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SOME INVERSION AND PSEUDOINVERSION PHENOMENA OCCURRING IN THE REGION OF THE ARCTOWSKI STATION (KING GEORGE ISLAND, SOUTH SHETLAND ISLANDS, WEST ANTARCTICA)

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ABSTRACT

Topoclimatic conditions in the vicinity of Arctowski Station are influenced by great differences in the amount of sun radiation reaching ground. It leads to significant differences in air temperature over that area. In the season 1994-1995 measurements of air temperature were taken at Arctowski Station and Point Thomas (173 m a.s.l., 850 m WNW of the Arctowski Station). Two periods with clear anomalies from a normal vertical air temperature distribution were observed. In winter (July - September) the observed inversions (up to 14 deg) are of radiation character and can be present only when the Admiralty Bay is covered by ice. They were observed during calms and characterised by rapid decrease in temperature at the Arctowski Station at night. They can be present even over the period of dozens of hours. In summer the anomalies in vertical temperature distribution are frequent but occur only for a short period of time at daylight. Such anomalies are connected with faster temperature increase at Point Thomas during morning hours which results in homothermy or in small inversion (maximum up to 4 deg).

KEY WORDS: topoclimate - solar radiation - temperature inversion - Arctowski Station - West Antarctica

INTRODUCTION

Land areas surrounding the Admiralty Bay are characterised by great variety both of the features of the environment and the topoclimatic conditions as well. The spatial changeability of topoclimatic conditions of the coastal oases in the region the Admiralty Bay is caused by great variability of features of the ground and hypsometry occurring there (see Fig. 1).

A few authors dealt with the studies concerning the spatial changeability of some topoclimatic features of the Arctowski Station Oasis. Moczydłowski (1986) observed the differences in the local climatic conditions occurring between the meteorological station at the Arctowski Station and the conditions present at the local penguin rookery. He noted that hypsometry had a great influence on the length of the period of snow cover existence which influenced the ground temperature. He also pointed out that a high concentration of birds have some influence on the local climate during summer season. Styszyńska (1995) analysed the distribution of solar radiation reaching the surface of that area indicating that, depending on the exposure and inclination of the surface, the amount of solar radiation reaching the ground may vary within short distances even up to a few hundred percent. Prošek *et al.* (1996) analysed components of the radiation balance at the Arctowski Station during summer season 1994/95 and dependence of its fluxes from cloudiness and direction of advection. Kruszewski (1998, in print) presented the results of his studies on the occurrence of strong winter thermal inversions at the marine terrace in the region of the Arctowski Station. Kejna (1999) dealt with the air temperature changeability in summer in the near ground air layer on the area of five ecotopes. They differed from one another with regard to the time they had been uncovered by ice cap, their exposure, types of ground and flora. He has stated that the exposure and the types of ground are of primary importance in the course of air temperature and that the flora has significant role in changes of the ground temperature.

One of the characteristic features of the topoclimate is the occurrence of temperature inversion causing that temporarily the air temperature on elevations is higher than on those areas located lower.

In 1994/95 at the Arctowski Station studies were carried out in order to find the character and values of temperature inversion and to explain why and how the inversion occurs. The aim of this paper is to present the main results of the above mentioned studies.

MATERIALS, METHOD

In order to find the characteristic features of the inversion (the frequency of occurrence, distribution in time, lapse-rates, etc.) a meteorological screen fitted with thermohigrographs was installed on the summit of a rocky wall of Point Thomas. The Point Thomas summit is 173 m. high above sea level, i.e. 170 m. above and 850 m. WNW of the meteorological station at the Arctowski Station (3 m a.s.l.), (see Fig. 1). The thermohigrographs were controlled once a day (except for a few cases when the weather conditions were so bad that it was impossible to leave the station). Over the period from 14 December 1994 to 11 December 1995 a permanent record of air temperature and of relative humidity was held, apart from a few situations when the instruments were out of order (they froze) or the charts were not replaced in the right moment. The precision of the temperature readings is about 0.1°C (+-0.2°C) and the accuracy of the time when a given temperature occurred is 10 (+-5) minutes.

First the temperature values were read from the thermograph's charts every hour and then they were compared to the adequate air temperature readings from the Arctowski Station. In this way the calculation of vertical gradients of air temperature was possible as well as establishing the time when the inversion began and ended, so how long it lasted (accuracy about hour). Each of these cases was thoroughly analysed with regard to external conditions which accompanied the formation, development and disappearance of the inversion. Special attention was devoted to cloudiness, sunshine duration and wind speed and direction.

RESULTS

In the course of analysis of the thermographic charts readings a few dozens of inversions were found. The analysed inversion did not occur regularly during the year, i.e. they occur much more frequently during the summer season (from November to February) and winter (July – September) than in other seasons.

The detailed analysis of each separate case showed that there were two different types of inversion depending on the season. They are:

- winter radiation inversions characterised by generally long duration occurring both during day and night with high negative lapse-rates (average -1.2° to -4.3°C/100 m., maximum to -8.2°/100 m.);
- summer inversion characterised by short duration (a few hours), occurrence at daylight and small values of lapse-rates when compared to winter ones (maximum -2.4°/100 m.).

