NEW DATA ON HOLOCENE MONOGENETIC VOLCANISM OF THE NORTHERN KAMCHATKA: AGES AND SPACE DISTRIBUTION

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The recent volcanic activity in the Northern Kamchatka is particularly interesting, since it overlies the suggested northern rim of the subducting Pacific plate. We have found and documented a number of Holocene monogenetic volcanic vents located farther north of the westward extension of the Aleutian fault that is beyond the identified-as-active subduction zone. Our tephrochronological and radiocarbon studies have allowed us to date some Late Pleistocene–Holocene monogenetic volcanoes in this region and study their deposits. The dated vents are located both on the eastern and western slopes of Sredinnyi Range.

The lava flow of the Levaya Belaya River. The source of this lava flow (56°38'N, 159°43'E) is located 5 km to the ENE from the summit of Mt. Chashakondzha (2526.6 m), on the steep right bank of the river valley. The altitude of the cone's summit is ~1400 m. The length of the lava flow is 3.5 km, the width is 450 m and might have reached 550 m if we consider the eroded parts of the flow. The estimated volume of the cone with regard to its position on the steep slope is ~0.0015 km^3 (diameter is 500 m with a height of 200 m). The volume of tephra fall is 0.025 km^3. The total volume of the pyroclastic material is 0.04 km^3. The area of the flow amounts to 1.6 km^2. Considering the average thickness of the lava flow being ~100 m, the volume of the flow ranges from 0.16 to 0.21 km^3. The total volume of erupted material is 0.2-0.25 km^3 [1].

The Kireunsky lava flow. The Kireunsky cone (56°41'N, 159°44'E) is situated on the divide between the Kirevna and Pravaya Kirevna Rivers, 5.5 km to the east of the Mt. Alney summit (2598.0 m). The elevation of the summit is ~1400 m. The length of the flow is 9 km with a width of up to 1 km. The calculated volume of the cone is about 0.006 km^3 (the diameter at the base is around 400 m, the height is 100 m), the volume of the air-borne tephra is about 0.01 km^3. The total volume of the pyroclastic material is 0.016 km^3. The area of the lava flow is 3.6 km^2. Assuming the average thickness of the lava flow of 50 m, the volume of the flow is close to 0.18 km^3. The total volume of the erupted material is about 0.2 km^3 [1].

The tephra from this cone is overlain by the marker ash layer of the Sheveluch volcano (SH_5), with an age of 2553±46 ^{14}C years [2]. Tephra of the Kireunsky Cone almost immediately overlies the tephra of the Levaya Belaya River Cone. The sandy loam underlying the pyroclastic material of both cones yielded the radiocarbon date of 2610±70 years (GIN-12089). Therefore, the monogenetic volcanic structures of the eastern slope of the Alney-Chashakondzha massif were formed almost synchronously ~2600 ^{14}C years ago.

The Mt. Bolshaya-Kekuknaysky volcano massif is situated in the western foothills of the Sredinnyi Range, 200 km away from Sheveluch volcano. The large trough valley dissects the volcano's body and hosts several well preserved lava flows and cinder cones, which dammed Bolshoe Gol'tsovoe and Maloe Gol'tsovoe lakes. Based on our tephrochronological data and signs of a glaciation, the **lava flows at Goltsovoe lakes** were formed during the last glacial period.

The Kekuk Crater (56°34'N, 158°02'E) is situated at the northern foothill of the Kekyknaisky Volcano, 20 km NE of the summit of Mt. Bolshaya (1299.0 m). It represents an explosive crater with a diameter of ~1 km that was formed on a flank of the extrusion (728 m), which likely has formed immediately prior to the crater. The wall of the crater is composed of a juvenile pumiceous material with an admixture of fragmented rocks of the destroyed extrusion. The estimated volume of the primary extrusion (with a diameter of 1.5 km and a height of 100 m) is 0.06-0.08 km^3; the volume of the ejected pyroclastic material is estimated at ~0.02 km^3, whereas the total volume of the erupted material is 0.1 km^3. The tephra, which originated from the crater, has an intermediate stratigraphic position between the marker ashes of the Kurile Lake caldera-forming eruption (7600 ^{14}C years BP) [3] and the ash of the sub-caldera eruption of the

Khangar volcano (6900 ^{14}C years BP) [4]. Radiocarbon dates of 7210±50 (GIN-12490) and 7310±40 (GIN-12493) from the underlying organic-rich loam and peat allow us to date this eruption at about 7200–7300 ^{14}C years. The Kekuk Crater has an extreme north-western position among the presently known centers of Holocene silicic volcanism in Kamchatka.

The Kinenin Maar (57°21'N, 160°58'E) is located in the eastern piedmonts of the Sredinnyi Range, at the stream of the same name (right upper tributary of the Elovka River) 80 km to NNW from the Sheveluch volcano. The maar is represented by a funnel-shaped crater, encircled by the wall of ejected material (the diameter of ~2.5 km and the maximum height of the wall of 583 m). The crater is filled with the lake with a diameter of 1 km and the height of the water table of 400 m. The eruption of the Kinenin Maar was of the phreato-magmatic type: the crater wall is composed mostly of disintegrated host rocks, but the juvenile material was found at the base of this sequence (silicic ignimbrite) and at its top (mafic pyroclastic material). The tephra of this eruption spread to ENE. The volume of the erupted material is approximately estimated at 0.5 km^3. The age of the eruption is bracketed by radiocarbon dates of 1070±40 (GIN-12505), the overlying peat, and 1110±40 (GIN-12511), underlying soil, and is estimated as ~1100 ^{14}C years BP. The Kinenin is the youngest of the known Kamchatka maars. Its location is also unique: it is situated considerably far to the north from the Aleutian transform fault, that is beyond the currently accepted limits of the zone of the active influence of the subducting Pacific Plate.

The Bliznetsy («Twins») lava flows (57°21'N, 161°22'E) originated from the closely spaced lava centers. They are situated 25 km to the east from the Kinenin Maar, at the right bank of the Ozernaya River, 80 km to the north from the Sheveluch volcano. The eruption was preceded by weak phreato-magmatic explosions. The resulting lava field has an area of 5 km^2 (length is 2.5 km, the width is 2 km) and the average lava thickness of 30 m. The volume of the erupted material is 0.15 km^3. The radiocarbon dates for the peat overlying the deposits associated with the eruption (2800±40 (GIN-12510) and 3010±40 years (GIN-12508)) allow us to estimate the age of the event at 3000 ^{14}C years BP. The Bliznetsy flows as well as the Kinenin Maar are situated beyond the identified-as-active subduction zone of Kamchatka.

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Refernces

1. Pevzner M.M. 2003. Holocene monogenetic volcanic forms of the eastern slope of the Alney-Chashakondzha Massive (the Sredinnyi Range, Kamchatka). In: Volcanism and geodynamics. Ekaterinburg, September 9-12, pp. 695-698.
2. Braitseva O. A., Ponomareva V. V., Sulerzhitsky L. D., Bailey J. 1997. Holocene key-marker tephra layers in Kamchatka, Russia // Quaternary Research. V.47. P.125-139.
3. Zaretskaia N.E., Ponomareva V.V., Sulerzhitsky L.D., Dirksen O.V. 2001. Radiocarbon dating of the Kurile Lake caldera eruption (South Kamchatka, Russia) // Geochronometria, 20: 95-102.
4. Bazanova L.I. and Pevzner M.M. 2001. Khangar: One More Active Volcano in Kamchatka // Transactions (Doklady) of the Russian Academy of Sciences, Earth Sciences, Volume 377A, March–April, p. 307-310.