

Effect of optical properties variability on retrieval of chlorophyll *a* from ocean color data in Oyashio and coastal Oyashio waters in early spring

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Massive phytoplankton bloom occurs in Oyashio and coastal Oyashio waters off Kushiro during spring. Ocean color images also illustrates the spring bloom as high chlorophyll *a* (chl.*a*) concentration. While a validation result showed the estimated chl.*a* concentrations in these waters are within a range of +/-35% of in situ values, effects of Tokachi river plume on chl.*a* estimation were anticipated. However, little is known about optical properties in this region. We measured remote sensing reflectance (R_{rs}), absorption coefficient, backscattering coefficient (b_{bp}) and chl.*a* of the waters during the cruise of R/V Hakuho-maru in March 2015 and investigated the effects of the optical properties on chl.*a* estimation from satellite data.

In the coastal stations of study area where was highly turbid for a few days due to passing of a low pressure during 10–13 March, absorption coefficient of non-algal particles (a_d) accounted for >60% of that of particulate matters (a_p) and b_{bp} was also higher than those in offshore stations. These optical properties induced high R_{rs} and resulted in overestimation of chl.*a* concentration by 2-3 folds when the standard ocean color chl.*a* algorithm was applied to the R_{rs} . On March 20, however, ratio of a_d and b_{bp} decreased and estimated chl.*a* concentration using the algorithm coincided with *in situ* data.

Phytoplankton absorption coefficient at 443 nm ($a_{ph}(443)$) and $b_{bp}(555)$ were linearly correlated with chl.*a* concentration and $a_d(443)$, respectively. Estimated values of chl.*a* concentration and $a_{CDOM}(443)$ applying these relationship to satellite ocean color data indicated that relatively higher ocean color chl.*a* in offshore region had interferences by non-algal particles and CDOM advected from coastal region. In this study region, satellite chl.*a* images should be carefully used and retrieval of chl.*a* from a_{ph} is better than using standard band-ratio algorithm because spatio-temporal variability in optical properties are dynamic and complicated not only in coastal region but also in offshore.

Keywords: optical property, ocean color remote sensing, Oyashio