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Assimilation Experiments for Forecasting Tropical Cyclone Track Using Ensemble Kalman Filter

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Accurate prediction of tropical cyclones remains a major challenge in meteorology. The lack of routine high-density observations over the vast ocean over which tropical cyclones form, develop, and spend most of their vigorous lifespan is one of the main reasons for their relatively low prediction skills.

For the recently initiated WMO-sponsored THORPEX program, the drift-sonde system that carries and deploys GPS dropsondes over data sparse regions including the oceans is proposed as one of the major observing systems for improved observations of the atmosphere. Before the actual deployment of such systems, it is worthwhile to carefully study the potential impact of such observations on tropical cyclone forecast through observing system simulation experiments (OSSE).

Typhoon Rusa (2002), which produced a record-breaking amount of rainfall and damages over eastern coast of the Korean Peninsula, is chosen as the case for our data assimilation and impact study. In this study, an ensemble Kalman filter (EnKF) system originally developed for the ARPS [1] is coupled with the MM5 model to assimilate dropsonde data collected in and around typhoon Rusa 2-3 days preceding the landfall. The effectiveness of the EnKF method in assimilating dropsondes for a typhoon system, and the impact of the number as well as the spatial and temporal distributions of the dropsondes will be examined, in terms of the track and intensity forecast of Rusa (e.g., [2]).

References

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