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A study on improvement the accuracy of wind field in the southeastern coastal area, Korea

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The southeastern coastal area of the Korean peninsula has a complex terrain including an irregular coastline and moderately high mountains. This implies mesoscale circulations such as mountain-valley breeze and land-sea breeze can play an important role in wind field and ocean forcing. In this study, to improve the accuracy of complex coastal wind (surface wind and sea surface wind), we carried out sensitivity experiments based on PBL schemes in PSU/NCAR Mesoscale Model (MM5), which is being used in the operational system at Korea Meteorological Administration, and next-generation Weather Research and Forecasting (WRF) model.

Four widely used PBL parameterization schemes in sensitivity experiments were chosen: Medium-Range Forecast (MRF), High-resolution Blackadar, Eta, and Gayno-Seaman scheme. Thereafter, two cases of weak-gradient flows and wind-wave days according to the strength of wind speed were simulated. The time series of each grid simulated both horizontal and vertical winds are compared with those of hourly surface observations (AWS, BUOY) and other available satellite data. In the analysis of the hourly surface observational data, the strength of wind speed of all of schemes overestimated in complex coastal regions, while that of about four different schemes underestimated in islands and over the sea. Sea surface wind using the Eta scheme showed the highest wind speed over the sea and its distribution was similar to the observational data. We also applied WRF model to the prediction of complex coastal wind and compared the horizontal and vertical distribution of wind field between WRF and MM5. WRF model generated more similar distribution to the wind field of real observational data, compared with that of MM5.

Keyword: surface wind, sea surface wind, PBL schemes, sensitivity experiment, MM5, WRF