Winter inversion of air temperature is connected with low speeds of wind or calms, little cloudiness and what is very important, with close pack ice in the Admiralty Bay. The ice cover considerably decreases the heat flux from the waters of the Admiralty Bay to the atmosphere and at the same time causes that the direct influence of the sea heat resources on the air temperature is impossible, as well as the formation of strong convection destroying extremely static stability. So, there is nothing unusual in the occurrence of strong winter inversions. The only interesting question to be asked here is why the lapse-rate reaches such big values in that specific area (up to –8.2°C/100 m.). Selected examples of the course of air temperature at the Arctowski Station and at Point Thomas in winter are shown in Figures 2 and 3.

Much more complicated is the problem of the occurrence of summer inversions. Normal distribution of air temperature (positive vertical gradient of air temperature) present at night experiences disturbances during morning hours due to the increase in air temperature that is faster at Point Thomas than at the Arctowski Station which is situated lower. As a result, every second day, maximum daily air temperature at Point Thomas is higher than the temperature at Arctowski Station. Such cases with air temperature at Point Thomas being higher than at the Arctowski Station most often occur between 9.00 a.m. and 6.00 p.m. local time. Figures 4 and 5 show examples of courses of air temperature at Arctowski Station and Point Thomas.

INTERPRETATION

The occurrence of summer inversions at daylight and not during the night excludes their radiation genesis on the one hand (in its traditional meaning) and seems to indicate at their relation with the insolation on the other hand.

In order to explain the latter problem the possible radiation reaching the area (in the region of the Arctowski Station) under cloudless sky (transparent coefficient q = 0.85) was calculated for a few selected days in December and January. The calculations were carried out with the help of POLEPODS programme which enables to calculate the radiation reaching the surface of any inclination and exposure (Styszyńska 1995). Similar calculations were done for the longest day (22nd December), i.e. at the time when the sun has the highest altitude in a year, the results did not differ much. Figure 6 shows spatial distribution of possible daily sums of global solar radiation in the surrounding of the Arctowski Station.

On the 3rd and 8th January 1995 the biggest differences in daily mean temperature between the Arctowski Station and Point Thomas were noted at Point Thomas being 0.4 deg higher. The maximum hourly values of the temperature differences reached 2.6 and 3.2 deg during these days and they were noted at 1 p.m. and 2 p.m. respectively. Both days were characterised by considerable sunshine duration (3rd January – 9.8 hours, 8th January – 11.5 hours).

The differences in daily sums (22nd December) of possible global radiation between the horizontal surface (32.43 MJ/m2) of the coastal oasis, where the meteorological station at the Arctowski Station is situated, and the rocky walls of Point Thomas get only up to 4.4% of the solar radiation more than the surface of the marine terrace.

On the level of hourly sums the differences are notable and significant. From morning hours till early afternoon hours (from 7 a.m. to 3 p.m.) particular parts of rocky walls and summit parts receive from 60% to a dozen percents of solar energy more than the marine terrace. These differences disappear in the afternoon when the sums of hourly radiation reaching the marine terrace are bigger. Table 1 contains a list of hourly sums of the possible radiation at the Arctowski Station in the selected basic fields.

The presented distribution of differences in hourly values of radiation reaching the selected fields makes the following interpretation of the origin of summer inversions possible.

The rocky walls of Point Thomas, because of their inclination and favourable, sunny exposure, experience already from morning hours more radiation than the adjacent marine terrace. These walls built of dark volcanic rock have low albedo thanks to which they absorb large amount of radiation. On their upper, steep slopes water flows down quickly, then infiltrates coating of chisley debris and talus cones present at foot of slopes and as a consequence the entire slope is dry. The lack of water on the slope reduced, to a great extent, the evaporation heat loss. The concurrence of these factors causes that the rocky walls of Point Thomas are able to accumulate large amount of heat.

With the increase in the ground temperature, larger amounts of heat are delivered to the near ground air layer. They go up the slope and reach the upper part of it and its summit, where the measuring station was located. This process results in fast increase in air temperature at the top of Point Thomas in the morning hours. The highest temperatures are observed there around midday and in early morning hours when the solar energy reaching the walls and slopes of Point Thomas gradually decreases but the temperature of rocky surfaces is the largest. It depends on changes in cloudiness and the wind speed during the day. Because of the fact that a heat flux originating from the air going up the slope and the radiation heat flux are cumulated, the air temperatures are higher here than at the Arctowski Station. Nevertheless, in order to fulfil the conditions of the heat cumulation, specific conditions must occur. The most important condition is the reduction in the turbulence in the near ground layer. That is why the occurrence of positive differences in air temperature between Point Thomas and the Arctowski Station is not observed every day and generally speaking, does not occur with the wind speed more than 6 m/s.

