

The water mass structure and nutrients distribution were revealed using colored dissolved organic matter (CDOM) in the western north Pacific Ocean and the northern Bering Sea

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The Kuroshio-Oyashio mixing area off the east coast of Japan and the northern Bering Sea are known as one of the productive areas where cold and eutrophic water mass mixes with warm and oligotrophic water mass (Yasuda et al., 2003; Grebmeier et al., 1988). Therefore, physical and chemical mechanisms to produce the high primary production in the both areas might be similar. A conventional and common way for water mass classification uses water temperature and salinity (Hanawa and Mitsudera 1987; Danielson et al., 2017; Eisner et al., 2013). However, increase of water temperature and changes in water mass structure due to the global warming makes the conventional way difficult. Here, characteristics of light absorption spectrum of colored dissolved organic matter (CDOM) were used as a new index for water mass classification to elucidate a relationship between the water mass structure and nutrients condition relevant to primary production in the both sea areas. Spectral light absorption coefficient of CDOM (a_{CDOM}) was measured at 126 points in the area during the summer of 2017-2019. We determined a_{CDOM} at 350 nm ($a_{\text{CDOM}}(350)$), spectral slope of a_{CDOM} for the spectral ranges from 275 to 295 nm and from 350 to 400 nm ($S_{275-295}$ and $S_{350-400}$) as an indicator of the quantity and quality of CDOM, respectively. Cluster analysis with the a_{CDOM} parameters separated water masses in the study area into 8 groups. Terrigenous water masses with high $a_{\text{CDOM}}(350)$ and low $S_{275-295}$ was found at the surface in coastal region of northern Bering Sea. Water mass with low $S_{275-295}$ and $S_{350-400}$ distributed at the bottom layer of Gulf of Anadyr. Low $a_{\text{CDOM}}(350)$ and high $S_{275-295}$ waters widely existed at the surface in both sea areas. These characteristics of water masses expressed by CDOM parameters are geographically consistent with the water mass distribution reported in the past studies. Furthermore, the CDOM parameter indicated that the water masses with high primary production were formed by mixing of deep/subsurface water with surface waters in both areas. Nutrient concentrations both in the bottom water of Gulf of Anadyr and subsurface water of the Kuroshio-Oyashio mixing area were high, suggesting CDOM parameter is also useful as a tracer of nutrients.

Keywords: Water mass structure, Colored dissolved organic matter, Northern Bering Sea, Western north Pacific Ocean