The 2008-2009 John E. Willard Lectures

presented by

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Strategic Choices for Global Energy: Constraints from Feedbacks in the Climate System

Monday, April 6 1:30 p.m. Room 1315 Chemistry Building

The issues of energy and climate may be complex and contentious, but they intertwine to reflect, in stark simplicity, limitations on the amount of carbon dioxide that can be released into the atmosphere from the worldwide combustion of fossil fuels that today constitute the primary energy source for nearly 80 percent of global primary energy demand. The informed implementation of a fundamentally re-architected energy policy in the United States constitutes one of the most important imperatives we face in the immediate future. A key consideration determining the time scale for setting a new energy policy in place is the analysis of feedbacks within the climate system that now place us in a position, not of gradual change, but of irreversible change. Small temperature changes in globally averaged land surface or ocean temperatures are often cited and debated, or their significance dismissed. That discussion misses the crucial point. It is the net flow of thermal energy into the primary reservoirs of the climate system, not globally averaged temperatures, that matter. A description of feedbacks within the climate system and the irreversibility associated with those feedbacks will be addressed.

and

The Chemical Physics of Climate Feedbacks: Radicals, Isotopes, and Spectrally Resolved Absolute Radiance

Tuesday, April 7 11:00 a.m. Room 1315 Chemistry Building

A combination of feedbacks within the climate system dictate the time scale for irreversible change in the climate structure resulting from increased forcing by carbon dioxide and methane. The feedbacks include (1) changes to the large scale dynamics of the atmosphere that opens pathways for increasing water vapor flux into the stratosphere that amplifies the rate of bromine catalyzed destruction of ozone, (2) loss of the Arctic Ice Cap that pre-stages (a) release of methane and carbon dioxide from clathrates and permafrost at high latitudes of the northern hemisphere and (b) accelerated loss of the Greenland glacial system, (3) water vapor, cloud and temperature change patterns in the troposphere that determine climate sensitivity to carbon dioxide forcing. A series of spectroscopic techniques are presented, both in situ and remote, to quantitatively address these feedbacks in the climate structure.

Grad students are welcome to meet with Professor Anderson on Tuesday at 1:15 pm in Room 8305f