A similar phenomenon of heat fluxes cumulation in the region of Point Thomas summit may be observed also at lower direct radiation sums but accompanied by large amounts of diffuse radiation and by relatively low wind speed. We may assume that the process will have a similar mechanism but low albedo will be greater of influence than the exposure of rocky slopes and their debris cones. Situation of this kind was noted on 2nd January 1995. On this day the daily mean air temperature at Point Thomas was 0.3 deg higher than that at the Arctowski Station and at 2 p.m. local time a maximum difference in temperature in the summer season was noted. At Point Thomas the temperature was 4°C higher. On this day the sunshine duration lasted only 0.2 h, the daily mean cloudiness was 6.8/8 and was mainly made up of low and middle level clouds. The wind speed did not exceed 2.8 m/s.

A problem arises here whether the described phenomena should be treated as a typical temperature inversion or not. According to some authors (among others Kostin, 1956 and Barry, 1984) in the areas of varied relief, the increase in temperature accompanied by the increase in height is observed only in relatively thin air layer above the slope. This process has dynamic nature. These phenomena do not relate to larger air masses filling that valley. So, according to the cited authors, that phenomenon should be treated as small scale near slope process having other than inversion character.

Another important problem seems to be, whether the described phenomenon may also occur in winter season. During winter inversions the values of the air temperature of lapse-rates between the Arctowski Station and Point Thomas are sometimes extremely high even at daylight.

The highest, very steep parts of rocky walls of Point Thomas, even in winter season, remain without snow because the snow slides down resulting in low albedo. In such conditions the absorption of even relatively small portions of direct radiation or larger amounts of diffuse radiation is significant and at the same time the temperature on the surface is higher than at the Arctowski Station. The heated air (despite being very cold) rises and causes that the temperature at Point Thomas increases. This phenomenon makes the difference bigger and consequently the values of lapse-rates too. The above mentioned situations were noted, among others, on 11^{th} – 13^{th} August and on 18^{th} September. In the morning hours, during sunny weather the reinforcement of the already existing and formation of new inversions took place. The summit parts of Point Thomas (see fields C-4, C-3 as Fig. 6) may receive 3.3 times more solar energy than the marine terrace at the Arctowski Station (daily sum for 13 August). In hourly values of solar energy in August such a differences between Point Thomas and the Arctowski Station is largest at 08-09LT (up to 8.7 times more at Pt. Thomas). The biggest differences in hourly values of possible solar radiation occur at 22^{nd} June (see Table 2).

CONCLUSIONS

As in the coastal oases in the region of the Admiralty Bay there are a lot of similar rocky walls we may assume that a process similar to the described one is common. Due to the fact that the slopes are oriented in various ways, the temperatures maximum may appear in each of these areas in different times of day. High frequency of occurrence of the described increase in air temperature at Point Thomas in the summer season indicates that other, similar slopes may also experience this kind of phenomenon.

A conclusion arises here that the regions of the upper crest of slopes in the summer season are characterised by thermal privilege when compared to the areas located lower. Such thermal privilege of the upper parts of rocky walls crests and steep slopes may have the influence on the choice of places for nests by some birds species. This can be observed in the region of Arctowski Station Oasis, especially in higher located places where a lot of birds protect their nests against intruders (e.g. Panorama Ridge, Jardine Peak region). However, the final thesis should be verified by ornithologists.

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Tab. 1 Hourly sums of possible radiation under cloudless sky [kJ/m^2] at the Arctowski Station and the selected basic fields on 22nd December (values in bold type) and ratio of basic fields to the Arctowski Station.
Solar constant = 1365 W/m^2, Transparency coefficient - q = 0,85

