) University of Cambridge, Cambridge, UK

Basaltic fissure eruptions on Iceland are important for multiple reasons. They shed light on magmatic processes in general, and allow us to gain insight into the larger scale processes that form Earth's crust. In relatively recent history gas emissions from Iceland's basaltic fissure eruptions have produced a major impact to human activities both on Iceland and further afield. In this context, new insights into the nature of these eruptions, and mechanisms driving them are valuable.

During the recent Holuhraun eruption we performed detailed open-Path FTIR measurements of the gas compositions emitted by both the erupting vent and erupted lavas. This technique is well-suited to explosive basaltic eruptions, allowing multiple gases to be measured at a safe distance, even in poor weather. We were able to measure the major magmatic gases, including H_2O, CO_2, SO_2, HCl, HF, and CO. These gases typically make up >99% of all gases emitted, allowing a reconstruction of the total gas composition a the moment of eruption. A total of three campaigns were conducted, with a gradually increasing level of difficulty, as the explosive activity waned and lava flow spread around the eruptive fissure, limiting access. We also performed SO_2 camera measurements of SO_2 flux emissions, the results from which appear to compare favourably with other measurements. We are therefore able to report quantitative fluxes for each of the measured magmatic species.

Our results show a dramatic difference in halogen emissions, and richer S content compared with the OP-FTIR measurements of gas emissions during the 2010 eruption at Fimmvörðuháls. Such differences may reflect mantle melting regimes, various degrees of interaction with crustal material, or different eruptive processes. We highlight that the remarkable degree of heterogeneity in the gas compositions in these two eruptions suggests that the impact of Icelandic basaltic eruptions are inherently challenging to predict, and very widely on a case-by-case basis.