for this difference seems to be due to the shallowness of the boundary layer and probably to the existence of the subsidence flow which occurs from the predominant wind system at Mizuho Station, which is the katabatic wind.

(*Received April 22, 1983*)

RADIATION BUDGET AND SURFACE INVERSION AT MIZUHO STATION, ANTARCTICA (Abstract)

Takashi YAMANOUCHI

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

The relation between the strength of the surface temperature inversion and the radiation budget was examined using the results of measurement at Mizuho Station in the katabatic wind zone, Antarctica. This relation expressed in other words was, what was the surface temperature T_s when the temperature distribution in the free atmosphere was given.

The radiation budget R_n was related to the temperature difference of T_s and T_a, where T_a was defined as the equivalent blackbody temperature for the downward longwave and net shortwave radiative flux. From the monthly averages of the measured value, R_n was approximated by a simple quadratic formula of (T_s-T_a).

In order to maintain the heat equilibrium at the ground surface, there should be another heat flux(es) H $(=-R_n)$ to compensate for the net radiation. From the measured monthly averages, H was found to be highly correlated to the strength of the inversion ΔT, which was defined as the temperature difference of T_s and T_x (T_x: maximum temperature of the free atmosphere, represented by the temperature of 700 mb level, which was about 300 m above the surface. Actually, T_x was substituted for by 700 mb temperature at Syowa Station). H, namely $-R_n$, increased against ΔT, and this dependence was opposite to the dependence of the net longwave flux on ΔT. H might be mostly composed of the sensible heat, *i.e.*, mechanical mixing of the inversion layer through the katabatic wind which also had a relation to ΔT. H was approximated by the linear function of ΔT. The function for H was different from that at other stations where the wind condition was different.

When the temperature distribution in the free atmosphere was given, the surface temperature T_s would be determined between T_x and T_a so as to realize the heat equilibrium under the radiative cooling situation ($T_x > T_a$).

(*Received April 8, 1983*)

PRELIMINARY ESTIMATE OF THE RADIATION BUDGET OF THE ANTARCTIC ATMOSPHERE FROM SATELLITE AND GROUND-BASED OBSERVATIONS (Abstract)

Takashi YAMANOUCHI

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

and

Garret G. CAMPBELL

CIRA Colorado State University, Foothills Campus, Fort Collins, Colorado 80523, U.S.A.

The albedo and upward longwave radiation flux at the top of the atmosphere measured by the satellite and at the ground surface both over the Antarctic were compared and the atmospheric component of radiation budget was estimated. The satellite data were from Nimbus-7 ERB Experiment, measured by the broadband scanning radiometer and averaged over about 500×500 km (72–67.5°S, 36–48°E). The surface data were from POLEX-South radiation measurements made at Mizuho Station (70°42′S, 44°20′E). Comparison was made for the data of 1979.

The daily albedo at the top was always less than the surface albedo about 10%, and the correlation between the both was low. The surface albedo varied according to the cloud amount. The upward longwave flux at the top was about 10 to 50 Wm^{-2} smaller than that at the surface. The surface flux showed large daily variations according to the cloud amount and the flux at the top also followed some variations, which meant that the effect of large-scale cloud movements could appear in the both fluxes, whereas, small-scale cloud movements were masked in the wide region satellite data.

The atmospheric component of the net radiation was estimated as a difference of those at the top and at the surface. Calculations were made for the monthly value, since the seasonal variations seemed to be comparable in spite of the different sizes of field of view. The net shortwave flux was very similar for both the atmosphere and the surface. The net longwave flux of the atmosphere was larger than that of the surface about twice to four times. The total net flux for the atmosphere was 130 Wm^{-2} at most in April and 50 Wm^{-2} in December. The atmospheric cooling was largest in the autumn before the polar night and smaller in the spring side even in the winter.

(Received April 8, 1983)

TWO-DIMENSIONAL NUMERICAL MODELING OF KATABATIC WINDS (Abstract)

Nobutaka MANNOUJI

Geophysical Institute, University of Tokyo, 3–1, Hongo 7-chome, Bunkyo-ku, Tokyo 113

A two-dimensional numerical model is made. The present purpose is to represent the vertical structure of the surface temperature inversion and the katabatic wind on a clear day of the winter. An anelastic equation system is used. It is assumed that all variables are uniform along the direction perpendicular to the fall line. Radiative cooling and turbulent transfer are included in the equations. The topography consists of a slightly inclined plateau of 1525 km in length and 3500 m in height, with the slope of 500 km in length and the plain of 875 km in length.

The model is integrated for 5 days. Some of the features of the katabatic wind are represented, though they are not yet stationary. An inversion layer of 20°C in strength and 580 m in height is formed on the slope; wind speed is 18 m/s at the height of 100 m. Strong wind blows in the layer above which the temperature gradient is very large. An inversion layer of 25°C in strength and 600 m in height is formed on the plateau; wind speed is 6 m/s at the height of 60 m. Qualitatively realistic profiles of wind and temperature can be obtained, though they are not good quantitatively. The circulation over Antarctica is not formed; no return current of the katabatic wind is found.

Some improvement is necessary. Calculations of radiative flux and turbulence