Hours (LT)																	
03-04	04-05	05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21
Arctowski Station (J - 7)																	
113	**439**	**905**	**1426**	**1944**	**2413**	**2797**	**3065**	**2985**	**3195**	**3051**	**2775**	**2385**	**1913**	**1395**	**878**	**420**	**105**
E - 5																	
381	**1153**	**2004**	**2768**	**3362**	**3714**	**3790**	**3623**	**3082**	**2829**	**2158**	**1395**	**644**	**64**	**0**	**0**	**0**	**0**
3,37	2,63	2,21	1,94	1,73	1,54	1,36	1,18	1,03	0,89	0,71	0,50	0,27	0,03	-	-	-	-
E - 4																	
206	**824**	**1628**	**2423**	**3113**	**3630**	**3910**	**3904**	**3424**	**3277**	**2698**	**1958**	**1155**	**390**	**0**	**0**	**0**	**0**
1,82	1,88	1,80	1,70	1,60	1,50	1,40	1,27	1,15	1,03	0,88	0,71	0,48	0,20	-	-	-	-
E - 3																	
124	**550**	**1161**	**1818**	**2437**	**2957**	**3337**	**3547**	**3337**	**3431**	**3116**	**2656**	**2092**	**1475**	**864**	**0**	**0**	**0**
1,10	1,25	1,28	1,27	1,25	1,23	1,19	1,16	1,12	1,07	1,02	0,96	0,88	0,77	0,62	-	-	-
D - 5																	
281	**847**	**1493**	**2104**	**2624**	**3016**	**3258**	**3336**	**3040**	**3033**	**2670**	**2205**	**1678**	**1140**	**629**	**214**	**0**	**0**
2,49	1,93	1,05	1,48	1,35	1,25	1,16	1,09	1,02	0,95	0,88	0,79	0,70	0,60	0,45	0,24	-	-
D - 4																	
163	**747**	**1545**	**2349**	**3060**	**3611**	**3934**	**3959**	**3480**	**3339**	**2772**	**2030**	**1205**	**414**	**2**	**0**	**0**	**0**
1,44	1,70	1,71	1,65	1,57	1,50	1,41	1,29	1,17	1,05	0,91	0,73	0,51	0,22	0,00	-	-	-
D - 3																	
24	**424**	**1162**	**1978**	**2738**	**3374**	**3841**	**4053**	**3692**	**3630**	**3136**	**2471**	**1661**	**821**	**117**	**0**	**0**	**0**
0,21	0,97	1,28	1,39	1,41	1,40	1,37	1,33	1,24	1,14	1,03	0,89	0,70	0,43	0,08	-	-	-
C - 4																	
0	**53**	**591**	**1378**	**2192**	**2917**	**3504**	**3916**	**3810**	**3966**	**3606**	**3070**	**2374**	**1570**	**748**	**98**	**0**	**0**
-	0,12	0,65	0,97	1,13	1,21	1,25	1,28	1,28	1,24	1,18	1,11	1,00	0,82	0,54	0,11	-	-
C - 3																	
0	**0**	**142**	**856**	**1708**	**2508**	**3177**	**3695**	**3764**	**4091**	**3823**	**3343**	**2714**	**1950**	**1105**	**321**	**0**	**0**
-	-	0,16	0,60	0,88	1,04	1,14	1,21	1,26	1,28	1,25	1,20	1,14	1,02	0,79	0,37	-	-
B - 4																	
0	**0**	**0**	**0**	**172**	**945**	**1826**	**2619**	**2974**	**3622**	**3959**	**3990**	**3653**	**3079**	**2359**	**1554**	**746**	**151**
-	-	-	-	0,09	0,39	0,65	0,85	1,00	1,13	1,30	1,44	1,53	1,61	1,69	1,77	1,78	1,44
B - 3																	
0	**0**	**9**	**450**	**1225**	**2032**	**2774**	**3369**	**3530**	**4009**	**3989**	**3698**	**3193**	**2532**	**1759**	**963**	**287**	**2**
-	-	-	0,32	0,63	0,84	0,99	1,10	1,18	1,25	1,31	1,33	1,34	1,32	1,26	1,10	0,68	0,02

Tab. 2 Hourly sums of possible radiation under cloudless sky [kJ/m^2] at the Arctowski Station and the selected basic fields (see fig. 6) on 22nd June (values in bold type) and ratio of basic fields to the Arctowski Station.

Solar constant = 1365 W/m^2, Transparency coefficient - q = 0,85

Hours (LT)						Daily sum
09-10	10-11	11-12	12-13	13-14	14-15	
Horizontal surface						
0,95	50,58	116,17	116,17	50,58	0,95	335,41
Arctowski Station (J - 7)						
0	**36,16**	**111,74**	**119,72**	**11,88**	**0**	**279,50**
D – 4						
0	**99,22**	**714,49**	**615,60**	**29,91**	**0**	**1459,22**
-	2,75	6,39	5,14	2,52	-	5,22
D – 3						
0	**452,84**	**852,02**	**662,20**	**0**	**0**	**1969,06**
-	12,58	7,63	5,53	0	-	7,04
C – 4						
0	**508,87**	**885,72**	**912,22**	**420,62**	**0**	**2727,43**
-	14,07	7,93	7,62	35,41	-	9,76
C – 3						
0	**491,76**	**964,47**	**794,58**	**0**	**0**	**2250,81**
-	13,60	8,63	6,64	-	-	8,05
B – 4						
0	**288,34**	**638,90**	**857,61**	**0**	**0**	**1784,84**
-	7,97	5,72	7,16	-	-	6,39
B – 3						
0	**339,44**	**723,30**	**696,20**	**0**	**0**	**1758,94**
-	9,39	6,47	5,82	-	-	6,23

