Quantitative and qualitative distribution of fluorescent dissolved organic matter in surface waters throughout the Pacific

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Dissolved organic matter (DOM) in the ocean basically originates from marine organisms, i.e., phytoplankton and heterotrophic bacteria exudation, viral cell lysis, protozoan grazing and zooplankton sloppy feeding, and is mainly consumed by heterotrophic bacteria. It has also been well documented that ocean physics together with biological processes shape the basin scale distribution of dissolved organic carbon (DOC) concentration. Thus, distributional patterns of quantity and quality of DOM are possibly related to oceanic ecological provinces such as Longhurst's oceanic provinces that are divided based on the prevailing role of physical forcing as a regulator of phytoplankton distribution. Even though basin scale distribution of DOC concentrations throughout the open ocean has been clarified, qualitative (compositional) distribution of DOM in relation with oceanic ecological provinces has scarcely been reported. Thus, the knowledge regarding with factors controlling the oceanic DOM composition with basin scale is limited.

In this study, we determined quantity and quality of fluorescent DOM (FDOM) in surface waters throughout the Pacific using excitation and emission matrix (EEM) fluorescence spectroscopy combined with parallel factor analysis (PARAFAC). Surface water samples were collected from the North and South Pacific during four Hakuho-Maru cruises (KH-11-10, KH-12-3, KH-13-7, and KH-14-3 cruises). EEM analysis was performed using FluoroMax-4 (Horiba), and PARAFAC was conducted by the drEEM toolbox on MATLAB (MathWorks). EEM-PARAFAC identified two protein-like components and two humic-like components. We clarified spatial distributions regarding with abundance and composition (i.e., ratio of two components) of humic-like as well as protein-like components. In addition, we used cluster analysis for establishing oceanic provinces from FDOM composition. In the presentation, we will present (1) the meridional differences in FDOM abundance and composition throughout the Pacific, and (2) the similarity/difference between Longhurst's oceanic provinces and oceanic provinces determined by FDOM composition.

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