1 Introduction

A quantitative evaluation of climate change such as the global warming is impossible without a high-quality numerical model which incorporates the dynamical and physical processes of the climate system including the circulations of the momentum, energy and materials. The numerical models are also useful tools to help our understanding of the dynamics of climate system. Although there already are a number of comprehensive climate models, none of them are complete and further improvements are still needed. One of the most important points is the incompleteness of parameterization schemes of physical processes. A number of parameterization schemes are proposed for each process, but there is no common agreement which parameterization scheme is the best one.

We have developed an atmospheric part of the model, *i.e.*, an atmospheric general circulation model, which is named CCSR/NIES AGCM. The model is based on a simple global atmospheric model developed at University of Tokyo (Numaguti, 1993). The basic standpoint in the development is to build the model based on simple but sound physical basis and to be less dependent on empirical parameters. Effective model code was employed to make possible a long-term integration with high resolution. In addition, considerable attention was paid to the readability and module compatibility of the model code to enable community use of the model.

2 Description of the Model

2.1 Overview of the Model

The model is based on the global three-dimensional primitive equations and uses spectral transformation method in horizontal and grid differentiation on sigma coordinate in vertical. The physical parameterization includes a radiation scheme with two-stream k-distribution method, simplified Arakawa-Schubert cumulus scheme, prognostic cloud water scheme, turbulence closure scheme with cloud effect, orographic gravity wave drag, and a simple land-surface model. The characteristics of the model are summarized as follows.

Basic Equations :

Three-dimensional hydrostatic primitive equations on sphere with normalized pressure (σ) coordinate.

Prognostic Variables :

Horizontal velocities $\boldsymbol{v} = (u, v)$, temperature T, surface pressure p_S, specific humidity q, cloud liquid water l, soil temperature T_g, soil moisture W_g, snow