

Factors of the temporal variation of marine phytoplankton at Yodo River estuary

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Red tides of *Alexandrium tamarense* have occurred in the estuary of the Yodo River in Japan in 2007, 2011 and 2013. *A. tamarense* is marine phytoplankton and causes shellfish poisoning. We have made in-situ observation in April 2-3 2012, and analyzed the temporal variation of marine phytoplankton by using the numerical ecosystem model. CTD and ADCP observation and water sampling were carried out linked to the tidal change. Nutrient and chl.a concentration and cell density of *A. tamarense* were analyzed. *A. tamarense* was a few in this year. Typical estuary circulation which seawater run up to upstream in the surface layer and fresh water go down to the sea in the bottom layer. Therefore the estuary which have 2800m length was divided to three layers, 0-0.5m, 0.5-1.5m and 1.5m-bottom. The thickness of the bottom layer is changed with the tidal change. Nutrient, phytoplankton, the dissolved organic matter and the particulate matter are in each layer, and the bio-chemical process between the forms, photosynthesis, mortality, decomposition and so on, are formulated. Then the temporal variations of each morphology and *A. tamarense*. Diurnal migration, salt limitation and utilization of organic matter for the photosynthesis and mortality by low salinity were considered in the bio-chemical process of *A. tamarense*. The temporal variations of phytoplankton in each layer were almost reproduced. Marine phytoplankton in the Yodo River estuary were not produced hardly and were supplied from the ocean. Phytoplankton which cannot swim by oneself is almost floated by the horizontal advection, it is the estuary circulation. But only 27% of *A. tamarense* transported from the ocean in the bottom layer go through upstream. 36% of it returned to the ocean in the middle and surface layers, and other 36% die in the surface layer. Weak estuary circulation is effective to limit the transport upstream of *A. tamarense* in Yodo River estuary.

Keywords: Yodo River, Estuary, Numerical ecosystem model, Phytoplankton, *Alexandrium tamarense*