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Plinian basaltic andesite eruptions of Avachinsky volcano, Kamchatka, Russia: chronology, dynamics and deposits

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Avachinsky volcano is one of the most active volcanoes of Kamchatka, Russia. It is located in the Eastern volcanic belt at a distance of 25-30 km from the largest cities of Kamchatka Petropavlovsk-Kamchatsky and Elizovo with the population about 300 thousand people. Avachinsky is a Somma-Vesuvius type volcano. It consists of the Late-Pleistocene stratovolcano with a large (4.5 x 4.0 km) crater, which was formed about 30 000 14C year B.P., and the active Young cone built inside the crater. The Holocene eruptive history of Avachinsky volcano was reconstructed in detail by geological and tephrochronological studies and radiocarbon dating. The explosive eruptions were characterized by the andesite composition of their juvenile pyroclastics since 7250 to 3700 14C years B.P. About 3500 14C year B.P. the feeding system of the volcano was cardinally rebuilt and the Young cone of Avachinsky volcano started to grow and it is still active. Two initial catastrophic eruptions at 3500 (IIAV1) and 3300 (IIAV3) 14C yrs B.P. marked the onset of a new stage of the volcanic activity. This stage is characterized by eruptives with low silica content (basaltic andesite). According to their parameters and products peculiarities the both eruptions fall into the plinian category and can supplement the present catalogue of such a large events including the list of plinian eruptions with products of basic composition. Opening phases of the eruptions IIAV1, IIAV3 were represented by fine basal ashes. Then, in case of IIAV1, phreatomagmatic explosions caused formation of base surge and small pyroclastic flow. During the plinian phases of eruptions several tephra falls alternated with formations of pyroclastic flows and pyroclastic surges with accretionary lapilli. Tephra prevailed among the products of both eruptions and its volume comprised ≥3.0 and $>$1.1 km3, respectively. Column height was calculated and comprised 21-28 km. The IIAV1 ash dispersed on the distance of 300 km NE from

the source. The ashfall area within the 1cm isopach was about 50 000 km2. Dispersal indexes - 34 000 km2 (IIAV1) and 17 000 km2 (IIAV3) - exceed those of some silicic plinian eruptions. Tephra units are reversely graded scoria deposits with a total thickness of 1-1.5 m on the distance of 5-7 km from the vent. They are predominantly composed of juvenile black and dark-brown dense scoria with rare small lapilli of andesitic pumice. Lithic material is represented by the rocks of the Late-Pleistocene Somma and Early-Holocene extrusive domes buried under the recent Young cone. We have found numerous altered clasts and rare basite-ultrabasite xenoliths. Chemically, the juvenile scoria are tholeiitic basaltic andesits with 52 to 56 wt.% SiO2. Pyroclastic flows radially moved down the river valleys on a distance of 10-12 km. Nowadays the maximum thickness of these deposits comprises 10 m on the distance of 8 km from the vent. These deposits contain the abundant charcoals. We suppose that eruptions column collapses resulted in formation of these pyroclastic flows. It differs from Fuji volcano events, where basaltic pyroclastic flows were formed when ejecta from the explosive summit eruptions fell on the steep slopes, tumbled down the slopes, and were remobilized as high-temperature granular flows (Yamamoto et.al., 2005). The total volumes of IIAV1 and IIAV3 ejecta comprised ≥3.6 km3 (≥1.97 DRE km3) and $>$1.21 km3 ($>$0.65 DRE km3), respectively. Complex volcanological, petrological and geophysical data suggest that formation of gas-saturated basaltic andesite magmas is likely a result of ascent of wet andesite magma into shallow chamber of basic magmas. This research was supported by RFBR grants.