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In the early days of upper air research it was customary to speak of what is now called the stratosphere as the isothermal region, and even now there is some tendency to think of it as a part of the atmosphere in which temperature does not change with height. If mean values of temperature be plotted against height there seems to be justification for this idea, for a curve is obtained similar to that shown in Fig. 1, in which the vertical extension continues to the limit of the observations available. Anyone, however, who has studied the data of individual soundings, is aware of the fact that they usually differ considerably in type from the mean curve, and the analysis following was undertaken in order to discover whether the departures which are found are connected with any of the other variables of the atmosphere.

The results are given for what they are worth, but are mainly of a negative nature; with one exception it has been found impossible to formulate any very definite law. The data examined were about 350 soundings made with registering balloons in the British Isles between January 1909 and December 1925; most of them were made in England, north or south, and a few in Scotland and Ireland. Some were not utilised, as they did not penetrate into the stratosphere for more than 2 km. The meteorograph employed was in all cases the Dines barothermograph.

The instrument when in use is protected from the direct rays of the sun by a polished case, ventilation is provided solely by the vertical velocity of the apparatus through the air. On the ascent this was, at first, generally about 200 metres per minute, but of late years has been more; it is not sufficient to prevent solar radiation from causing the temperature to read a few degrees centigrade too high in the upper parts of high soundings made in the daytime, or even more at the extreme top. For this reason records made at night or in the early morning or late evening are the more reliable. After the balloon has burst the velocity of falling is much higher, the ventilation is ample, and the temperature error attributable to direct solar radiation is consequently much smaller.

For the purposes of this investigation daylight soundings have been reckoned as those starting between sunrise and one hour before sunset, which means, roughly, that the stratosphere is reached between about half an hour after sunrise, and half an hour before sunset. The procedure adopted has been to use T_c, the absolute temperature at the base of the stratosphere, and H_c, the height of that point *above M.S.L.* in kilometres, as the standards in each sounding, and to denote temperatures and heights as differences from them. Thus θ_r represents in degrees absolute the excess of the temperature at a height of (H_c+r) km. over T_c, where r may have positive or negative integral values. Upper air temperatures published by the Meteorological Office, and derived from balloon soundings, in general denote the mean of the ascending and descending records, but it sometimes happens that separate values for the two are given; in such cases the rule in the present investigation has been to use the mean.

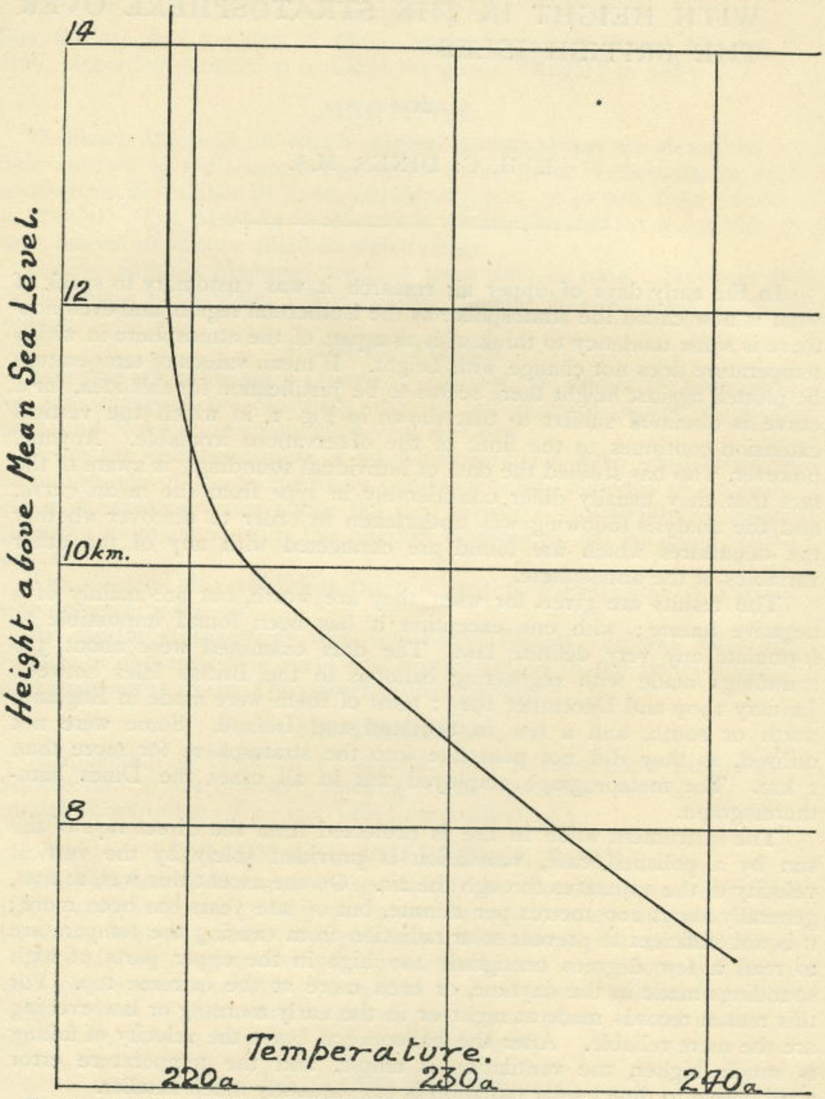

FIG. 1.—Mean annual temperature from 6 km. to 14 km. over S.E. England. (Dines.)

