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THE 2018 FIELDWORKS AT ALAID VOLCANO, ATLASOV ISLAND, THE KURILES

In August 2018, we carried out comprehensive geological and geophysical investigation of the northwestern part of island type Alaid Volcano located in the Kuril Island arc on Atlasov Island (fig. 1a). These research study is a part of a continuous investigation resulted from field works performed on Alaid Volcano in 2007, 2008, 2013–2016. (Rashidov, 2013; Rashidov, Anikin, 2014, 2015, 2016, 2017; Rashidov et al., 2013). Personal observations, Internet data analysis, information received from the Vityaz-Aero company's helicopter plane commander D.A. Zaderay and photos, courtesy of the Volcanoes of Kamchatka natural park's

employee A.N. Bichenko allowed us to conclude that in August and September, 2018 Alaid Volcano was in the stage of fumarolic activity.

In 2018, the research area was located within the coastal zone from the Nochnoi Cape to the Plecho Cape, and the base camp, as in 2014, was located at the mouth of Alaidsky Brook (fig. 1b, 1c).

Unlike the Baklan, Alaid and Severny bays (fig. 1b), landing on this part of Atlasov Island is difficult because of the large amount of seaweed. Quite comfortable conditions for successful field work this year resulted from many streams and large amount

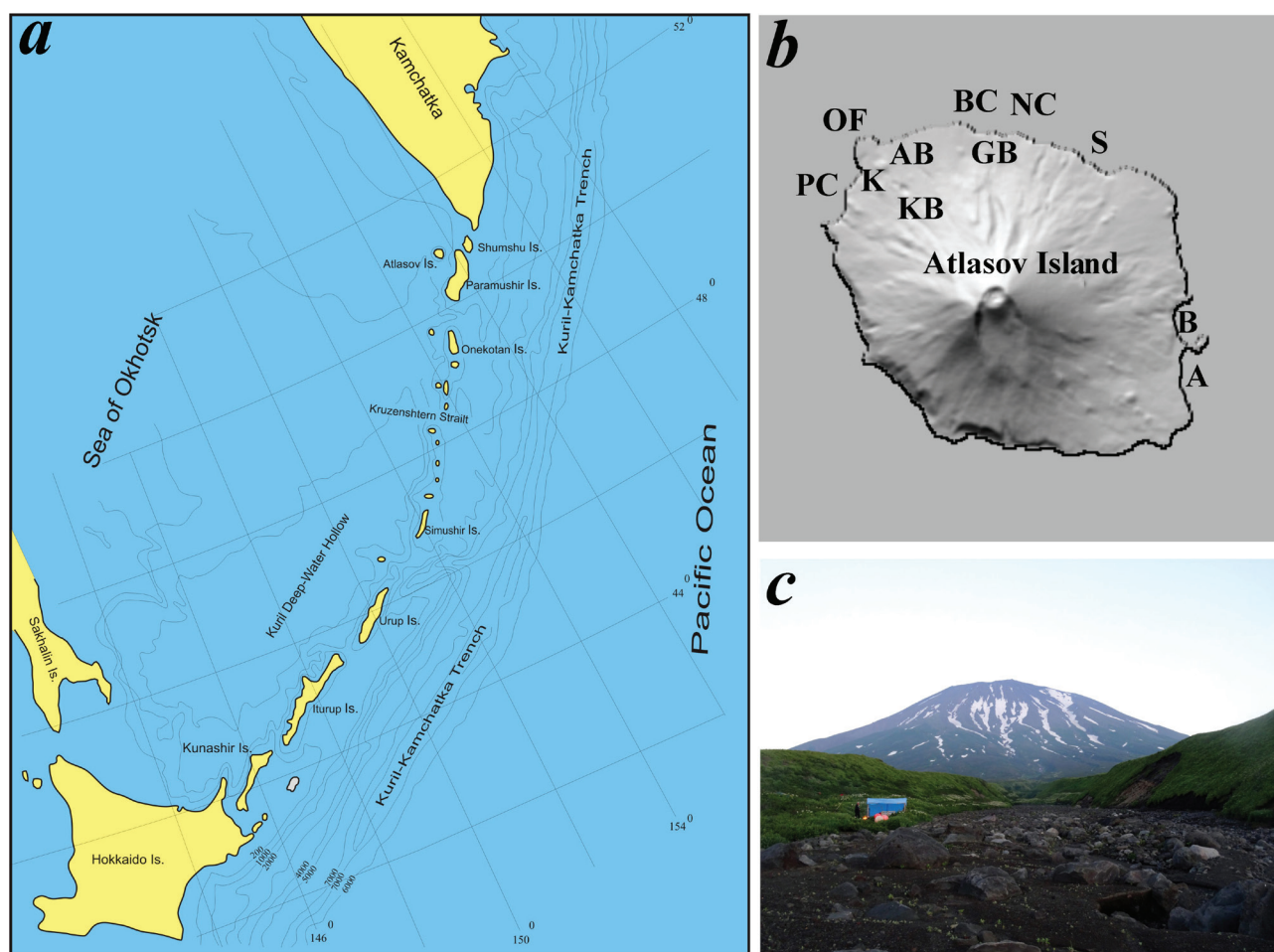


Fig. 1. Location of Atlasov Island (a); objects of investigation (b), Alaid Volcano, Alaid brook and a base camp (c). A — Alaid Bay, B — Baklan Bay, S — Severnaya Bay, NC — the Nochnoy Cape, GB — Glavniy Brook, MC — the Borodavka Cape, AB — Alaid Brook, OF — Olimpiysky fissure, K — the studied cone KB — Krivoy Brook, PC — the Plecho Cape.

of firewood in this place and unusually for the Kuriles dry and sunny weather.

