6. SEA STATE MODELS

6.1 Summary

(i) Two types of sea surface temperature analysis systems, in addition to that shown in section 3.8, are operated at JMA. One is a high resolution analysis using satellite remote sensing data and *in-situ* observation data to provide real-time ocean information. The other is an analysis based on *in-situ* observation data to monitor long-term variations in the ocean such as El Niño events and global warming.

(ii) An ocean data assimilation system (ODAS) has been operated at JMA since 1995 for the monitoring of El Niño and the Southern Oscillation (ENSO). ODAS consists of an ocean general circulation model (OGCM) and an objective analysis scheme. The output of ODAS, along with the atmospheric analysis, is given to a coupled ocean-atmosphere model for the prediction of ENSO. The model provides the basis for the six-month outlook of the oceanic and atmospheric conditions in the equatorial Pacific.

(iii) Another operational ocean data assimilation system (Ocean Comprehensive Analysis System) is operated to analyze and predict variations of sea-water temperature, salinity and current associated with eddy-scale oceanic phenomena, such as the Kuroshio, Oyashio and mid-scale eddies in the seas adjacent to Japan. This system succeeded in predicting the development of the Kuroshio large meander in 2004.

(iv) Two ocean wave models, one for the global ocean and the other for the seas around Japan, both called MRI-III, are operated for ocean wave prediction at JMA. They are composed of prognostic differential equations of wave spectra and classified into the third generation Discrete Interaction (DI) model.

(v) JMA has operated a numerical storm surge model to predict storm surges generated by tropical and extratropical cyclones. The model runs four times a day and provides 33-hour predictions of storm surges and sea levels for 280 points along Japanese coastlines. When a tropical cyclone (TC) of tropical storm intensity or higher is around Japan, the model predicts five possible scenarios of storm surges with five possible tracks of the target TC.

(vi) A numerical sea ice model is developed and has been operated at JMA to support sea ice forecast for the southern part of the Sea of Okhotsk. The model predicts distributions and concentrations of sea ice for one week based on dynamic and thermodynamic equations in the winter season.

(vii) An oil spill prediction model was developed and has been ready for operation at JMA. The model is an advection-diffusion model to predict distributions of spilled oil. The operation is triggered when a large-scale oil spill occurs in the offshore deepwater seas where tidal current is negligible. Effects of transport by sea surface winds, ocean waves and sea surface currents, turbulent diffusion, evaporation and emulsification are incorporated in the model.