

# Note

## Meteorological Observations in 1999 at the Arctic Station, Qeqertarsuaq (Godhavn), Central West Greenland

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### Abstract

In October 1990 an automatic weather station was established at the Arctic Station (65°15', 53°31'W), Qeqertarsuaq (Godhavn), Central West Greenland. The Station register parameters each 20 minutes, and the parameters have been described in an earlier paper in this journal by Nielsen et al. (1995). The present paper summarizes meteorological parameters during 1999.

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### Outline of the Meteorological Year 1999

The mean annual air temperature (MAAT) for 1999 was -4.2°C (Table 1), which is slightly higher than the average since the station was established in late 1990 (Nielsen et al., 1995). The MAAT at the station is -4.6°C for the entire period 1991-1999. According to official meteorological data 1961-1990 the MAAT at Qeqertarsuaq is -3.9°C. The lowest air temperature (-26.1°C) occurred on 19 March, while the highest air temperature (15.7°C) was measured on 5 July. For a 72 days period (from 26 June to 5 September) no negative air temperatures were registered.

Liquid precipitation was registered on 73 days covering all 12 months except January, and an annual total of 421.4 mm was 87 % above the normal of 225 mm for the period 1991-1999. Snow accumulation during the spring of 1999 was rather high, 50-55 mm water equivalent, so in general the precipitation in 1999 was the highest annual precipitation ever measured at the station. Especially August and September were very rainy (Table 1) culminating on 28 September with no less than 70 mm per day 13.5 mm per hour in the early morning hours which is a rather high intensity of rain for Arctic areas.

In the winter 1998/1999 a persistent snow cover was established as usual in the beginning of October, but it lasted until the end of June (Figure 1). A total of 265 days of snow cover - the longest ever registered duration of snow cover. It

started with a typical thickness of about 20 cm, which lasted until the beginning of April where a heavy snowfall was registered all along the westcoast of Greenland. The thickness of the snow cover was doubled to about 40 cm, which lasted to the end of May, when the spring started, but a thin patchy snow cover was registered for the rest of June. The thick and long lasting snow cover resulted in relatively high subsurface temperatures than normal. At 5 cm the temperature only dropped to -5.9°C in April, while -21.9°C and -20.9°C were reached in 1994 and 1995 when the snow cover was much thinner. At lower depths, the temperature was 2-3 °C above normal in the spring when the snow cover was thickest.

The mean annual wind speed (MAWS) was only 3.6 m/sec, which is the lowest MAWS ever registered at the station. Maximum gust of 23.0 m/sec was measured during a Foehn situation on 28 December, but maximum wind speeds above 20 m/sec were normal during Foehn situa-

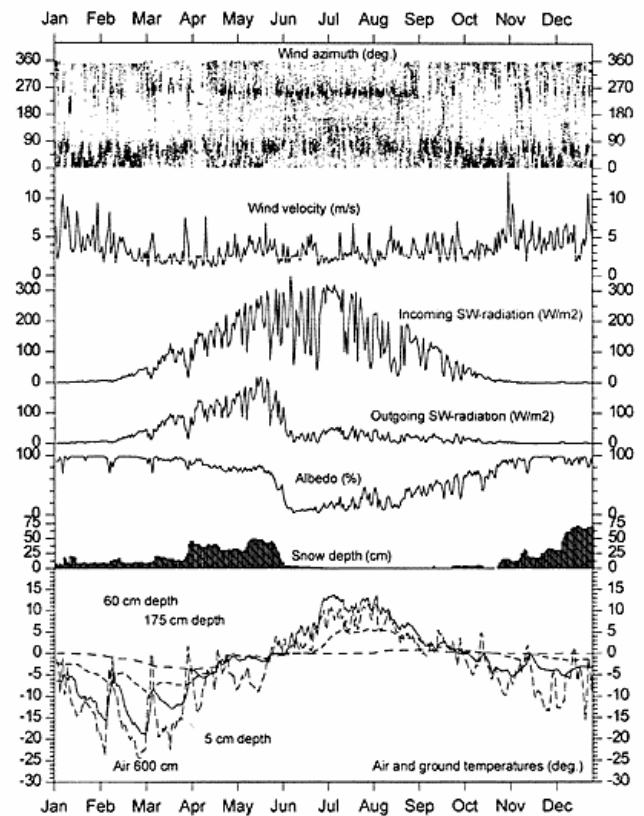


Figure 1: Diagrams showing various mean daily meteorological parameters and ground temperatures at the Arctic Station 1999. The snow cover thickness was measured daily.

