

Observations of the Terminus of Bunde Glacier, Axel Heiberg Island, Northwest Territories, Canada, in 1955 and 1983

N.J. McMILLAN¹

(Received 26 May 1997; accepted in revised form 2 October 1997)

ABSTRACT. The terminus of Bunde Glacier (name used here for the first time), situated at 80°25'N, 93°45'W on northwestern Axel Heiberg Island, Canadian Arctic Archipelago, was observed and photographed in 1955 and 1983. Comparison of the photos indicates that there has been no appreciable advance or retreat during the 28-year span, as the terminal moraine appears to have remained practically unchanged. The possibility exists that Bunde Glacier retreated or advanced after 1955 but re-advanced or retreated to occupy its 1955 position by 1983. This situation marks a departure from the observation that glaciers in most parts of the world are in retreat.

Key words: alpine glacier, Axel Heiberg Island, terminal moraine, advance, retreat, climate

RÉSUMÉ. En 1955 et 1983, on a observé et photographié le front du glacier Bunde (c'est la première fois ici que l'on utilise ce nom), situé par 80° 25' de latit. N. et 93° 45' de longit. O., sur la partie nord-ouest de l'île Axel Heiberg dans l'archipel arctique canadien. Une comparaison des photos révèle qu'il n'y a pas eu d'avance ou de retrait notable durant cet intervalle de 28 ans, vu que la moraine terminale semble n'avoir pratiquement pas changé. Il est possible que le glacier Bunde ait reculé ou avancé après 1955, puis avancé ou reculé à nouveau en 1983, pour occuper la même position qu'en 1955. Cette situation signale une divergence par rapport à l'observation que sur la plupart de la planète, les glaciers sont en recul.

Mots clés: glacier alpin, île Axel Heiberg, moraine terminale, avance, recul, climat

Traduit pour la revue *Arctic* par Nésida Loyer.

INTRODUCTION

In August 1955, the author, assisted by R.C. McCulloch, mapped the geology of an east-west strip of northern Axel Heiberg Island at 80°30'N during the Geological Survey of Canada's Operation Franklin (McMillan, 1963). The opportunity was taken to do a reconnaissance of the permanent ice cap and the valley glaciers issuing from the ice cap's west side. Two cairns were built near the terminus of Bunde Glacier, located on the east bank of the Bunde River approximately 15 km south of the head of Bunde Fiord (Fig. 1). The site is labelled "Glacial retreat observation monument" on Figure 40 of McMillan (1963). The terminus of the lobe is at an elevation of approximately 150 m at approximately 80°25'N, 93°45'W. It was photographed from a standing position from the northernmost cairn (Fig. 2a). The southernmost cairn is on the right side of each photograph, which allows comparison of the position and nature of the terminus of the glacier with the snowfields on the mountains in the background (McMillan, 1963:502).

The author and Claude Blanchard-Williamson returned to the site in July 1983 and photographed the same part of the glacier's piedmont lobe from the cairns (Fig. 2b). We deposited notes in the cairns that invite other interested travellers to take photos from the northern cairn aiming south, so that the

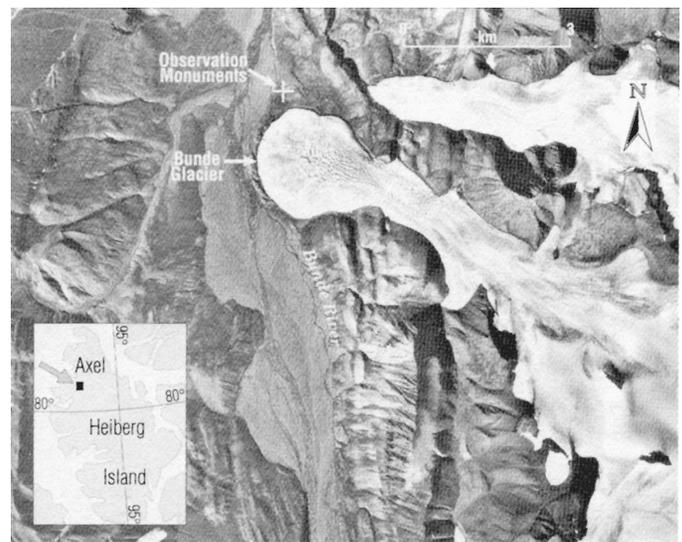


FIG. 1. Bunde Glacier on Axel Heiberg Island and environs (Airphoto A16861-50, Airphoto Division EMR, Canada). Photo taken on August 5, 1959. Physical characteristics according to Ommanney (1969) are: Canadian Glacier Inventory: Axel Heiberg Island West, Area 46444, Drainage Basin K, Glacier Number 5, Drains Ice Cap, Expanded Foot. Maximum length = 12.0 km; Mean width of main stream = 0.9 km; Max elevation = 1372 m a.s.l.; Min elevation = 107 m a.s.l.; UNESCO Classification 433112: primary classification = outlet glacier; form = simple basin; frontal characteristic = lobed; longitudinal profile = even; nourishment = snow and/or drift snow; activity of tongue = slight retreat.

