A Study of Wave Characteristics for Northeast Asian Waters with Wave Hindcasting Method, WAM

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ABSTRACT

Wave distribution data acquisition is important for ocean development and safety of ships. There are limitations to get the wave distribution data through the installation of observation equipment, so wave hindcasting methods are used. Among the wave hindcasting methods, the WAM model of high precision and simple construction is widely used. In a previous study of Shin et al. (2004), the improved WAM model was suggested so that it is applicable to both shallow water sea and fine mesh wave simulation. In this paper, we investigated and analyzed 2001 to 2007 wave characteristics for Northeast Asian waters based on this improved WAM model. To verify model’s accuracy, hindcasted wave data were compared with the observed data of waverider at Ieodo Ocean Research Station and Jeju Sea. In the course of this analysis, we identify the wave information according to the seasonal and spatial change and it could be used as an important data of ship and ocean activities.

KEY WORDS: Corrected WAM model, Wave hindcasting, Northeast Asian waters

INTRODUCTION

According to increasing in the activity of human on the coast and ocean, there is increasing interest in wave, an important factor for sailing and structural safety verification. The obtaining the information about wave is studied lively because civil engineering facilities and ships are designed and safety standard is provided based on information about wave such as wave height, period and wave direction. So if we could know the temporal and spatial wave information accumulated over the years, it could bring great benefits.

To acquire wave data, we install the wave observation equipment in the specific place during period wanted to obtain. But this wave observation equipment has a difficulty in obtaining information steadily due to being damaged and swept through the extreme wave such as typhoon. Also it couldn’t get data of large area spatially because of the wave observation equipment’s property which could obtain information of wave only specific place. To overcome these limitations, wave hindcasting methods are used to acquire wave data.

Wave hindcasting methods solve the energy balance equation about ocean energy spectrum numerically and could hindcast wave variation according to the temporal and spatial change. In contrast to first and second generation models, the third generation WAM model deal with non-linear energy transfer function. The third generation wave hindcasting method has WAM developed by the WAMDI group, WAVEWATCH 3 developed in the American NOAA and JWA3G developed in Japan meteorological agency. Among these methods, simple structure with high precision WAM model has been used as a representative.

WAM model is designed to work with deep wide-area conditions on a large grid and bad results could come out depending on the wave direction characteristics. In a previous study Shin et al. (2004) showed the applicability for shallow water sea by modifying WAM model’s grid placement and relaxing the wave development restriction.

In this study, using previous studied modified WAM cycle 4 model by Shin et al. (2004) capable of high accuracy wave hindcasting for shallow and detailed waters, we hindcast ocean wave from 2001 to 2007. To verify modified WAM model, compare the simulated result with the observed data at Ieodo Ocean Research Station and Jeju sea. Through the 7 years of wave computation, Northeast Asian wave data such as wave height, period and wave direction were obtained and seasonal, spatial analysis was made possible.

Fig. 1 Location of Ieodo Ocean Research Station and Jeju Sea Observation