

Basin-scale transport of allochthonous humic-like fluorescent dissolved organic matter by the North Pacific Intermediate water

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The levels of humic-like fluorescent dissolved organic matter (FDOM) in the open ocean generally showed nutrient-type vertical profile. In the surface water, low levels of humic-like FDOM is due to degradation by sunlight. In the dark ocean, linear relationships between levels of humic-like FDOM and apparent oxygen utilization (AOU) have been observed throughout the global ocean, indicating that humic-like FDOM is produced in situ in the ocean interior as organic matter is oxidized by microbes and is resistant to microbial degradation with time scales of thermohaline circulation.

While, it has also been observed that some plots of humic-like FDOM vs AOU in the specific water masses, namely, the North Pacific Intermediate Water (NPIW) and the North Atlantic Deep Water (NADW), seemed to deviate from the general relationship between humic-like FDOM and AOU. The previous studies showed that concentrations of lignin phenols, a unique biomarker of vascular plants, were found to be higher in the NPIW and the NADW compared with other water masses. Thus, the deviations of plots between humic-like FDOM and AOU in the NPIW and the NADW can be considered to be derived from terrestrial (allochthonous) humic-like FDOM.

In this study, we determined a basin-scale distribution of humic-like FDOM from the Sea of Okhotsk to the western subtropical North Pacific. We found the linear relationship between levels of humic-like FDOM and AOU in the deep layer (>1000 m) of the western North Pacific. While, we also found plots in the mesopelagic layer, corresponding to the NPIW, were significantly deviated from the relationship observed in the deep layer. Such distributional pattern implies that allochthonous humic-like FDOM derived from the Sea of Okhotsk is transported widely to the intermediate layer of the North Pacific by the NPIW.

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