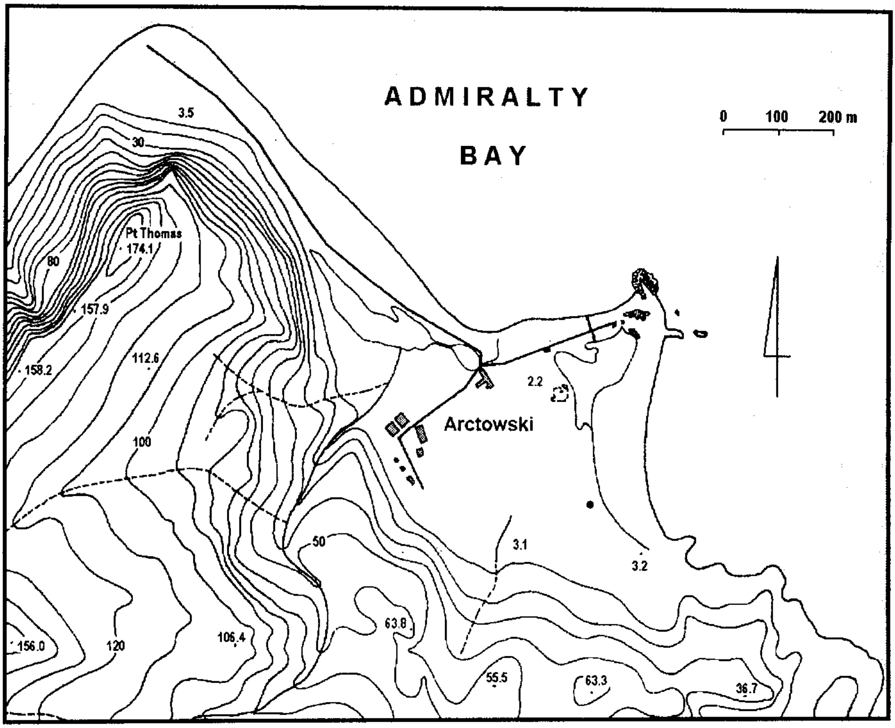

Fig. 1 A schematic map of the surrounding of the Arctowski Station.

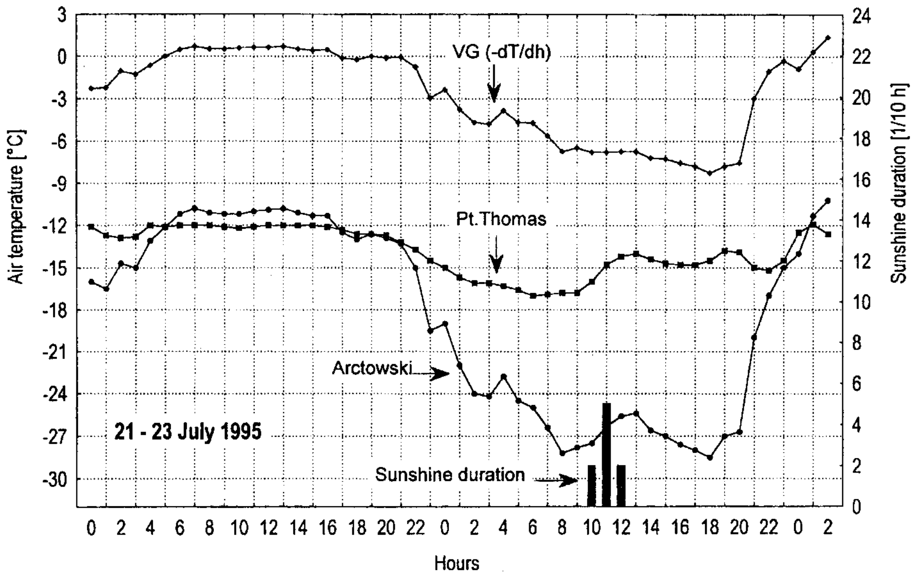

Fig. 2 Course of air temperature at the Arctowski Station and Point Thomas, lapse-rate and sunshine duration values on 21-23 July 1995.

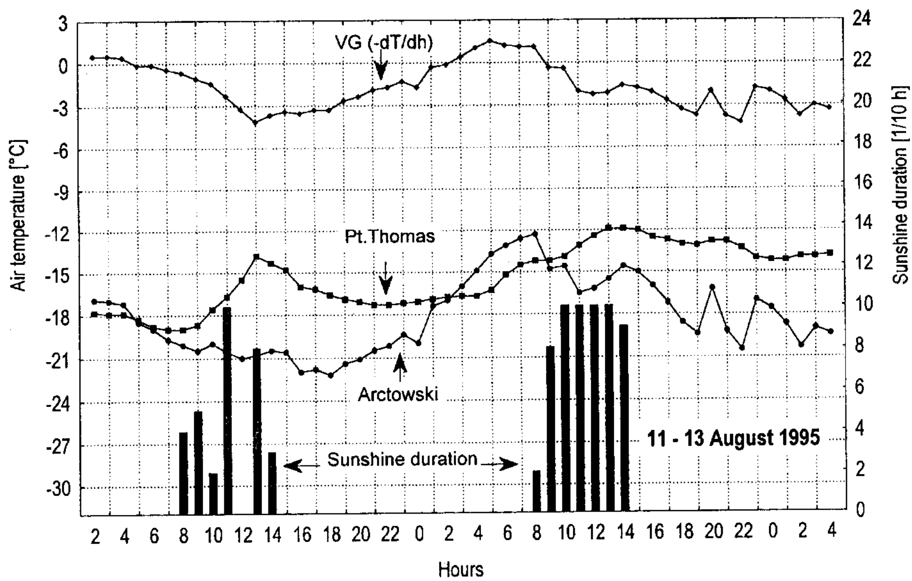

Fig. 3 Course of air temperature at the Arctowski Station and Point Thomas, lapse-rate and sunshine duration values on 11-33 August 1995.

