Assessing WRF Model Parameter Sensitivity and Optimization: A Case Study with 5-day Summer Precipitation Forecasting in the Greater Beijing Area

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A global sensitivity analysis method was used to identify the parameters of the Weather Research and Forecasting (WRF) model that exert the most influence on precipitation forecasting skill. Twenty-three adjustable parameters were selected from seven physical components of the WRF model. The sensitivity was evaluated based on skill scores calculated over nine 5-day precipitation forecasts during the summer seasons from 2008 to 2010 in the Greater Beijing Area in North China. We found that 8 parameters are more sensitive than others. Storm type seems to have no impact on the list of sensitive parameters, but does influence the degree of sensitivity. We also examined the physical interpretation of the sensitivity analysis results. The results of this study are used for further optimization of the WRF model parameters to improve WRF predictive performance. The improving rate has arrived at 17% for new parameter values, showing the screening and optimization are very effective in reducing the uncertainty of WRF parameters.