Starting with the conditions just above and just below the base of the stratosphere, 216 soundings were picked out which reached at least

$(H_c + 4)$, and from them Table I. was formed. Table II. was formed in similar manner from 257 soundings reaching at least $(H_c + 3)$, and extending over a rather shorter period of time. What are described in the tables as "Low" and "High" pressure indicate that the pressure at mean sea-level at the time of the sounding was less or more than 1013·5 millibars, respectively.

The substance of Tables I. and II. is shown graphed in Fig. 2, and it will be seen that the typical form of temperature distribution for this region is a very definite inversion of 3° C. just above H_c and extending to a height of 2 kilometres; it corresponds to Type 1 in the classification adopted by the Meteorological Office.[1] The magnitude of the inversion appears in this case to be nearly independent of the pressure at mean sea-level, but to be a little more pronounced by day than by night; as will be noticed later, it is doubtful if the latter is a real phenomenon. Attention may be called to the difference in shape between the curves shown in Figs. 1 and 2 in view of the fact that Fig. 1 is the mean of a number of curves which are mainly of the type shown in Fig. 2. The reason is that

TABLE I.—MEAN DIFFERENCES IN TEMPERATURE FROM THAT AT THE BASE OF THE STRATOSPHERE, AT HEIGHTS ABOVE IT OF 1, 2 AND 3 KILOMETRES.

Based on 216 soundings reaching H_c+4 or more.
Period Jan. 1909–Dec. 1925.

Mean T_c.	Number of ascents.	θ_{+1}.	θ_{+2}.	θ_{+3}.	
219·6	130	+2·2	+3·6	+3·9	Day.
218·3	86	1·9	2·7	2·7	Night.
217·4	110	2·1	3·3	3·6	High.
220·7	106	2·1	3·2	3·3	Low.

TABLE II.—MEAN DIFFERENCES IN TEMPERATURE FROM THAT AT THE BASE OF THE STRATOSPHERE, AT HEIGHTS BELOW IT OF 1, 2 AND 3 KILOMETRES.

Based on 257 soundings reaching H_c+3 or more.
Period Jan. 1909–Nov. 1924.

Number of ascents.	θ_{-1}.	θ_{-2}.	θ_{-3}.	
135	+5·1	+12·2	+19·6	Day.
122	5·1	12·1	19·7	Night.
139	4·8	11·7	19·2	High.
118	5·5	12·7	20·3	Low.

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[1] See *Geophysical Memoirs of the Meteorological Office*, No. 13, p. 59.

H_c may occur at any height between about 7 and 14 km., and that, therefore, the inversion entirely disappears in the mean of a large number of soundings.

In extreme cases the inversion may be as great as 10° C., while in about 13 per cent of the total number there is no inversion found at all; the latter seem to occur rather more frequently in winter than in summer, and are denoted by Types 2 and 3 in the Meteorological Office classification. By picking out all cases in which both θ_{+1} and θ_{+2} were either zero or negative (which roughly denote Types 2 and 3), it was found that

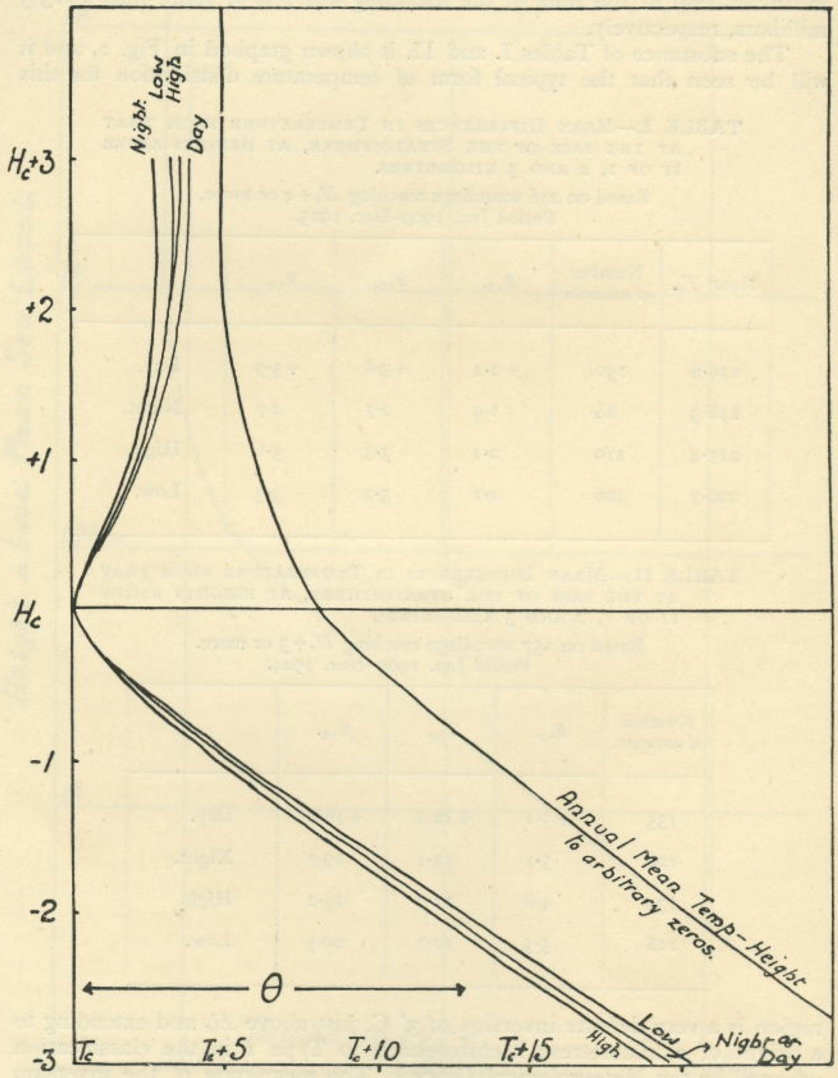

FIG. 2.—Mean temperature variations with regard to height near the base of the stratosphere. (Dines.)

