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Isotope Disequilibrium of ^{238}U-series in latest Pleistocene through Holocene volcanic rocks from Hangay, Central Mongolia and Eastern Sayans, Siberia

S. Rasskazov (1), E. Chebykin (2), I. Chuvashova (1), N. Zhuchenko (2), and O. Stepanova (2)

(1) Institute of the Earth's crust SB RAS, Irkutsk, Russia (rassk@crust.irk.ru / Fax: +3952 426900 Phone: +3952 511659), (2) 1Limnological Institute SB RAS, Irkutsk, Russia (cheb@lin.irk.ru / Fax: +3952 425405 Phone: +3951 425312)

Isotopes of ^{238}U-series have been measured in volcanic rocks using mass-spectrometer Agilent 7500ce by ICP-MS technique developed for express-analysis of Late Pleistocene through Holocene sedimentary sequences in Lake Baikal (Goldberg et al., 2001; Chebykin et al., 2004, 2007; Zhuchenko et al., 2007). In Eastern Sayans, measurements were performed on samples from the Holocene lava flow of the Zhom-Bolok River valley and Late Pleistocene Ulug-Arga volcano. In Hangay, isotopes were determined also for samples from two sites. The first one exhibited a W-E stretching line of three unnamed Late Pleistocene shield volcanoes in the upper current of the Orkhon River. The second one represented another W-E stretching line of the Late Pleistocene volcanoes Odnobokiy, Listvennichny, and Sosnovy located together with the Holocene volcano Khorgo in the Taryat Basin (Chuvashova et al., 2007).

Samples from the Holocene volcanic units of both regions showed ^{230}Th excesses expressed by significant shift of points from an equiline (^{230}Th/^{238}U) = 1.0 (parentheses denote units of activity). Samples from the Late Pleistocene units also demonstrated notable isotopic disequilibrium. Isochron coordinates (^{230}Th/^{232}Th) vs. (^{238}U/^{232}Th) were used for estimations of volcanic timing. Three samples from the Ulug-Arga volcano distributed along a line corresponding to age of 51 Ka with stability of solution from 31 to 61 Ka (calculations performed using results of integrated signal maxima

with interval running from 6 to 9 channels of peaks). This estimate was consistent with the previously measured K-Ar age of 48 $\pm$ 20 Ka (Yarmolyuk et al., 1999). Eleven samples from volcanoes Odnobokiy, Listvennichny, and Sosnovy yielded an age of 68 Ka with stability of solution from 54 to 82 Ka. Eight samples from the Orkhon shield volcanoes showed similar age of 65 Ka with stability of solution from 51 to 78 Ka.

The Holocene volcanic rocks from both regions indicated (^{234}U/^{238}U) close to 1.0. This value is characteristic for samples without post-eruption alteration [Asmerom, 1999]. The three studied Late Pleistocene volcanic units in both regions without any visible alteration demonstrated however different (^{234}U/^{238}U) values in a range from 1.03 in the Ulug-Arga volcano to 1.06 in volcanic lines of Central Mongolia. This isotopic disequilibrium could be caused by the Chalov-Cherdyntsev effect i.e. by extraction of ^{234}U from defects of crystalline structures into water. Increasing (^{234}U/^{238}U) values in water up to 10 was directly recorded during earthquakes (Zverev et al., 1975). We suggest that the elevated (^{234}U/^{238}U) values in lavas reflected sin-kinematical conditions of volcanic activity in Eastern Sayans and Central Mongolia between 70 and 50 Ka, when water from tectonically active faults was entrained into magmatic liquids. This was not the case in the Holocene, when volcanic eruptions took place in relatively stable tectonic conditions.

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