Biogeochemical cycle between atmosphere and ocean via particulate matters
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The oceans absorbs carbon dioxide which is increasing in the atmosphere and has the ability to mitigate sudden climate change. The biological pump driven by marine phytoplankton play an important role in the global carbon cycle. In order to accurately estimate the carbon absorptive capacity of the oceans, it is important to know the supply amount of nutrient elements that support the growth of phytoplankton. Despite the fact that iron is an essential element for marine phytoplankton, the concentration of dissolved iron in the surface ocean is extremely low. Iron containing aerosols such as mineral dust in the atmosphere could be important as a source of iron to the surface ocean.

In my previous work, the sporadic deposition of atmospheric mineral dust by sea fog over the North Pacific was observed during an Asian dust event. By using bulk and individual particle analyses for suspended particulate matters in seawater, the biogeochemical impact of the dust deposition was investigated. As a result, it was found that the bioavailable iron supply to the surface ocean by an Asian dust event was sufficient to promote the growth of phytoplankton, and it also contribute the carbon absorption to the northern North Pacific. In addition, from a mapping data covering the North Pacific and its marginal seas, it was revealed that mineral particles of atmospheric origin existed ubiquitously in the surface ocean even during summer when the influence of Asian dust event is small.

On the other hand, the growth of marine phytoplankton causes changes in the atmospheric environment through aerosol generation. My current research focuses on oceanic aerosols acting as cloud condensation nuclei. From the continuous observation conducted at Noto ground-based research observatory (NOTOGRO) facing the Sea of Japan, it was found that the growth rate of cloud droplets delayed when the organic mass fraction of the aerosol was high. Currently, researches on the linkage between phytoplankton species and marine biogenic aerosol and the climate effect of aerosol generated by bubble bursting at the air-sea interface are conducted.

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