

Seismic profiler survey and its application for lake research

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The geophysical survey is helpful to reveal the lake basin morphology and to identify the sub-bottom sedimentary structure, to localize appropriate coring sites, and to identify the different impacts on sediments, e. g. tectonics, currents, mass wasting and other lake-internal/external processes. The GeoPulse Sub-bottom Profiler from GeoAcoustics Ltd. in the UK is one of the main seismic profiler equipments. The whole system mainly comprises the deck unit, including transmitter, receiver, sonar interface and processor (workstation with the software), and transducer fixed with a catamaran to be a towed mounted platform. The high accuracy GPS and more than 2.5kW generator are also necessary as the main supplementary equipment. Combined with echosounder, the system operates from rubber boat, crossing the lake according to a prepared operation plan. They could provide detailed information not only about the bathymetry, but basin structure and sediment architecture downward to approximately 50 m below the lake bottom.

It is necessary to get detailed information about the sedimentary structure around the coring sites in order to ensure undisturbed stratigraphy of cored sediment sequences. Thus, this technique is a basic requirement for detecting the structure of lake sediments and to ensure the optimal positions for coring lake sediments. On the contrary, cores are “windows“ that show the sediment and its structure, which are important and helpful to interpret the records from seismic profiles. Obviously, coring lake sediments in combination with geophysical surveys are considered to be indispensable methods for future lake research.

Seismic stratigraphy and basin morphology were conducted in several different lakes in the plateau area in recent years. Seismic survey at Lake Donggi Cona (a deep large lake), NE Tibetan Plateau shows that active tectonic movements control the lake basin formation and influence the sediment architecture. Research at Heihai lake, Kunlun Mountains, NW Tibetan Plateau indicates a complex sediment architecture and basin morphology, developed on a large fluvial fan. Researches at Lake Kotekel (a shallow small lake), Lake Baikal region indicate that at many parts of the lake, sediments are not accessible for coring, as they are disturbed by lake-internal processes and neotectonics.

Key words: Seismic profiler survey, sediment architecture, lake formation, basin morphology, plateau