



Hydrothermal fluxes of magmatic chlorine and sulfur from volcano-hydrothermal systems of the Kuril Islands (Russia).

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The hydrothermal flux may be provided by the discharge of fluids formed at depth over the magma body and/or by acid waters, which are formed by the absorption of the ascending volcanic vapor by shallow groundwater. Thus, the anion composition (Cl and SO₄) of the discharging thermal waters from a volcano-hydrothermal system in many cases originates from the volcanic vapor and should be taken into account in estimations of the magmatic volatile output and volatile recycling in subduction zones. Here we report the chemical composition of thermal waters and the measured solute fluxes from volcano-hydrothermal systems of Kuril Islands including Paramushir (Ebeko volcanic centre), Shiashkotan (volcanoes Sinarka and Kuntomintar), Ketoy (Pallas volcano), Kunashir (volcanoes Mendeleev and Golovnin). The fluxes were estimated after measuring flow rates and water composition of streams that drain thermal fields of islands. The maximal hydrothermal flux of Cl and S within the Kuril Chain was measured for Ebeko volcano, Paramushir (drained by Yurieva River) as 82 t/d and 222 t/d of chloride and sulfate, respectively. This is comparable with output by fumaroles of Ebeko. The total discharge of Cl and SO₄ from Shiashkotan Island to the Sea of Okhotsk and Pacific Ocean associated with magmatic activity of two volcanoes is estimated as 20 t/d and 102 t/d, respectively, which is significantly lower than the fumarolic output. The hydrothermal flux of Ketoy Island is also low, 8.5 t/d of Cl and 30 t/d of SO₄, much lower than the fumarolic flux. There are two volcano-hydrothermal systems at the Kunashir, the southern island of Kurils. The Ozernaya River drains all thermal fields inside of the Golovnin caldera into the Sea of Okhotsk. The Lesnaya River drains two main thermal fields and thermal springs on the Mendeleev volcano slopes into Pacific Ocean. The volcano-hydrothermal output of chloride and sulfate from Mendeleev volcano was measured as 7.8 t/d of Cl and 11.6 of SO₄, and from Golovnin caldera - 5.7 t/d of Cl and 7.3 of SO₄. The total output of Cl and S from these four islands is 122 t/d and 124 t/d (as S) with the mass Cl/S~1. The highest-temperature fumaroles of Kuril Islands are characterized by Cl/S weight ratio~0.4. Therefore, it could be suggested that a part of hydrothermal sulfur is lost as mineral precipitates (anhydrite, alunites, native sulfur). This work was supported by the RSF grant #15-17-20011.