

Seasonal variability of biomarkers in sinking particles in the Japan Sea

T. NAKANISHI AND M. MINAGAWA

Graduate School of Environmental Earth Science, Hokkaido University, Sapporo, Japan (tnaka@ees.hokudai.ac.jp and mas@ees.hokudai.ac.jp)

Sediment trap experiment

The purpose of this study is to determine seasonal variation of biomarker flux in sinking particles collected by a time-series sediment trap at the northern Japan Sea for one year on 1998-99. Sterols, alkenones as well as stable carbon and nitrogen isotopes were measured by conventional chemical procedures.

Results and discussion

In this area, usually blooming has observed two times in winter and early summer based on chlorophyll variation detected by Satellite studies (e.g. Kim *et al.*, 2000). Sinking fluxes of TOC and dry materials were consistent with such seasonal change, suggesting that the sediment trap even deployed in 1000 m depth successfully indicates seasonal change of primary production in euphotic layer.

Biomarkers for diatom and dinoflagellate (24-methylcholesta-5,24(28)-dien-3 β -ol, 24-methylcholest-5-en-3 β -ol and dinosterol) showed temporal peaks in early winter and early summer. Two factors might be related to this. Nutrient supply would be enhanced by increase of vertical mixing in winter. The low $\delta^{15}\text{N}$ values in autumn to spring evidenced this interpretation. Increase of solar radiance in early summer might also lead increase of production.

The increase of cholesterol was found slightly later than the phytoplankton markers. We estimated that the population of zooplankton increased after phytoplankton bloom.

Unexpectedly, C_{37} alkenones (haptophyte origin) showed also maximum flux in two seasons, winter and summer. Furthermore, C_{37} alkenone unsaturation index (U_{37}^k) showed relatively less variation compared with seasonal change of sea surface temperature. We considered several reasons; change of haptophyte species and changing water depth for haptophyte habitat, etc. It might be an important clue to interpret unusual U_{37}^k temperature profiles in LGM found in piston core samples in the Japan Sea (Ishiwatari *et al.*, 2001).

References

- Ishiwatari R., Houtatsu M. and Okada H., (2001), *Org. Geochem.* **32**, 57-67.
Kim S.W., Saitoh S., Ishizaka J., Isoda Y. and Kishino M., (2000), *J. Oceanogr.* **56**, 527-538.

δD of individual PAHs from the Murchison and an Antarctic carbonaceous chondrite

H. NARAOKA¹, H. MITA² M. KOMIYA³ AND A. SHIMOYAMA²

¹ Dept. of Chemistry, Tokyo Metropolitan University, Tokyo, Japan (naraoka-hiroshi@c.metro-u.ac.jp)

² Dept. of Chemistry, University of Tsukuba, Ibaraki, Japan (mita@staff.chem.tsukuba.ac.jp)

³ Natl. Inst. Advanced Industrial Science & Technology, Ibaraki, Japan (masa-komiya@aist.go.jp)

Polycyclic aromatic hydrocarbons (PAHs) have been reported from carbonaceous chondrites and interplanetary dust particles, and also suggested to be present in interstellar medium. PAHs may be among the most ubiquitous organic compounds in the universe. Naraoka et al (2000) proposed two reaction pathways ("pyrene series" and "fluoranthene series") of extraterrestrial PAH formation based on $\delta^{13}\text{C}$ values of individual PAH from an Antarctic CM2 carbonaceous chondrite (A881458). In this study, we have measured δD values of fluoranthene and pyrene from the Murchison and A881458 by gas chromatography-pyrolysis-isotope ratio mass spectrometry.

Preliminary compound-specific δD and $\delta^{13}\text{C}$ values of pyrene and fluoranthene are shown in Table 1 as averaged values based on replicate injections. Standard deviations were generally less than 10‰ for δD and 0.5‰ for $\delta^{13}\text{C}$. δD value of individual PAHs is quite different from δD value of the reported bulk PAH fraction (~+500‰) from the Murchison. Fluoranthene is more depleted in D than pyrene, although pyrene and fluoranthene are structural isomers ($\text{C}_{16}\text{H}_{10}$) each other. This δD signature may also suggest two distinctive reaction pathways for the extraterrestrial PAH formation. However, the δD trend is opposite to $\delta^{13}\text{C}$ trend (fluoranthene more enriched in ^{13}C than pyrene). In addition, $\delta^{13}\text{C}$ values of PAHs are similar between the Murchison and A-881458, while the δD values are quite different (250-340‰). This isotopic difference may indicate a different aqueous history between the Murchison and A-881458.

Table 1. δD and $\delta^{13}\text{C}$ values of fluoranthene and pyrene from the Murchison and A881458 meteorite

	Murchison	A881458
δD (vs. SMOW)		
Fluoranthene	-560	-219
Pyrene	-421	-168
$\delta^{13}\text{C}$ (vs. PDB)		
Fluoranthene	-7.5	-8.3
Pyrene	-15.6	-15.8

Reference

- Naraoka H. et al (2000) *Earth Planet. Sci. Lett.* **184**, 1-7.