BPO02-14 会場:103 時間:5 月 25 日 14:15-14:30

沿岸浅海域の化学躍層におけるアーキア膜脂質分布の季節変化と TEX86 解析
TEX86 and seasonal distributions of archaeal membrane lipids across the chemocline in the modern shallow coastal ocean

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Aquatic ecosystems in the shallow coastal ocean would be quite sensitive to the ongoing global warming. In fact, anomalous occurrences of many macro fauna have been reported in these decades in the Seto Inland Sea. For predicting the biological responses to the global warming, it is really important to analyze precise sea surface temperature (SST) records and micro and/or macro faunal abundances in the shallow coastal ocean. However, since historical records of instrumental SSTs are very scarce in the Seto Inland Sea, we need to employ an appropriate paleotemperature proxy for historical SST analyses. Nonetheless, conventional paleotemperature proxies of oxygen isotope and alkenone paleothermometry are practically inapplicable in the Seto Inland Sea. Therefore, we need to rely on the organic paleotemperautre proxy of TEX_{86}. On the other hand, since TEX_{86} has rarely been systematically applied to the paleothermometry in the shallow coastal ocean, we need to test the applicability of TEX_{86} in the Seto Inland Sea.

Here we present relationships between the distribution of thaumarcaeotal isoprenoid glycerol dibiphytanyl glycerol tetraethers (GDGTs) and *in situ* SST, and abundances of GDGT and nutrient/chlorophyll, on the basis of time-series analyses of particulate organic matters (POMs) in Beppu Bay, the Seto Inland Sea. Because Beppu Bay is the archetypal enclosed basin, bottom water is decoupled from surface and intermediate water, resulting in bottom water anoxia through summer to autumn. Within the anoxic water mass, ammonium is extremely concentrated, accompanied by the significant chemocline at the redox boundary, which is disappeared on January by vigorous mixing of a water column. Then, we sampled POMs within a water column on October, November, showing bottom water anoxia, and March, representing the month of phytoplankton blooming.

Calculated temperatures derived from $TEX_{86}{}^{H}$ and $TEX_{86}{}^{L}$ show significant positive correlation with *in situ* temperatures, indicating that TEX_{86} paleotermometry can be firmly applicable to the shallow coastal ocean. On the other hand, the relationship observed in Beppu Bay shows slight deference from that reported by Kim et al. (2010), suggesting that $TEX_{86}{}^{H}$ and $TEX_{86}{}^{L}$ in open ocean might not be representatives of true SSTs as implied by Wuchter et al. (2005). In addition to the thermometry, concentrations of total GDGTs within a water column were also analyzed on October, November, and March. Total GDGTs in the anoxic water mass are significantly higher than those in overlying oxic layers, whereas particulate organic carbon (POC) concentrations show no increase in the anoxic water mass, indicating enhanced biosynthesis of GDGTs within the anoxia. On the other hand, although POC concentrations are elevated at the depth showing chlorophyll maximum, GDGTs indicate no increase at the chlorophyll maximum. In addition, GDGT concentrations show no correlation with chlorophyll concentrations in any samples analyzed, while they indicate significant correlation with ammonium concentrations. Although the heterotrophic physiology has been reported for the marine mesophilic Archaea, our results demonstrate that the Archaea, which produced GDGTs analyzed in this study, is assumed to have grown by chemoautotrophic ammonium oxidation.

Kim et al. (2010) *Geochimica et Cosmochimica Acta*, v. 74, no. 16, p. 4639-4654.
Wuchter et al. (2005) *Paleoceanography*, v. 20, no. 3., PA3013.

キーワード: Thaumarchaeota, TEX86, 古水温, 化学合成, 瀬戸内海
Keywords: Thaumarchaeota, TEX86, paleotemperature, chemoautotroph, Seto Inland Sea