RESPONSE TO RIND AND PETEET

I am pleased that David Rind and Dorothy Peteet agree with the basic premise of my recent editorial (Schneider, 1986) that climate models can help to interpret paleoclimatic records and paleoclimatic reconstruction can help to verify the sensivity of climatic models to various forcing mechanisms. They disagree, however, with my presumption that the different responses of NCAR and GISS general circulation models (GCMs) to Younger Dryas simulations was "presumably, because of the differences in their [GISS vs. NCAR] basic sensitivities to radiative forcing over land" (Schneider, 1986, p. 118). Instead, Rind and Peteet argue, with good reason, that the differences in the models' responses were also due to differences in their respective boundary conditions. Indeed, Rind (1986) had, unknown to me at that time, already performed a set of experiments for the last glacial maximum (18 000 years before present) in which a realistic ice sheet of several thousand meters height was used as well as an comparison case in which the 'ice sheets' were only 10 m in elevation. In the former case there was a substantial distortion of atmospheric flow patterns compared either to present conditions or the 10 m ice sheet simulations. This distortion, which, incidentally, has also been found by Manabe and collaborators (e.g., Manabe and Broccoli, 1984) and Kutzbach and others (e.g., Kutzbach and Wright, 1985) in a number of their simulations, leads in the GISS model to the subsidence of air in the lee of the ice sheets and thus a downstream surface warming. Therefore, I cheerfully concede that I overstated my presumption that the 10 °K summer Eurasian warming in the GISS model was due primarily to local radiative forcing. But, I would not go as far as Rind and Peteet do in their comment to assert that "this difference is NOT the result of different model sensitivities: instead, it reflects the different boundary conditions used in the simulations". In order to fully justify this assertion, it would be necessary to repeat the GISS 11 000 yBP experiment with smaller ice sheets, and then compare it to the NCAR model results published by Kutzbach co-workers. Although I agree that it is likely, to use another set of Rind and Peteet's words, that "subsidence. . . was responsible for a portion of the warming over Eurasia", I still suspect that there could well be some significant differences in the sensitivities of these different GCMs to radiative forcings, even after comparable boundary conditions are used in both models. I look forward to seeing the results of such experiments soon, as I understand from the authors that they may perform such tests in the near future.

In any case, let me reiterate the main point of my editorial (and that of an expanded paper by Schneider et al., 1987): when intercomparison of different climate models' response to similar forcing yields different sensitivity – which must occur to some degree – then it is appropriate to ask paleoclimatic field researchers to reconstruct 'paleoclimatic ground truth' to help resolve the differences. And even if different models had identical sensitivities to a given set of forcings, it is still an essential need to have close working collaborations among modelers and paleoclimatic field investigators both to verify the models' performance and to help explain the past. The latter need, we all agree, is a growing priority for interdisciplinary climatology.

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