

Cloud and Radiation Processes Simulated by a Coupled Ocean-Atmosphere Model

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Using NCC/IAP T63 atmosphere-ocean coupled model, a 20 years'integration is processed, and its ability to simulating cloud and radiation is also analysed in detail. The results shows that the model can simulate the basic distribution of cloud cover, however obvious differences still exist compared to ISCCP satellite data and ERA reanalysis data. The simulated cloud cover is less in general, especially the abnormal low values in some regions of ocean. By improving the cloud cover scheme, simulated cloud cover in eastern ocean, summer hemisphere's ocean from subtropical to mid-latitude is considerably improved. But in tropical Indian Ocean and west Pacific the cloud cover difference is still evident, which is mainly caused by the deficiency of high cloud simulation in these regions caused by deep cumulus convection. In terms of the analysis to radiation and cloud radiative forcing, we find that simulation on long wave radiation is better than short wave. The simulation error of shortwave radiation is caused mostly by the simulation difference in shortwave radiative forcing, sea ice and snow cover, and also by not involving aerosol's effect. The simulation error of longwave radiation is mainly resulted from deficiency in simulating cloud cover and underlying surface temperature. Corresponding to improvement of cloud cover, simulated radiation(especially shortwave radiation) in eastern ocean, summer hemisphere's ocean from subtropical to mid-latitude is markedly improved. This also brings obvious improvement to net radiation in these regions.

Keywords: AOGCM, cloud and radiation, cloud radiative forcing, cloud cover scheme