the mean pressure at sea-level on these occasions was 1012 mb., and the mean value of T_c was 221a. These are so close to the annual mean

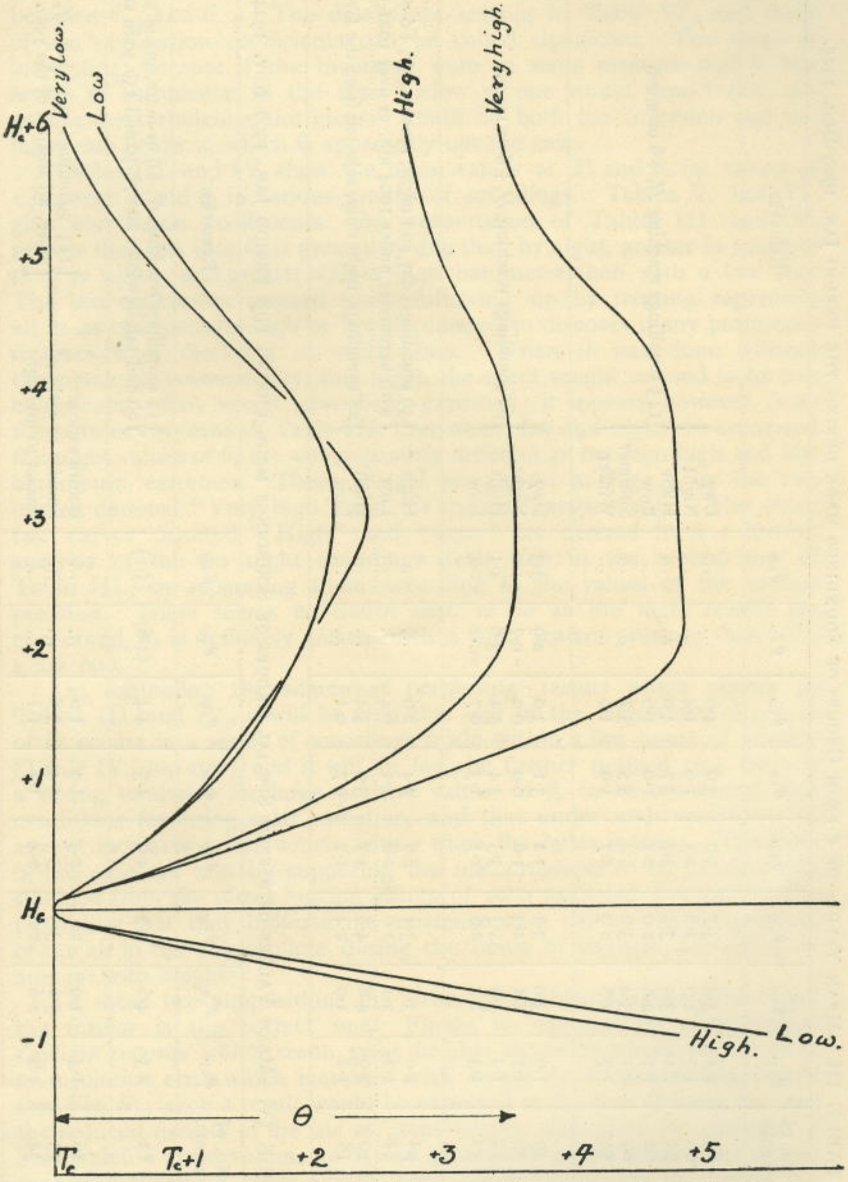

FIG. 3.—Mean values of θ at night in groups of soundings under conditions of high and low pressure respectively.

values that it cannot be said that the presence or absence of an inversion at the base of the stratosphere has any certain connection with either P_s or T_c.

TABLE III.—MEAN VALUES OF θ FROM GROUPS OF SOUNDINGS MADE DURING THE PERIOD JAN. 1909–DEC. 1925.

