Geoscientific

Model Development

Discussions

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comment

Interactive comment on "Multi-year Downscaling Application of Online Coupled WRFCMAQ over East Asia for Regional Climate and Air Quality Modeling: Model Evaluation and Aerosol Direct Effects" *by* Chaopeng Hong et al.

Anonymous Referee #2

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This study reports the evaluation against measurements of the output from a dynamical downscaling link between the global Community Earth System Model (CESM) and the WRF-CMAQ modelling system over the East Asia region for a number of meteorological and air quality composition variables. The climatological simulations were for RCP4.5 for 2006-10 and the air quality applications were for winter and summer months in 2013 (principal compositional variables of interest: PM2.5 and O3). The authors report satisfactory prediction of major meteorological variables, although see the first of the general comments below. The paper reports on a major piece of work, with what appear to be generally appropriate methods, and is within the scope for

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[Discussion paper]

consideration of publication in GMD.

General comments

(1) The description of the downscaling (P5-6) indicates that aspects of it involves significant bias corrections, so to what extent is it valid to judge model performance by model-observation statistics? For example, it is stated on P8, lines 1-6, that the improved statistical performance of the modelling approach used in this study may be related to the bias-correction applied. If a bias correction is applied then presumably we expect better model-observation statistics, so have we learned anything fundamental about the model performance by these comparison statistics?

(2) The model-observation statistics should include RMSE instead of, or in place of, the normalized mean error (NME). The former is the statistic usually used alongside the correlation coefficient and mean bias (or normalised mean bias) in the suite of statistics that captures the spectrum of model performance characteristics.

(3) In general, the discussion of model output against meteorological and compositional variations is (i) vague, i.e. non-quantitative (using phrasing like agreed well, satisfactory, etc.), and (ii) lacking explanatory insight, i.e. lists of potential reasons for discrepancy are given which could be written down as potential explanations without needing to do these comparisons. The authors should endeavour to provide more quantitative assessments of model performance, including how their mod-obs statistics compare with expectation and with other studies, and also to provide some more informed analysis of what is the driving explanation for mod-obs discrepancies for particular variables or circumstances.

Specific comments

P1, L27: The phrasing "The model showed good ability to predict PM2.5 . . ..and O3. . ." is non-quantitative and vague.

P4, L20: Rephrase as "Several modifications in model. . ."

P7, L16: Although the acronym TOR is defined here, there needs to be some further explanation of what it means in practice, particularly in the context of its relevance to model performance evaluation.

P12, L18: "were much closer to...