tions in both January and November. In general the wind directions at Arctic Station as all other places in Greenland, are dominated by orographic conditions. At Godhavn the prevailing wind is dominated by an easterly drainage of cold air down slope of the Greenland Ice Sheet. This cold katabatic flow takes place all year around, but dominates during nighttime and in the snow covered period. In the snow free months "warm" winds blowing from westerly directions can occur, when maritime air masses reach the area, and in the summer season a westerly sea breeze dominates in the daytime.

Qeqertarsuaq is characterized by continuous darkness during the polar night from 28 November to 13 January and continuous daylight from 29 May to 14 July with maximum solar radiation of approximately 890 W/m<sup>2</sup> at noon on cloud free summer days (Table 1). Mean annual solar radiation (MASR) was 94.9 W/m<sup>2</sup> and very close to the MASR for the entire period 1991-1999, which was 93.7 W/m<sup>2</sup>. The mean

annual surface albedo (MASA) was 41 % (Table 1), and due to the long lasting snow cover it was 7 % higher than MASA for the period 1991-1999.

Meteorological data measured at the meteorological station at the Arctic Station are validated at the Institute of Geography and stored in databases and standard spreadsheet formats. The data are available for scientists. Applications for data should be directed to Arctic Station, the Secretary, c/o Gitte Henriksen, Øster Voldgade 3, DK-1350 Copenhagen K, e-mail: GIN@adm.ku.dk.

### References

Nielsen, N., Hansen, B.U., Humlum, O. & Rasch, O. (1995): Meteorological Observations at Arctic Station, Qeqertarsuaq (Godhavn), Central West Greenland. *Danish Journal of Geography*, 95: 97-104.

**Table 1:** Monthly maximum, mean and minimum values of wind speed, air temperature, relative humidity, incoming and reflected solar radiation, precipitation (liquid), snow depth, number of days with snow and ground temperature at various depths (5, 60, 175 and 300 cm).