Mean T_c.	No. of ascents.	θ_{+1}.	θ_{+2}.	θ_{+3}.	θ_{+4}.	θ_{+5}.	θ_{+6}.	θ_{+7}.	θ_{+8}.	Remarks.	
220·5	83	2·1	3·5	3·7	3·6	3·6	4·0	...	...	Day	143 soundings reaching H_c+6 or more.
219·1	60	1·7	2·6	2·8	2·5	1·9	1·4	...	...	Night	
217·8	75	2·1	3·5	3·7	3·7	3·7	4·0	...	...	High	
222·0	68	1·7	2·8	2·9	2·5	1·9	1·6	...	...	Low	
221·0	89	2·1	3·4	3·6	3·4	3·5	3·7	...	...	Summer	
218·1	54	1·7	2·8	2·9	2·7	1·9	1·6	...	...	Winter	
220·9	42	1·6	3·0	3·3	3·2	3·1	3·0	2·9	3·3	Day	62 soundings reaching H_c+8 or more.
221·6	20	1·7	2·5	2·3	1·6	0·9	0·2	−0·7	−1·1	Night	
219·2	32	1·9	3·3	3·3	3·3	3·4	3·4	3·6	4·1	High	
223·1	30	1·3	2·4	2·6	2·1	1·3	0·7	−0·2	−0·4	Low	
217·8	28	2·0	3·3	3·1	2·6	2·4	2·6	...	...	High	59 soundings, day and night, reaching H_c+6 or more, with barometer under 1004 mb. or over 1021 mb.
224·6	31	1·2	2·1	2·6	2·0	1·1	0·4	...	...	Low	
213·7	10	2·9	4·8	4·8	4·7	3·9	3·4	...	...	High	28 soundings, night only, selected from the foregoing.
223·6	18	1·2	1·9	2·4	1·7	0·7	0·1	...	...	Low	

TABLE IV.—MEAN VALUES OF θ FROM SPECIAL GROUPS OF SOUNDINGS MADE DURING THE PERIOD JAN. 1909–NOV. 1924.

Mean T_c.	No. of ascents.	θ_{+1}.	θ_{+2}.	θ_{+3}.	θ_{+4}.	θ_{+5}.	θ_{+6}.	θ_{+7}.	θ_{+8}.	Remarks.	
	12	2·3	4·6	4·7	4·0	4·3	4·4	(4·6)	(5·1)		12 soundings reaching H_c+6 or more, made between 9h and 14h in winter and 7h.30 and 15h.30 in summer.
219·3	16	1·3	1·9	2·4	2·3	1·9	1·6	...	...	Before sunrise	113 soundings reaching H_c+5 or more, all seasons of the year.
221·0	63	2·0	3·4	3·5	3·3	3·4	3·8	...	...	Sunrise to early afternoon	
219·2	34	1·8	2·6	2·6	2·4	1·7	1·1	...	...	Sunset to midnight	

It was thought possible that there might be some connection between the magnitude of the inversion and the lapse rate just below it, and to this end the correlation was determined between θ_{+2} and θ_{-1}, and between θ_{+2} and θ_{-2}. The details are set out in Table VI., and none of the correlation coefficients can be called significant. The result is interesting, because if the inversion were in some measure due to the action of turbulence in the layer below it, one would expect that the greater the turbulence, the greater would be both the inversion and the lapse rate below it, which is apparently not the case.

Tables III. and IV. show the mean values of T_c and θ_r for values of r between 1 and 8, in various groups of soundings. Tables V. and VI. give correlation coefficients. An examination of Tables III. and IV. reveals the facts that θ_r is greater by day than by night, greater in summer than in winter, and greater with a high barometer than with a low one. The last conclusion seemed worth following up by treating separately all cases of especially high or low barometer, to discover if any prominent features were disclosed in such cases. When it was done without distinction as between day and night, the effect sought seemed to be less conspicuous than would have been expected; it appears, however, from the bottom two rows of Table III. that when day and night are separated the night values of θ_r are conspicuously different as between high and low barometric extremes. These results are shown in Fig. 3 by the two curves denoted "Very high" and "Very low" respectively. The other two curves denoted "High" and "Low" are derived from a further analysis of the 60 night soundings dealt with in the second row of Table III., by separating them according to the values of the surface pressure. There seems no doubt that, as far as the night results are concerned, θ_r is definitely greater with a high surface-pressure than with a low one.

On examining the somewhat perplexing results which appear in Tables III. and IV., it will be seen that one of the largest sets of values of θ_r occurs in a series of soundings made within a few hours of midday (Table IV., top row), and it will, in fact, be further noticed that there is a strong tendency for large positive values of θ_r to be associated with conditions favouring solar radiation, and that under such conditions θ_r always increases continuously with r when the latter is large. The facts of the case are met by supposing the meteorograph to be insufficiently shielded from the direct heating effects of solar radiation, but there is the possibility that they indicate the existence of a rise in the temperature of the air in the stratosphere during the hours of daylight, increasing in amount with height.

Of these two suppositions the writer for several reasons thinks that the former is the correct one. Firstly, an examination of individual daylight records which reach great heights shows unmistakable traces of an insolation error which increases with height on the ascending record (see Fig. 6); such a result would be expected at the best of times because the reduced density of the air at great heights decreases the quantity of heat which a given volume of it can abstract from the instrument in unit time, and therefore, other things being equal, the greater the height the greater the error which insolation is capable of producing. This error must be greatly exaggerated when the vertical velocity of the balloon slows down, as apparently it sometimes does, owing to leakage before the final burst; this point will be referred to again later. Secondly, it should be noted that the observed increase in θ_r is a differential effect, and if it be due to an actual warming up of the air, it seemingly must involve a considerable rise in T_c at the same time. It is difficult to understand how radiation could cause a rise of temperature in the stratosphere without T_c being affected also, because there are no clouds in the stratosphere which could shield the lower parts of it. It will be seen from Tables I. and III. that though T_c is generally greater by day than by night, the difference is quite small and not even definite as to sign. Thirdly, at the bottom of Table IV. will be found data derived from observations roughly classified according to the time of day at which they were made; it appears that there is no appreciable difference between the values of T_c and θ_r before sunrise and after sunset. This is quite incompatible with the idea of a rise in the air temperature in the stratosphere following without much lag the incidence of direct solar radiation during the daytime; the air would inevitably in such case be warmer in the evening than before sunrise. If then it may be accepted that observations made in daylight are more or less affected by this source of error, it is desirable to concentrate attention more particularly on those described as being made at night. Looking at Tables III. and IV. in this light the conclusion is reached that the true average conditions in the stratosphere are represented by a preliminary inversion of 2·7° C. from H_c to (H_c+2), an isothermal layer from (H_c+2) to (H_c+3), and above that a steady fall of about 0·5° per km. up to the limit of the observations.

