In conclusion, the particular instance mentioned above calls for some consideration to be given to the numerous records of extinct glacial lakes and the substantial effects that their disappearance may have had on the motion of adjoining ice fronts.

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GLACIOLOGICAL WORK IN TERRE ADÉLIE* IN 1951†

PRELIMINARY REPORT

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During a stay of one year in Terre Adélie some studies were made of the mass and heat economy of the surface. I acted as Observer for the Australian National Antarctic Research Expedition with the French team, led by Lt. de Vaisseau M. Barré of the Expédition Antarctique Française, 1951 (Expéditions Polaires Françaises, Missions Paul-Émile Victor). The heavy gales and dense snow drifts of Adélie Land made glaciological work, and indeed all outdoor work, difficult. The Base at Port Martin had an annual mean wind velocity of 19 metres per second (42 miles per hour).

Instruments and Methods

From the coast to a distance of 50 km. southward on the ice cap accumulation and ablation stakes were established. Unfortunately, during my absence on a sledging trip during midsummer, melting and wind caused the stakes near the coast to fall. The amount of ablation in the coastal zone is, therefore, not well known. Short numbered aluminium tubes are recommended for use as ablation stakes. These are placed on top of each other in a bore hole.

To measure the transport of snow by the wind, the most important item in the mass economy of the coastal region, two drift-snow collectors were used. One was a square box with a funnel on the windward side and an opening at the rear like the one used by Mawson.[1a,b] The second was based upon the same principle, but it was in the shape of a section of an aeroplane wing to allow smoother flow of the snow-carrying wind. This instrument caught more drift-snow than the first. This showed that the Mawson collector which could be used over a longer period, gave minimum values only.

To observe the stratification of the snow and firn, pits were dug at different points on the ice cap.

Firn temperatures were measured on the ice cap to a depth of 9 m. in pits and bore holes from the firn limit to a distance of 300 km. on the ice cap. Toluol and mercury thermometers and, to a limited extent, resistance thermometers were used.

Snow and firn densities were determined by cutting and weighing samples of known volume.

* Adélie Land, Antarctica.

† An account of the glaciological and other scientific work of this expedition, with some illustrations, will be found in *Expédition en Terre Adélie, 1950–52, Expéditions Polaires Françaises, Missions Paul-Émile Victor*, Rapports Préliminaires, 20, Série Scientifique. *Ed.*

The rapid local variations caused by the continuous deposition and removal of snow by the wind made great accuracy meaningless. The hardness was tested by the force needed for penetration of discs of known surface.

The heat economy of the snow surface was studied by observations of temperature and density in the uppermost snow layers, of the temperature gradients of the air near the snow surface, and by the determination of the radiation balance of the surface with a "net radiation recorder," the "*Strahlungsbilanzmesser*" of Albrecht.[2] These observations were, however, considerably hampered by the great frequency and the sudden onset of the blizzards, which did not allow any permanent installations to be set up. No observations of the vertical humidity gradients were attempted.

Altogether accumulation and ablation were observed at 15 points on the ice cap. One hundred observations of density and hardness were made, 5 pits were dug in the accumulation region of the ice cap, and several hundred observations of the heat economy were made during the year. Comprehensive records of sea ice, ice foot and snow dune formation were unfortunately lost in the fire which destroyed the base on the day of departure of the team.

Results

The following data are preliminary as the results have not yet been closely studied. This study will offer special difficulties as all the instruments used were lost in the fire. On the ice cap the firn limit is found a few kilometres from the edge at a height of less than 300 m., but on account of the snow drift the local firn limit varies greatly from place to place. While even in midwinter the lowest slopes of the ice cap near the base were swept clear of snow, big accumulations survived in summer in all protected places along the coast.

The amounts of snow transported by the wind which almost invariably blows from the ice cap, are stupendous. To obtain values for the total transport from the catch of the snow trap, the opening of which was less than 1 m. above the surface, evidently demands very far-reaching extrapolation. It seems, however, certain that on the frequently recurring days of heavy blizzards, at least 50 tons of snow are carried from the ice cap across each metre of the coast line. As the drift particles have a diameter of only 0·1 to 0·2 mm., the wind packs the snow deposits very tightly. Even the surface deposits have a density of 0·4 to 0·5, and no marked density increase was found to a depth of $3\frac{1}{2}$ m. On account of the very irregular deposition of the snow drifts no annual stratification of the firn could be found down to that depth.

The very high albedo of the snow surface makes the net radiation of the surface negative with clear sky and the height of the sun of nearly 25 degrees, and the surface of the snow is almost invariably colder than the overlying air. The firn temperatures which, at a depth of a few metres, are very nearly identical with the annual mean temperature of the firn near the surface, and very close to that of the air, decrease very nearly by 1° C. for a rise of the surface of the ice cap of 100 m. At the southernmost point (lat. $69\frac{1}{4}$° S.) at a height of 1950 m. this temperature was found to be −33·5° C., that is to say lower than the temperature in the centre of the Greenland Ice Cap in the same latitude at a height of 3000 m.

During these studies I enjoyed the help of many members of the wintering team.

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