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COMMENT ON

James Hurrell, Gerald A. Meehl, David Bader, Thomas L. Delworth, Ben Kirtman, and Bruce Wielicki 2009: A Unified Modeling Approach to Climate System Prediction. Bull. Amer. Meteor. Soc., in press.

The authors of this paper do not present a new perspective as they claim in their text "*There is a new perspective of a continuum of prediction problems, with a blurring of the distinction between short-term predictions and long-term climate projections."*

I discussed this subject over a decade ago in Pielke (1998) where I wrote

"An important practical conclusion results if climate prediction is an initial value problem. This means that there are necessarily limits on the time into the future that we can predict climate, since the feedbacks between the ocean, atmosphere, and land surface are large and nonlinear. These limits have not been determined, yet climate "predictions" are routinely communicated to policy makers on timescales of decades and centuries. Second, in the context of predicting what the future climate would be in response to an anthropogenic forcing such as carbon dioxide input, there are, as of yet, undefined limits on what aspects of future climate we can forecast even if all the important ocean-atmosphere-land surface feedbacks were included and also accurately represented in the models. This leads to the conclusion that weather prediction is a subset of climate prediction. Societally useful (i.e., reliable, accurate, etc.) climate prediction requires that all of the feedbacks and other physical processes included in weather prediction be presented in the climate prediction model. In addition, longer-term feedback and physical processes must be included. This makes climate prediction a much more difficult problem than weather prediction."

The authors of the paper should have completed a more thorough review of the past literature. At least they finally recognize that climate is an initial value problem!

With respect to their statement that *"[f]undamental barriers to advancing weather and climate prediction on time scales from days to years are partly attributable to our limited understanding and capability to simulate the complex, multi-scale interactions intrinsic to atmospheric, oceanic and cryospheric fluid motions", if they are "partly attributable to our limited understanding*" what are our other barriers? The fundamental barrier is our limited understanding as to how the real world climate system actually works [NRC, 2005]. The examples presented in the Hurrell et al. paper actually show how difficult this subject is.

However, they did not recognize that longer term variations in the climate also behave nonlinearly, as illustrated, for example, for drought in Meko et al. (2008). Climate undergoes sudden and significant shifts on a wide variety of time and space scales (e.g., Rial et al. 2004), such that the concept of a "cycle" is an inaccurate way to explain how the actual climate system works.

To the extent that the system is influenced by *"the internal variability of the climate system based on an initialized state of the ocean, atmosphere, land and cryosphere system",* there will necessarily be a limit to

the time period of skillful prediction. Also, what role does "past radiative forcing" play in improving predictability, as claimed in their article? The effect of the past forcing is already in the initial conditions.

There is an amazing admission in their paper that *"quantifying prediction skill becomes even more difficult for decadal and longer time scales and that we have no current method to prioritize or weight their impact in measuring uncertainty in predicting future climate change for temperature, precipitation, soil moisture and other variables of critical interest to society*". I agree with their statement. However, the consequence then is how will their proposed modeling approach satisfy the *"[d]emand for more accurate predictions of regional climate*" as written by the authors in their abstract?

Thus, while I commend the authors for adopting a framework of climate modeling as an initial value problem, they are at serious risk of overselling what they will be able to provide to policymakers. Some of the funds they are seeking for this effort would be more effectively used if they were spent on assessing risk and reducing the vulnerability of local/regional resources to climate variability and change and other environmental issues (Pielke and Guenni, 2004). This is what is "of critical interest to society."

References

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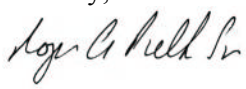
Sincerely,



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