D-3 Study on the Marine Environmental Change by Global Mapping of the Satellite Ocean Color Data(Final Report)

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Abstract:

Satellite ocean color sensors such as CZCS (1978 - 1986) and Sea WiFS and OCTS (scheduled 1995 - and 1996 -, respectively) produce phytoplankton photosynthetic pigment maps. They indicate the change of ocean environments, which is the result of perturbation in C, N, P, or other material cycles. Efficient use of the ocean color data requires several other *in situ* data sets, models, data processing system and analysis clarifying the relationship between the pigments' concentration and the environmental parameters.

Under this research title, four sub-titles were generated featuring (1)Use of ferry as a platform to investigate the *in situ* time series of biological and chemical data to supplement the satellite data by National Institute for Environmental Studies+Kinki University, (2) Investigation of the mechanism of the chlorophyll variation in the Pacific Ocean and Japan Sea using research vessels and CZCS data system by National Research Insititute for Far Seas Fisheries, Chiba University, Tokai University and Japan Sea Fisheries Research Institute, (3) Biological-Physical Modelling of the central part of the Japan Sea using the satellite and bio-optical mooring data by National Institute for Resources and Environment, (4) Modeling the basin-scale circulation and upper mixed layer that affect the chlorophyll distribution by Meteorological Research Institute.

Observational results of (1) showed the time change of phytoplankton bloom in the early summer with their succession of species constituents from diatom to dinoflagellates, which occured along with the depletion of Si and resulting increase of (N, P)/Si ratio. Thus it is suggested that anthropogenic increase of (N,P) discharge may cause the shift of the marine ecosystem.

Results of (2) established a monthly time series of CZCS composite processed via the atmospheric correction algorithm pertinent for the western North Pacific area affected by the Kosa (yellow dust from Gobi Desert). The observational results in the Oyashio area also suggested that the depletion of Si is the primary cause that terminates the spring bloom.

The models established by (3) and (4) shows that the seasonal cycle of the development of mixing layer and the generation of spring thermocline is the mechanism to cause the natural (background) phytoplankton blooms.

Integration of the results from (1), (2), (3) and (4) shows that the phytoplankton chlorophyll derived from the satellite ocean color data is a good indication of marine environmental change both of the natural and the anthropogenic factors provided that appropriate *in situ* biogeochemical monitoring and modeling are pararelly done.