In comparison to 2014 (Rashidov, Anikin, 2014), the Olimpiyskiy Fissure (fig. 2) was slightly overgrown with vegetation, and there the population of bumblebees increased. As a result of flood-and-ebb and landslide processes the coastline within the area from the Plecho Cape to the Borodavka Cape greatly changed: large blocks disappeared, pebbles redistributed and sandy areas appeared. We revealed recent landslides in the area of Alaid'sky Brook and the Nochnoy Cape (fig. 3).

During the field work we made geomorphological and geomagnetic analysis of the Bezymaynny lateral volcanic cone located southwards of the Olimpiyskiy Fissure (fig. 1b). During the works we revealed that the relative height of this cone reached 44 m, and the absolute mark of its top was 110 m (fig. 4a). The magnetic field anomaly ΔT_a , associated with the volcanic edifice, reaches 1266 nT (fig. 4b). Magnetic susceptibility of rocks in the area of Atlasov Island varies in the range of $(0.7-45.2) \times 10^{-3} \text{SI}$, which agrees well with the data of Sakhalin colleagues (Kornev, 1992; Kornev, Volgin, 2000; Kornev, Shkut, 1979) and the results of our previous studies (Rashidov, Anikin, 2014; Rashidov et al., 2018).

During the field studies we sampled the collection of rocks, composing the part of Atlasov Island from

the Plecho Cape to the Nochnoy Cape. We sampled the representative collection of xenoliths from the coastline area of the Borodavka and Nochnoy Capes, the explosive craters of the Olimpiyskiy Fissure, Alaid and Krivoy Brooks (fig. 1b).

We observed copper manifestations in the area of the Olimpiyskiy Fissure, Alaid Brook, the Plecho and Nochnoy Capes as well as in the other parts of Atlasov Island (Rashidov, Anikin, 2014, 2015, 2016, 2017, Rashidov et al., 2013), along the cracks and in the form of continuous covers (fig. 1b, 5).

