

D-3 Study on the Detection of Ecological Changes and Land-Based Loading Effects in the Asian Marginal Seas

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Objective and Methods:

The objective of this project is to detect and evaluate the anthropogenic and/or the land-based effects on the biogeochemical conditions in the seas neighboring to the East Asia by synthesizing the results from several methodologies. The change in the ratio of the anthropogenic loading of N and P to the natural supply of Si is hypothesized to lead to the long-term shift in the phytoplankton composition, namely, from dominance of diatom species to that of non-diatom species. A monitoring scheme was developed using ship of opportunity that plies the route between Japan and Malaysia. A three-dimensional numerical simulation of the South China Seas was carried out to interpret the those data. The satellite data from OCTS were used to obtain the spatial distribution of phytoplankton pigments and the indicator of land-based effects, namely, CDOM(Colored Dissolved Organic Matter). Also, the investigation by the research vessels were carried out for detailed measurements particularly in the vertical distribution, which would supplement the data from the ship of opportunity and the satellites.

Results

Distribution of CDOM was found to be indicative of the land-based effluent. The nutrients from the continent seemed to be consumed rapidly by the phytoplankton within the the western part of the East China Sea imposing less effects on the major part of the marginal seas . However, a long-term time series in the Tsushima Strait showed that the transparency decreased by 6m in these 30 years implying the anthropogenic effect is extending there. The apparent land-based effects such as the higher ratio of N/Si and seasonal dominance of dinoflagellates were confined mainly in the coastal seas such as Osaka Bay or the vicinity of Hong Kong. A summary of the appearance of phytoplankton composition is proposed as follows. Basically, the marginal seas is nutrient-limited and the cyanobacteria, dinoflagellates and other smaller flagellates contributed to the carbon biomass except for the coastal seas. The diatom dominates when and where the nutrients are newly supplied from land (anthropogenic) or from the lower layer (natural) . When diatom has exhausted Si and a small amounts of N and P remain, non-diatom species such as dinoflagellates appear. Among the global marginal seas, the South China Sea should be watched and evaluated sustainably based on the collaboration of related coastal countries because of its closedness and the observed dominance of the non-diatom species, although it is still recognized as oligotrophic. A meeting was held inviting the specialists from the related coastal countries and the CoMEMAMS Panel (temporary) is planned to be generated for the future collaborations.