

Earth Syst. Dynam. Discuss., community comment CC1
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Comment on esd-2020-85

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Community comment on "The potential for structural errors in emergent constraints" by Benjamin M. Sanderson et al., Earth Syst. Dynam. Discuss., <https://doi.org/10.5194/esd-2020-85-CC1>, 2021

While the three comments from reviewers so far seem to complain that the article in question is more like a review article than an article describing new research, I think this is a good reason to publish it, not a negative. While I am not a researcher who develops earth system models, in most areas of applied science there are far too many "original" research articles, and far too few articles discussing the strengths and weaknesses of how very complex models like ESMs are being developed and applied in making forecasts. After CWIP6 it is certainly time for climate system modelers to step back and assess the value of trying to analyze multi-model ensembles, especially when the results of so many models are so different. Needless to say, policy makers probably do not have the slightest idea of how to evaluate these differences.

The gist of the current article under review is that the key focus in developing climate science models, like all scientifically-based models, must be on the scientific basis for each major process modeled. Thus, rather than try to use emerging constraints to help make forecasts more accurate, one should focus on improving the scientific basis for how each process is modeled. To me, this implies trying to get more scientific consensus as to how each process should be modeled, and not to think that diverse methodologies are helpful. This is especially true when the number of degrees of freedom is too limited in order to get reasonably accurate backcasts for each process in all past time periods. This issue exists for other types of scientific models, and even applies to more policy oriented models like the integrated assessment models used to create climate change mitigation scenarios.

My takeaway from the article is that having fewer earth systems models that include more consensual methodologies for each process modeled would be better than the current situation. More cooperation between climate scientists, then, would be helpful for make each process modeled in a sufficiently detailed and more scientifically accurate way, rather than the more approximate approaches that different modeling groups currently take. To summarize, I think the implication of this article, whether or not the authors would want to say this, is that there are too many different modeling groups in the world, and thus too many different models, each of which is too simplistic, and which don't agree with each other sufficiently to have much comfort in the overall progress of the field. Unfortunately, there is a tendency in most fields for too many research groups to exist, often supported by their national governments, which tends to prevent greater scientific

cooperation and agreement between model experts because they focus their work on their own models. Competition is not always a plus whether in dealing with science or other social issues. The right balance needs to be achieved between cooperation and competition to maximize scientific progress, and the field of earth system modeling is no exception.