Laboratory hydrochemical analysis revealed that both the water samples (table) from Alaid and Glavnny brooks (fig. 1b), which are the most full-flowing brooks in the northwestern part of Atlasov Island and the other ones from other brooks and waterfalls of the island are quite suitable for cooking and drinking (Rashidov, Anikin, 2015, 2016, 2017).

During the field work we discovered the splash pools with "coloured water" (Rashidov, Anikin, 2015, 2016, 2017) and another one interesting biogeographic discovery. In the area of the investigated cone, located not far from the Olimpiyskiy Fissure (fig. 1b), we managed to find a colony of land snails of the Bradybaenidae family, which are the largest among the terrestrial mollusk fauna of the Asian part of Russia (fig. 6). For the first time these mollusks were observed on Atlasov Island by Japanese zoologists as

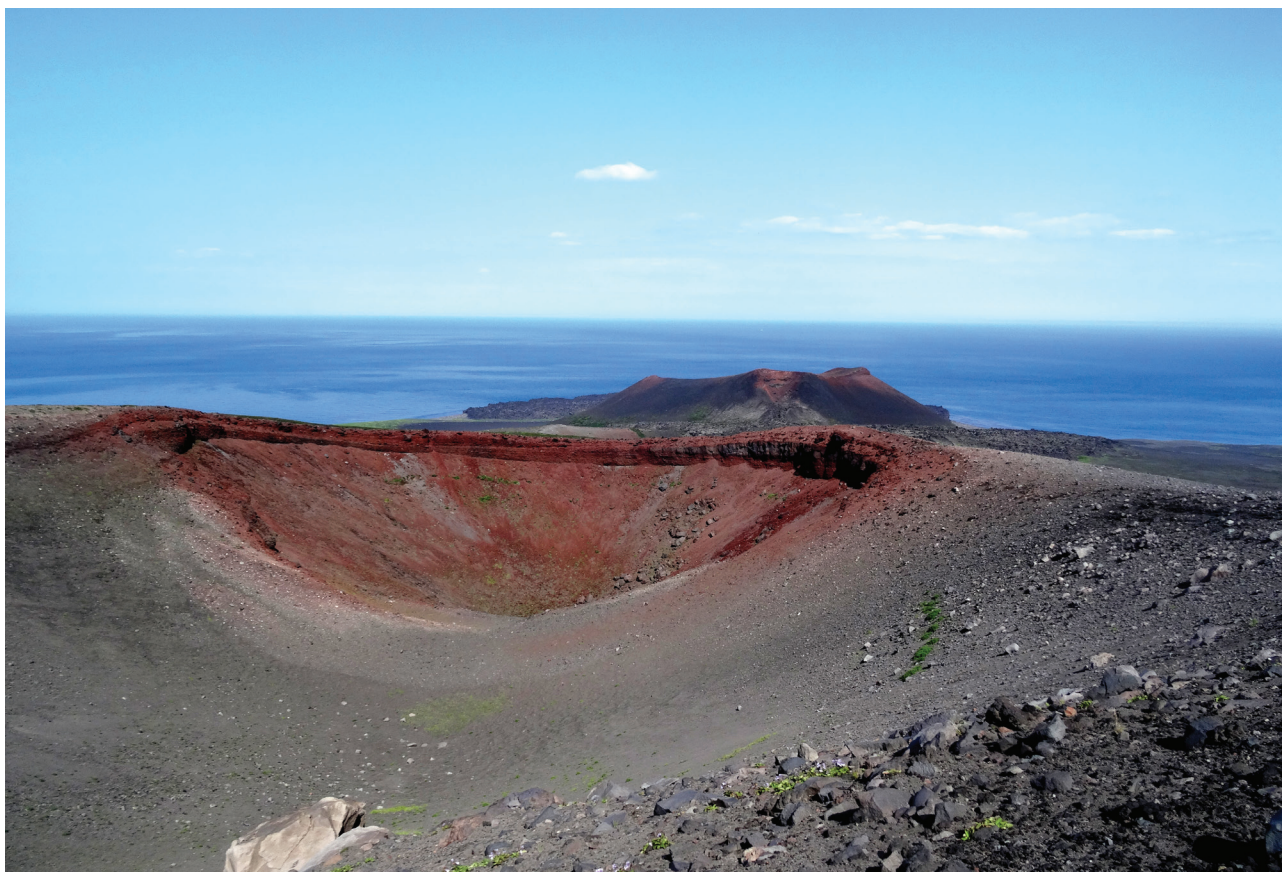


Fig. 2. Olimpiyskiy fissure.

a*b*

Fig. 3. Landslides within Alaid Brook (a) and the Nochnoy Cape (b).

Bradybaena urupensis, however, after the 1933–1934 Taketomi Volcano eruption *Bradybaena urupensis* were not found on the island until 2004 when one snail was observed in the south of the island (Solovyov, 2005). We found a colony of snails in the northwestern part of the island. At the present level of knowledge, we can confidently say that large snails of the *Bradybaena urupensis* family survived the eruptions of the 20th and 21st centuries, at least in the southern and northwestern parts of Atlas Island.

The Vice-President of the Far Eastern Malacological Society, PhD in biology L.A. Prozorova in her personal report told, that it was necessary to select material with special fixation and subsequent molecular and phylogenetic analysis to establish not only the species, but also the tribal affiliation of these snails. And that it was not possible to distinguish the *Karatohelix* and *Fruticicola* genera by conchological signs, because the ranges of them intersect on Onekotan Island and other islands in the northern

