The impact of aerosols on primary productivity in the oligotrophic ocean based on the field observation

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Aerosols are transported from continent to the ocean surface as the wet and dry depositions. Previous model studies showed the positive effect of aerosols on phytoplankton growth in the oligotrophic ocean due to the rich inorganic nitrogen compounds containing in aerosols. We conducted the shipboard observations at the several sites of the oligotrophic ocean in the northwestern subtropical Pacific Ocean and the eastern Indian Ocean to verify the impact of aerosols on primary productivity. The experiments of photosynthesis-irradiance curve (P-E curve) were conducted to estimate the oceanic productivity at the surface. Then, we confirmed a significant linear relationship of the photosynthetic parameters obtained by the P-E curve experiments between the several sites. Despite a similar oceanic environmental condition, primary productivity has changed up to three times in the northwestern subtropical Pacific Ocean. It is considered that the wet deposition of aerosols had an impact to enhance primary productivity because the rainfall event was recognized at the site of higher primary productivity. Similarly, it was suggested that the aerosol deposition have an impact on primary productivity in the eastern Indian Ocean. The aerosol concentration was estimated to be higher in the northern hemisphere (Bay of Bengal), and primary productivity seems to be affected even by the dry deposition of aerosols. However, the wet deposition of aerosols did not necessary to enhance primary productivity in the eastern Indian Ocean. Although the aerosol effect on primary productivity was not uniform, it was suggested that aerosols had some impact on primary productivity through the field observation.

Keywords: Aerosol, Primary productivity, Oligotrophic ocean

