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The Institute for Integrative and Multidisciplinary Earth Studies
Institute for Mathematics Applied to Geosciences
Institute for the Study of Society and the Environment

Network Dynamics and Dynamics on Networks: Steps towards modeling human interaction with climate

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It is widely accepted that human actions and reactions form a critical component of the climate system. Modeling human decision making in ways that are compatible with climate models is still in its infancy, however. So far, only the economic dimension of human actions has been consistently integrated with biophysical processes and the resulting climate-economic models are normative and contentious. A major barrier to including other aspects of social processes in integrated models is the absence of good parameterizations of societal dynamics.

Traditional approaches to describing human ecosystems have relied on dynamical systems theory. A new and promising alternative is to represent human-biophysical interactions as networks of interacting elements and to use the tools of graph theory to describe their dynamics. A property of random networks or graphs is that as the number and strength of connections between their elements change smoothly with time and external forcing, global properties of the network pass through sudden thresholds that have the character of phase changes. Amongst these suddenly changing properties are the stability of the underlying ecosystem to external perturbations and the spread of diseases, invasive species, ideas or fashions across it. Network theory thus offers a natural framework in which to model sudden changes in societal behavior under climate forcing.

This talk will review the development of these ideas and illustrate them with examples from natural ecosystems and human societies past and present.

Friday, 10 February 2006
11:00 a.m.

Foothills Lab 2
Room 1022

Refreshments will be served at 10:30am just outside of room 1022 on the west side.