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New data on the late Pleistocene ice-dammed lakes formation in the Kurai intermountain depression, SE Altai, Russia

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Mountain systems of Russian Altai, mountains of southern Siberia, are one of the areas where extensive ice-dammed lakes were formed in intermountain depressions during the Pleistocene glacial epochs. The subsequent warming led to degradation of ice dams and repeated cataclysmic draining of these reservoirs. Significant landscape transformation took place as a result of geological work of such flood events. Specific landforms and sediments, including high lake shorelines, giant current ripples, lacustrine bars, marginal channels, indicators of fluvial activity on the basins floor, and fluvially transported boulders, which mark the pathway of floods, as well as specific vertical lithofacies profile of outwash deposits were generated. Significant landscape changes occurred not only within these basins, but also in the drainage valley network over hundreds of kilometers.

The Kurai-Chuya system of intermountain depressions, presented in this study, is located in the high-mountainous southeastern part of Russian Altai. It is well-known due to the giant Pleistocene glacier-dammed palaeolakes with their cataclysmic runoff into the Arctic Ocean along the Ob River. These paleoflood events are ranked among the largest known terrestrial discharges of fresh water in the Earth and are the most studied among such phenomena in Central Asia.

At the same time, the Quaternary of the Russian Altai, with controversial number and chronology of glacial cycles, is still debatable and the proposed extent of glaciations varies widely for different authors. There is also no agreement on the chronology of outburst floods from ice-dammed lakes in the Kurai-Chuya system of intermountain depressions.

One of the unsolved problems is chronological correlation of developing of giant current ripples and accumulating deposits of one of the last ice-dammed lakes within the bottom of the Kurai basin. Clearly identified lake terraces, which argue for prolonged existence of a relatively large reservoir, are located nearby the landforms associated with cataclysmic outburst floods. The surface of giant current ripples is not covered by lacustrine deposits (which is a problem in case of assuming the more ancient age of landforms in comparison with lacustrine deposits), otherwise, there are no ground effects of passing high-energy floods on the surface of lake terraces.

We present the results of multidisciplinary investigations (including geomorphological and paleontological analysis, X-ray diffraction and IR spectroscopy, OSL and radiocarbon dating) of deposits associated with one of the last stages of existing late Pleistocene dammed lakes in the Kurai depression. New data evidence for developing relatively deep (not less than 80 m) lake about 19 ka BP. Drying of such reservoir can provide conditions for creating current ripples within the bottom of the Kurai basin, and clarify the problem of chronological correlation of lacustrine deposits and landforms associated with cataclysmic outburst floods. At the same time, drying of this lake did not have such a critical influence on the downstream topography of the Chuya and Katun river valleys in comparison with outburst floods from more ancient and significantly larger ice-dammed lakes.