310

ARE THERE UNCONSOLIDATED SEDIMENTS AT THE BOTTOM OF LAKE VOSTOK?

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Among more than 100 subglacial lakes identified beneath the Antarctic Ice Sheet the largest known one is located beneath the Russian station Vostok in East Antarctica. Lake Vostok, covered by 4 km of ice, is about 300 km long and 60 km wide. The Russian Antarctic Expedition in collaboration with the Polar Marine Geological Research Expedition have acquired more than a hundred seismic soundings over the lake, revealing water depth in Lake Vostok. The recorded seismograms show two relatively close spaced reflections after the ice-water echo. In early publications those events were interpreted as boundaries of a several hundred meters thick layer of unconsolidated sediment, overlying the lake floor. However, more recent interpretations postulate that the second bottom reflection on seismic records, which used to be interpreted as a bottom of sedimentary layer, is just a side reflection due to the lake's bottom roughness. Thus, the nature of this second reflection should reveal the presence of unconsolidated sediments at the bottom of Lake Vostok. The objective for this study was to test a hypothesis of presence of the unconsolidated sediments at the bottom of Lake Vostok.

To achieve our goals we used seismic data in several locations over the lake as well as airborne gravity data, collected by the University of Texas Institute for Geophysics during 2000/2001 field season. Along with calculation of the reflection coefficients for all recorded events and a velocity analysis of seismic data, we also constructed the synthetic seismogram for those locations for the two different models (with and without sediment) and compared those with recorded seismograms. In addition, we used gravity data for those locations to validate our results.

We analyzed seismograms acquired in the vicinity of Vostok Station, where the lake bottom topography is rough, as well as several shots in the middle and the northern part of the lake, where the lake bottom is relatively smooth. We present the results of our analysis for five locations over the Lake Vostok.