EMS Annual Meeting Abstracts
Vol. 16, EMS2019-722, 2019

Optimization of Multiple Physics Schemes in WRF Using the Micro-Genetic Algorithm for Quantitative Precipitation Forecast for Both the Combined Rain and Snow Precipitation Event in Korea

Sojung Park (1,2,3), Ebony Lee (1,2,3), Seung Yeon Lee (1,2,3), Seon Ki Park (1,2,3)

(1) Department of Climate and Energy Systems Engineering, Ewha Womans University, Seoul, Republic of Korea (spark@ewha.ac.kr), (2) Severe Storm Research Center, Ewha Womans University, Seoul, Republic of Korea, (3) Center for Climate/Environment Change Prediction Research, Ewha Womans University, Seoul, Republic of Korea

The forecast skill of regional weather/climate prediction is highly dependent on how accurately the subgrid-scale physical processes are represented. In most numerical weather/climate models, each subgrid-scale physical process is parameterized with several optional parameterization schemes. 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. 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. The genetic algorithm (GA) is a global optimization approach based on the Darwinian principles of natural selection, developed by John Holland. The micro-GA algorithm (μ-GA), which is an improved version of GA with smaller generation sizes and simplified generic modifications, hence efficiently reducing the computational resources, automatically finds the optimal set with maximum or minimum fitness by means of a stochastic global search. We optimize the selected physics schemes – microphysics, cumulus, longwave and shortwave radiation, surface layer, and boundary layer options – in terms of quantitative precipitation forecast for the event in which two types of precipitation (i.e. rain over the coastal region and snow over the mountain) appeared at the same time. The precipitation event occurred on 15 March 2019 due to the development of the polar low. Through the numerical weather prediction with the optimization of physics schemes, we can most accurately analyses the structures, mechanisms, and characteristics of the weather system. Furthermore, the GA interfaced with WRF has a great advantage can be simply applied the different domains and cases by changing the WRF configuration setting to improve quantitative precipitation forecast.