

Modeling on the North Pacific Ocean

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A North Pacific Ocean Model has been developed with the Global Ocean Model of the Meteorological Research Institute of Japan which solves the primitive equations with Boussinesq, rigid-lid, and hydrostatic assumptions. The objective of the study is to improve the description of the variability on the East Sea and northwestern Pacific Ocean. Firstly we focus on the development of the whole North Pacific Ocean Model because the East Sea is directly influenced by the Pacific Ocean through its opening. The superior characteristic of the model is the employment of the Oonish advection scheme on the bottom relief, which produces the reasonable circulation where topography is important.

The model domain covers 100° to 290° in longitude and 30° S to 66.5° N in latitude with 64 islands. The horizontal grid is 0.5-degree resolution and vertical grid has 44 layers with variable depth. The minimum and maximum depths of the model are 10m and 7500m, respectively. The forcing of the model was done by the Hellerman & Rosenstein wind and Levitus climatology data. In the surface and southern boundary, 30 days restoring time scale used for the tracers. In the 2000m below, restoring scheme (720-day to 1800-day time scale) was also used because the time scale arriving steady state is very large compared to the wind-driven upper layer circulation. The sensitivity of the parameters was also investigated.

The developed Pacific Ocean Model reproduced the known circulation of the Ocean. In the Kuroshio system, the meandering in the south of Japan, anticyclonic structure below the Shikoku, and the cyclonic feature below the Honshu are nicely reproduced. In the Kuroshio system, the model also reproduced well the flow quantitatively, in addition to the qualitative nature, in spite of the low-resolution of the model.

The model also reproduced successfully the temperature field in the several depths in terms of monthly mean, annual rms variability, and the amplitude of the annual harmonics. During the model test process, we also found the strong Rossby Wave activities in the central and western Pacific which was reported by the Chelton(1995) based on the Topex/Poseidon altimeter data.