STRUCTURE OF THE ENERGY BALANCE IN THE

ICE SHEET-ATMOSPHERE SYSTEM AS AN

INDEX OF ANTARCTIC GLACIATION

(Abstract only)

by

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ABSTRACT

Various methods have been used to estimate mean multi-year values of moisture, radiation, and heat exchange in the Antarctic ice sheet/atmosphere system. The major components of the balance have been determined as absolute and relative values. The net advection of moisture is taken as 100%, of which 83% is deposited as accumulation on the ice sheet, and the residue in the atmosphere is 15%; loss from the ice-sheet surface is 2%. In the radiation balance, input at the top of the atmosphere is 57%, absorption in the atmosphere is 43%, loss due to reflected short-wave radiation is 35%, and long-wave radiation from the atmosphere is 78%, while net outgoing long-wave radiation from the surface is 9%. The heat-budget components are:

Income	
absorbed short-wave radiation	49%
advection of heat	40%
latent heat from phase change of advected moisture	11%

Loss	
outgoing long-wave radiation	98%
heat from phase change of atmospheric moisture	2%

The Antarctic ice sheet is a vast heat sink. Constant negative surface-radiation balance and low temperature of the ice sheet suggests that it will survive with even small amounts of precipitation. Thus the contemporary glaciation of Antarctica is rather stable.

THE HEAT REGIME OF THE CENTRAL PARTS OF THE

ANTARCTIC ICE SHEET WITH CHANGING CLIMATE

(Abstract only)

by

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ABSTRACT

The heat regime and dynamics of the Antarctic ice sheet are studied using numerical modelling for two flow lines, one of which passes Vostok station and the other Byrd station. A two-dimensional non-steady heat-transfer equation with an energy dissipation term was used. The study consists of two parts. The first is a study of velocity and temperature distributions within the glacier under steady-state conditions. The second study was performed assuming surface temperature changes intended to model palaeoclimatic changes for the last 100 ka and also to model future climate changes due to a possible "greenhouse" effect.

Computer numerical modelling shows that the Antarctic ice sheet retains a record of the climatic temperature minimum 18 ka BP. Numerical modelling of the greenhouse effect assumes a temperature increasing by 10 deg within the next 100 a; its influence increases after this even if the surface temperature then remains the same for the next 20 ka. It is shown that for the next 1 ka the temperature wave will penetrate only a thin surface layer of the ice. Even in 20 ka the bottom temperature of the ice sheet will still be unchanged. Small increases of ice velocity can produce ice-sheet thinning of the order of 10 mm a^{-1}.

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