A Study on the Assimilation of Meteorological Data and Sea Surface Temperature Data for Improving the Accuracy of WRF Prediction during Typhoon periods on the Korean Peninsula

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Typhoons affecting the Korean peninsula and the surrounding regions originate in the Western Pacific Ocean. The SST around Korean peninsula are increasing at a more rapid rate than the rate of global SST. Consequently, the intensity of typhoons affecting the Korean peninsula will become stronger. Therefore, studies on the implementation of the typhoon disaster prevention system, to minimize the damage by predicting the maximum possible wind speed at the time of the influence of the typhoon, were carried out. In addition, recent studies have used the WRF model, which is useful for work-site operation and research. It is suitable for work-site operation as well as research to emulate the high-resolution data of the typhoon disaster prevention model. In this study, SST data and FDDA data were assimilated to produce the optimal WRF results. The results obtained were used as input data to the typhoon disaster prevention model, which is part of the typhoon disaster prevention system. This study selected Typhoon Bolaven (that moved north to the Yellow Sea and greatly damaged the metropolitan area in the Korean peninsula), and used WRF 3.5.1 version for data evaluation. The RDAPS numerical model data of the Korea Meteorological Administration were used as the model input data, and the OSTIA data were used as the SST data. For the FDDA data assimilation (OBS nudging), the sensitivity test was performed using the wind speed and temperature data of vertical and synoptic observations in the Korean peninsula region. As a results of time series analysis and statistical analysis, the maximum wind speed difference was about 5 m/s when the input data were applied differently. High-resolution sea surface temperature data assimilation yielded better results than the meteorological data assimilation. When the meteorological data assimilation and high-resolution sea surface temperature data assimilation were applied simultaneously, better results were obtained than under individual data assimilation cases. If the maximum possible wind speed of the 3-second gust that can occur during a typhoon is estimated using the optimal high-resolution results, the damage due to the typhoon will be effectively reduced through accurate prediction.

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