Bacterial activity in Lake Baikal during Late Quaternary as revealed by carbon isotope composition of biomakers

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In the deepest part of modern Lake Baikal, ca. 9 mg/l dissolved oxygen occurs, which suggests a large-scale vertical convection in the lake in spite of its great depth (1634m). Watanabe et al. [2003] suggested less-oxic conditions of Lake Baikal bottom water in climate transition periods, such as Younger Dryas (YD), based on high TS contents (up to 13mg/g dry sed) and high TS/TOC ratios (up to 0.5 atomic ratio), being much larger than average TS/TOC ratios of freshwater and normal oxic marine sediment. The high TS/TOC are usually observed not only as a result of less-oxic condition but also diagenetic pyritization. We have measured $\delta^{13}C$ of bacterial biomakers and $\delta^{34}S$ of pyrite through the YD event (ca.12kyr B.P.).

In the YD event, pyrite shows an extreme depletion in ^{34}S (-28.1 to -32.4 ‰), which indicates enhancement of aqueous sulfate content and limitation of oxygen circulation to deeper part of Lake Baikal. The ^{13}C-depleted squalane (-46.2‰) is detected in the YD. Additionally, hop-17(21)-ene in the YD is more depleted in ^{13}C (-43‰) than that in the Holocene by ~10‰, suggesting increase of methanotrophic bacterial activity. The $\delta^{13}C$ variation of homohopane differs from that of hop-17(21)-ene. Homohopane in the YD may have originated from other chemotrophic bacteria.

These results indicate high bacterial activities and occurrence of less-oxic condition in Lake Baikal caused by an abrupt climatic cooling in the Eurasian continental interior.

Table 1. Stable isotope ratios of pyrite sulfur and lipid carbon from the Lake Baikal sediment

Depth	$\delta^{34}S_{pyrite}$	$\delta^{13}C$ (‰, PDB)		
(cm)	(‰, CDT)	Homohopane	Hop-17(21)-ene	Squalane
16	+11.9	-32.6	-33.1	-
20	+7.8	-33.0	-32.8	-
30	**-32.4**	**-34.6**	**-43.7**	**-46.2**
32	**-28.1**	**-34.2**	**-43.1**	**-**

Reference

Watanabe et al. (2003) *Geochem. J.* in press.

High resolution reconstructing palaeoclimates in tropical and sub tropical regions using stable isotopes and trace elements in biogenic carbonates

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My recent scientific interests are to reconstruct palaeoclimates in the tropical and sub tropical areas using geochemical tracer of biogenic carbonates including coral skeletons and molluskan shells, which have annual and daily growth bands. Understanding the past climate variability in the tropical ocean is a high priority in climate change research. The tropical climate variability has global consequences such as El Niño-Southern Oscillation (ENSO) and Asian-Australian monsoon but the instrumental records in this area are limited only up to past several decades. Recently the oxygen isotopic and trace elemental records of living and fossil coral skeletons have provided the seasonal variations of sea surface temperature and precipitation in the tropical oceans over several hundred years. Despite such a great advance, there still remain problems to use coral skeletons for reconstructing palaeoclimates because of their biological and physical processes. I would like to present recent our results of geochemical tracers in aragonitic skeletons of coral reefs dwellers which have different skeletal structures and growth rates in order to access these problems and robustness as palaeoclimate recorders.

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