



Ground-based measurements of the emission rate and composition of gases from the Holuhraun eruption

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The ongoing fissure eruption at Holuhraun is distinguished by high concentrations of gases being released both from the vent(s) where lava is being extruded and from the cooling lava. The conditions for making ground-based measurements of the gases are particularly challenging: remote location, optically dense plume with high SO₂ column amounts, low UV intensity, frequent clouds and precipitation, an extensive and hot lava field, and ramparts around the main vent.

Three scanning DOASes capable of streaming data in almost real-time have been installed less than 15 km from the fissure. As of writing, there are two scanning DOASes operating while one unrecoverable instrument has been trapped by the lava. Traverses with a car-mounted DOAS are made along the ring road down-wind from the eruption when conditions are favorable. The SO₂ emission rate is greater in the long-range traverses than from the near-source DOAS measurements. The data is being examined so that the uncertainty in the DOAS measurements can be constrained. Preliminary SO₂ emission rates for the first month and a half of the eruption are ~400 kg/s with some days greater than 1000 kg/s.

Plume composition measurements were made by FTIR, MultiGAS, DOAS and filter pack during multiple campaigns in the first two months of the eruption. The FTIR measurements indicated a significantly drier plume than the MultiGAS measurements. The CO₂/SO₂ ratio measured by MultiGAS and FTIR agree very well. Mobile DOAS traverses indicate that 80–90 % of the SO₂ emissions came from the main vent with the remainder being released by the cooling lava. FTIR measured higher HCl/SO₂ ratios from the cooling lava than from the main vent. The last campaign that successfully collected data (in October) showed with both FTIR and MultiGAS a drop in CO₂/SO₂. Since then, there have been no successful campaign measurements. Further ground-based measurements to determine the relative contribution of the lava field to the total emissions and the plume composition in later stages of the eruption will be made when accessibility and UV conditions allow.