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NEWS

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SAN FRANCISCO -- The impact of the so-called carbon dioxide "greenhouse effect" on the earth's climate may be more complicated than previously thought, two General Motors Research Laboratories (GMR) climatologists reported to the American Geophysical Union today.

In their report "Carbon Dioxide and Climate: The Effects of Cloud Specifications in Radiative-Convective Models," Drs. John R. Hummel and Ruth A. Reck of GMR's Physics Department ascribed the increased uncertainty to differences in computer modeling procedures of clouds and water vapor distributions.

"The purpose of the study was to compare effects of fixed-cloud models to a model which has water vapor transport and cloud developments," Dr. Hummel explained.

The two scientists compared calculations from one-dimensional radiative-convective models with different cloud and water vapor formulations. Radiative-convective models, standard modeling tools among climatologists, include a detailed accounting of atmospheric radiative processes plus a rather simplified numerical representation that attempts to simulate the heat redistribution performed by world-wide weather systems. The result is a vertical temperature profile representative of average global conditions.

The two GMR scientists reported that for a doubling of atmospheric CO_2 from the present level, the Hummel-Kuhn model predicts a 20% larger increase in surface temperature than the Manabe-Wetherald model predicts for an average, planet-wide, cloud coverage of 47%, a value assumed in modeling to be representative of global conditions.

The radiative-convective model with the water vapor transport was first introduced by Hummel while working with Professor William Kuhn of the Department of Atmospheric and Oceanic Sciences at the University of Michigan. The "standard" model used for

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comparison is the Manabe-Wetherald model, first developed at the Geophysical Fluid Dynamics Laboratory at Princeton University.

Adds the GMR scientists: "While these results indicate that the direct contribution of CO_2 to surface heating may be larger than previously calculated, the question of indirect influences of CO_2 is still far from resolved. Clearly, we need to develop models that can interactively predict cloud locations, thickness and amounts."

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