Factors shaping spatial distribution of dissolved black carbon in the eastern Indian Ocean

Yutaro Mori[2], Hiroshi Ogawa[3], *Youhei Yamashita[1]

1. Faculty of Environmental Earth Science, Hokkaido University, 2. Graduate School of Environemtnal Science, Hokkaido University, 3. Atmosphere and Ocean Research Institute, The University of Tokyo

Pyrogenic carbon, also called black carbon (BC), has known to be an important component in the global carbon cycle. BC is produced by biomass burning or fossil fuel combustion on the land. Some of BC produced on the land is exported to ocean through atmospheric deposition or riverine transport, and marine sediment has known to be one of the major BC pools on the Earth’ s surface. It has also reported that BC is ubiquitously occurred in a fraction of dissolved organic matter (DOM) in soil water, freshwater, and seawater, and BC in DOM fraction is defined as dissolved BC (DBC). Even though river is well recognized as a transporter of DBC from soil to marine environments, environmental dynamics, i.e., major sources and sinks, of DBC in marine environments has not been well documented. In this study, spatial distribution of DBC from surface to deep waters of the eastern Indian Ocean was determined to obtain a knowledge regarding with factors shaping its spatial distribution.

About 10 L of seawater was collected from 3–4 depths at 5 stations located from 15ºN to 20ºS along a 88ºE transect during the Hakuho Maru KH-18-6 cruise. DBC was concentrated by a solid phase extraction and was quantified with the benzene polycarboxylic acid (BPCA) method. A ratio of B5CA and B6CA to all BPCAs was determined as an index of condensation degree (molecular weight) of DBC.

DBC concentrations in the surface layer (approximately 10 m) were higher than those in the mesopelagic layer (approximately 100–500 m) and deep layer (approximately 1500–4000 m), irrespective of differences in sampling stations. The condensation degree of DBC were usually lower in the surface layer compared with the mesopelagic and deep layers. The highest concentration accompanying with relatively low condensation degree was observed in the surface layer of the northernmost station in which lowest salinity was observed. Such vertical distributions of quantity and quality of DBC imply that less condensed DBC is supplied in the surface layer through atmospheric deposition and possibly riverine transport. Furthermore, vertical patterns in condensation degree of DBC suggest that a major source of DBC is different vertically in the same station observed by this study.

Keywords: Pyrogenic Organic Matter , Dissolved Black Carbon, eastern Indian Ocean

