Using cosmogenic nuclides in sediments to have an insight into the river landscape evolution of Altay area in northern Xinjiang, NE China

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The drainage network rearrangement is the most regular role to induce the regional landscape evolution. Fluvial terraces recorded the information about time sequence of the pre- and post-drainage arrangement events and its driving force, which are the perfect geomorphological markers for the quantification of the regional landscape evolution.

The Ulungur and Ergis rivers are two major rivers in the Altay area of northern Xinjiang, NE China. Peculiar fluvial geomorphology has been molded by the two rivers. In the mountain front area, the tributaries of both two rivers injected perpendicularly into their trunk streams, and flow northwest parallelly. The Ergis River belongs to the Arctic Ocean water system, which goes across the Zaysan Lake and then injects into the Arctic Ocean. The Ulungur River is an inland river and imports the catchment named Buluntuo Lake, whose northeast margin is very near to the river channel of the Ergis River. However, the two rivers are not connected, but separated by a very narrow drainage divide terrace.

In this study, we date the fluvial sediments collected from a series of river terraces abandoned by the two rivers using cosmogenic nuclide dating method. The highest modern terraces of the two rivers give the deposition ages of 2.65(+0.39/-0.33) Ma and the maximum exposure age of 2.57 Ma, respectively. The coincident ages indicate the drainage rearrangement of the two rivers happened in the same period, which may support the argument that the drainage network rearrangement is linked to the onset of Northern Hemisphere glaciations about 2.75 Ma ago. The exposure age of the overlying fluvial sediments collected from the drainage divide terrace of this two river system is 0.72±0.04 Ma, suggests the two river system has connected when the Buluntuo Lake was at its high lake level, with the Ulungur River draining to the Ergis River and flowing abroad. The close of the Buluntuo Lake is attributed to the rapid incision of the Ergis River, which may be induced by the tectonic activities of the Altay Mountain Front Fault, the increasing discharge of the Ergis River during the interglacial period, or the combined effect of both the two factors.