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Model development for simulating nutrient dynamics in coral reefs

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Coral reefs are ecosystems which support biological diversity particularly for tropical and subtropical seas. Recently due to anthropogenic stresses such as excess nutrient input and fresh water runoff, resultant deterioration of reef system is one of major concerns in coastal issues. In this study, dynamics of nutrient cycle were simulated in a coral reef ecosystem by applying a newly developed nutrient dynamics model. This model is based on a 3-D hydrodynamic Princeton Ocean Model, and biological interactions related to organic and inorganic nutrient exchanges between benthic organisms (coral and seagrass) and the water column were incorporated in the formulae of photosynthesis and respiration rates. In this model, these rates are simulated as a function of ambient conditions such as light condition, temperature, carbon and nutrient availability which may enhance/limit the activities, and nutrient uptake and release rates were calculated in relation to tissue C:N:P ratio of the organisms. Spatio-temporal characteristics of nutrient dynamics in coral reefs will be discussed according to the model results.

Keywords: Nutrient dynamics model, Coral reef, Seagrass, Photosynthesis, Spatio-temporal variations