



SEISMIC-STRATIGRAPHIC INDICATIONS FOR MULTIPLE DESSICATION EVENTS IN LAKE KHUBSUGUL, MONGOLIA

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Lake Khubsugul is one of the largest lakes in Central Asia. It is located in northern Mongolia, close to the border with Russia, and is part of the Baikal Rift Zone. The lake is situated at 1645 m altitude, and is 136 km long and on average 20 km wide. The maximum water depth is 262 m. The lake has only one outflowing river: the Egiin-Gol River.

In summer 2001, an exploratory seismic expedition by RCMG and LIN yielded the very first reflection seismic profiles from Lake Khubsugul. In total, 35 sparker profiles were collected from different parts of the lake; they have a penetration of up to 400 ms TWT and a resolution of < 1 m. These seismic profiles provide new information with regard to the structure and tectonic evolution of the basin, and to the main sedimentary environments and their variations through time that have contributed to the infill of the basin.

The basin has a typical half-graben structure, with the main border fault along its western margin and a clearly westward-diverging infill. Overprinted on the predominantly N-S trending half-graben structure is a series of SW-NE-oriented oblique/transverse structures, which correspond to structural highs (locally expressed as outcropping basement, such as on Dailan-Hois Island) and are responsible for the compartmentalization of the basin in three sub-basins.

Although the seismic data suggest that the tectonic activity has significantly decreased since about 200 ka, this structural compartmentalization is still reflected in the present-day bathymetry.

Seismic-stratigraphic interpretation allowed to distinguish 8 regional depositional sequences, responsible for the main part of the infill of the lake basin. Seismic facies analysis suggests that:

1. units 1 and 2 represent shallow-water, deltaic deposits,
2. units 3, 4 and 5 deep-water hemipelagic deposits, and
3. units 6, 7 and 8 – deposited after cessation of the main tectonic activity, at about 200 ka – a cyclic succession of shallow-water (lowstand) delta deposits and deep-water (highstand) hemipelagic deposits. Units 6, 7 and 8 are bounded at the base by a distinct erosional unconformity with uneven channelised morphology clearly indicative of sub-aerial erosion. Near the lake borders, off the outlets of the major river valleys, these erosional unconformities are overlain by submerged frontal moraines.

These observations and seismic-stratigraphic mapping suggests that the upper part of the lake infill holds a record of several dessication events during which the entire lake dried out (apparently coeval with major expansions of valley glaciers). After the dessication, lake level started to rise, first slowly with the deposition of lowstand deltas, and later on faster with the installation of deep-water environments similar to the present-day situation.

Our first seismic data indicate that the sedimentary record of Lake Khubsugul is – maybe unexpectedly – totally different from that of its large sister-lake Lake Baikal and highly variable, complex and discontinuous, and that no deep drilling should thus be executed without a thorough seismic exploration.