TABLE V.

CORRELATION COEFFICIENTS BASED ON ABOUT 60 SOUNDINGS MADE BOTH BY NIGHT AND DAY BETWEEN JAN. 1909 AND DEC. 1925, REACHING AT LEAST 8 KM. INTO THE STRATOSPHERE.

Variables compared.	Standard deviations.	Total correlation coefficients.	Partial correlation coefficients.	Variables compared.	Standard deviations.	Total correlation coefficients.	Variables compared.	Standard deviations.	Total correlation coefficients.
θ_{+2} T_c	2·3 5·2	−·48	[−·45]*	[1] θ_{+2} T_c	2·2 5·4	−·34	[2] θ_{+2} T_c	2·4 5·3	−·51
θ_{+4} T_c	3·1 5·2	−·54	[−·50]*	[1] θ_{+4} T_c	2·7 5·4	−·32	[2] θ_{+4} T_c	3·3 5·3	−·65
θ_{+6} T_c	3·7 5·2	−·64	[−·58]*	[1] θ_{+6} T_c	2·9 5·4	−·33	[2] θ_{+6} T_c	3·9 5·3	−·75
θ_{+8} T_c	4·8 5·2	−·61	...	[1] θ_{+8} T_c	3·1 5·4	−·40	[2] θ_{+8} T_c	5·0 5·3	−·70
θ_{+2} P_9	2·3 12·1	+·12	...	θ_{+4} P_9	3·1 12·1	+·20	θ_{+6} P_9	3·7 12·1	+·40
T_c P_9	5·2 12·1	−·13	...	[3] θ_{+2} ϕ	2·3 7·9	+·11	[4] θ_{+2} ϕ	2·3 5·6	+·18
$(\theta_{+6}-\theta_{+4})$ T_c	1·5 5·2	−·39	...	[3] θ_{+4} ϕ	3·1 7·9	+·19	[4] θ_{+4} ϕ	3·1 5·6	+·27
$(\theta_{+4}-\theta_{+2})$ T_c	1·8 5·2	−·34	...	[3] θ_{+6} ϕ	3·7 7·9	+·38	[4] θ_{+6} ϕ	3·7 5·6	+·46
$(\theta_{+6}-\theta_{+2})$ T_c	2·8 5·2	−·42	...	[3] T_c ϕ	5·2 7·9	−·12	[4] T_c ϕ	5·2 5·6	−·33

* Partial coefficients when the effect of ϕ is excluded; the departures of ϕ being taken from seasonal monthly means.

[1] Night soundings only. About 20 in number.

[2] Day ,, ,, 40 ,,

[3] Departures of ϕ taken from the crude mean.

[4] ,, ϕ ,, seasonal monthly means.

Tables V. and VI. set out, by means of correlation coefficients, the results of a series of investigations into the connections between the various quantities concerned. The symbol ϕ denotes the mean temperature in the troposphere between the heights 3·5 and 7·5 km. above mean sea-level. Except where definitely stated to the contrary, the departures of the various quantities have been taken from their crude means without regard to seasonal variations. In the case of the important quantity T_c it was found that the seasonal variations did not exceed 2 or 3 degrees, and were not worth while taking into account. From Table V.

TABLE VI.—CORRELATION COEFFICIENTS BASED ON MISCELLANEOUS GROUPS OF SOUNDINGS.

Variables compared.	Standard deviations.	Total correlation coefficients.	Period.	Remarks.
θ_{+4} T_c	3·3 6·9	−·72	Jan. 1909–Dec. 1925	60 soundings at night reaching at least H_c+6
θ_{+4} T_c	3·5 5·5	−·58	,, ,,	83 ,, by day ,, ,,
θ_{+6} T_c	3·7 6·9	−·73	,, ,,	60 ,, at night ,, ,,
θ_{+4} H_c	3·4 1·5	+·47	Jan. 1909–Dec. 1925	142 soundings by day and night reaching at least H_c+6
θ_{+2} T_c	2·5 6·1	−·61	,, ,,	86 ,, at night reaching at least H_c+4
θ_{+2} T_c	2·6 5·7	−·40	,, ,,	130 ,, by day ,, ,,
θ_{+2} T_c	2·7 6·3	−·39	Jan. 1915–Dec. 1925	71 soundings by day and night reaching at least H_c+4
θ_{-1} T_c	1·3 6·3	−·28	,, ,,	71 ,, ,, ,, ,,
θ_{-1} θ_{+2}	1·3 2·7	+·22	, ,,	71 ,, ,, ,, ,,
θ_{-2} θ_{+2}	2·1 2·7	+·22	,, ,,	71 ,, ,, ,, ,,
θ_{-2} T_c	2·1 6·3	−·16	,, ,,	71 ,, ,, ,, ,,
θ_{-1} θ_{+2}	1·3 2·7	[+·12]	Jan. 1915–Dec. 1925	71 The same as the foregoing, but partial correlation coefficients obtained when the effect of T_c is excluded.
θ_{-2} θ_{+2}	2·1 2·7	[+·18]	,, ,,	71

