

Determination of region-specific background Secchi depth in four temperate semi-enclosed seas, central Japan

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Region-specific background Secchi depth (BSD), which excludes influences from phytoplankton, in four temperate semi-enclosed seas, central Japan were determined based on monitoring data from 1981 to 2015. Furthermore, the relationship between estimated BSD and environmental factors were examined to explore factors influencing sources and distribution of background optical constitutes contributing light attenuation. Correlation analysis between region-specific BSD and chlorophyll *a* concentration were also conducted to examine their distribution pattern and their impacts on distribution of optical condition within different enclosed seas. BSD was obtained in 89-96%, 67-94%, 70-100% and 15-57% of the monitoring sites in the Tokyo Bay, Ise Bay, Osaka Bay and Seto Inland Sea (excluding the Osaka Bay), respectively. Unstable background light attenuation resulted from high turbulence made it difficult to obtain statistically significant estimates of BSD in some seasons, especially in the less enclosed Seto Inland Sea. The estimated BSD were highly correlated with salinity ($r > 0.6$, $p < 0.05$) and location (latitude or longitude, $r > 0.6$, $p < 0.05$ in spring, summer and winter) in the Tokyo Bay, Ise Bay and Osaka Bay, indicating a major role for the river in input of background optical constitutes like tripton and chromophoric dissolved organic matter. Moreover, the high correlation between BSD and chlorophyll *a* ($r < 0.6$, $p < 0.05$) confirmed the similar spatial variation in factors contributing to light attenuation, which explains why areas with worst light availability were usually located in the innermost part receiving substantial freshwater input within enclosed seas.

Keywords: background Secchi depth, chlorophyll *a*, enclosed sea, eutrophication, light transmittance

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