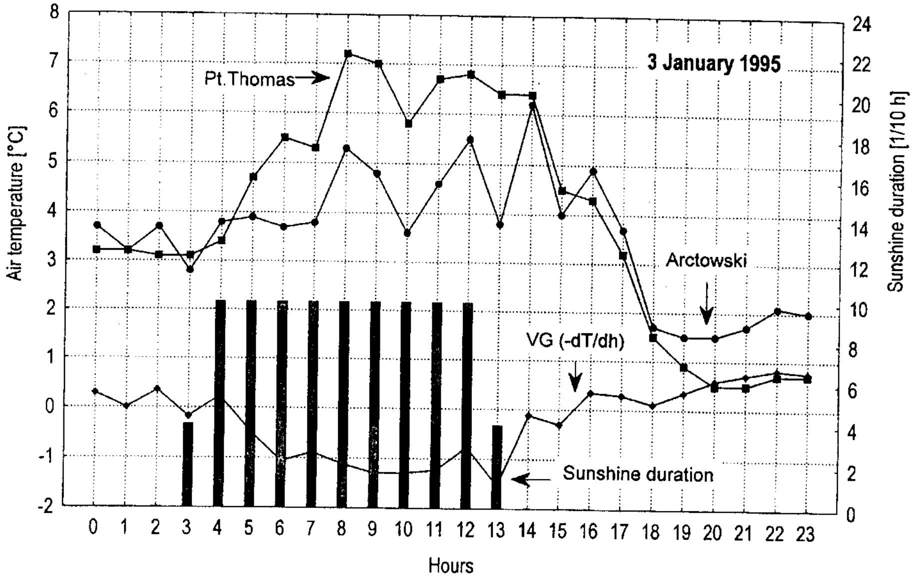

Fig. 4 Course of air temperature at the Arctowski Station and Point Thomas, lapse-rate and sunshine duration values on 3 January 1995.

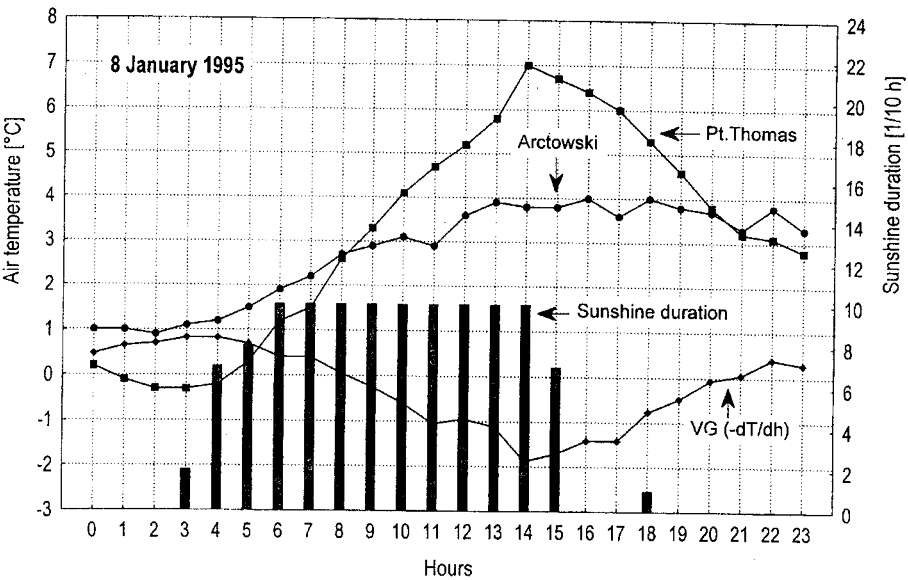

Fig. 5 Course of air temperature at the Arctowski Station and Point Thomas, lapse-rate and sunshine duration values on 8 January 1995.

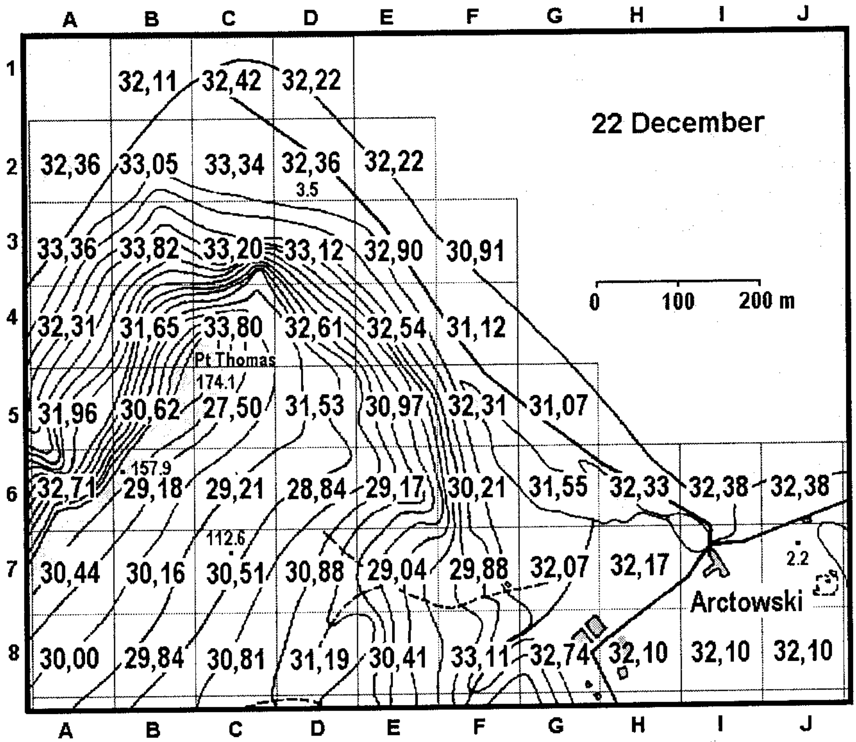

Fig. 6 Daily sums of possible radiation under cloudless sky [MJ/m^2] at basic field in the surroundings at the Arctowski Station on 22nd December. Solar constant = 1365 W/m^2, transparency coefficient = 0,85.

