

Short Papers and Notes

AGE OF A WIDESPREAD LAYER OF VOLCANIC ASH IN THE SOUTHWESTERN YUKON TERRITORY

Radiocarbon dates pertaining to a widespread layer of volcanic ash in the southwestern Yukon Territory are here reported. The volcanic ash generally occurs in lacustrine sediments and in peat and loess deposited during the Little Ice Age and thus affords a valuable marker horizon for correlating these deposits. A reliable date for this ash layer will provide future workers with a limiting age for Little Ice Age deposits in this region.

Schwatka (ref. 1, p. 196) and Dawson (ref. 2, pp. 43b - 46b) first described a stratum of white volcanic ash from large areas of the southern Yukon Territory and eastern Alaska. This conspicuous deposit occurs at or close to the surface and is easily seen in vertical exposures.

Capps (ref. 3, pp. 59 - 64), Bostock (ref. 4, pp. 36 - 9), Berger (ref. 5, pp. 117 - 18), and Fernald (ref. 6, pp. B29 - 30) have since added to the description and interpretation of the ash.

Bostock (ref. 4, Fig. 1) constructed an isopach map showing two coalescing fans of ash with a combined area of about 129,000 sq. mi. and a maximum thickness of about 300 ft. near the international boundary about 10 mi. south of the White River. Both Bostock (ref. 4, p. 37) and Capps (ref. 3, p. 61) suggested that there was probably the source of the ash.

Moffit and Knopf (ref. 7, p. 44) reported that a sample of this ash collected in the White River Basin, Alaska was an andesitic pumice. Berger (ref. 5, p. 118) described ash from the Tepee Lake area, southern Yukon Territory, and concluded that it was of dacitic composition.

Capps (ref. 3, p. 64) studied the rate of peat accumulation above the ash in

a bog exposed in the bank of the White River 25 mi. northwest of the centre of eruption and concluded that the ash was deposited about 1400 years ago.

In 1962 Fernald (ref. 6, p. B30) reported radiocarbon dates that placed the age of the ash fall at around 1635 ± 80 years B.P. in the Tanana River valley, Alaska. The value of 1635 ± 80 years was obtained by averaging two dates: 1520 ± 100 years B.P. (sample I-275) and 1750 ± 110 years B.P. (sample I-276) that were derived from peat immediately above and below the ash layer, respectively.

A microscopic analysis of an ash sample collected near the southeast shore of Kluane Lake, southwestern Yukon Territory, in 1963 showed it to be composed of whole and broken euhedral crystals of plagioclase (An 35 to An 50), hornblende, biotite, and a trace of magnetite. The glass sherds have a refractive index of approximately 1.510, suggesting a dacitic composition (ref. 8, p. 538). The results of this analysis and that of Berger's are consistent, but both differ slightly from the analysis reported in ref. 7, p. 43 in the type of plagioclase present. Knopf reported a composition slightly more calcic than Ab 1, An 1, or essentially labradorite, whereas the two analyses from the Yukon Territory show the plagioclase to be andesine.

The ash layer, 1 inch thick, was found in a peat bog on the timbered rocky knob separating the Slims and Kaskawulsh rivers, southwestern Yukon Territory, approximately 100 yd. north of and about 40 ft. above the Little Ice Age terminal moraine of the Kaskawulsh Glacier. In an excavation the top of the 1-in. thick ash layer in this locality was 13 in. below the surface of the bog. Samples of peat, 0.5 in. thick, were collected from positions immediately above and below the ash for radiocarbon dating. The sample

Y-1363 from just above the ash yielded an age of 1460 ± 70 years B.P. and the sample Y-1364 from just below the ash was dated 1390 ± 70 years B.P., indicating that the time of the ash fall was around 1425 ± 50 years ago. Although the lower sample provides a younger date, the difference is not significant in view of the statistical error of ± 70 years. The peat sections are very thin and one can expect that both samples are of about the same age. In a case like this there is a 50-per cent chance that the lower sample turns out to be the "younger" one.

Our date is very close to the non-radiometric date of 1400 years ago approximated by Capps, but it is different from the average radiocarbon date of 1635 ± 80 years presented by Fernald (ref. 6, p. B30). The difference suggests the possibility that there were two eruptions from the same source separated by approximately 200 years, with the older fan extending northwards.

