SOME PECULIARITIES OF ICE FORMATION IN MACROBERTSON LAND

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Abstract: Three unusual features of ice formation observed during aerial reconnaissance in the region are described - viz. a large rift or potential calving line in the Amery Ice Shelf; inland mountain top "ice boulders"; and the formation of a large open water pool in the winter sea-ice.

1. INTRODUCTION

During a number of flights on R. A. A. F. aircraft based at Mawson with the 1960/61 A. N. A. R. E. wintering party some unusual features of ice formation in the MacRobertson land region were observed. The following are descriptions of the appearance of these peculiarities as they appeared from aerial observation.

2. THE AMERY ICE SHELF RIFT

During a flight from Davis to Mawson in August 1960 a notable fracture in the Amery Ice Shelf (Fig. 1) was observed under very good observational conditions and was subsequently sighted on a number of occasions.

At the time of observation this fracture line was the most notable feature of the Shelf, extending from the shore of Prydz Bay in a roughly westerly direction towards the southern extremity of MacKenzie Bay, being in all some 50 miles long.

The rift (Fig. 2) appears as a great fissure in the Ice Shelf varying in width from several miles at the eastern end, where it links into an inlet at Prydz Bay, to a few hundred yards at the western extremity, where a huge area of open and apparently recent crevassing is evident directed towards the southern part of MacKenzie Bay.

The rift forms a shallow valley, the floor of which appears as a mass of debris and contorted ice formation and has the appearance in places of having areas of refrozen melt water.

The fracture line does not appear to have been described previously and is not mentioned by Crohn (1959) in his detailed account of the glaciology of the area, nor specifically by Mellor and McKinnon (1960). Earlier maps of the Shelf area constructed from aerial photographs show the inlet on the Prydz Bay side of the rift but not the full length of the rift as it now appears.

The rift is evidently a hinge line where, if the ice mass is freely afloat, calving on a large scale is likely. If the rift were completed to MacKenzie Bay, the initial resulting berg would be one of considerable proportions, roughly fifty miles square.

Such icebergs have been reported previously. Mawson (1915) describes a berg some forty miles in length encountered off the coast of King George V Land, while a gigantic piece estimated at one hundred and twenty miles in length and ten miles in width is known to have broken from the Ross Ice Shelf in 1947 (Sullivan 1957).

Calving on a large scale seems to be a feature of the great ice shelves and the Amery Shelf should thus provide an example where the rate of fracture could be studied if accurate measurements of the rift line can be made.
FIG. 1 Location Map—The Amery Ice Shelf
FIG. 2 The Amery Ice Shelf Ritt looking westward. Aerial view from 5000 ft.
FIG. 4 Winter Sea Ice Pool - coast near Mawson.
Aerial view from 5000 ft.
3. INLAND MOUNTAIN TOP "ICE BOULDERS"

While a low level flight was being made over the Goodspeed Nunataks (Lat. 73°00'S, Long. 61°30'E) in the southern Prince Charles Range in December 1960, an unusual ice formation was noted which was not observed on any of the other mountains viewed from the air during the year. Visibility conditions were fair during the period of observation.

The formation (Fig. 3) took the form of large boulders of ice (which had the appearance of shattered portions of plateau ice) scattered on the top of one of the nunataks. They appeared to consist of clear ice and showed no indication of being built around rock cores, but the actual composition would require examination from the ground. In size, the "boulders" appeared to be of the order of one to two metres to a side and were irregular in shape. The nunatak is of the order of 300 to 400 feet above the plateau which is here some 6000 feet above sea level. The top surface of the nunatak is roughly flat and is covered with small moraine fragments on which the ice masses rest.

The boulders could possibly be considered as glacial ice erratics but their continued maintenance on an exposed mountain top so high above the ice surface is somewhat puzzling. The formation of the "boulders" in situ also appears difficult of explanation.

4. AN UNUSUAL SEA-ICE POOL

On a number of flights westward from Mawson from July to November, a large breakage in the sea-ice was observed at the junction of a small coastal glacier and the sea-ice, leaving a large pool of open water close to the glacier cliffs. Apart from narrow tidal cracks and smaller areas of pressure and rafted ice, the sea-ice along the coastal area west of Mawson for at least a hundred miles appeared as a solid mass which in August was approximately two metres thick at Mawson and presumably of a somewhat similar thickness elsewhere along the coastline. To seaward no open water was found within fifty miles in late August. The pool (Fig. 4) was of considerable size, being roughly circular and approximately 100 to 150 metres in diameter.

The hole appeared to have been formed by a breakaway of the glacier cliff and the shattering of the sea-ice by a large mass falling through it. However, no sign of any debris remained nearby and presumably a large ice breakaway would remain afloat and refreeze into the sea-ice as usually occurs.

Once formed, however, the hole remained as open water throughout the period of the lowest mean air temperature for the year and with minima frequently below -20°F, maintaining its existence until early December when the annual general breakout of the sea-ice occurred.

Presumably tidal and swell motion must be responsible for the continued open water, but the initial formation as well as the maintenance of such pools is interesting. Information as to the frequency of occurrence of such open water areas in mid-winter would also be significant in the study of the winter feeding of bird life on the coast, particularly that of the Emperor Penguin.

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