

Spatial and temporal distribution of Inorganic nitrogen compounds in marine aerosol and their deposition over the Pacific Ocean

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Nutrient supply to the ocean surface layer is an important factor controlling the marine ecosystem. The major paths of supplies of nutrients have been considered as those from nutrient-rich deep waters and riverine input, which is mostly taken up near the estuary region, but the nutrients transported through the atmosphere are recognized to be important for the open ocean, where the nutrients are limiting primary productivity. Because of rapid economic development surrounding the Pacific Ocean, anthropogenic NO_x emissions have increased by 2-3 times during the past decades. This rapid increase of NO_x emission causes a large amount of N deposition mostly in the form of nitrate and ammonium over ocean surfaces, and strongly impacts their marine ecosystems. Especially, biological N₂ fixation, riverine input and atmospheric deposition contribute to support "new production" and affect CO₂ air-sea exchange.

Nitrogen compounds in marine aerosol have been measured on the island stations and onboard research vessels in the Pacific Ocean over a few decades. The temporal and spatial atmospheric distribution of water-soluble particulate nitrogen compounds is summarized in this study. As reflection of the transport of anthropogenic nitrogen compounds from land, high concentration is revealed over the marginal seas in the western North Pacific. Most of nitrate exists in the coarse aerosol associated with sea-salt particle while ammonium exists in the fine particle and showing a good relationship with non-sea-salt sulfate.

Over high primary productive areas such as the equatorial Pacific and the Southern Ocean, ammonia is released to the atmosphere and transported to other areas. By atmospheric deposition, ammonia/ammonium is expected to be supplied to the ocean surface and enhanced primary production especially in the nutrient deficient areas just like a little precipitation on the desert area to maintain their ecosystem.