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Heat and mass balance at snow surface of inland Dome Fuji station, East Antarctica

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The meteorological observations near the snow surface were conducted at Dome Fuji station (77 19S, 39 42E, 3810 m a.s.l. 1000 km away from coast), East Antarctica in 1997. Observational components were air temperature (1m, 0.1m), wind speed (10m, 1m, 0.1m), air pressure, snow temperatures (surface, 5, 10, 20, 50, 80 cm in depth), short wave and long wave radiations. The amounts of precipitation, evaporation/condensation at snow surface were also measured. The minimum air temperature was – 79.7 C and mean annual temperature was –54.4 C. The peculiar phenomenon of temperature variation near snow surface was observed.

The heat balance at the snow surface was calculated. (net short wave radiation)+(net long wave radiation)+(sensible heat flux)+(latent heat flux)=(conductive heat flux in snow cover). We applied bulk method for sensible and latent heat flux calculations.

The latent heat flux was small in comparison with other component. Net radiation and sensible heat flux were the most important components. It seemed that the sensible heat flux made up for the radiative cooling in polar night. The characteristics of the heat balance to various time unit will be discussed.

Using the evaporation pan method, we observed the amount of evaporation / condensation at snow surface. It showed that the evaporation occurred in summer and condensation in winter. However the quantity calculated by the heat balance method e using meteorological observations at near the snow surface reached only 10 % of observed value. The hypothesis means that the snow under the surface evaporated as

for the source of condensation to the surface snow in winter. In summer, Water vapor evaporate in the firn layer near surface to the atmosphere at day time and condense to the snow surface at day and night time. This is because the snow surface was always cooled by radiative cooling.