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SPATIAL AND TEMPORAL DIFFERENTIATION OF GROUND SURFACE TEMPERATURE IN THE REGION OF ADMIRALTY BAY IN 1998 (KING GEORGE ISLAND, SOUTH SHETLANDS)

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ABSTRACT

Measurements of ground temperature were taken out at three places in the region of Arctowski Station: in the meteorological station from January to December, on the recent storm ridge from January to August and at six points in the valley near the Jardine Peak from January to March. Measurements were made at 1 and 5 cm depth in various meteorological conditions, exposure, kind of cover and soil structure. The temperature at the ground surface reached 17,8°C in the summer and in the winter decreased to -8,9°C. The mean annual ground temperature was 0,5°C at the 1 cm depth and which was 1,2°C higher than the air temperature (-0,7°C), the warmest was at the 5 cm depth (0,9°C).Daily fluctuations of ground temperature was 13,6°C at the 1 cm depth and 9,1°C at the 5 cm depth according to changing meteorological conditions. The temperature fluctuated less in the vicinity of Admiralty Bay (the storm ridge and meteorological station) 9,2°C than in the valley near Jardine Peak (12,4°C). Interestingly, the maximum and minimum temperatures were lower and higher respectively in the vicinity of Admiralty Bay. Sites without plants and with northern exposure i.e. sun were warmest (mean temperature 5,1°C); the lowest mean temperature (3,7°C) occurred on the floor of the valley, on the sites covered with plants and close to flowing water.

KEY WORDS: Arctowski Station - ground temperature - meteorological factors

INTRODUCTION

Ground absorb the best part of solar radiation, therefore it is the main source of heat for the atmosphere (Chromow, 1969). Degree of ground warmth is an importent parameter that the conditions of plants and animals existence in soil and on the surface (Olech, 1998). Temperature of ground in the climatic conditions of Maritime Antarctic has a particular pattern resulting from extensive variability of atmospheric conditions (Marsz, Rakusa-Suszczewski, 1987). Distribution of ground warmth also depends on contents humidity, andof air, humidity, mineralogical composition, porosity and soil structure. Thermal conditions of grount are also determined by its exposure and kind of cover (Washborn, 1979).

MATERIALS AND METHODS

The measurements of ground temperature were taken out at three sites in the region of Arctowski Station: in the meteorological station from January to December, on the recent storm ridge from January to August and at six sites in the valley near the Jardine Peak from January to March during XXII Polish Antarctic Expedition in 1998. Dependence of thermal conditions on the type of ground cover and exposure was studied in the small valley, below

Jardine Peak, 200 metres above sea level. Thermometers were placed along NW-SE profile, on different types of slopes: sunny and shaded, wet and dry, with or without vegetation cover. Measurements were made from 1 cm until 130 cm depth, but only ground surface temperature (1 cm and 5 cm) is describing in this study.

RESULTS

The mean annual ground temperature was 0,5°C at the 1 cm depth which was 1,2°C higher than the air temperature (-0,7°C) on the standard height. The warmest was at the 5 cm depth (0,9°C). In January (Fig. 1) mean temperature was 5,5°C at the 1 cm depth and 6,3°C at the 5 cm. The temperature often exceeded 10,0°C (17th January 17,8°C at 1 cm depth) in the warm, sunny days. Daily fluctuations of ground temperature was 13,6°C at the 1 cm depth and 9,1°C at the 5 cm depth. The lowest temperature occured in May (-8,9°C at 1 cm depth, -7,3°C at 5 cm depth) when there was no snow cover but already an influence of cool air masses from the South was marked. In August and September temperature of ground increased to -0,7°C and -0,6°C respectively at 1 cm depth and to -0,6°C and 0,5°C at 5 cm. That was a result of a thick snow cover which limited the heat exchange between the atmospher and the ground. Almost constant, close to zero grount temperature (-0,1°C) was result thaw and flooding of moss bank in October.

Ground surface temperature in the valley close to Jardine Peak (Fig. 2) had a high spatial differentiation. The highest temperatures (13,4°C) were observed at the 1 cm depth on sites without plant cover, dry, with northern (sunny) exposure (V and VI). The lowest temperature as at sites located on the shaded slope (with southern exposure) -1,5°C (I and II). The most thermically stable sites (III and IV) were situated close to flowing water on the floor of the valley, which was wet when covered with plants and very wet without a plant cover. The highest mean average 5,1°C occured on the dry slope (VI) and the lowest 3,7°C at the site III.

