

Environmental impact of the 2014-15 eruption of the Bardarbunga volcano, Iceland

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The effusive six months long 2014–2015 Bardarbunga eruption (31 August-27 February) released 11.8 Mt of SO₂ gas to the atmosphere, 5.6 Mt of CO₂, about 0.1 Mt of HCl and some HF [1]. The SO₂ gas flux was more than the anthropogenic flux from Europe in 2011 and similar to the annual average SO₂ gas emission from all the Earth's volcanoes. The ground level concentration of SO₂ exceeded the 350 µg m⁻³ hourly average health limit over much of Iceland for days to weeks. Anomalously high SO₂ concentrations were also measured at several locations in Europe in September 2014 when magma effusion rates were highest. The lowest pH of fresh snowmelt at the eruption site was 3.3, and 3.2 in precipitation 105 km SE from the source. Elevated dissolved SO₄, Cl, F, and metal concentrations were measured in snow and precipitation. Continuous monitoring of dissolved constituents and discharge of a direct runoff river 100 km east of the eruption site for March to July 2015, covering the early and late snowmelt within the catchment, shows that the median riverine H⁺ concentration were 100% higher in 2015 than the years before the eruption, dissolved median Al and Cl 50% higher, but the median 2015 SO₄ concentration was similar to the control year's concentrations. These observations suggest that; 1) the dry westerly-wind transporting the volcanic plume over the catchment, 2) the relatively high wind speed and 3) limited light in the winter time at the high latitude, all resulted in insignificant SO₂ oxidation. In general at high latitude, during winter there is perhaps greater environmental and human health risk from SO₂ gas than from SO₄ aerosol particles due to reduced conversion efficiency, whereas in summer the aerosol particle effects may dominate [1].

[1] Gislason et al. 2015. Environmental pressure from the 2014–15 eruption of Bárðarbunga volcano, Iceland. *Geochem. Persp. Let.* 1, 84-93 | doi: 10.7185/86 geochemlet.1509