

南大洋インド洋区における植物プランクトン群集の光保護応答

片山智代¹、真壁竜介²、三瓶真³、成田篤史⁴、飯田高大⁵、服部寛⁶、佐々木洋⁴、田口哲¹
¹創価大学、²極地研究所、³広島大学、⁴石巻専修大学、⁵北海道大学、⁶東海大学

Photoprotection of phytoplankton assemblages in the Indian sector of Southern Ocean

Tomoyo Katayama¹, Ryosuke Makabe², Makoto Sampei³, Atsushi Narita⁴, Takahiro Iida⁵, Hiroshi Hattori⁶,
Hiroshi Sasaki⁴ and Satoru Taguchi¹

¹*Soka University*, ²*NIPR*, ³*Hiroshima University*, ⁴*Ishinomaki Senshu University*, ⁵*Hokkaido University*, ⁶*Tokai University*

Light is an essential resource for phytoplankton, and it varies from extremely low to relatively high irradiance in the ocean environment. Light can be also harmful at supraoptimal irradiance such as surface water column, leading to a damage of photosystem II (PSII). One of the most important protection mechanisms against high light intensity is the thermal dissipation of excess energy by xanthophyll pigments in the de-epoxidated state. In this study, we investigated the photoprotective response to natural sunlight in phytoplankton assemblages during the austral summer in the Indian sector of Southern Ocean.

Water sampling for the incubation experiments were carried out at three stations, 45°S (Stn KC2), 61°S (Stn M03) 65°S (KC6) of 110°E, during cruises of the TR/V Umitaka-maru in the austral summers of 2014. The samples of phytoplankton assemblages, collected from subsurface chlorophyll maximum layer under low light conditions of <3% of the surface irradiance, were exposed to sunlight for 2 hours. Subsamples were collected after light exposure to measure variable Chl fluorescence and pigments of phytoplankton. Chlorophyll fluorescence are employed to estimate maximum quantum efficiency (F_v/F_m) of PSII. The degree of damage of PSII can be examined by variation in F_v/F_m .

Phytoplankton assemblages were dominated by coccolithophores in KC2, whereas in M03 and KC6 diatoms dominated the assemblages. After the phytoplankton assemblages were exposed to sunlight, diatoxanthin (DT) increased by de-epoxidation of diadinoxanthin but F_v/F_m decreased around 50% compared to initial values in the all experiments at three stations. In the all experiments, the relationship between DT and the relative F_v/F_m to the initial value showed similarly significant negative relationship. These results suggested that the photoprotective capacity, which reduce the damage of PSII, is similar between the different phytoplankton composition in the Indian sector of Southern Ocean.