

Impact of Combining Near Ocean Surface Wind Field Observed by Satellite with Multiple-Doppler Radar Data on Retrieving the Dynamic Structure and Numerical Weather Prediction of the Convective System: OSSE Study

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The objective of the study is that investigating the impact of the three-dimensional wind field and numerical weather prediction by assimilating near ocean surface wind through a series of experiments. An advanced scheme—WInd Synthesis System used to DOppler Measurements(WISSDOM)—is applied to combine near ocean surface wind with radar data through OSSE(Observing Systems Simulation Experiments) test. The concept of WISSDOM is based on the variational analysis, which can minimize the cost function formed by constraints, to derive the three-dimensional wind field. The case is the southwest monsoon case on 23 June 2013 to test the combination of radar radial wind and near ocean surface wind.

The results demonstrate that assimilating both wind speed and wind direction by near ocean surface wind improves the horizontal wind field at first level, especially wind direction; then, the correct information is transported to higher levels through other constraints from WISSDOM, but a limited effect on wind speed. In contrast, the improvement is not significant when only wind speed information is available from satellites; moreover, the more observation data are utilized, the better effect at lower atmosphere. Finally, the model forecast indicates the improvement of rainfall distribution and overestimated rainfall. In addition, Equivalent Threat Score(ETS) is also improved for different forecast times and thresholds.

The advantage of this research is assimilating near surface wind to improve the dynamic structure and numerical weather prediction. Future works are investigating the impact of retrieving thermodynamic fields.

Keywords: Radial wind, WISSDOM, Near ocean surface wind