
 [JJ] Evening Poster | M (Multidisciplinary and Interdisciplinary) | M-IS Intersection

[M-IS14]Biogeochemistry

convener: Keisuke Koba (Center for Ecological Research, Kyoto University), Hideaki Shibata (Field Science Center for Northern Biosphere, Hokkaido University), Naohiko Ohkouchi (海洋研究開発機構, 共同), Youhei Yamashita (Faculty of Environmental Earth Science, Hokkaido University)

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Biogeochemistry is an interdisciplinary study field including ecology, geochemistry, oceanography, limnology, hydrology, soil science and environmental sciences. Respective researches have tended to be conducted separately so far. This session aims to provide a common platform for biogeochemists of different disciplines, which facilitates the interactive discussion and information exchanges for further development of biogeochemical studies.

[MIS14-P09]Determination of methylphosphonate in natural waters by ion chromatography

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Introduction

Recently methylphosphonate has attracted attention as a P-resource for aquatic organisms in natural waters. In Lake Saiko (Yamanashi, Japan), subsurface maximum layer of methane concentration is observed in the lake, and this layer is formed by hydrolysis of methylphosphonate by bacteria. Vertical distribution of cell densities of *Synecococcus* and other cyanobacterium was similar to that of methane concentration (Iwata, 2014). Additionally, methane was produced by incubation of hybridized bacteria sampled in Lake Saiko with methylphosphonic acid. Although this process might be usual in P-limited lake waters, there was no data of methylphosphonate concentration in natural water samples. New analytical method for the determination of methylphosphonate in natural water was developed based on ion chromatography.

Methods

This analytical method was based on that for the determination of trace phosphate in natural waters (Maruo et al., 2016). AS-23 (Thermo Fisher Scientific) was applied as analytical column because of high ion exchange capacity to stand for large volume injection of sample waters. For the suppression of baseline electroconductivity, external mode was applied to reduce baseline noise of chromatograms. Water samples were obtained from Lake Biwa (Shiga, Japan), rivers flowing into Lake Biwa, attached Lakes of Lake Biwa, treated waste water, and springs, in Nov. and Dec., 2017. To check the existence of methylphosphonate, we spiked standard methylphosphonate in natural samples, and chromatogram of spiked sample and that of unspiked sample were compared.

Results and Discussion

In the use of eluent condition recommended by the manufacturer was not suitable for the separation of methylphosphonate from major anions in natural waters. Eluent concentration was reduced to half from the recommended condition to effectively separate the peak of methylphosphonate from those of sulfate, phosphate, and nitrate. As the peak area linearly increased with the increase in sample injection

volume up to 5 mL, this volume was applied for the analysis of natural samples. Peak area showed linear increase from 0 to 10 nmol L⁻¹ (R^2 : 0.998). Detection limit was 5 pmol L⁻¹ (S/N=3). Methylphosphonate was detected clearly in the samples from the spring and R. Amano with the concentration of 2.9 nmol L⁻¹ and 2.3 nmol L⁻¹, respectively. From other samples, methylphosphonate was not detected. Methylphosphonate might be supplied from spring waters that has passed through anoxic environments.

References

Tomoya Iwata (2014) Aerobic methane production in oxygenated water column of lake ecosystems. Grants-in-Aid for Scientific Research (KAKEN) 2013 Fiscal Year Final Research Report #23681003.
Maruo M., Ishimaru M., Azumi Y., Kawasumi Y., Nagafuchi O., Obata H. (2016) Comparison of soluble reactive phosphorus and orthophosphate concentrations in river waters. *Limnology* 17:7-12.