

Global environmental change during the last 12 million years inferred from organic components in Baikal sediment cores

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The studies on long-term paleoenvironmental changes are important to estimate the influence of future global warming induced by human activity. The information of long-term paleoenvironmental changes has mainly been obtained by the analyses of marine sediment cores. However, very little is known on the paleoenvironmental changes in continental interior. Lake Baikal is most appropriate site for the study of long-term paleoenvironmental changes, since the lake is one of the oldest [30 million years (Myr) old] and largest freshwater lake in the world, located in the southern Siberia in the Eurasian continent. The sediment layer of the lake attained greater than 8,000 m at thickest point, and can be expected to record paleoenvironmental changes in the Eurasian continental interior for the last 30 Myr. Baikal Drilling Project (BDP) has been carried out by scientists from Japan, Russia, U.S.A. and Germany to drill holes in the bottom sediments of Lake Baikal, and to elucidate long-term paleoenvironmental changes in the Eurasian continental interior and in the world. BDP96-1 and -2, and BDP98-1, -2 and -3 sediment cores were taken in 1996 and 1998, respectively, at the Academician Ridge from Lake Baikal.

Here, we studied organic components in combined sediment cores (BDP96&98) of BDP96/1,2 (200 m) and BDP98/1,2 (600 m) from the Academician Ridge in Lake Baikal to clarify biological production, sources of organic matter and paleoenvironmental changes during the last 12 Myr in the Eurasian continental interior as well as in the world. TOC contents ranging from 0.13 to 2.8% with an average of 0.93% ($n=7,710$) were fairly low and similar to those in some oligotrophic lakes. TOC and TN contents decreased about a half from the past 12 Myr to the present with a large fluctuation, indicating the decrease of biological production caused by global cooling of the climate. The major cooling episodes have been occurred at the past 8.6, 6.2-5.8, 2.8-2.6 and 1.6 Myr. The higher biological production periods, 12-9.5, 7.7-7.0, 4.4-3.6 and 2.0-1.6 Myr B.P. were mainly attributed to the contribution of allochthonous organic matter through river waters in the warm with humid climate.

The abundance of long-chain n-alkanes (longer than C19), n-C27, n-C29 and/or n-C31, and long-chain n-alkanoic acids, n-C26 and n-C28 reflects that the dominant plants of the Lake Baikal basin were *Pinus* spp., *Betula* spp., *Salix* spp., etc. Normal-C29 alkane is mainly attributed to conifers, increased from the past 1 Myr to the present. Methanogens were probably abundant at the past 9.5, 6.3, 5.1 and 0.9 Myr. The pattern of changes in the C29/(C27+C29) sterol ratios is similar to that of allochthonous organic matter estimated from the TOC/TN ratios.