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Effects of the Tide on the Marine Ecosystem in the Northwestern Pacific Marginal Seas using a 3-dimensional Coupled Physico-Biogeochemical Model

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Tide is a crucial factor for the proper simulation of the ocean circulation in the Northwestern Pacific Marginal Seas, especially in the Yellow Sea. The different physical status due to the inclusion (or exclusion) of tide in the coupled ocean physics and biogeochemistry system also produces a different ecosystem. In this study, we have applied 3-dimensional coupled ocean system model based on POLCOMS (Proudman Oceanographic Laboratory Coastal Ocean Modelling System) and ERSEM (European Regional Seas Ecosystem Model) to the Northwestern Pacific Marginal Seas and have investigated the influences of the tide in the marine system model on the ecosystem. The model covers the Yellow and the East China Seas (YES), the East/Japan Sea (EJS) and the Okhotsk Sea (OS) as well as the major western boundary currents, the Kuroshio and the Oyashio currents.

The effects of tide in the physical system, as expected, are prominent in the YES circulation pattern change in terms of the Changiang Diluted Water (CDW) dispersion path, the Yellow Sea Warm Current (YSWC), the Yellow Sea Bottom Cold Water (YSBCW) distribution as well as local influences driven by tidal mixing. These changes of physical status control the changes of nutrients as well as plankton distributions in the YES. It is noteworthy that the ecosystem in the southern EJS is also highly affected by the lateral transport of different nutrients conditions and changed ecosystem from the YES. The changes of the OS ecosystem and physical status due to the tide are not notable compared to the YES but there are local changes especially in the northern shelf region. It is concluded that the tide is very important not only for the local ecosystem but also for the remote ecosystem, though the local tide seems not so much crucial, if it is linked with the strong tidal regime inflow region.