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Interactive comment on "Evaluating Simulated Climate Patterns from theCMIP Archives Using Satellite and Reanalysis Datasets" *by* John T. Fasullo

Anonymous Referee #2

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The manuscript "Evaluating Simulated Climate Patterns from the CMIP Archives Using Satellite and Reanalysis Datasets" by J.T. Fasullo describes a methodology how developments and improvements of Earth system models can tracked and objectively evaluated using observational datasets and their uncertainties. With the increasing complexity of the models participating in CMIP, a new way of evaluating their proximity to observed parameters is important. While there are already some evaluating and grading methods available, this new method uses some different fields than usual (seasonal differences, ENSO), and also takes into account observational uncertainties. The manuscript is mostly very well written and well structured. However, there are a few things that I think would help to improve the manuscript, and that I would suggest

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Discussion paper

the author to consider while revising the manuscript. These comments are outlined below.

I therefore recommend the publication of the manuscript after minor revisions.

General comments:

- I think it would be helpful to put the method in perspective with other evaluation and grading methodologies (e.g. Gleckler et al., 2008; Reichler and Kim, 2008) that are available for the reader to understand the similarities and differences of the described method to already existing methods.
- I agree with reviewer 1 that the methodology needs to be described in a lot more detail. At the moment it is not clear how the scores are calculated exactly.
- I think it would be helpful to show not just examples for the annual mean bias patterns, but also one of the seasonal patterns and one of the ENSO patterns. After all, these are different to other methods and are therefore definitely worth some more detailed description.

More specific comments:

- l. 36: “increasing” -> should be “increasingly”?
- l. 84: Why was the ENSO pattern chosen as one of the bias fields to be evaluated? Could you provide a little more background information about this decision here?
- l. 129: “ERAI” -> should be “ERA-Interim”?
- l. 142-153: This is the that, in my opinion, needs a lot more detail to be easily understandable. How are the scores for the different realms combined from the

individual variable scores? How exactly is the weighting determined? There is a brief example in line 152-153, but even this does not make it clear how the weighting factor was determined.

- l. 155: What does the “0.04” mean? What kind of value range can be expected?
- l. 178-180: Explain the stippling and hatching in a little more detail.
- l. 213: What exactly is cross correlated? All CMIP results at the same time?
- l. 217: “are” -> should be “as”?
- l. 217: “import” -> should be “important”?
- l. 235: I think it would be good to very briefly mention what it means in the plot when the bias diminishes.
- l. 410: Figure 1. What do the three colored lines at the right edge of each global map show? They are not mentioned or explained anywhere.
- l. 413: “CESM-CERES differences exceed twice the estimated internal spread” -> this seems slightly different to the definition presented in the first paragraph of Section 3. Please adjust this so that it is clearer and the same in both parts.
- l. 434: Figure 6. What do the colored lines to the right of the global maps represent in this figure?

References:

- Gleckler et al., JGR, 2008, doi:10.1029/2007jd008972
- Reichler and Kim, BAMS, 2008, doi:10.1175/bams-89-3-303

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