Verification of meteorological variables from developed HNS Alert system

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Key Words : HNS, weather forecast, atmospheric dispersion, WRF-chem

1. Introduction

Marine accidents are becoming serious problems arising from human loss and environmental pollution (Kim et al., 2011). Also, chemical vessels, particularly the transport of hazardous and noxious substances (HNSs), have the risk of fire, explosion and release of toxic chemicals. An attempt has been made to develop a weather and atmospheric dispersion monitoring system, named as HNS alert system, to prepare unexpected HNS exposure accident over the sea around the Korean Peninsula.

2. Method

The HNS alert system activates to start WRF-Chem to forecast weather and chemical behavior for the domain including the East Sea, Yellow Sea, and part of the East China Sea with 9 km horizontal resolution. We verified the weather forecast data from the system, especially wind speed and direction which are important to understand the released chemicals where to disperse, comparing with buoy observation data from KMA (Sinan, Mara-do, Geomun-do, Pohang, Ulleung-do, and Donghae) during winter and typhoon season in 2015.

Correlation coefficient and RMSE were used to verify sea level pressure, temperature, and wind speed. For the wind direction forecast skill score (SS) defined as the number of occurrences when a forecast falls within ranged ±22.5° from the observed value was used (A. Papadopoulous and P. Katsafados, 2009).

3. Results

Correlation coefficient for the forecast evaluation showed more than about 0.6 for sea level pressure, temperature and wind speed for the two durations. The value of RMSE were less than about 2.2 hPa for sea level pressure; 1.5 °C for temperature; and 2.6 m/s for wind speed. When the typhoon GONI was passing, it simulated well a steep change in sea level pressure. For wind direction skill score were more than about 60%. In the case of site Sinan, the correlation values were lower than those of other locations because of complex coastal terrain. The model resolution was 9 km in horizontal. Thus it may not cognize near small islands and not accounted total impact for the wind. Nonetheless, it showed high prediction accuracy by indicating a relatively low RMSE (1.33 m/s).

4. Conclusions

Statistics for the forecast evaluation showed high accuracy. The verification results show the robustness of this proposed system with high accuracy compared to sea level pressure, temperature, wind speed and direction of six buoy data. Based on this high accuracy, the proposed HNS alert system might be good enough to be operated to watch the transportation of HNS safely, especially for the case of no observation.

Acknowledgement

This research was a part of the project titled 'Development of Management Technology for HNS Accident', funded by the Ministry of Oceans and Fisheries, Korea

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