it may be inferred that there is a clear connection between T_c and θ_{+2}, θ_{+4}, and θ_{+6}, both by day and night. A corresponding relation of the opposite sign is found between H_c and θ_{+4} in a large group of soundings dealt with in the fourth row of Table VI. Such a relation is probably inevitable owing to the negative correlation which is always found to exist between H_c and T_c. The correlation in Table V. between P_9 and θ_{+2} and θ_{+4} is negligible, which fits in with the figures in Tables I. and III., where a connection between θ_{+2} and the surface pressure appears in some cases, but not in all. Tables III. and IV. certainly suggest a connection between θ_{+6} and θ_{+8} and the pressure at mean sea-level, and this is quite consonant with the correlation between T_c and θ_2 found above, for there is always a significant negative correlation between T_c and the pressure at mean sea-level. There seems to be no significant connection between ϕ and θ_{+2} or θ_{+4}.

It is noteworthy that the correlation between T_c and θ_r seems to increase as r increases; the sign is always negative, and on any large sample is significant. Expressed in a general way, the relation between the two quantities is such that when T_c is unusually small the temperature higher up tends to increase, while if T_c is large it tends to decrease. The standard variation of the temperature from its mean value at any particular height above H_c varies little with increasing height; the information is readily deducible from the data of Tables V. and VI., and the average value is about 4·7.

Regression equations between θ_r and T_c have been formed below, but it will be seen that the casual variations of θ_r are too great for it to be possible to form a close estimate of its value from the known value of T_c; other factors evidently enter largely into the question, but what they are has not been determined.

It has been shown that abnormal values of T_c tend on the average to adjust themselves again in the upper parts of the stratosphere, and the question arises whether it may be inferred that there is some level at which the temperature is independent of T_c. By forming regression equations between T_c and θ_r we may determine the most probable values of θ_r when T_c is known, and by plotting them for different values of r obtain curves which by extrapolation will enable, on certain assumptions, a rough guess to be made. Taking the data in Tables V. and VI., the following table is deduced, where $\delta\theta_r$ and δT_c are corresponding departures of θ_r and T_c from their mean values.

TABLE VII.—Most Probable Values of $\frac{\delta\theta_r}{\delta T_c}$ assuming Linear Regression between T_c and θ_r.

r in kilometres	2	4	6	8
Derived from the first two columns of Table V.	·22	·32	·45	·56
Night soundings only, from Table VI. . .	·25	·34	·39	...

The following are the actual regression equations on which the last line in Table VII. is based, the standard deviations being employed as units:

$$\Delta\theta_{+2} = -\cdot 61.\Delta T_c + \cdot 79 Ca.$$
$$\Delta\theta_{+4} = -\cdot 72.\Delta T_c + \cdot 69 Ca.$$
$$\Delta\theta_{+6} = -\cdot 73.\Delta T_c + \cdot 68 Ca.$$

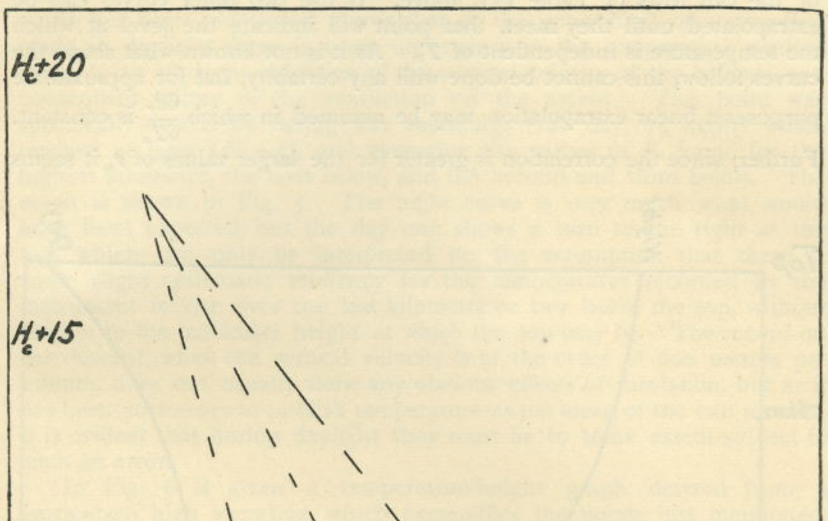

FIG. 4.—Temperature in the stratosphere. The middle curve gives mean values derived from night observations; the outer pair the most probable values when T_c differs from its mean value by ± 5° C.

