

Long-term variability in land snow cover, sea ice extent and ocean color in Arctic region

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Satellite-based observations revealed that sea ice extent and land snow cover in the Arctic region have decreased since 1979 under the influence of warming trend. Reduced sea ice cover increases open water area, a longer growing season, and annual net primary production (NPP) by phytoplankton. The greatest contribution to the Arctic Ocean's freshwater input is the discharge from terrestrial rivers. Because river inflow supplies a large amount of nutrient salts and organic matter to the ocean, change in the discharge affects the Arctic Ocean's NPP. Thus, successive observations on sea ice extent and land snow cover are crucial to understand the influence of those area reductions on marine ecosystems in Arctic region. In this study, we used multiple optical and microwave radiometric satellite data for 1978–2015 to analyze land snow cover, sea ice extent and ocean color in the northern hemisphere. Sea ice extent decreased during the observation period with the mean rate of $200 \text{ km}^2 \text{ a}^{-1}$. Snow cover extent decreased in all seasons (winter, spring, summer and autumn) from 1978 to 2015. Decreases in land snow cover and sea ice extent are likely to affect to seasonal and inter-annual variabilities in the amount of freshwater inflow to the Arctic Ocean. However, no clear trend of the ocean color (chlorophyll-a concentration) was observed with statistically significant in this study. To better understand relationship between spatiotemporal variabilities in these factors and other physical parameters, we also analyze variability in sea surface temperature and meteorological parameters and examine their cross-correlation relationship in space and time.