Post-Late Glacial travertines of Gorny Altai (Russia): palaeoclimatic and tectonic proxies

S.N. KOKH[1]*, E.V. SOKOL[1], E.V. DEEV[2] AND YU.M. RYAPOLOVA[2]

[1]V.S. Sobolev Institute of Geology and Mineralogy, Koptyuga 3, Novosibirsk, 630090 Russia (*correspondence: s.n.kokh@gmail.com)

[2]Institute of Petroleum Geology and Geophysics, Koptyuga 3, Novosibirsk, 630090 Russia

Two travertine deposits have been discovered in the Chibitka River valley (1800-2000 m asl) at the junction of the Kurai and Teletsk-Kurai large active faults in the southeastern Gorny Altai, Russia. The inactive travertine is composed of calcite and cements Holocene grey colluvium and glacial till deposited by the Late Glacial Chibitka Glacier. Active travertine precipitation was observed from a spring with cold (10°C) HCO_3-SO_4–Ca-Mg water, pH = 6.86. The active travertine consists of Mg-calcite and Sr-aragonite crusts, with abundant algae on their surfaces. All travertines are depleted in REE (a total of 0.40-16.4 ppm) and have similar PAAS-normalized REE+Y spectra with HREE enrichment and slight progressive LREE depletion. The active travertines show positive $\delta^{13}C$ values of 0.1‰ to 0.9‰ VPDB while the inactive ones have an isotopically lighter composition of $\delta^{13}C$ = −4.1‰ to –1.9‰ VPDB. The narrow range of $\delta^{18}O$ (–13.0 to –13.8 ‰ VPDB) indicates that travertines formed in a cold continental climate similar to the present conditions [1]. Unlike past travertine formation, current precipitation of carbonates has been microbially mediated. Both stable isotope and trace-element signatures of the travertines indicate that they precipitated from cold groundwaters subjected to prolonged interaction with a carbonate aquifer (the Baratal Group of limestone and dolostone) [2]. Travertine deposition in the studied area began with the onset of post-Late Glacial global warming and permafrost degradation. Warming, ice rebound, and permafrost degradation induced seismicity and fracturing, which channeled groundwaters previously sealed in carbonate aquifers. Thus, both tectonic and climate factors controlled the time and place of post-Late Glacial travertine deposition in this part of Gorny Altai. Obtaining more time constraints on the travertine growth episodes will provide further updates to the glacial/interglacial and seismicity chronologies. *Studywas supported by grant MK-6322.2016.*

[1] Andrews (2006) *Earth-Sci. Rev* **75**, 85-104. [2] Choi *et al.* (2009) *Chem. Geol.* **262(3-4)**, 334-343.