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Satellite observation of marine ecosystem and ocean biogeochemistry

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The oceans absorb approximately 25-30% of anthropogenic carbon dioxide released into the atmosphere. While physics, as represented by temperature and wind speed etc., contribute to carbon flux between the atmosphere and the ocean, marine biota also plays a significant role via photosynthesis on fixation and export of the carbon within the surface ocean and from the surface to the deep ocean, respectively. Especially, the photosynthesis requiring the carbon dioxide in its process can even accelerate the ocean absorption of the carbon dioxide. An ability of the carbon fixation and the export is dependent on photosynthesizing microbe, or phytoplankton. While a large-sized phytoplankton such as diatom fixes and exports the carbon faster than other phytoplankton, cocolithophore even releases the carbon dioxide during its calcium fixation, reducing a net amount of its carbon fixation. Therefore, variability in marine ecosystem structure would, at least partly, explain spatial or temporal anomaly of the carbon flux within the ocean. Currently, the ocean colour remote sensing is only a practical means to observe marine biological and biogeochemical variables with considerable frequency for the large-scale oceans. Under the JAXA GCOM-C project, we have been developing novel algorithms to observe the marine ecosystem structure (especially phytoplankton community structure) and other biogeochemical variables. In this presentation we show these observed by satellite as well as a comparison with the state-of-the-art marine ecosystem model.

Keywords: Biogeochemistry, Ocean Ecosystems, Satellite observation, Ocean color