Prediction of the bulk liquid fraction of mixed-phase particles in the Predicted Particle Properties (P3) microphysics scheme

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The accurate prediction of freezing rain, ice pellets and wet snow, is a principal source of uncertainty in weather forecasting because mixed-phase particles involved in their formations are neglected in microphysics parameterizations. A new approach to predict the liquid fraction of mixed-phase particles in the Predicted Particle Properties (P3) microphysics scheme is described. The objective is to show the impacts of the predicted liquid fraction on the precipitation types produced during the extreme North American 1998 Ice Storm simulated with the Weather Research and Forecasting model (WRF). A decrease in freezing rain and an increase in solid accumulations are obtained when the liquid fraction is predicted because of smaller raindrop sizes from partial melting and larger ice particle sizes from refreezing. The predicted liquid fraction impacts the simulated precipitation properties and atmospheric conditions while permitting the realistic representation of new precipitation types.