DISPLACEMENT, ABLATION, AND METEORITE CONCENTRATIONS AT THE ALLAN HILLS ICEFIELD, 1978 TO 1982; J. O. Annexstad, NASA Johnson Space Center, Code SN2, Houston, TX 77058.

The Allan Hills Main Icefield has yielded over 1,000 meteorite specimens since the initial find in 1976 by a joint U.S.-Japanese field party. These finds are exceeded only by those from the Meteorite Icefield near the Yamato Mountains which is over 40 times as large. Both icefields exhibit surface characteristics which appear to be representative of Antarctic blue icefields that are similarly located. Some of the significant features of blue icefields are a rippled or cupped surface, extensive orthogonal crack systems (2-4 mm wide), parabolically shaped flow bands and monoclinal step-like features. Although meteorites have been recovered from various types of terrain in Antarctica, the majority are found on blue icefields located upstream from flow-blocking mountains or nunataks. In an attempt to quantify the movement and ablation patterns of a blue icefield, a five year program of measurement of these parameters was initiated in 1978. The surface horizontal and the vertical emergent/submergent displacements were measured using the stake method in 1978, 1979, and 1981. The rate of ablation of the ice surface was measured yearly from 1978-1982 at the same stations used for position survey determinations. The stake network is composed of 20 triangulation stations extending from the Allan Hills westward across the main region of meteorite accumulation. A four-station (21-24) ablation network was constructed in 1978 just north of the midpoint of the network to provide information from the zone of densest meteorite finds. In addition to these data, surface ice samples were collected from selected sites for the determination of oxygen and hydrogen isotopic ratios. Table 1 is a listing of ablation averages with standard deviations, horizontal displacement, vertical motion, and the isotopic ratios of surface ice from the Allan Hills network. The ablation values vary widely from station to station with an overall average of -4.2 cm/yr for blue ice and -0.8 cm/yr for firn. The horizontal displacement of the stations increases in magnitude from east to west (stations 3 to 20) with the far western stations averaging about 1 m/yr. The azimuth of the movement along the line is generally eastward. Vertical motion, defined as the rate of rise of the ice surface if there was no ablation, seems to be positive although errors in measurement exceed the measured values at most stations. The conclusions reached by this study can be summarized as follows:

1 - the surface rate of ablation of the blue ice averages slightly more than 4 cm/yr;

2 - the surface rate of ablation of the firn averages less than 1 cm/yr;

3 - the rate of horizontal displacement at stations close to the Allan Hills indicates little or no movement;

4 - the rate of horizontal displacement at stations far to the west of the Allan Hills is about 1 m/yr;

5 - the vertical velocity appears to be emergent at those stations where measurement errors are low;

6 - isotopic data varies widely between closely spaced stations which may indicate a complex source model for the ice.

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Table 1

Station	Ablation Avg. 1978-1982 (cm/yr)	Horizontal Motion $S_m \pm S_m$ 1978-1981 (m)	Vertical Motion V ± V 1979 - 1981 (cm)	$\delta^{18}O$(°/oo) SMOW	δD(°/oo) SMOW
3	+0.1 ± 2.6	0.03 ± 0.05	+5.7 ± 6.0		
4	+3.0 ± 10.1	0.08 ± 0.07	+18.7 ± 4.0		
5	-0.5 ± 1.5	0.18 ± 0.07	+11.7 ± 4.0		
6	-2.6 ± 0.6	0.20 ± 0.13	+11.3 ± 4.0		
7	-0.8 ± 2.5	0.14 ± 0.11	+5.0 ± 4.0		
8	-2.2 ± 1.1	0.63 ± 0.27	-8.7 ± 7.0		
9	-3.6 ± 1.2	0.33 ± 0.19	+12.5 ± 4.0		
10	-4.0 ± 2.8	1.20 ± 0.43	+11.5 ± 27.0		-307.1
11	-5.3 ± 1.9	1.48 ± 0.55	+16.2 ± 26.0	-43.9	-340.0
12	-3.7 ± 1.3	2.06 ± 0.67	+2.3 ± 36.0		-287.1
13	-6.0 ± 0.4	1.98 ± 0.71	-6.4 ± 32.0	-38.1	-287.2
14	-4.7 ± 1.9	1.98 ± 0.82	+9.6 ± 32.0		-303.1
15	-4.2 ± 1.6	2.50 ± 0.90	+13.3 ± 36.0		-301.5
16	-2.0 ± 1.7	2.90 ± 1.23	+5.9 ± 45.0		-310.7
17	-4.8 ± 2.0	3.17 ± 1.40	-1.9 ± 43.0	-45.6	-351.5
18	-4.5 ± 0.9	3.09 ± 1.42	-11.0 ± 40.0		
19	-2.2 ± 0.9	3.09 ± 1.43	-0.9 ± 30.0		
20	-1.1 ± 1.0	3.05 ± 1.42	-7.9 ± 26.0		
21	-2.2 ± 5.1				
22	-4.6 ± 3.1			-41.8	-321.2
23	-4.5 ± 1.6				
24	-4.8 ± 0.8				