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Biases and Skill of Four Two-Moment Bulk Microphysics Schemes in Convection-Allowing Forecasts for the 2018 Hazardous Weather Testbed Spring Forecasting Experiment Period

Abstract

Evaluation of convective hazards is applied to short-term (1–6 h) forecasts using the Morrison(MORR), National Severe Storms Laboratory (NSSL), Predicted Particle Properties (P3), and Thompson(THOM) two-moment microphysics schemes for the 2018 NOAA Hazardous Weather Testbed Spring Forecasting Experiment (HWT SFE) period.

Four convective line case with composite reflectivity and 1-h accumulated precipitation are examined to determine storm coverage/precipitation biases/skill using point-based verification with a neighborhood. Simulated 1–6-km updraft helicity and observed 3–6-km azimuthal shear and MESH(Maximum Expected Size of Hail) are examined to consider simulated rotation and hail core prediction with object-based scores.

In the experiment, MORR shows little storm coverage bias relative to others' underprediction. The equitable threat score (ETS) and fractions skill score (FSS) of P3 are lower. P3 and THOM underpredict convective regions relative to MORR and NSSL overprediction. All experiments underpredict precipitation amounts. P3 light precipitation FSS is lower than other experiments.

Rotation object shows sensitivity to microphysics experiments, which has an indirect influence on dynamics. While P3 has the largest hail object underprediction, all experiments overpredict the number of hail objects in convective line cases. The importance of microphysics ice parameterization and scheme updates shows the need to apply this verification.

Keywords

Cloud Microphysics

Forecast Skill

Reference

Johnson, M., M. Xue, and Y. Jung, 2023: Biases and Skill of Four Two-Moment Bulk Microphysics Schemes in Convection-Allowing Forecasts for the 2018 Hazardous Weather Testbed Spring Forecasting Experiment Period. *Wea. Forecasting*, **38**, 1621-1642, https://doi.org/10.1175/WAF-D-22-0171.1.