

## RECONSTRUCTION OF A GIANT PYROCLASTIC FLOW ASSOCIATED WITH KARYMSHINA CALDERA, SOUTH KAMCHATKA

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**New extensive ignimbrite field was allocated (Fig. 1.), their relationship with Karymshina caldera, the only known Russia supervolcano [1], was proved.** Earlier ignimbrites associated with Karymshina caldera were known only within this structure. Karymshina caldera was allocated after dismemberment of "Karymshinsky complex" of rocks – thick layer of mostly tuffs and ignimbrites, which geologists distinguished earlier in this territory. Study of cross-sections in the field [1], dating of rocks with Ar-Ar method [2, 3] allowed to divide "Karymshinsky complex" into few assises [4]. It was found that tuffs and ignimbrites associated with Karymshina caldera ("Karymshinsky" ignimbrites) are of Eopleistocene age (1.5-1.78 million years). Tuffs and ignimbrites, exposed at the sides of the caldera ("Sychugansky" ignimbrites – named after the mountain where most complete cross-section of these rocks is outcropped), are of more ancient age – 3.5-4 million years old [5].

Microscopic tuffs and ignimbrites of Karymshina caldera are rocks rich of plagioclase, quartz, biotite phenocrysts, constituting 45-50% of the rock volume. Plagioclase prevails; there are individual grains and fragments of mono-mineral attachments. Phenocrysts are melted, resorbed, contain melt inclusions. Biotite (0.3-0.5 mm) forms lamellar grains and thin sometimes curved and split-off laths. The **bulk** of the rock is represented by brown devitrified glass, with preserved outlines of ash particles. Pocks composition is rhyolites (70-72% SiO<sub>2</sub>). Partly rocks are sintered so much that they have a lava-like shape.

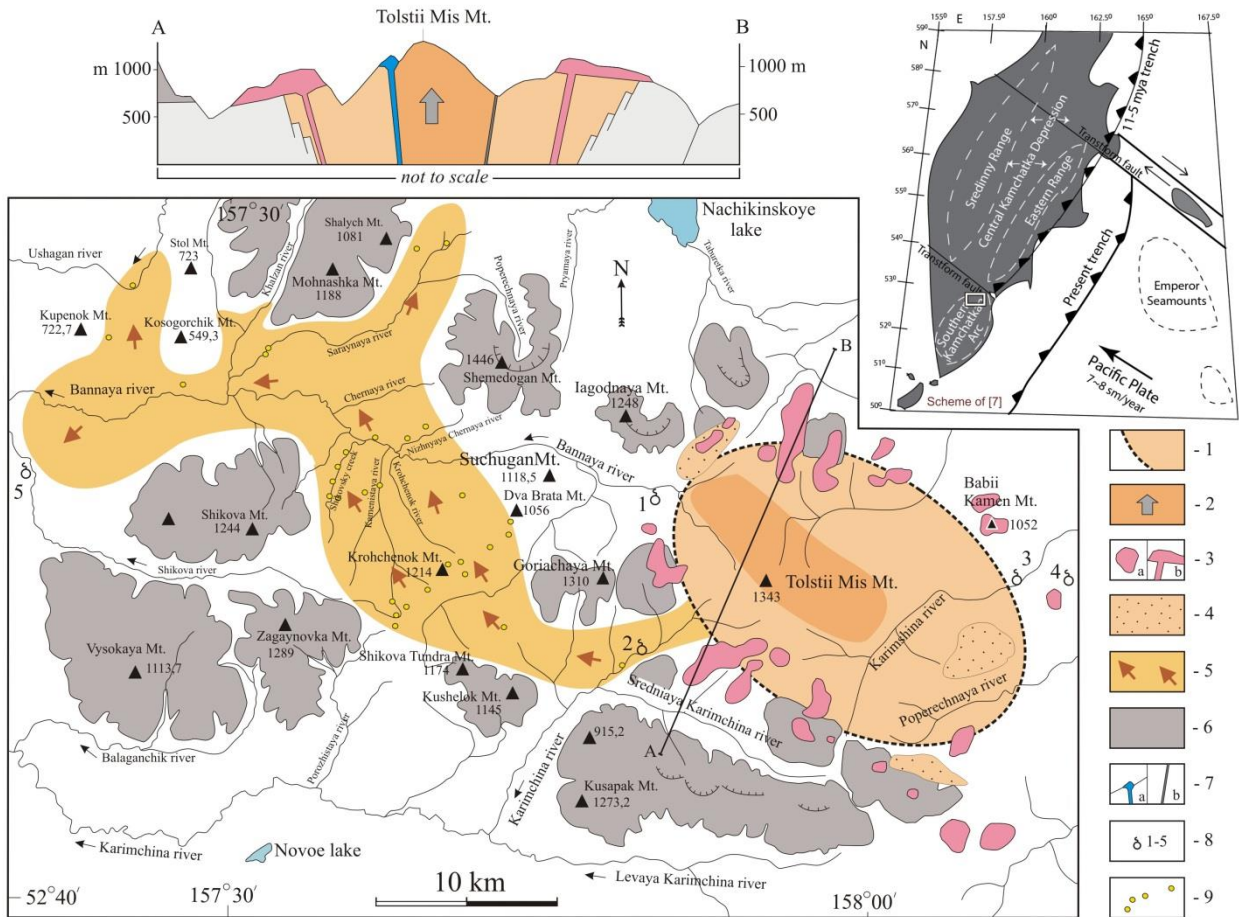
**In 2007-2012** (at the first stage of works) ignimbrites associated with Karymshina caldera were identified only within the caldera, which they have filled many years ago. Their thickness is more than 1000 m and it is a minimal value since we didn't find ignimbrites underlying sediments inside the caldera. We also didn't find associated ignimbrites outside the caldera before 2012, although we examined all the surrounding areas. Numerous pre-caldera volcanoes located on the perimeter of the caldera were identified and studied [6].