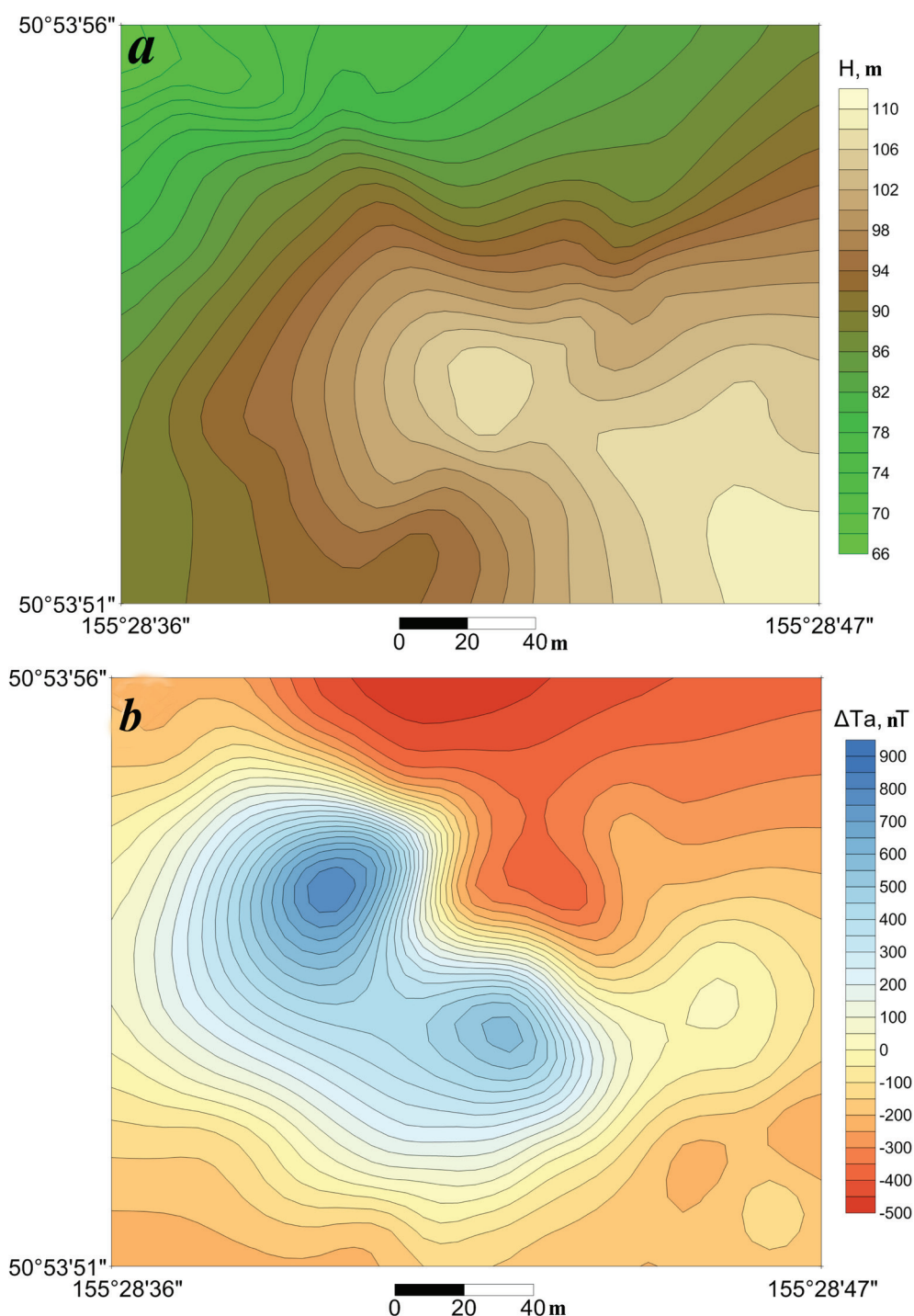


Fig. 4. Terrain (a) and anomalous magnetic field ΔT_a (b) of an unnamed cone.

part of the Great Kuril Ridge (Prozorova, 2000, 2002, 2009).

The above facts once again show that it is important to continue complex interdisciplinary research of Atlasov Island. This unique island-volcano, located on the border of two constituent entities of the Russian Federation, Sakhalin Region and Kamchatka Region, as well as its neighboring islands, may become reference objects for research conducted by both Russian and foreign scientists over the course of many years.

While we were in Severo-Kurilsk during our journey from Petropavlovsk-Kamchatsky to the island-volcano Alaid and back, just like in 2016–2017 (Rashidov, Anikin, 2016, 2017), we observed the activity of Ebeko Volcano.

Since the period 2015–2016 the ecological situation in Severo-Kurilsk has deteriorated drastically: permanent ashfalls within the town (fig. 7); certain ash emissions were accompanied by a perceptible rumble, which, according to old residents, had never been observed before. Sometime the volcano produced



Fig. 5. Copper occurrence within Olinpiysky fissure (a), Alaid Brook (b), the Nochnoy (c) and Pleco capes (d).



Fig 6. Land snail of the family Bradybaenidae.

During the field work we collected fresh-looking rock samples in the near-crater zone of Ebeko Volcano, the magnetic susceptibility of which varies in the range $(1.6-9.9) \times 10^{-3} \text{SI}$, and collected ash samples at different places on Paramushir Island over the period July-August 2018.

Laboratory hydrochemical analysis of water samples collected from water intakes and a brook in Severo-Kurilsk showed high acidity (Table).

Analysis of messages and photographs sent by Severo-Kurilsk residents, V.I. Gaidukov and S.P. Lakomov, as well as materials from the Internet (<http://www.emsd.ru/>; <https://ds.data.jma.go.jp/svd/vaac/data/>) suggested that the behavior of Ebeko Volcano in September 2018 remained unchanged.

Of course, the Severo-Kurilsk residents are worried about the existing situation. Besides the common problems with health services and transport links to the mainland of Russia, there have also been added permanent ash emissions that significantly aggravate the ecological situation. The concern is further aggravated by the fact that, due to insufficient funding, ground monitoring of Ebeko Volcano at

the emissions up to three times per hour (fig. 8). First-hand observations and analysis of photographs and videos kindly provided by residents of Severo-Kurilsk showed that emissions were often produced almost simultaneously from two craters.