In Fig. 4 the middle curve shows the mean values of the air temperature as determined from night soundings taken from Table III. On either side are the most probable values of the temperature when T_c is 5 degrees above and below its mean value respectively, based on means of the two rows of Table VII. above. If the two outer curves can be extrapolated until they meet, that point will indicate the level at which the temperature is independent of T_c. As it is not known what shape the curves follow, this cannot be done with any certainty, but for approximate purposes a linear extrapolation may be assumed in which $\frac{\delta\theta_r}{\delta T_c}$ is constant. Further, since the correlation is greater for the larger values of r, it seems reasonable to attach more weight to the upper parts of the curves than the lower; accordingly the dotted lines are drawn on the basis of $\frac{\delta\theta_r}{\delta T_c}$ being constant above (H_c+7), with a fall in the mean temperature of 0·5 per km. Taking everything into consideration, it may be suggested that at a height of about (H_c+17) km. the temperature variations are nearly independent of T_c, and the mean temperature is about 215a. It should be pointed out that it is not implied that the temperature is even approximately constant in this part of the stratosphere, all the evidence is against it; the only thing here considered is how far the variations follow those of T_c.

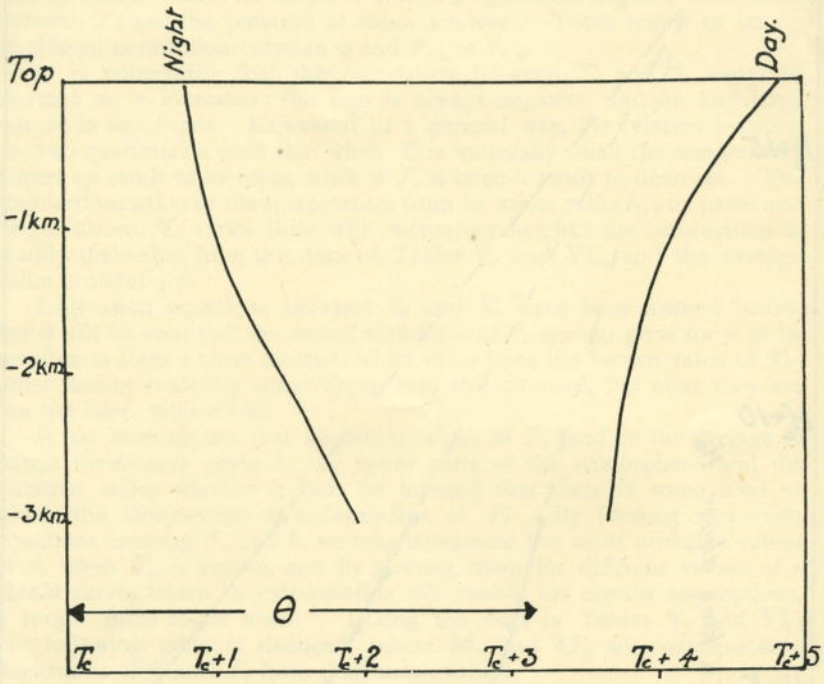

FIG. 5.—Mean temperature changes over the upper three kilometres of all soundings reaching at least five kilometres above H_c.

In this speculation no account has been taken of the fact that H_c is not a constant quantity, its range being roughly between 7 and 14 km.

This still further prevents any precision being attempted, and all that can be said is that on the assumptions made, the temperature variations would be nearly independent of T_c at a height of about 27 km. above mean sea-level; such a height is above the range of observation at the present time.

It has been mentioned above that at the upper limit of a sounding made in daylight there is some uncertainty in the temperature reading owing to an apparent reduction of the vertical velocity of the balloon, and consequent failure of the ventilation on the ascent. This point was specifically tested by taking 201 soundings (126 day, 75 night) which reached at least (H_c+5), and averaging the values of θ_r found for the highest kilometre, the next below, and the second and third below. The result is shown in Fig. 5. The night curve is very much what would have been expected, but the day one shows a turn to the right at the top, which can only be interpreted on the assumption that there is some slight systematic tendency for the temperatures recorded by the instrument to rise over the last kilometre or two below the top, without respect to the particular height at which the top may be. The record on the descent, when the vertical velocity is of the order of 600 metres per minute, does not usually show any obvious effects of insolation, but as it has been customary to publish temperature as the mean of the two records, it is evident that during daylight they must be to some extent subject to such an error.

In Fig. 6 is given a temperature-height graph derived from a particularly high sounding, which exemplifies the points just mentioned. The ascent and descent are shown separately, and a small but rapid rise in temperature is seen on the ascent just before the bursting of the balloon. Immediately after, a sudden fall of about 10 degrees occurs, and associated with it is the curious anomaly of an apparent rise in height after the balloon had burst. These features are not errors in tabulation, but are quite common in the cases of daylight soundings which reach a great height. It seems clear that when falling at a high velocity through an almost isothermal region the registration of temperature cannot be subject to much error, and this fact gives a means of estimating the magnitude of the errors in the ascending record. In the case in point, between 20 and 22 km. the latter would seem to be about 5 degrees too warm.

The reason for the apparent fall in pressure after the balloon had burst seems to be that the aneroid box which measures the pressure has a very large temperature correction, and at the same time its lag as regards temperature is greater than that of the thermograph. Hence during the time that the whole instrument is cooling rapidly, the aneroid box is warmer than the thermograph, and a wrong correction for temperature is therefore automatically applied to it. Before the bursting of the balloon it seems reasonable to assume that the whole instrument is at the same temperature, and therefore a true estimate of the pressure can be made even though the temperature recorded is incorrect. In the light of many records of this nature it has for some years been the practice in dealing with the British balloon soundings to give greater weight to the descending record than the ascending one in the upper part of high soundings which show characteristics similar to those of Fig. 6, and to ignore the rise at the extreme top of the ascent altogether. Current and future soundings made in daylight are not likely to show the peculiarity found in Fig. 5 to anything like the same extent as did older ones.

