

30 October 2007

Dear Dr. Cook and Climate Center Committee,

We request funds to hold a two-day miniconference titled “Climate Sensitivity Extremes: Assessing the Risk” in summer 2008. The miniconference will evaluate the likelihood that Earth’s climate sensitivity is substantially higher than 4.5°C, which is the upper end of the likely range of climate sensitivity according to the Intergovernmental Panel on Climate Change (IPCC). Such high climate sensitivity could significantly increase the risk of dangerous anthropogenic interference with the climate system in coming years.

Background and Motivation

The response of the climate system to changes in net radiative energy input, or *radiative forcing*, is important for understanding past variations in Earth’s climate as well as the future climate changes that will occur as a result of anthropogenic emissions of greenhouse gases and aerosols. The global-mean surface temperature change ΔT_s , or *climate sensitivity*, resulting from a radiative forcing ΔQ is given by

$$\Delta T_s = \lambda \Delta Q$$

where λ is the climate sensitivity parameter in $^{\circ}\text{C} (\text{W m}^{-2})^{-1}$. According to the recently released Fourth Assessment Report (AR4) of the IPCC, climate sensitivity due to a doubling of the atmospheric CO_2 concentration “is likely to be in the range 2°C to 4.5°C” (Solomon et al., 2007). The AR4 notes, however, that “values substantially higher than 4.5°C cannot be excluded”. Uncertainty in the sensitivity of Earth’s climate in general, and in particular our current inability to rule out very high sensitivities, is important for at least two reasons. First, on a fundamental level, it speaks to our continued incomplete understanding of the feedback mechanisms that ultimately determine climate sensitivity, in particular cloud feedback, which remains the largest source of uncertainty in climate sensitivity estimates (Solomon et al., 2007). Secondly, in a more applied sense, uncertainty in climate sensitivity translates into uncertainty in the level and timing of greenhouse gas emission reductions that need to occur in order to prevent dangerous anthropogenic interference with the climate system (Barker et al., 2007). For higher climate sensitivities, emission reductions must be more stringent and should occur sooner in order to avoid possible catastrophic effects of climate change such as rapid sea level rise and mass extinction of species.

Miniconference Goals and Possible Speakers

The primary goal of the miniconference is to assess the likelihood that Earth’s climate sensitivity is substantially higher than 4.5°C. To this end, we will invite speakers who will discuss various methods for constraining climate sensitivity, including methods that utilize paleoclimatic data, state-of-the-art climate models, and the instrumental temperature record. Since high climate sensitivity essentially implies that strong positive feedbacks are operating within the system, some of the invited talks will describe process-level studies that attempt to constrain climate sensitivity by constraining the sign and magnitude of the relevant climate feedback mechanisms, such as cloud and carbon cycle feedbacks. We will also examine the extent to which climate sensitivity depends on the nature of the forcing (e.g., greenhouse gas versus aerosol, Hansen et al., 2005) and on the state of the climate system (e.g., Boer and Yu, 2003). Such sensitivity dependence might limit the extent to which climate sensitivity estimates based on past and

present-day climates are applicable to future climate change, since the balance of forcings in the future as well as the climate state will be different than they were in the past.

The important findings from the miniconference will be reported in a peer-reviewed journal article that will also outline priorities for future research. We plan to invite approximately 15-20 scientists to participate in this event, including among others Natalia Andronova, James Annan, George Boer, Peter Cox, Tony Del Genio, Chris Forest, Jim Hansen, Gabriele Hegerl, Dave McGuire, Raymond Pierrehumbert, David Rind, Thomas Schneider von Deimling and Mark Siddall. We have chosen to hold the miniconference at NASA GISS in New York, NY because of its rich history in scientific research on the subject of climate sensitivity. The anticipated date for the miniconference is July 2008. On page 3 of this proposal is a budget for the event. We intend to seek additional funds from the Earth Institute (Steve Cohen, Peter Schlosser) or from the National Science Foundation's (NSF) Climate and Large-Scale Dynamics program (Jay Fein) to match the funds requested from the Climate Center.

Thank you very much for your consideration. We look forward to hearing from you.

Sincerely,

Michael Previdi, Beate Liepert and Dorothy Peteet

References

- Barker, T., and Coauthors, 2007: Technical Summary. In: *Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [B. Metz et al. (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- Boer, G. J., and B. Yu, 2003: Climate sensitivity and climate state. *Clim. Dyn.*, **21**, 167 – 176.
- Hansen, J., and Coauthors, 2005: Efficacy of climate forcings. *J. Geophys. Res.*, **110**, D18104, doi:10.1029/2005JD005776.
- Solomon, S., and Coauthors, 2007: Technical Summary. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [S. Solomon et al. (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Proposed Budget

The budget reflects the anticipated full cost for the miniconference. In this request we ask for 50% of the full cost from the Climate Center, which amounts to \$6,000. We plan to request the remaining 50% from the Earth Institute and/or NSF.

	Amount
Travel support:	
Domestic (accommodations)	\$3,000
International (5 flights)	\$5,000
Catering (coffee breaks, breakfast, dinner)	\$2,000
Communications and publication costs	\$2,000
Total:	\$12,000
Requested amount from Climate Center (50%)	\$6,000