

Review of Manuscript # gmdd-7-2933-2014

Multi-model ensemble: technique and validation

Recommendation: accepted subject to minor revisions

The manuscript presents the development and implementation a multi-model ensemble technique to atmospheric weather prediction models. The technique combines several regional and global weather models, by weighting each model according to their performance, with the objective of improving the specification and prediction of the atmosphere. The authors implement the multi-model technique to southern Latin America, in particular, the area surrounding and including Brazil. The multi-model solution provides a prediction with a lower forecast error than any given single model, and is comparable to the NCEP analysis. The paper is well structured and clearly written, with very encouraging results. I recommend the manuscript be accepted for publication with minor revisions.

Major Comments:

1. The authors develop a multi-model weighting technique to estimate an improve forecast, but do not cite previous relevant work done in the area. In particular, there are a number of methods that are closely related to the technique in the manuscript, such as the Unweighted Multi-Model Ensemble Average [1, 3, 5], the Reliable Ensemble Averaging Technique [2], and the Modified REA with Bayesian Analysis [4] to name a few. What is the difference or advantage of the method presented by the authors the these methods? Please include the proper literature citations and a brief paragraph on the advantages and/or differences between the method presented in the manuscript and those already published in the literature.
2. In page 2936, line 20, the authors mention that “Grid Analysis and Display System (GrADS) was used to calculate the weights”, what does this mean? Were all the computations for the method done in GrADS? Is there a scripting language? Why was this scripting language selected over more traditional languages, such as C, Fortran or even Python?
3. On page 2938, lines 5, the first equation contains $nD_{(DEZ)}$ and $nD_{(FEV)}$, what are these variables? Please include a description of these variables in the text.
4. The labels, text, color legends and titles of all of the plots are very hard to read, if they can be spotted at all. I strongly encourage the authors to use bigger, more clear fonts and/or formatting to make the plots readable.
5. On Figure 3, what is FCT in the x-axis?
6. On Figure 6, I strongly encourage the authors to put plot (f) as a separate figure, it is not aesthetically pleasing to see it crammed in the same figure as the other plots.
7. Figure 8 and 9 are extremely hard to read, please use better formatting of the fonts and/or better plots.

Minor Comments:

1. Please review the manuscript for grammatical errors and typos
2. There is a comma missing at the end of Equation (2)
3. There is a dot missing at the end of Equation (3)

References

- [1] R.E. Chandler. Exploiting strength, discounting weakness: combining information from multiple climate simulators. Phil. Trans. R. Soc. A, 371, 2013.
- [2] F. Giorgi and L.O. Mearns. Calculation of average, uncertainty range, and reliability of regional climate changes from aogcm simulations via the reliability ensemble averaging(rea) method. J. Climate, 15:1141–1158, 2002.
- [3] J. Hesselbjerg Christensen, E. Kjellström, F. Giorgi, G. Lenderink, and M. Rummukainen. Weight assignment in regional climate models. Clim. Res., 44(2-3):179–194, 2010.
- [4] C. Tebaldi, L.O. Mearns, D. Nychka, and R.L. Smith. Regional probabilities of precipitation change: A bayesian analysis of multimodel simulations. Geophys. Res. Lett., 31:L24213, 2004.
- [5] A.P. Weigel, R. Knutti, M.A. Liniger, and C. Appenzeller. Risks of model weighting in multimodel climate projections. J. Climate, 23:4175–4191, 2010.