High-temperature fumarolic activity at Kudriavy volcano (Iturup Isl., Kuriles) during past 25 years

ILYA CHAPLYGIN[1*], YURI TARAN[2], SALVATORE INGUAGGIATO[3]

[1] IGEM RAS, Staromonetny 35, 119017 Moscow, Russia (*correspondence: ichap@igem.ru)
[2] Institute of Geophysics, UNAM, 05410 Mexico, Mexico
[3] INGV, Sez Palermo, I-90146 Palermo, Italy

Kudriavy on Iturup Island is a rare example of volcano with quasi-stable high-temperature fumarolic system. Since the last magmatic eruption (1883) volcanic activity there is characterized by strong field (3000 m^2) degassing with episodic phreatic explosions (the last in October 1999). First gas studies in early 1990-ties revealed temperatures up to 940^{o}C [1]. The fumarolic system of the Kudriavy volcano has been monitored almost each year from 1991 up to 2015 [1, 2, 3]. During this period the concentrations of main components in high-temperature gases varied as follows (mol%): H_2O 92–96, CO_2 0.7–3.23, S_t 1.27–2.96, HCl 0.1–0.7. The maximum gas temperature varied from 820 to 940°C (in 1992). Since 1992 the max temperature slowly decreased down to ~900°C in 1999. At the 1999 phreatic explosion the hottest vent has been buried and max temperature in 2001 (870°C) was measured inside the phreatic crater. In the 2002–2015 period the max temperature remained within the range of 820–850°C at vents of adjacent to the crater fumarolic field. Water isotopes from condensates show that most high-temperature gases (δD -28.5 – -12‰, $\delta^{18}O$ 4.0–11.6‰) are close to magmatic fluids. The $^3He/^4He$ ratios of 7,7 Ra and 7,8 Ra in 2012 and 2013 gases, respectively, which are among the highest values for subduction related volcanoes, indicate high portion of mantle He. The most plausible mechanism supporting such a persistent activity at the Kudriavy implies convection in a magmatic column linking shallow degassing zone and magma chamber. According to that mechanism gas-rich magma ascend and release gases, then submerge within the same magmatic conduit [4, 5]. Observed fluctuations in gas composition at the Kudriavy volcano could be explained by a pulsing character of the convection. This study is supported by RFBR (project 14-05-00874) and RNF (project 15-17-20011).

[1] Taran *et al*. (1995) *GCA* **59**, 1749–1761. [2] Korzhinsky *et al*. (2002) *EPS* **54**, 337–347. [3] Fischer *et al*. (1998) *EPSL* **166**. 81–96. [4] Kazahaya *et al*. (1994) *Bull Volcanol* **56**. 207–216. [5] Stevenson & Blake (1998) *Bull Volcanol* **60.** 307–317.