

【Grant-in-Aid for Scientific Research(S)】

Integrated Science and Innovative Science (New multidisciplinary fields)



Title of Project : A study on inventory and distribution of nutrient in seawater together with higher comparability

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Research Area : environmental science, geochemistry

Keyword : marine chemistry, measurements, global warming

【Purpose and Background of the Research】

The comparability and traceability of nutrient data in the world's oceans are fundamental issues in marine science, and particularly for studies of global change. The oceanography community has been continuing to improve comparability of nutrient data from the world's oceans in many ways, including international inter-laboratory comparison exercises and also development of nutrient reference materials. However, as the Climate Change 2007 – The Physical Science Basis (IPCC2007) report stated, adequate comparability and traceability have not yet been achieved. Recent comparison study at the 120 crossings of WOCE and CLIVAR cruises revealed that nutrients concentrations show larger differences up to 10 %. Therefore, previously stated distribution and inventory of nutrient should have larger uncertainty. This means that present nutrients dataset used in biogeochemical models for global warming should also have larger uncertainty, too.

This study can solve the problem above. This study will conduct global observation of nutrient using Reference Material of Nutrients in Seawater, RMNS, and create new global nutrient dataset to reveal more accurate distribution and inventory of nutrient.

【Research Methods】

To ensure comparability of nutrient dataset which will be obtained in this study, we use nutrient data from more than 30 cruises without RMNS these are corrected by the factors estimated at each crossing between previous cruise and latest cruise with RMNS. We already have 10 cruises data with RMNS and will also conduct more than 6 cruises during this study period. Therefore we can cover the world's oceans by nutrient data which have higher comparability. A dataset (0.5 deg. X 0.5 deg in horizontal grid and vertically 136 layers) with 3% uncertainty will be created. We also create the sigma coordinate dataset together with the depth coordinate. Estimations of inventory and distribution of nutrient will be done based on the new dataset.

【Expected Research Achievements and Scientific Significance】

This study is based on new RMNS developed by our group and new nutrients manual (Hydes et al., 2010) both can ensure comparability of nutrient data. We also work to establish International Nutrients Scale System.

Obtained dataset of nutrient with considerably high comparability can provide 1) accurate inventory of nutrient and distribution of nutrient. This could not be achieved until today, 2) The dataset would also enable to estimate accurate increase of anthropogenic carbon in the ocean, 3) re-evaluation of global ocean circulation based on revised nutrient distribution.

This means that our study can contribute progress of geochemistry of nutrient, provide more accurate initial condition of global biogeochemical models.

【Publications Relevant to the Project】

Aoyama, M., D. J. Hydes, How Do We Improve the Comparability of Nutrient Measurements?. In: Aoyama, M., A. G. Dickson, D. J. Hydes, A. Murata, J. R. Oh, P. Roose, E. M. S. Woodward, (Eds.), Comparability of nutrients in the world's ocean INSS international workshop 10-12 Feb. 2009, Paris. Mother Tank, Tsukuba, pp. 1-10. (2010)

Aoyama, M., D. Hydes, A. Daniel, K. Bakker, A. Murata, T. Tanhua, E. M. S. Woodward, Joint IOC-ICES study group on Nutrient standards (SGONES) First Meeting UNESCO Headquarters, Paris, France 23-24 March 2010. IOC Reports of Meetings of Experts and Equivalent Bodies, 223. UNESCO 2010.(English) ,223, (2010)

【Term of Project】 FY2011-2013

【Budget Allocation】 59,600 Thousand Yen

【Homepage Address and Other Contact Information】

<http://www.mri-jma.go.jp/Dep/ge/INSS.html>