Pollution from the 2014/15 Bárðarbunga eruption monitored by snow cores from Vatnajökull glacier, Iceland

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The six month long 2014/15 Bárðarbunga volcanic eruption released 11 Mt of SO_2, 6 Mt of CO_2, 0.1 Mt of HCl, and 0.05 Mt of HF [1-2]. To study the effect of this eruption on the winter precipitation, snow cores were collected from the Vatnajökull glacier and the highlands northeast of the glacier. The pH and chemical compositions of melted snow samples indicate that these compositions have been affected by the Bárðarbunga eruption. The pH of the bulk snow samples ranged from 4.41 to 5.51. This is 4 times more acidic than pure water saturated with the atmospheric CO_2. The anion concentrations (SO_4, Cl, and F) were higher and the pH was lower compared to the equivalent snow from the unpolluted Icelandic Langjökull glacier. The chemical evolution of the snow with depth, decreasing pH, increasing SO_4, F, Cl and metal concentrations, reflect changes in the lava effusion and gas emission rates. They were the highest at the early stage of the eruption. The snow scavenging potential in close vicinity of the eruption site was minor. The snow removed only up to 1.2% of Cl, less than 1% of F, and less than 1‰ of S released during the entire eruption period confirming its limited cleaning capability of the volcanic pollutants from the air in vicinity of the eruption site. The toxic and heavy metals concentrations did not exceed drinking water standards given by European Commission and the micobiological communities was similar to those found in other parts of Arctic. This indicate that only minor environmental impacts on the snow were caused by its interaction with the volcanic aerosols/gases.

[1] Gislason et al. 2015, GPL; [2] Stefánsson et al. 2017, JGR

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