NEW DISCOVERED LATE MIOCENE VERCHNEAVACHINSKAY CALDERA ON EASTERN KAMCHATKA (UPSTREAM OF LEVAYA AVACHA AND KAVYCHA RIVERS): GEOLOGY, BOUNDARY AND COMPOSITION

O.V. Bergal-Kuvikas[1,2], V.L. Leonov[2], A.N. Rogozin[2], I.N. Bindeman[3], E.S. Kliapitskiy[2]
[1]Earth Observatory of Singapore, Nanyang Technological University, Singapore
[2]Institute of Volcanology and Seismology, Petropavlovsk-Kamchatsky, Russia
[3]University of Oregon, USA

During 2009, 2010, 2014 field works the new obtained caldera complex descripted in springheads of Levaya Avacha and Kavycha rivers (Eastern Range, Kamchatka) (Kuvikas & Rogozin, 2009; Leonov et al., 2011). Natural outcrops represented by thick interbedded layers of welded tuffs and ignimbrite (>500 meters thickness). The interbedded layers cover nearly 10 km area (Fig. 1). Volume of pyroclastic deposits was calculated as 220-230 km^3, based on size of caldera (Mason et al., 2004). These ejected volumes correspond to strong explosive eruptions with VEI 7 or more. The age of caldera-forming eruption was determined by Ar-Ar method to be of Late Miocene (5.78~5.58 Ma BP).

Detailed descriptions of the numerous thin sections and whole-rock geochemistry allows us to correlate sections of exposed outcrops from Verhneavachinskaya caldera (Fig. 2). We distinguished four main types of the rocks, which are characterized by different major and trace element composition, colors, textures, mineralogical and geochemical compositions. First types of the layers is ignimbrite of basaltic andesitic composition. Columnar jointing occurs at the most of the ignimbrite, exposed by active erosion process. Pyroclastic texture characterize most ignimbrite layers: microtexture represents by fragments of plagioclase, pyroxene phenocrystalls, and matrix of the rocks contains lithified welded tuffs with numerous fiammes. Second type of the layers is black, dense basaltic andesite less-changed ignimbrite layers. Structure of rocks contents fragments of plagioclase, pyroxene phenocrysts. Matrix of rocks represents by oriented plagioclase microlites. Third type is altered tuffs with yellow-orange tone. These rocks characterized by significant secondary hydrothermal alteration of rock`s matrix with quartz micro veins. Fourth type of the layers is volcanic breccias, which composed of broken different sizes rocks fragments with cemented tuffs matrix.

Whole-rock geochemistry of ignimbrite changes from basalt to andesite (SiO_2 51.2-59.5 wt. %), with corresponding natural decreasing FeO*, CaO, MgO, TiO_2. Across the outcrops from lower to upper ignimbrite layers the decreasing contents of SiO_2, MgO, Na_2O are observed with minimum on the top of outcrop. In comparing with another ignimbrite fields on Kamchatka the rocks from Verhneavachinskaya caldera characterized by higher contents of Nb, Ta, TiO_2 and MgO, lower contents of Na_2O, SiO_2 (Kliapitskiy, 2014).

New discovery of the Late Miocene Verhneavachinskaya caldera is as one of the older and mafic complex on Kamchatka opens many questions for origin and evolution magma in active island arc system: which are features of Late Miocene volcanism and how it correlate with geodynamic setting, e.g. with slab jumping and originated transform faults (Avdeiko, Bergal-Kuvikas, 2015).

Reference

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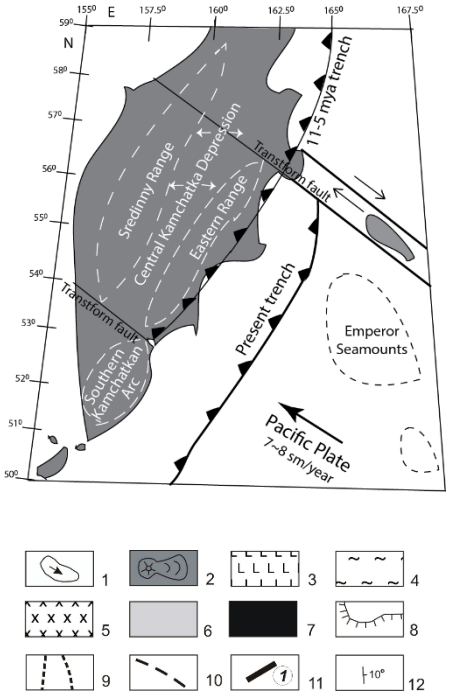

