A FEW FINDINGS RELATED TO THE KATABATIC WIND AT MIZUHO STATION, ANTARCTICA (Abstract)

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To explain the surface wind system of the Antarctic continent, two concepts were presented: One is the "katabatic wind" and the other is the "inversion wind". The physical formulation for the dynamics of the two is almost the same, but the needed parameters are a little different, that is, the former includes the friction stress at the surface. In order to check the applicability of the two theories to the situation at Mizuho Station, the observed upper air data were used to see how these theories can explain the wind speed and the wind direction at the surface level. The concept of "katabatic wind" showed a better result for the wind speed and nearly the same result for the wind direction. The concept of "katabatic wind" is more applicable to the wind at Mizuho Station.

The katabatic wind theory includes the interrelation of four factors, that is, the pressure gradient force of the synoptic scale and the inversion layer, the height of the inversion, the wind speed and the deviation of the wind direction from the fall line. However, this theory cannot determine explicitly the height of the inversion layer which is proportionate to the height of the katabatic wind at a certain site. This means that there is still some room for improvement of this theory. The key seems to exist in the incorporation of the subsidence flow and the drainage area. A simple model was established by taking these into consideration.

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ON THE CALCULATION OF SENSIBLE HEAT FLUX NEAR THE SURFACE AT MIZUHO STATION, ANTARCTICA (Abstract)

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The study of the heat balance at the snow surface was one of the main themes of the Japanese POLEX-South program (1979–1981). Among the heat balance components, the ones which involve the direct contact of air at the snow surface are the sensible heat and latent heat. Measurement of vertical sensible heat flux by eddy correlation method using the ultrasonic thermo-anemometer, did not work out well for the full observation period. Therefore, an alternative method using the vertical profile data of air temperature and wind speed, had to be constructed. If the non-dimensional universal functions $\phi_M = kz/u_* \cdot \partial U/\partial z$ and $\phi_H = kz/\theta_* \cdot \partial\theta/\partial z$ can be determined, the sensible heat flux can be obtained from the observed data. ϕ_M and ϕ_H were obtained for stable region. However, ϕ_M and ϕ_H at Mizuho Station differed much from the ones obtained in the past, such as the one shown in BUSINGER *et al.* (J. Atmos. Sci., **28**, 181, 1971). The reason

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.

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

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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 $(T_x>T_a)$.

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

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The albedo and upward longwave radiation flux at the top of the atmosphere