Bostock (ref. 4, p. 38) suggested that these fans were probably the result of two different surges during the same eruption with the northward extending fan being the older of the two. If this were so there would be essentially no time difference between the surges. It is suggested that a study of the area of fan coalescence may show two distinct ash layers of essentially the same composition but separated by a thickness of peat or sediment equivalent to about 200 years. From the area of coalescence Moffit and Knopf (ref. 7, p. 43) reported two separate ash beds in a peat bog exposed in the bank of Holmes Creek, a tributary of the White River, Alaska. They were not sure whether these beds represent two distinct eruptions or whether the top layer had been washed into the bog a considerable time after deposition of the lower. Assuming a constant rate of peat growth for this locality, it would have taken approximately 120 years to form 2 in. of peat between the separate layers.

Near the southeast shore of Kluane Lake, Yukon Territory, the ash occurs near the base of a deposit of loess 4 ft. thick. The centre part of a tree buried

there in the growth position immediately above the ash was dated at 870 ± 100 years B.P. (sample Y-1365) and gives a minimum age for the ash.

The study of this ash is only a small part of the larger one of the Pleistocene history of Shakwak and Slims River valleys, Yukon Territory, which was undertaken with the encouragement and help of Dr. W. A. Wood, director, and Mr. Richard H. Ragle, field leader of the Icefield Ranges Research Project.

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MINZE STUIVER*

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¹Schwatka, F. 1885. Along Alaska's great river. New York: Cassel and Co. 360 p.

²Dawson, G. M. 1889. Report on an expedition in the Yukon district, N.W.T., and adjacent northern portion of British Columbia. Geol. Surv. Can. Annu. Rept., V. 3, Pt. 1, 277 p.

³Capps, S. R. 1915. An ancient volcanic eruption in the upper Yukon basin. U.S. Geol. Surv. Prof. Pap. 95:59-64.

⁴Bostock, H. S. 1952. Geology of northwest Shakwak valley, Yukon Territory. Geol. Surv. Can. Mem. 267, 54 p.

⁵Berger, A. R. 1960. On a recent volcanic ash deposit, Yukon Territory. Proc. Geol. Assoc. Can. 12:117-8.

⁶Fernald, A. T. 1962. Radiocarbon dates relating to a widespread volcanic ash deposit, eastern Alaska. U.S. Geol. Surv. Prof. Pap. 450, pp. B29-30.

⁷Moffit, F. H., and A. Knopf. 1910. Mineral resources of the Nabesna-White River

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district, Alaska, with a section on the Quaternary by S. R. Capps. U.S. Geol. Surv. Bull. 417, pp. 42-4.

⁸George, W. O. 1924. The relation of the physical properties of natural glasses to their chemical composition. J. Geol. 32:353-72.

CLIMATOLOGICAL NOTES FROM AXEL HEIBERG ISLAND, N.W.T., CANADA

The main purpose of the meteorological program of the Axel Heiberg Island Expedition during the summers 1960 to

S. M. Stones in 1960, as well as for a glacier camp in an ablation area, the Lower Ice Station on White Glacier, for selected periods in 1960 (R. H. G. Andrews, unpub.) and in 1962 (Havens, unpub.). Sections of these heat-balance analyses are being incorporated into a study for separate publication. In the meantime this note summarizes some of the general information collected in the bare-ground and ablation areas of west-central Axel Heiberg Island (see *Arctic* 15:160 for location map). A summary of the data for 1960 from the ice cap station has been published².

Climatological data

Climatological investigations were undertaken not only to provide the necessary background material for the

Table 1. Climatological information for the base camp station of the Axel Heiberg Island Expedition (79°25'N. 90°30'W.).

	1962	July 1961	1960	1962	August 1-25 1961	1960
<i>Air temperature</i>						
Daily mean (°C.)	8.7	4.8	6.6	4.5	5.8	7.9
Highest maximum (°C.)	18.9	13.1	15.8	16.7	16.3	18.9
Days with max. \geq 15°C.	8	0	1	3	2	2
<i>Precipitation</i>						
Total (mm.)	18.5	98.0	61.8	17.8	1.5	13.8
Days with 0.3 mm. or more	8	18	12	4	2	9
Days with trace	11	23	16	9	6	12
<i>Bright sunshine</i>						
Total hours	357.3	110.5*	236.9*	256.3	193.7*	248.6*
Daily mean (hrs.)	11.5	3.6*	7.6*	9.7	7.8*	9.9*
Per cent of possible	49	15	32	52	42	55

*Lower Ice Station

62 was the evaluation of heat-energy balances at snow and ice surfaces for two localities on the island. Estimates have been made for a station on the ice cap in the main accumulation area of the island¹, operated by the writer and

heat-balance studies, but also to supply information for a heretofore relatively unknown area. Table 1 summarizes some of the weather elements for the base camp area, so arranged as to draw attention to the considerable variety of