Geophysical Research Abstracts,
Vol. 10, EGU2008-A-09332, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-09332
EGU General Assembly 2008

On estimating probability distributions for climate system properties: exploring sensitivity to unforced climate variability from AOGCM control simulations.

C.E. Forest (1) and B. Sansó (2)

(1) Joint Program on the Science and Policy of Global Change, MIT, Rm E40-427, Cambridge, MA 02139 USA (mailto:ceforest@mit.edu), (2) Dept. of Applied Math. and Statistics, University of California-Santa Cruz, Santa Cruz, CA 95064 USA

A probabilistic approach to quantifying future climate change on large spatial scales requires estimates of the probability distributions for key climate system properties that govern the decadal to century response to large-scale forcings. Advanced statistical methods have been developed to estimate the probability distributions for climate system properties (effective climate sensitivity, rate of deep-ocean heat uptake, and the strength of the net aerosol forcing) that are based on comparing simulated and observed spatio-temporal patterns of climate change in the 20th century. At the core of the statistical methods, we require estimates of the unforced variability in the spatio-temporal patterns and these are typically estimated from "long" control simulations of AOGCMs because the observational records are too short to provide adequate estimates. We have recently developed a Bayesian hierarchical statistical model that includes uncertainty in the estimates of the unforced variability in addition to the estimates of climate system properties. As a critical test, we will use the CMIP3 archive for AOGCM data to include estimates of the unforced variability from multiple models. We will explore the sensitivity of the estimated probability distributions to using individual AOGCM control runs and from combining the outputs from multiple AOGCMs. By separating the results from individual models, we will obtain an estimate of the effects of structural uncertainty in the AOGCMs on their estimates of the variability and how this influences the distributions of climate system properties. These tests will help inform the research and policy community what features of the

probability distributions are robust to changes in these variability estimates.