coating was probably not uniform on the film surface. An attempt to check this point is being carried out.

(Received February 3, 1990; Revised manuscript received April 2, 1990)

THE DOUBLE-JET AND SEMI-ANNUAL OSCILLATIONS IN THE SOUTHERN HEMISPHERE SIMULATED BY THE METEOROLOGICAL RESEARCH INSTITUTE GENERAL CIRCULATION MODEL (ABSTRACT)

Akio KITOH, Koji YAMAZAKI and Tatsushi TOKIOKA

Meteorological Research Institute, 1–1, Nagamine, Tsukuba 305

The tropospheric circulation in the Southern Hemisphere has some remarkable features such as a deep circumpolar trough throughout the year, a double-jet in winter months and large semi-annual components in the fields of sea-level pressure and zonal wind. A 12-year integration with the Japan Meteorological Research Institute general circulation model is presented and compared with 9-year observations for the period 1979–1987.

The simulated meridional temperature gradient in July has two maxima, one at 30°S in the upper troposphere and the other at 60°S in the lower troposphere. The horizontal distribution of the strong baroclinic zone is not zonally uniform. The simulated zonal wind at 500 mb in July shows double-jet structures in the Pacific sector, one at 30°S and the other at 60°S, and only one jet in the Atlantic and Indian sectors, corresponding to the observation. There is a large wavenumber 1 stationary eddy field at 60°S with a trough in the Indian Ocean and a ridge in the Pacific, in accordance with the double-jet in the latter. Two strong baroclinic zones in the Pacific sector can be seen from May to October, while there is only one in the Pacific sector during the rest of the year. The seasonal change of the zonal wind follows it. Between 50°S and 60°S, baroclinity becomes strong twice a year during spring and fall, leading to the semi-annual oscillation in the fields of the zonal wind and sea-level pressure. A good simulation of the stationary eddies and the seasonal cycle of the Antarctic temperature field such as a rapid cooling in autumn of the Antarctic lower troposphere, a coreless winter and coldest atmosphere in early spring, is crucial to a successful simulation of the winter double-jet structures and the semi-annual oscillations in high southern latitudes.

(Received November 9, 1989)

RADIATIVELY DETERMINED TEMPERATURE IN THE MIDDLE ATMOSPHERE IN THE POLAR REGION (ABSTRACT)

Kiyotaka SHIBATA

Meteorological Research Institute, 1–1, Naganime, Tsukuba 305

Radiatively determined temperature, *i.e.*, time-marched temperature under the absence of dynamical warming, in the middle atmosphere is investigated for various conditions. The model used in this study extends from the surface to the middle mesosphere at about 70 km. First, the temperature change during the polar night is studied. For a clear atmosphere, the surface temperature of which is calculated from the radiation heat budget, temperature decreases uniformly with respect to height except for the first 20 days. The decrease rate becomes very small as temperature becomes low, and hence even the lowest temperature at the surface cannot reach 100 K for the polar night. When the surface temperature is prescribed to have the climatological value, the temperature in the stratosphere and mesosphere decreases in a similar way. However, there appears a relatively high temperature region from about 150 mb to 30 mb. This is because CO_2 and O_3 absorb longwave radiation from the warm surface.

Second, the temperature change is studied after the sun reappears. It is found that according to the intensity of warming, the stratosphere can be separated into 3 regions: upper ($P<$ 10 mb), middle (10 mb$<P<$100 mb), lower (100 mb$<P$). The temperature in the upper and middle stratosphere is restored to the climatological value in a rather short time, 1 to 2 months. On the other hand, the temperature in the lower stratosphere rises far more slowly and remains much lower than the climatological value. This suggests that the dynamical warming plays a crucial role in the lower stratosphere.

(Received October 31, 1989; Revised manuscript received April 10, 1990)

CLOUD DISTRIBUTION AROUND SYOWA STATION BY NOAA AVHRR (ABSTRACT)

Takashi YAMANOUCHI

National Institute of Polar Research, 9-10, Kaga 1-chome, Itabashi-ku, Tokyo 173

Cloud distributions are analyzed from AVHRR data of the NOAA satellite received at Syowa Station (69°00'S, 39°35'E), Antarctica. Satellite observations of clouds and sea ice are major components of the Japanese program of Antarctic Climate Research. Algorithms to derive cloud amount using the brightness temperature differences between infrared channels 3 (3.7 μm) and 4 (11 μm), 4 and 5 (12 μm) are assessed by comparing to the manual cloud amount and the downward longwave radiation at the ground surface. Cloud amounts obtained from the brightness temperature difference between channels 3 and 4 in summer (month) agree with the manual cloud amounts at the surface (correlation coefficient $r\approx0.88$) and highly correlate to the downward longwave fluxes ($r\approx0.95$). Cloud amounts from channels 4 and 5 show rough agreements with the surface cloud amounts throughout the year. The brightness temperature difference of thick cloud overlaps that of clear area and the temperature dependence of clear pixels accompanies some uncertainties which makes the cloud detection uncertain.

Characteristics of cloud distributions around Syowa Station of 500 km scale are examined for two months. Cloud amount was higher than 0.5 over sea and sea ice, and was less than or equal to about 0.3 over the inland snow field, in both July and December. The average brightness temperature itself varies only within 12 K in summer within the area; however, the variance differs greatly according to the region and was largest at the coast. In winter, the average brightness temperature varied 30 K, from 220 to 250 K, and the correlation between the brightness temperature and cloud amount became low.

(Received November 30, 1989)