ON SENSITIVITY OF KUROSHIO MODELING IN THE LUZON STRAIT WITH ERS-1/2 WIND FIELD FORCING

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1. INTRODUCTION

Kuroshio plays an important role in the water exchange in the Luzon Strait. In the last decades, considerable efforts have gone into Kuroshio modeling in the Luzon Strait with different wind field forcing. Metzger and Hulbert [2001] suggested that accurate presentation of the north-south island chain within Luzon strait is important in modeling the water exchange between Kuroshio and South China Sea. Their results with $1/8^0$ and $1/16^0$ are 2.2 Sv and 3.0 Sv, respectively. Qu [2000] estimate the Luzon Strait transport at 3.0 Sv from the observations. In our model, high horizontal resolution ($1/16^0 \times 1/16^0$) was chosen so that two very small shoals (Calayan Bank and a shoal north of Calayan Island) can stand out, which are extremely sensitive to the $1/16^0$ model. Satellite wind field is less used for momentum forcing in ocean model near Luzon Strait area. Common used wind fields are the Comprehensive Ocean-Atmosphere Data Set (COADS) and Hellerman &Rosenstein objective analysis data set (HR). It is well known that ocean water movement is sensitive to wind forcing on the ocean surface. However, there is difference between the wind field dataset, Xie and Wang [2001] suggested that the HR data set exists a strong seasonal rate of change, and the remote sensing data has higher resolution and more reasonable values. Also, many modelers get different results from the different datasets. Fang and Wei [2002] overestimated the transport in the Karimata Strait, he suggested that the reason may be the HR dataset value is much bigger than the real condition.

A three-dimensional ocean model-Princeton ocean model (POM) with the high horizontal resolution ($1/16^0 \times 1/16^0$) has been utilized to simulate the realistic upper Kuroshio path in the Luzon strait area. In order to simulate the whole and realistic Kuroshio dynamic processes at the Luzon strait, the model domain covers part of the North pacific and part of East China Sea. The seasonal variation in response to the forcing of the ERS-1/2

monthly mean wind field has been investigated and the simulated results are compared with the model results from other common wind field forcing —COADS dataset and HR dataset. The high resolution model can support a more accurate representation of the coastline geometry and the simulated results are compared with the previous one with a lower horizontal resolution under the same wind stress. The sea level simulated by the model is compared to the observation made by the TOPEX/POSEIDON(T/P) altimeter.

2. METHOD AND RESULTS

POM is time-dependent, primitive equation circulation model on a three dimensional grid that includes realistic topography and a free surface. The model grid is set with high horizontal spatial resolution (about 8 km) in the north South China Sea (SCS) and Luzon Strait. The ETOPO5 dataset is used for model bathymetry; the vertical sigma coordinate has 30 levels; the model is initialized with the climatologically mean temperature and salinity data from the World Ocean Atlas 2001 [Boyer et al., 2005] with 0.25^0 resolution and the wind stress obtained from COADS dataset; then integration for many years for stable condition; and next we use the ERS1/2 monthly mean wind field for simulation. It is found that in the study that the use of the ERS-1/2 scatterometer wind in driving an ocean model has improved the model's ability to simulate the Kuroshio in the Luzon Strait. The result is reasonable when compared to the conclusions from the observation and much better than the results with the COADS dataset and HR dataset; The sea level simulations resulting from the ERS1/2 are found to be closer to the T/P observations; And with the ERS1/2 forcing, the seasonal variations are obvious and in agreement with the previous studies and observations.

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