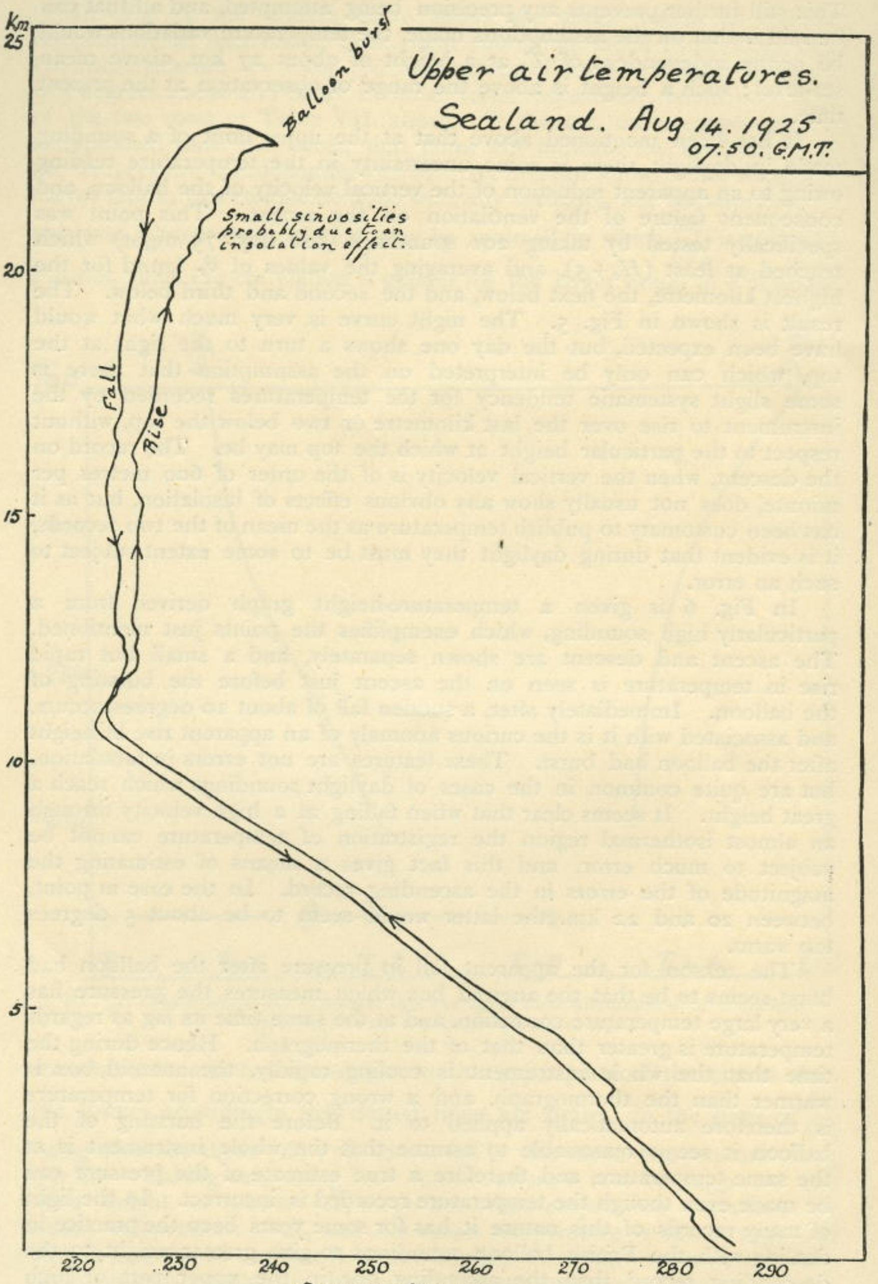
Km
25
20
15
10
5
Upper air temperatures.
Sealand. Aug 14. 1925
07.50. G.M.T.
Balloon burst
Small sinuosities probably due to an insolation effect.
Fall
Rise
220
230
240
250
260
270
280
290
Degrees Absolute

FIG. 6.

SUMMARY.

The Dines meteorograph, when employed with balloons giving a rising velocity of about 200-250 metres per minute, is not sufficiently well ventilated to yield accurate readings of the temperature of the air in the upper part of the stratosphere during the hours of daylight. In such cases an average error of about $+3°$ C. appears to exist in the ascending record at a height of $(H_c + 6)$ km. and increasing above. The corresponding error in the descent in this region is believed to be insignificant.

The average temperature distribution in the stratosphere over the British Isles consists of a pronounced inversion of 3° C. at the bottom, followed by a lapse of about 0·5° C. per km. from $(H_c + 3)$ km. upwards to at least $(H_c + 8)$. There is no significant connection between the magnitude of the inversion and either the lapse rate just below it, or the temperature in the troposphere in the layer $3\frac{1}{2}$ to $7\frac{1}{2}$ km.

Individual soundings into the stratosphere show considerable departures from the average distribution of temperature, but as the height above H_c increases there is a definite tendency towards a lessening of the dependence of the temperature on T_c. At a height of $(H_c + 17)$ the variations in temperature may possibly be independent of T_c.

Such evidence as is available is against the existence of a diurnal variation of temperature in the stratosphere.