**In 2012**, while working in the middle reaches of the Bannaya River, 15 km to the west of the Karymshina caldera borders "Karymshinsky" ignimbrites were first discovered outside the caldera. After that the work focused on the mapping of the ignimbrites thickness was conducted. It was found that they occupy vast areas in the Bannaya river basin, and in the basins of neighboring Saraynaya, Khalzan and Ushagan rivers.

**In 2013-2015** "Karymshinsky" ignimbrites were found at a distance of 35-45 km from the edge of the Karymshina caldera. As a result, it became clear that we are dealing with deposits of a giant pyroclastic flow that has spread to the west and north-west of the caldera across a paleovalley. Their thickness along the flow gradually decreases from 500-600 to 200 m or less as the distance from the eruption center increases. The field is located away from the caldera and previous researchers did not associate them and did not consider the field as a homogeneous, regularly arranged formation. We also clarified understanding of volume and distribution area of ignimbrites associated with Karymshina caldera. The flow area is 298.2 km<sup>2</sup> and volume is 84.4 km<sup>3</sup>.

The above data on the identified pyroclastic flow ignimbrites volume, apparently, give an idea only on a small part of deposits (ignimbrites coverings around the caldera), which were formed during the caldera-forming eruptions in the region. Probably, the explored flow is not the only one, and new areas are occupied by deposits of other pyroclastic flows, which spread in other directions from the Karymshina caldera boundaries, will be found in the future.

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**Fig.1 – A summary map showing the boundary of Karymshina caldera, its internal structure and a large pyroclastic flow associated with the caldera: (1) boundary of the Karymshina caldera and the deposits that fill it (only shown in cross-section); (2) resurgent uplift; (3) rhyolite extrusions and associated lava flows: (a) on map, (b) in cross-section; (4) areas of detected lacustrine deposits (tuff sandstone and tuff aleurolite); (5) pyroclastic flow; (6) pre-caldera volcanoes; (7) small volcanic structures composed of basaltic lavas (a) and ore veins (b) located at edges of resurgent uplift; (8) thermal hot springs: 1 – Bol'she-Bannaya, 2 – Karymchina, 3 – Karymshina, 4 – Verkhne-Paratunskie, 5 – Apachinskie; (9) – point sampling.**

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