Improvement of WRF forecast meteorological data by Model Output Statistics using linear, polynomial and scaling regression methods

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Abstract

The Numerical Weather Prediction (NWP) models determine the future state of the weather by forcing current weather conditions into the atmospheric models. The NWP models approximate mathematically the physical dynamics by nonlinear differential equations; however these approximations include uncertainties. The errors of the NWP estimations can be related to the initial and boundary conditions and model parameterization. Development in the meteorological forecast models did not solve the issues related to the inevitable biases. In spite of the efforts to incorporate all sources of uncertainty into the forecast, and regardless of the methodologies applied to generate the forecast ensembles, they are still subject to errors and systematic biases. The statistical post-processing increases the accuracy of the forecast data by decreasing the errors. Error prediction of the NWP models which is updating the NWP model outputs or model output statistics is one of the ways to improve the model forecast. The regression methods (including linear, polynomial and scaling regression) are applied to the present study to improve the real time forecast skill. Such post-processing consists of two main steps. Firstly, regression is built between forecast and measurement, available during a certain training period, and secondly, the regression is applied to new forecasts. In this study, the WRF real-time forecast data, in comparison with the observed data, had systematic biases; the errors related to the NWP model forecasts were reflected in the underestimation of the meteorological data forecast by the WRF model. The promising results will indicate that the post-processing techniques applied in this study improved the meteorological forecast data provided by WRF model. A comparison between various bias correction methods will show the strength and weakness of the each methods.

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Keywords : Model Output Statistics, Linear regression, Polynomial regression, Scaling regression, WRF

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