

BBG006-06

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## Comprehensive assessment of multiple stresses on coral reef ecosystems and their responses based on numerical models

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Coral reef ecosystems have been rapidly deteriorated by various environmental threats due to local anthropogenic impacts like land-based discharges of sediment and nutrients as well as global warming, acidification of sea water, etc., which may act on reef ecosystems through complicated interactive processes. For contributing to the establishment of effective reef ecosystem conservation and adaptive management strategy, we have been developing an integrated scheme with various numerical simulation models. The first part of the models are those for assessing and predicting multiple environmental stresses with their propagation processes through various physical and biochemical processes. And the second part models are those for describing the response of the reef ecosystems under these multiple stresses. The ecosystem models consist of the short-term and long-term response models, although the most of them are still in preparatory stages. Among these, a carbonate system dynamics model and nutrient dynamics model, which may be categorized both in the first and the second part of the models, are to be presented respectively by Watanabe et al. and Yamamoto et al. in this session. As the basis for all these models, we have developed quasi 2-D and 3-D hydrodynamics models for reef areas with complicated topographic features. In the presentation, we will show some examples of the computational results with these models including spatio-temporal variations of thermal stress, diffusive advection of red soil with its re-suspension in the reef.

**Keywords:** numerical simulation models, multiple environmental stresses, ecosystem response, coral reef