Coupled model system of vegetation model SEIB-DGVM and ocean model ROMS for modeling mangrove vegetation dynamics

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Mangrove ecosystem has recently highlighted as an ecosystem which has higher capacity of organic carbon (blue carbon) storage. For predicting the change of the blue carbon stock responding to future environmental changes, elucidating and modeling mangrove vegetation dynamics is needed. Mangrove species composition and vegetation pattern are highly related to soil salinity and interspecies competition. In the Fukido mangrove area, Ishigaki Island, Japan, there are mainly two mangrove species *Rhizophora stylosa*, which is high salinity tolerance but low shade tolerance species, and *Bruguiera gymnorhiza*, which is low salinity tolerance but high shade tolerance species, and clear vegetation zonation is observed, i.e. *R. stylosa* is vegetated near the river mouth area and *B. gymnorhiza* is vegetated relatively far area from the river mouth.

For reproducing such mangrove vegetation pattern, fine-scale mapping of soil salinity is one of very important components, because zonation pattern should be closely linked with soil salinity pattern. However, it is difficult to obtain the fine-scale mapping only by field observation. Therefore, firstly to obtain fine-scale soil salinity map in the Fukido mangrove area, 3D hydrodynamic model for Fukido mangrove area is developed based on the Regional Ocean Modeling System (ROMS; Shchepetkin and McWilliams 2005; Haidvogel et al. 2008).

Mangrove vegetation pattern is, of course, not only caused by soil salinity pattern but also by other factors such as light competition between the mangrove species. Spatially Explicit Individual Based Dynamic Global Vegetation Model (SEIB-DGVM; Sato et al. 2007) is a dynamic vegetation model and is incorporated plant light competition process. The SEIB-DGVM is powerful tool for computing dynamic plant vegetation, but it cannot be cared spatial heterogeneity inside the computational domain. Therefore the SEIB-DGVM was largely modified to be able to import spatially varied soil salinity calculated by ROMS. In addition, biological features of two mangrove species, i.e. salinity tolerance and shade tolerance, were incorporated in the SEIB-DGVM.
This coupled model system of SEIB-DGVM and ROMS was performed for reproducing vegetation pattern of two mangrove species, *R. stylosa* and *B. gymnorhiza*, in Fukido mangrove area. In the result of the simulation, although further improvement and validation are needed, trend of the vegetation patterns of two mangrove species was well reproduced.

Keywords: mangrove, vegetation dynamics, numerical simulation