¹ Geological Survey of Canada (Calgary), 3303 - 33rd St. NW, Calgary, Alberta T2L 2A7, Canada
© The Arctic Institute of North America



FIG. 2. The snout of Bunde Glacier. a) Photograph taken on 3 August 1955 by N.J. McMillan. East is to the left. (Archive number is Geological Survey of Canada, Calgary 2107-2.) b) Photograph taken on 17 July 1983 by N.J. McMillan. (Archive number is Geological Survey of Canada, Calgary 2107-6.)

southern cairn is in the lower right-hand segment of the picture frame.

NATURE OF THE BUNDE GLACIER TERMINUS

The geographic position of the near vertical face of the terminus remains practically unchanged. It displays ice stratified with rock debris that is more abundant and pronounced near the base of the glacier. The strata dip eastward (up-glacier). The background mountains contained a more extensive snow and ice cover in August 1955 than in July 1983 (Fig. 2). Ice appears to override the terminal moraine in both cases. The terminal moraine has been pushed forward since 1955, but the gross shape of its surface appears to be practically unchanged.

DISCUSSION

Studies of alpine glaciers and ice caps in northern Canada indicate that most have been in retreat for several decades (Koerner, 1989).

The average temperatures from east to west across Axel Heiberg Island are consistently reported to be lower in the west. Fletcher and Young (1975) report lower temperatures for the western half of the island on Maps 6 and 16 for the period 1948–73. Maxwell (1980) reported that the temperature was about 2.5°C colder in the west than in the east.

On the eastern side, the margin of the ice sheet is abrupt and even at approximately 750 m elevation (Thorsteinsson and Trettin, 1972). The margin of the western side of the ice sheet, however, is tortuous, uneven, and marked by disconnected snowfields and alpine and piedmont glaciers. In contrast with the east, the edge of the western margin of the ice sheet extends in many places to elevations as low as 450 m.

CONCLUSION

The terminus of the Bunde Glacier has not significantly changed location between 1955 and 1983, and the terminal moraine has maintained the same general shape. This does

not preclude the possibility that the glacier retreated or advanced since 1955 and then re-advanced or retreated to occupy its same 1955 position by 1983. The fact that the edge of the ice sheet is at 750 m on the northeastern part of Axel Heiberg Island and 450 m on the western part is perhaps accounted for by the 2.5°C colder temperature in the west.

ACKNOWLEDGEMENTS

I thank Dr. Ashton F. Embry, who encouraged me to write this note. Dr. R.W. Klassen and Dr. Don Lemmen offered many valuable suggestions. Peter Neelands is thanked for preparation of the figures. Dr. G. Holdsworth, Dr. M.N. Demuth, and Dr. L.V. Hills offered suggestions which were used to improve this note. This is Geological Survey of Canada Contribution Number 1996265.

REFERENCES

- FLETCHER, R.J., and YOUNG, G.S. 1975. Climate of Arctic Canada in Maps. Occasional Publication No. 13. Edmonton: Boreal Institute for Northern Studies. 85 maps.
- KOERNER, R.M. 1989. Queen Elizabeth Islands glaciers. In: Fulton, R.J., ed. Quaternary geology of Canada and Greenland, No. 1. Ottawa: Geological Survey of Canada. 464–478.
- MAXWELL, J.B. 1980. The climate of the Canadian Arctic Islands and adjacent waters. Environment Canada. Climatological Events, No. 30, Vol. 1. 531 p.
- McMILLAN, N.J. 1963. Geological traverse from Lightfoot River to Wading River. In: Fortier, Y.O., Blackadar, R.G., Glenister, B.F., Greiner, H.R., McLaren, D.J., McMillan, N.J., Norris, A.W., Roots, E.F., Souther, J.G., Thorsteinsson, R., and Tozer, E.T., eds. Geology of the north-central part of the Arctic Archipelago, Northwest Territories (Operation Franklin). Geological Survey of Canada, Memoir 320. 501–512.
- OMMANNEY, C.S.L. 1969. A study of glacial inventory—ice masses of Axel Heiberg Island—Canadian Arctic Archipelago. Axel Heiberg Island Research Reports, McGill University, Glaciology, No. 3. 97 p.
- THORSTEINSSON, R., and TRETTIN, H.P. 1972. Geology of Bukken Fiord. Geological Survey of Canada, Map 1310A, 1:250,000.