



Geochemistry and origin of Puschino hot springs, Kamchaka Peninsula, Russia

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Puschino hot springs are located in the valley of Kashkan River, Central Kamchatka (N54°2.938', E158°2.712') and are surface manifestations of a long-lived hydrothermal system associated with a Quaternary volcanism, off the modern volcanic front. The total natural discharge of thermal water from numerous vents is not more than 10 l/sec, vent temperatures are < 40°C, the total dissolved solids (TDS) < 5 g/L. The waters are near neutral (6 < pH < 7), with a composition of Na-Cl~HCO₃ and relatively high SO₄ content (< 360 ppm). The springs are characterized by a strong bubbling with CO₂ as a main gas component (> 95 vol%). Several wells drilled in 1980th up to 600 m depth found similar waters with temperature ~ 70°C and slightly higher TDS and pH. Bubbling gas is characterized by a very high ³He/⁴He up to 7.8Ra (Ra is the atmospheric ratio) and CO₂/³He ~ 1011, close to typical values for subduction zones. Water isotopic composition shows a positive correlation with chloride and a trend to magmatic values (up to 10 % of magmatic water). Waters have a low Ca/Sr weight ratio of ~ 20 and the total REE concentration lower than 2 ppb. Strontium isotope ratio ⁸⁷Sr/⁸⁶Sr of 0.7043 ± 0.0001 is close to the ratio in the local volcanic rocks. The geological setting and a high magmatic contribution to thermal waters of Puschino may evidence that the heat and volatile source for the hydrothermal system is associated with the Olenya volcanic massive, which, according to the reconstruction by Leonov (unpublished), is an early Pleistocene (~2Ma) postcaldera complex above a still hot and degassing intrusive body.