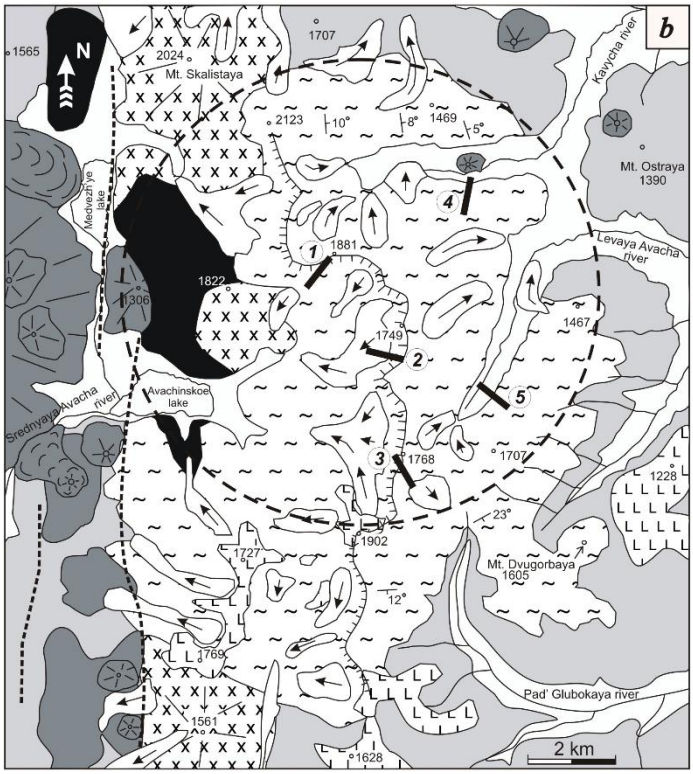

Fig. 1 a) General plate tectonic position of the Kamchatka and location of the Verhneavachinskaya caldera (black square).

b) Scheme of geological structure of springheads of Levaya Avacha and Kavycha rivers (Leonov et al., 2011). Note: 1 - Late Pleistocene-Holocene alluvium, glacial and debris deposits, arrows indicate movement of landslides, 2 - Pleistocene cinder comes and related lava flows, 3 – Pliocene-Early Pleistocene andesitic lava flows, 4 – Late Miocene ignimbrite deposits, 5 – Latter Miocene diorite intrusions, 6 – Miocene porphyritic basalts, agglomerate tuff, 7 - Late Cretaceous siltstones, argillites, 8 – cliffs of Avachinsky range, 9 - faults which are boundary graben of Srednyaya Avacha river, 10 - boundary of new-discovered caldera, 11- location of studied outcrops of ignimbrites (1-L-2010, 2-L-2014, 3-L-2012, 4- R-2009, 5-L-2009, please see details on Fig. 2), 12 – dip of the ignimbrite layer.

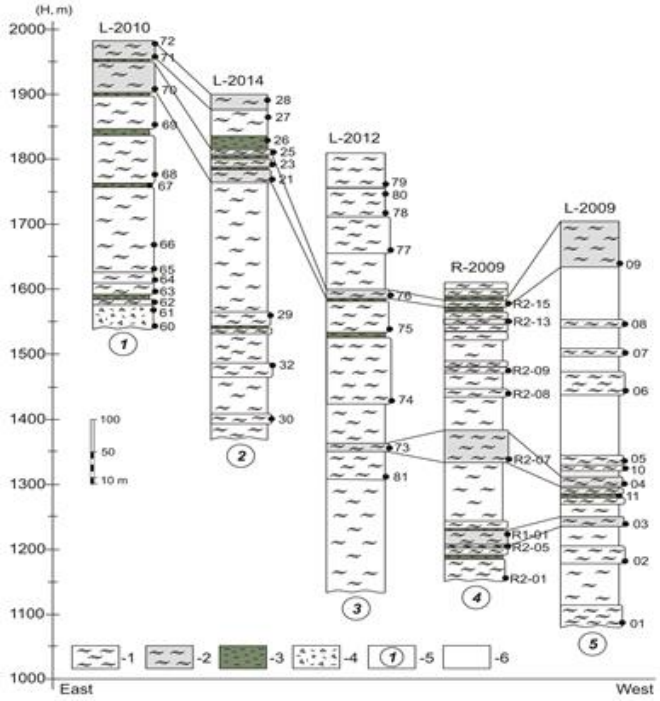

Fig. 2. Correlation of stratigraphic sections. Note: 1- ignimbrite layers, 2- marked ignimbrite layers, which are correlated on the sections, 3- altered tuffs with yellow-orange tones, 4-volcanic breccia, 5- numbers of the section are showed on Fig. 1, 6 – sodded outcrop area.

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