

Nitrogen cycles in the barrier reef lagoon of Palau Island

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The coral reef ecosystems at Palau Island have attracted growing attention recently. However, there are still many uncertainties about the coral reef ecosystems there because the characteristics of nutrient dynamics and primary production are expected to be largely different between shallow fringing coral reefs distributed in the Southern Japan and barrier reefs with deeper lagoon at Palau Island. Especially, how physical parameters such as light intensity, current velocity and wave strength, which vary depending on the water depth, control the primary production and material transport in the lagoon area is not yet well known. In this study, we investigated nitrogen cycles in the lagoon system combining the observations and several process studies: 1) distribution of nutrients and dissolved organic nitrogen in the water column, 2) depth-dependent characteristics of the surface sediment such as particle size, organic matter contents and nutrient profiles in the porewater, 3) flux of sinking particles, and 4) primary production in the water column and surface sediment.

The results showed that, as light intensity and current velocity decreases with an increase in the water depth, the main contributor to the primary production per unit area shifted from benthic microalgae to planktonic algae, and the material fluxes from the sediment to the water column appeared to shift from organic matters to inorganic nutrients. This finding suggests that these shifts are important factors to determine the vertical and horizontal profiles of nutrients in the water column in the lagoon of Palau Island.

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