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Response to R. Pielke, Sr. Commentary on Mearns et al. 2012

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The authors of Mearns et al. (2012) are aware of the role of driving RCMs with reanalyses and have written extensively on the roles of different types of RCM simulations (e.g., Giorgi and Mearns, 1999; Leung et al., 2003). Thus, we agree that the skill of dynamical downscaling in which global reanalysis is used to provide boundary conditions in general indicates an upper bound of skill compared to dynamical downscaling in which the boundary conditions come from global climate model simulations. This finding has long been established as global climate model simulations cannot outperform global reanalysis in providing boundary conditions since the latter is constrained by observations through data assimilation (that is unless the reanalyses themselves have been shown to have serious deficiences, e.g. Cerezo-Mota et al, 2011). The classification of different types of dynamical downscaling introduced by Castro et al. (2005) further adds clarity to this point.

Our conclusions as quoted by Pielke Sr. do not overstate the value of our simulations. Our statement that "We have shown that all the models can simulate aspects of climate well, implying that they all can provide useful information about climate change" was not intended to suggest that regional climate models used to project climate change can outperform regional climate simulations driven by global reanalysis. Thus we do not agree with Pielke's comment that "this conclusion significantly overstates the significance of their findings in terms of its application to the multi-decadal prediction of regional climate" as nowhere in Mearns et al. (2012) were there statements to suggest that regional models can produce more skillful

future climate projections than the information they can provide for the current
26 climate based on downscaling of global reanalysis. We are using these reanalysis-driven simulations in combination with the GCM-driven current simulations of
28 Phase II to establish differential credibility (see, e.g., Pan et al. 2001) and perhaps weights of the various simulations, which may be used in creating probability
30 distributions of temperature and precipitation on a seasonal basis. Such products are useful in some impacts contexts, such as water resources.

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We do argue, however, that regional climate models can provide useful information
34 about climate change as long as there is some value in the large-scale information provided by the multi-model GCM ensembles. This statement is a logical extension
36 of the fact that regional climate predictability can be derived from regional forcing as well as the large-scale conditions. Hence, one would expect a fraction of the
38 model skill demonstrated by the numerical experiments described in Mearns et al. (2012) to be retained in future projections given the role of regional forcing remains
40 and there is some skill in the large scale conditions derived from the multi-model ensemble of GCM projections. An important objective of NARCCAP is to advance our
42 understanding of uncertainties in the regional climate projections given uncertainties in the GCM projections and the downscaling tools. Thus, Phase II
44 studies are also analyzing the skill of the NARCCAP ensemble.

46 Pielke Sr. also refers to papers that promote the so-called bottom-up approach (e.g., Pielke Sr. et al., 2012), about which the lead author has also written (Mearns, 2010).

48 The bottom-up approach does not preclude using climate model information from both global and regional climate models. The goals of NARCCAP are to serve
50 multiple user communities, and thus a framework that served all these communities was needed. The NARCCAP simulations can be used for both top-down and bottom-
52 up approaches to impacts and adaptation studies. Over 70 articles have now been published using the NARCCAP simulations with most articles by researchers other
54 than NARCCAP PIs. The subjects range from general regional future climate analysis (Sobolowski and Pevelsky, 2012), extreme events (Mailhot et al., 2011; Wehner,
56 2012), and impacts studies (e.g., forest drought, Williams et al., 2012; human morbidity, Li et al., 2012; and hydrology, Bürger et al., 2011). Finally, Menzie et al.
58 (2011) notes the usefulness of NARCCAP for examining climate change impacts in an article discussing business planning for climate change.
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