

## ***Interactive comment on “Improved Forecasting of Thermospheric Densities using Multi-Model Ensembles” by S. Elvidge et al.***

### **Anonymous Referee #2**

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This paper describes a multi-model ensemble (MME) of thermosphere models. The MME was used to simulate three events. Three ways of combining the three models were used: (1) no weighting, (2) weighting by the error between the model and the data, and (3) weighting by the error, but only counting quiet times. The easiest method, no weighting, seems like it worked the most reliably. Then, a single model was initialized with the MME and used to forecast with good success.

Comments:

Line 164: The CHAMP data was probably taken more often than 45 seconds, but then was averaged to 3 degrees in latitude, which is about 45 seconds.

Lines 165-175: There is a change in tense in this paragraph compared to the rest of the paper that should be corrected.

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Line 178: Trilinear interpolation was mentioned. Does this mean the model files were output at the exact correct time? How often were the model output files written?

Line 252: The "l" is missing in "It"

Line 258: Comma after "conditions"

Line 261: Comma after "possible"

Line 262-263: Should use "e.g.," instead of "i.e."

Line 267: Comma after "models"

Line 270: Need should be "needed". Comma after "grids"

Line 274: Comma after "run", "grid" should be "state-vector", and then "conditions" should be "condition"

Line 275: "this" should be "the six-hour period"

Line 276: Comma after "period"

Line 278: The argument here that this is a "true forecast" is not really true at all, since it would imply that you are running all three models with real inputs/drivers. What really should be done is that all three models should be run in a "predictive" mode for 6 hours, then the MME should occur and all three should be re-initialized. Then the sequence should start again. But, as it is now, the MME is like a "truth" simulation and you are always bringing the TIEGCM back up to the truth. This is not like how it would be done in real predictive mode.

Line 284: "conditions" to "condition"

Line 285: "combine" to "converge"

Line 288: Change the rest of the sentence starting with "the two models..." to "the two models, started with different initial conditions, are decreasing towards zero, as expected, but it takes approximately 70 hours to read these levels." Really, a much

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better way to do this would be to fit an exponential decay to this curve and report the e-folding time. It should never really reach zero.

Line 305 and around there: It seems like the original MME - combining the 3 models - does better than the TIEGCM initialized with the MME. Why not run all 3 models and use an MME for the forecast also?

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