

Long-term variation of phytoplankton chlorophyll *a* in the Indian sector of the Southern Ocean

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Long-term monitoring of phytoplankton biomass is valuable to detect climate change impact on surface ecosystems in the Southern Ocean. Chlorophyll *a* (chl-*a*) observations by Japanese Antarctic Research Expedition (JARE) started in the 1965/1966 during austral summer and continued for over 50 years in the Indian sector of the Southern Ocean. We analyzed long-term chl-*a* dataset along 110° E in December and January to investigate inter-annual and decadal variations of phytoplankton biomass. In the region between 40°-60°S, chl-*a* values exceeded 0.5 mg m⁻³ were detected after the 1990s more frequently than before the 1980s. The similar long-term trend was also found in vertically integrated chl-*a* values. There was an increasing trend in the ten-year moving average of the mean surface chl-*a* value in the waters between 45°-55°S over the past 50 years. Moreover, this increasing trend in chl-*a* was correlated with the Southern Annular Mode (SAM) index positively. The positive correlation between trends of chl-*a* and the SAM index could be associated with enhanced westerly winds, which can lead to the supply of cold, iron-rich waters by upwelling (e.g., Lovenduski and Gruber, 2005). Recent observation along 110° E by Umitaka-maru (TUMSAT) and satellite remote sensing dataset revealed that inter-annual variation of surface chl-*a* in seasonal sea ice zone in January, although relationships among chl-*a*, sea ice, and climate index such as the SAM are still obscure.

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