



## **Fluxes of magmatic chlorine and sulfur from volcano-hydrothermal systems. Examples for Northern Kuril Islands Paramushir and Shiashkotan.**

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The total flux of components degassed from the magma through persistently degassing volcanoes comprises of the volcanic vapor flux from fumaroles to the atmosphere, diffuse flux through volcanic slopes and the hydrothermal flux to the local hydrologic network. 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 ground. The anion composition (Cl and SO<sub>4</sub>) of the discharging thermal waters from a volcano-hydrothermal system 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 (major and trace elements) and isotopic composition of acidic and neutral thermal waters, chemical and isotopic composition of volcanic vapors and solute fluxes from the northern Kurilian islands Paramushir (Ebeko volcanic center) and Shiashkotan (volcanoes Sinarka and Kuntomintar). The total measured outputs of chloride and sulfur from the system in 2006-2014 were estimated on average as 730 g/s and 980 g/s, respectively, which corresponds to the equivalent fluxes of 64 t/d of HCl and 169 t/d of SO<sub>2</sub>. These values are one order of magnitude higher than the fumarolic output of Cl and S from the low-temperature fumarolic field of Ebeko (<120°C). The estimated discharge rate of hot (85°C) water from the system with ~ 3500 ppm of chloride is about 0.3 m<sup>3</sup>s<sup>-1</sup> which is among the highest hot water natural outputs ever measured for a volcano-hydrothermal system. The total hydrothermal discharge of Cl and S from Shiashkotan island to the Sea of Okhotsk associated with magmatic activity of two volcanoes is estimated as ca. 20 t/d and 40 t/d, respectively, which is close to the fumarolic output from both volcanoes (Sinarka and Kuntomintar) estimated using the chemistry and flow rates of fumaroles those measured temperature is close to 500°C.