During the ascent of Ebeko Volcano we noted fragments of rock erupted from the crater; despite the cold fog, some of them were still warm (fig. 9), while the neighboring stones had an ambient temperature.

Chemical composition of brook waters from Atlasov Island, intake areas and a brook in Severo-Kurilsk.

Objects	Atlasov Island		Severo-Kurilsk			
Sampling point	Alaid Brook	Glavniy Brook	Exposed intake	Japanese water intake	Covered intake	Brook running at Ebeko Volcano
Cations, mg/l						
H ⁺	-	-	-	-	-	0.20
Na ⁺	10.44	13.40	5.99	8.17	11.01	8.80
K ⁺	3.36	3.43	1.16	1.51	1.40	2.80
Ca ²⁺	8.19	5.38	10.43	5.77	9.30	28.10
Mg ²⁺	2.72	2.61	1.79	1.68	2.00	4.40
Fe ²⁺	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.80
Fe ³⁺	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
NH ₄ ⁺	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Al ³⁺	-	-	-	-	-	4.50
Total amount	24.74	24.82	19.37	17.13	23.71	49.60
Anions, mg/l						
HCO ₃ ⁻	23.18	23.18	1.22	18.30	13.42	-
Cl ⁻	12.16	17.37	8.68	12.16	10.42	35.50
SO ₄ ²⁻	16.20	3.40	36.40	4.50	25.00	114.30
F	< 0.19	< 0.19	< 0.19	< 0.19	< 0.19	0.30
NO ₂ ⁻	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
NO ₃ ⁻	0.65	5.36	1.40	0.42	1.93	< 0.1
PO ₄ ³⁻	0.20	0.19	0.19	0.18	0.12	< 0.05
Total amount	52.39	49.31	47.89	35.56	50.89	150.10
Microcomponents						
Zn	0.08	0.08	0.08	0.07	0.17	-
Pb	0.03	< 0.005	0.03	0.03	0.02	-
Other components definitions						
pH	6.7	7.2	4.35	6.7	6.41	3.68
H ₃ BO ₃ , mg/l	1.23	-	1.23	1.23	1.23	41.60
SiO _{2p} , mg/l	22.68	-	22.34	22.00	22.68	3.70
SiO _{2k} , mg/l	-	-	-	-	-	41.60
Mineralization, mg/l	99.78	93.05	89.60	74.69	99.78	245.00

The water was analyzed in the Analysis Centre of the Institute of Volcanology and Seismology FEB RAS by S.M. Ivanova, A.A. Kuzmina, S.V. Sergeyeva, and V.M. Ragulina.



Fig. 7. The June 29, 2018 ash from Ebeko Volcano.



Fig. 8. The August 11, 2018 ash emission at Ebeko Volcano.

present is too far from perfect, while no proper training activities for the residents have been carried out so far.

The August 2018 fieldworks revealed active modern geological processes on the island-volcano Alaid, which is currently producing fumarolic activity. We performed geomorphological and geomagnetic studies of another adventive cone on Alaid Volcano and collected rocks and xenoliths. For the second

time in the XXI century, the largest among all terrestrial malacofauna in the Asian part of Russia, Bradybaenidae snails were found on Atlasov Island.

The observations of the Ebeko activity and the analysis of the collected information showed that frequent ash emissions over the period July to September 2018 were produced simultaneously from two craters.



Fig. 9. A near-crater zone at Ebeko Volcano, August 11, 2018.

It is obvious that this unique island-volcano Alaid, located on the border of two constituent entities of the Russian Federation, Sakhalin Region and Kamchatka Region, requires further integrated interdisciplinary research. It is also necessary to upgrade the ground monitoring of Ebeko Volcano and complete it with

a complex of modern geophysical methods and start proper training activities for the residents.

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