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Late Pleistocene landscape evolution of the Tsagan-Nuur intermountain depression, NW Mongolia: interplay between tectonic, climate and surface processes

Anna Agatova (1,2) and Roman Nepop (1,2)

(1) Institute of geology and mineralogy SB RAS, Novosibirsk, Russian Federation (agatr@mail.ru), (2) Ural Federal University, Yekaterinburg, Russian Federation

All researchers who worked in Mongolia reported significantly higher levels (in comparison with modern ones) of paleolakes, which occupied piedmont tectonic depressions of the Altai uplift. In addition to climatic reasons the greater water supply into the now arid areas of Mongolia can be explained by accumulating of large volumes of water during outburst floods from ice- and moraine-dammed lakes, located in intermountain depressions within the framing mountain systems. Neotectonic structure - a combination of piedmont basins and intermountain depressions located at different altitudes, caused the formation of a cascade type of hydrographic network. Repeated glaciers advances during the Pleistocene ice ages blocked local drainage system and impounded ice- and moraine-dam lakes. Subsequent warming and intensification of meltwater runoff from degraded glaciers led to dam failures. As a result, large volume of water was transported from intermountain depressions into piedmont basins. Ground effects of high-energy floods are preserved in topography of outlet mountain valleys as well as in topography of piedmont basins (large proluvial cones).

This study presents the geological and geomorphological evidence of significant water discharge from the Tsagan-Nuur intermountain depression, Mongolian Altai, into the piedmont basin of the Achit-Nuur lake, Mongolian Inland Drainage Basin. In addition to repeated cataclysmic outburst floods from dammed lakes, which occupied intermountain depressions of the SW Tuva such water supply is another factor that controlled much higher former lake levels in the Achit-Nuur depression. Modern lakes in the Tsagan-Nuur basin are relicts of ancient Pleistocene lake, which among other sources was fed by melt water from the ice reservoir, developed in the neighboring area of Russian Altai.

Multidisciplinary investigations including geomorphological, geoarchaeological, lithostratigraphic analysis and analysis of biological composition of lacustrine deposits accompanied by radiocarbon dating were applied to reconstruct the Late Pleistocene hydrological system transformation and landscape evolution in the Tsagan-Nuur intermountain depression.