Geophysical Research Abstracts, Vol. 8, 00914, 2006
SRef-ID: 1607-7962/gra/EGU06-A-00914

Chemical weathering of pristine Volcanic Ash and Metal Salts in the Vicinity of the Hekla Volcano, Iceland

T. K. Flaathen (1), S. R. Gislason (2)

(1) Nordic Volcanological Center, Institute of Earth Sciences, University of Iceland, Reykjavik, Iceland, (2) Institute of Earth Sciences, University of Iceland, Reykjavik, Iceland (therese@hi.is / Fax: +354-5629767 /Phone: +354-5254492)

The overall objective of this study is to investigate the weathering of pristine volcanic ash and metal salts during the first hours and days after volcanic eruptions. The investigated ash originates from the Hekla 1991 and 2000 eruptions, Iceland. The Hekla volcano is one of the most active volcanic systems in Iceland. The last two eruptions took place in 1991 and 2000. The volume of tephra was 0.02 km3 for the 1991 eruption (Gudmundsson et al. 1991) and 0.01 km3 for the 2000 eruption (Haraldsson et al. 2002). Experiments have shown that metal salts were adsorbed on the surface of the tephra and that they dissolved rapidly when exposed to de-ionized water and seawater (Frogner et al. 2001).

Ash embeded in snow was collected during the initial subpilinian phase of the 2000 eruption and in the later stage of the 1991 eruption. River Ytri Ranga, in the vicinity of Hekla, was monitored during and after both eruptions to detect changes in chemistry due to weathering of the ash and the metal salts. Dissolved metal and anion concentrations were very high in the melted snow samples (F: 66.2, Fe: 4.2, Al: 6.0 mmol/kg, Pb: 0.28 and Cd: 0.95 μmol/kg). The pH was as low as 2.6.

The pristine volcanic ash and metal salts was weathered rapidly when exposed to rain. This resulted in high concentrations of elements like F, Cl, Al, Fe, Mn, Pb, Cu, Zn, Co and Cd in River Ytri Ranga. There was more pollution in the river during the 2000 eruption than in 1991 due to a thicker ash load in the river catchments. In 2000, the concentration of F rose to 0.7 mmol/kg after the first period of rain. To get a better understanding of the solution chemistry and the transport to and through the river, solutions will be modeled using the PHREEQC2 program (Parkhurst and Appelo,

1999).

Gudmundsson, A., Oskarsson, N., Gronvold, K., Saemundsson, K., Sigurdsson, O., Stefansson, R., Gislason, S.R., Einarsson, P., Brandsdottir, B., Larsen, G., Johannesson, H. and Thordarson, T., 1992. The 1991 eruption of Hekla, Iceland. Bull. Volcanol. 54, 238-246.

Haraldsson, K.Ö., Árnason, S.G., Larsen, G. And Eiríksson, J., 2002. The Hekla eruption of 2000 – The tephra fall. 25th Nordic Geological Winter Meeting, Reykjavik, Abstract.

Frogner, P., Gislason, S.R. and Oskarsson, N., 2001. Fertilizing potential of volcanic ash in ocean surface water. Geology, 29-6, 487-490.

Parkhurst, D.L. and Appelo, C.A.J., 1999. User's guide to PHREEQC (version 2) – A computer program for speciation, batch-reaction, one-dimensional transport and inverse geochemical calculations. USGS-Report 99-4259