1999											
ARCTIC STATION, QEQERTARSUAQ - GODHAVN, GREENLAND											
	Wind Speed m/se	Air Temp ° C	Rel. Humi %	Si W/m <sup>2</sup>	Su W/m <sup>2</sup>	Precip mm H <sub>2</sub> O (normal)	Snow cm (day)	Temp 5 cm ° C	Temp 60 cm ° C	Temp 175 cm ° C	Temp 300 cm ° C
				(albedo)							
<b>January</b>											
Max	22.4	0.5	88.5	55.5	55.0		22.0	-4.7	-2.1	-0.0	-2.0
Mean	5.3	-11.0	57.4	2.5	2.4		9.5	-8.9	-3.4	-0.2	-2.8
Min	0.7	-20.5	24.4	0.0	0.0		-15.1	-5.7	-0.5	-3.9	
Sum				(94.5)		0.0 (19)	(31)				
<b>February</b>											
Max	19.7	2.7	91.7	249.9	224.9		16.0	-3.8	-4.7	-0.5	-3.8
Mean	3.5	-16.8	64.7	18.1	17.5		9.8	-13.0	-6.2	-1.3	-4.9
Min	0.1	-25.9	27.9	0.0	0.0		-19.6	-8.5	2.2	-5.7	
Sum				(96.5)		9.7 (19)	(28)				
<b>March</b>											
Max	17.0	5.7	91.7	511.0	393.4		25.0	-4.5	-6.9	-2.2	-5.7
Mean	2.8	-14.6	71.0	69.5	61.2		14.3	-12.3	-7.8	-3.2	-6.6
Min	0.2	-26.1	28.9	0.0	0.0		-19.7	-9.5	-3.7	-7.0	
Sum				(88.1)		24.9 (19)	(31)				
<b>April</b>											
Max	14.9	6.6	93.4	679.8	552.0		110.0	-0.1	-0.9	-0.0	-5.8
Mean	2.3	-5.7	71.5	144.2	112.2		38.5	-3.7	-4.1	-2.9	-6.5
Min	0.0	-16.5	29.5	0.0	0.0		-5.9	-7.3	-3.8	-7.0	
Sum				(77.8)		23.0 (25)	(30)				
<b>May</b>											
Max	16.1	9.1	93.4	783.1	621.0		49.0	-0.1	0.0	-0.3	-4.5
Mean	3.7	-4.8	68.1	211.2	156.0		39.6	-1.2	-0.7	-0.9	-5.0
Min	0.0	-12.1	39.6	0.0	0.0		-1.9	-1.1	-1.3	-5.8	
Sum				(73:9)		17.1 (30)	(31)				
<b>June</b>											
Max	13.4	12.3	93.4	874.4	414.2		25.0	13.7	1.5	0.0	-2.0
Mean	3.0	2.5	79.3	201.0	33.8		3.9	4.2	0.2	-0.1	-3.4
Min	0.2	-1.8	36.9	0.0	0.0		-0.2	0.0	-0.6	-4.6	
Sum				(16.8)		83.3 (41)	(0)				
<b>July</b>											
Max	18.2	15.7	94.2	886.2	161.5		0.0	17.8	5.6	0.0	1.6
Mean	2.8	8.6	73.6	243.4	37.4		0.0	12.1	4.6	-0.1	0.0
Min	0.1	0.7	29.9	0.0	0.0		0.0	7.7	1.5	-0.1	-2.0
Sum				(15.4)		14.2 (57)	(0)				
<b>August</b>											
Max	17.6	15.0	94.9	777.6	142.5		0.0	17.5	6.0	0.7	3.0
Mean	3.2	6.8	77.5	124.8	19.1		0.0	9.0	4.9	0.5	2.6
Min	0.1	1.7	38.5	0.0	0.0		0.0	3.9	3.5	0.0	1.6
Sum				(15.3)		100.4 (40)	(0)				
<b>September</b>											
Max	17.0	10.3	92.6	690.7	164.1		3.0	7.7	3.8	0.8	2.8
Mean	3.7	1.8	67.2	89.9	15.8		3.0	2.3	2.1	0.6	2.3
Min	0.1	-1.6	37.9	0.0	0.0		0.1	0.9	0.3	0.3	1.6
Sum				(17.6)		95.7 (80)	(4)				
<b>October</b>											
Max	14.9	7.3	92.5	299.5	151.1		10.0	0.2	0.7	0.2	1.8
Mean	3.7	-2.6	62.4	25.3	8.6		2.9	-2.0	0.1	0.0	0.9
Min	0.3	-9.8	26.9	0.0	0.0		-4.9	-0.2	0.0	0.0	-0.2
Sum				(34.1)		26.0 (46)	(19)				
<b>November</b>											
Max	20.3	5.3	92.9	92.8	90.8		31.0	-0.5	-0.3	0.0	-
Mean	4.6	-6.6	66.6	2.0	1.5		18.2	-3.5	-0.9	-0.1	-
Min	0.2	-15.4	30.5	0.0	0.0		-5.8	-1.5	-0.1	-	-
Sum				(76.5)		18.4 (46)	(30)				
<b>December</b>											
Max	23.0	4.6	91.6	16.6	16.0		71.0	-3.1	-1.0	0.0	-
Mean	5.0	-7.4	66.6	0.9	0.8		53.7	-3.9	-1.4	-0.1	-
Min	0.2	-17.2	26.0	0.0	0.0		-5.4	-1.8	-0.1	-	-
Sum				(96.5)		8.6 (55)	(31)				
<b>Year</b>											
Max	23.0	15.7	94.9	886.2	621.0		110.0	17.8	6.0	0.8	3.0
Mean	3.6	-4.2	68.8	94.9	39.9		22.0	-1.7	-1.1	-0.7	-
Min	0.0	-26.1	24.4	0.0	0.0		-19.7	-9.5	-3.8	-7.0	
Sum				(41.1)		421.3 (447)	(265)				

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