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Is Climate Change Predictable? Really?

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Auspices Statement

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FY05 LDRD Final Report
Is Climate Change Predictable? Really?
LDRD Project Tracking Code: 05-ERD-048
William P. Dannevik, Principal Investigator

Project Description

This project is the first application of a completely different approach to climate modeling, in which new prognostic equations are used to directly compute the evolution of two-point correlations. This project addresses three questions that are critical for the credibility of the science base for climate prediction: (1) What is the variability spectrum at equilibrium? (2) What is the rate of relaxation when subjected to external perturbations? (3) Can variations due to natural processes be distinguished from those due to transient external forces? The technical approach starts with the evolution equation for the probability distribution function and arrives at a prognostic equation for ensemble-mean two-point correlations, bypassing the detailed weather calculation.

Expected Results

This work will expand our basic understanding of the theoretical limits of climate prediction and stimulate new experiments to perform with conventional climate models. It will furnish statistical estimates that are inaccessible with conventional climate simulations and likely will raise important new questions about the very nature of climate change and about how (and whether) climate change can be predicted. Solid progress on such issues is vital to the credibility of the science base for climate change research and will provide policymakers evaluating tradeoffs among energy technology options and their attendant environmental and economic consequences.

Mission Relevance

This project directly contributes to the DOE and LLNL missions in climate-change research by narrowing uncertainties concerning the fundamental physical processes in the climate system and our ability to simulate climate variations.

Accomplishments and Results

Initial work focused on studying the benchmark problems designed by Leith confirming the linear and nonlinear properties of the correlation model and ensuring proper model set up for evaluation. At this point, the project ended; the PI left the laboratory.

Proposed Work

This project will not continue in FY2006.