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北西太平洋日本沖の堆積物コアからの新しい珪藻バイオマーカー温度計の開発・検討

Examination for new diatom thermometry by biomarker analyses in sediment cores from the northwestern Pacific off Japan

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Biomarker thermometers such as alkenone unsaturation index (U_{37}^k and U_{37}^{kl}) have been often used for reconstructing paleo-sea surface temperatures since 1980s. The alkenone are well known to be derived from Haptophycean algae, which are ubiquitous species in shallow to open ocean areas at low to high latitude, and therefore, their thermometers are powerful proxies in the almost over the world oceans. However, it has been pointed out that there were limitations for alkenone proxies; physiological effect, deflection of temperature records during the season of high production, variability of source species, and so on. More recently, several researchers [1] suggest new algal biomarker thermometer, the ratios of 28 carbon numbers (C_{28}) and C_{30} 1, 14-diols in marine sediments. These compounds are likely to be derived from specific diatom Proboscia. In this study, we examine the applicability of such diatom biomarker thermometer from sediment cores from the northwestern Pacific off Japan.

Sediment cores were collected by multiple corer from the Nishishichitou Ridge (LM-3 and LM-5P, off central Japan; [2]) and off the coast of Sanriku, northeastern Japan (LM-8), and by piston corer from the Nishishichitou Ridge (KT92-17 St. 20; near LM-3; [2]). Lipid extraction and separation, and saponification were performed by the method as previous reports ([1], [2]). The diol thermometer is proposed as the ratio of monounsaturated and saturated C_{28} to monounsaturated and saturated C_{30} 1, 14-diols, called Proboscia diol index (PD index), by the analyses of the Proboscia cultures and the sediments in the Atlantic and Southern Ocean [1]. All monounsaturated and saturated C_{28} and C_{30} 1, 14-diols could be detected in all sediment samples in this study. We compared some kinds of the 1, 14-diols ratios and U_{37}^{kl} in the same sample. It was found that the PD indices were not correlated with U_{37}^{kl} in the northwestern Pacific off Japan. However, the unsaturation ratios of C_{28} 1, 14 diols and C_{30} 1, 14-diols, which were defined as UD_{28} and UD_{30} , respectively, were well correlated with U_{37}^{kl} . These results might be attributed to the differences of source species (and/or genetic variations) producing the long-chain 1, 14-diol in the northwestern Pacific from those in the Atlantic and Southern Ocean as reported by literature [1]. Thus, we suggest that the diol indices such as UD_{28} and UD_{30} are more applicable proxies as paleothermometers, although more detailed examination is necessary.

References:

- [1] Rampen S. W., Schouten, S., Schefus, E., Sinninghe Damste, J. S. (2009) Organic Geochemistry 40, 1124-1131.
- [2] Sawada, K. and Handa, N. (1998) Nature 392, 592-595.

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