**FINAL PERFORMANCE REPORT**
(Submitted to DOE 2/24/97)

TITLE: Improvement of Moist and Radiative Processes In Highly Parallel Atmospheric General Circulation Models: Validation and Development

PI/INSTITUTION: James J. Hack, CGD, NCAR
William M. Frank, Pennsylvania State University
Jeffrey T. Kiehl, CGD NCAR



PROJECT START DATE: 1 August 1992

PROJECT END DATE: 1 May 1997

OBJECTIVES:

Develop an economical numerical experimentation environment to facilitate the investigation and improvement of parameterizations of radiative and moist processes in atmospheric general circulation models. Use this computational environment to accelerate the development of a generalized approach to the representation of cloud-scale processes capable of handling shallow nonprecipitating stratiform and convective clouds, and deep penetrative convection in combination with a more complete description of their interaction with the radiation fields. One focus of the parameterization research has been to integrate parameterization schemes through equilibrium assumptions that couple boundary layer processes and convection. The resulting parameterizations will then be more thoroughly tested in a three-dimensional atmospheric general circulation modeling framework.

ACCOMPLISHMENTS:

We have developed one-dimensional time-dependent versions of the NCAR CCM2 and CCM3 atmospheric/land surface models for which the local time-rate-of-change of the large-scale state variables (e.g., temperature, moisture, momentum, cloud water, etc.) depend on specified horizontal flux divergences, a specified vertical motion field (from which the large-scale vertical advection terms will be evaluated), and subgrid-scale sources, sinks and eddy transports. The subgrid-scale contributions are determined by an arbitrary collection of user-selected subgrid-scale physics parameterizations. The overall design includes the provision of a graphical user interface (GUI) to the model. The initial computational environment makes use of a sophisticated Motif-based user interface. This approach has required an integration of the FORTRAN-based CCM physics with the C-based GUI which up until now has restricted the modeling framework to more mature computational environments.

Model namelist parameters are specifiable as command-line data, or via X-Defaults. The point-and-click graphical interface streamlines the control of code flow including: dataset selection; column location (latitude/longitude) selection; modification of control variables (such as termination conditions, update frequencies, specification of history data, etc.); modification of initial data and the associated large-scale