The highest temperature difference among the sites at 1 cm depth was 7,0°C at the same date.

CONCLUSIONS

Great influence of meteorological factors on the ground temperature was observed. The highest surface ground temperature (17,8°C) was reached during the summer with high sunshine duration. The cloudiness and the strong winds decreased ground temperature.

The lowest ground temperature was –8,5°C when there were noted two coexisting factors: no snow cover and an influence of cool air masses from the South. The thick snow cover limited the heat radiation from ground. Almost constant ground temperature was result the thaw.

The ground temperatures on the storm ridge and neighbouring moss banks in the vicinity of Admiralty Bay had the lowest maximum temperatures and higher minimum than in the valley near Jardine Peak (amplitude was 9,2°C and 12,4°C respectively) during the summer

Mean ground surface temperatures were higher in the valley, than close to the sea level. The nearness of Admiralty Bay has the influence on the soft course of ground temperature.

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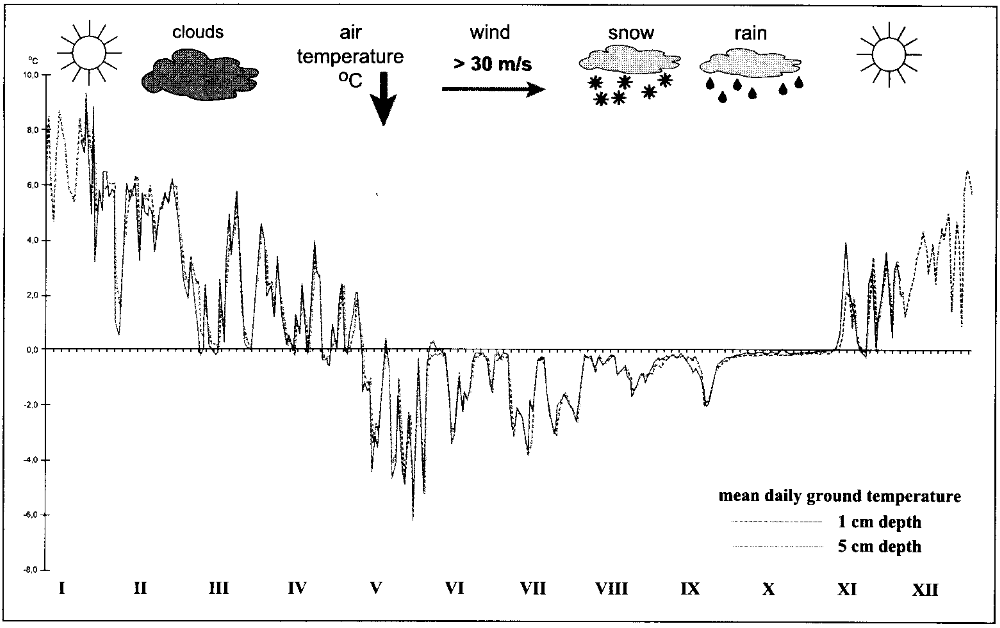

Fig. 1. Influence of meteorological factors on the saesonal change of ground surface temperature

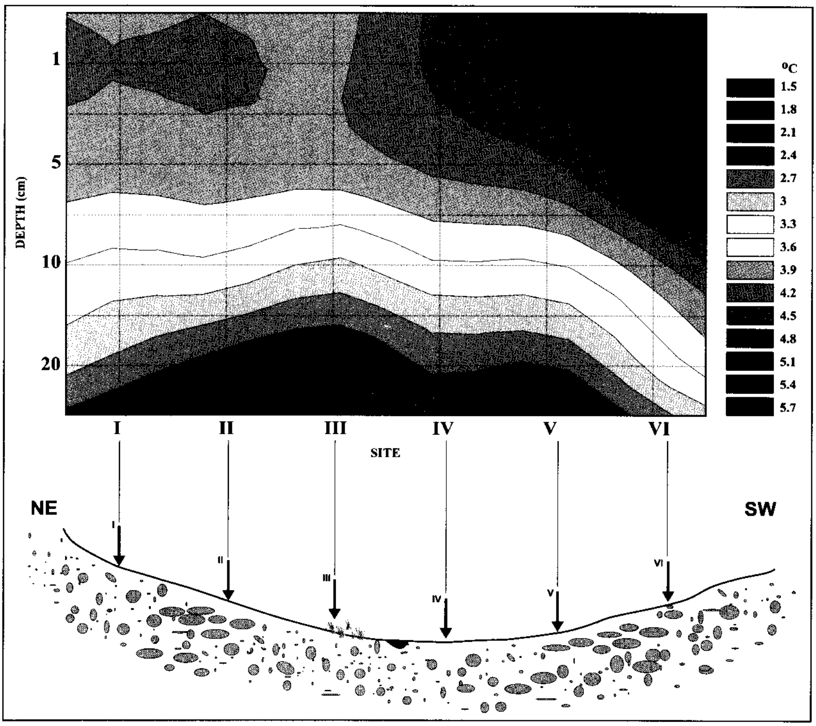

Fig. 2. Ground's temperature distribution in the valley near Jardine Peak