The very first reactions in the carbon and sulphur cycles during the 2014/15 Holuhraun volcanic eruption, Iceland

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The 2014/15 Holuhraun volcanic eruption in Iceland produced ~1.5 km^3 of lava which flowed directly into a Jökulsá á Fjöllum river channel. Furthermore this eruption released each day on average 60,000 tonnes of SO_2, 40,000 tonnes of CO_2, and 40 tonnes of HCl into the atmosphere affecting chemical composition of surface waters and precipitation [1]. When volcanic gases such as SO_2, HCl and HF condense and dissolve in rain, vapour and surface waters, they produce strong acids and ligands that lower pH, consume alkalinity and accelerate rock dissolution. This leads to intensified release of ions including toxic metals such as aluminium. On the other hand in the long term, it builds up alkalinity production and consumption of CO_2. In this study we investigate the very first reactions at the river water−lava surface and the potential effect of snow melt on the river water chemical composition.

Results of river monitoring including spot and continuous osmotic sampling show, that river water was affected by direct contact with molten lava. Even though the water conductivity was stable during the volcanic unrest, substantial changes in sulphate and dissolved carbon were observed. The volcanic derived strong acids titrated out the carbon−alkalinity. Water samples collected at the lava front show increase in multiple sulphur components such as SO_4^{2-} and SO_3^{2-}. In addition other water constituents' concentrations such as F, Si, Ca, Mg, and Mn rose considerably during the initial lava−gas−water interaction. Melted snow samples collected at the eruption site had a pH of 3.3−4.8 with strong dependence of SO_4, F and Cl concentrations on the pH indicating that the volcanic products acidified the snow. Protons balanced about half of the negatively charged anions; the rest was balanced by water soluble salt aerosols' metals such as Al, Fe, Na, Ca, and Mg. The concentrations of F, Al, Fe, Mn, Cd, Cu, and Pb in the snowmelt surpassed drinking− and surface water standards.

[1] Gislason et al. (2015). *Geochemical Perspective Letters* (submitted).