Optimization of Multiple Physics Schemes and parameters using the micro-Genetic Algorithm in WRF model for Quantitative Precipitation Forecast in the Eastern Coastal Region of Korea

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One of the largest uncertainties in numerical weather/climate predictions comes from treating the subgrid-scale physical processes. In most numerical weather/climate models, the subgrid-scale physical processes are parameterized, and each physical process has several optional parameterization schemes. The accuracy of numerical weather/climate prediction strongly depends on the followings: the value of parameter in a given uncertainty range in a parameterization scheme and the choice of parameter scheme for each corresponding physical process. Therefore, it is ardently desired to find an optimal set among multiple physics schemes that are suitable for weather/climate system over a regional area as well as optimal parameter estimation. However, it is a challenging task because almost an infinite number of possible scheme sets have to be evaluated. In this study, we developed micro-genetic algorithm interfaced with WRF to find an optimized set of parameterization schemes. In this study, through the micro-genetic algorithm (μ-GA), we optimize parameters in cumulus scheme and microphysics scheme and the set of physics parameterization schemes - microphysics, cumulus, and boundary layer options - in terms of quantitative precipitation forecast for the snowfall event in the Eastern coastal region of Korea.

Key words: optimization, micro-genetic algorithm, subgrid-scale physical process, WRF, quantitative precipitation forecast