

## Local variations of air temperature at Delhi

K. S. AGARWALA

*Meteorological Office, New Delhi*

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**ABSTRACT.** In this paper the results of analysis of the monthly mean maximum and minimum air temperatures recorded at three observatories situated at (a) Safdarjung Airport, (b) Lodi Road and (c) Palam Airport in the Delhi area during the years 1955-57 have been given and local variations of temperatures have been discussed.

1. The object of this paper is to study the local variations of air temperature at Delhi. For this purpose the monthly mean values of daily maximum and minimum air temperatures recorded at three observatories situated in the Delhi area have been analysed and discussed. The observatories are (i) meteorological observatory at the Safdarjung Airport, (ii) hydrological observatory at Lodi Road and (iii) meteorological observatory at the Palam Airport. The observatory at Lodi Road is at a distance of about 2 furlongs from the Safdarjung Airport observatory, while the observatory at Palam Airport is at a distance of about 8 miles from Safdarjung. At all the three observatories the thermometers are installed in standard Stevenson Screens at a height of 4 ft above ground and the exposure is good. As regards the topography of the place, it does not offer any unusual features but the Palam site is more open.

2. An idea of the air temperatures at Delhi may be had from Table 1 which gives the mean monthly values of (i) maximum temperature  $X_s$  (maximum at Safdarjung), (ii) minimum temperature  $N_s$ , (iii) mid-temperature  $\frac{1}{2}(X_s + N_s)$  and (iv) diurnal range  $(X_s - N_s)$  obtained from the observations for 3 years (1955-57) recorded at the meteorological observatory at the Safdarjung Airport.

April, May, June and July are months with the mean monthly maximum temperature above  $35^\circ\text{C}$ . During the monsoon season, July to September, the diurnal ranges of temperatures are small, the smallest being  $7^\circ.4\text{C}$  in the month of August. The remaining months are characterised by large diurnal ranges of temperature (above  $12^\circ\text{C}$ ), the largest being  $17^\circ.2\text{C}$  in the month of April. For the year as a whole, the mean maximum temperature is  $31^\circ.1\text{C}$ , the mean minimum  $18^\circ.9\text{C}$ , mean mid-temperature  $24^\circ.9\text{C}$  and the diurnal range is  $12^\circ.4\text{C}$ .

3. The results of analysis of 3 years' (1955-57) data of maximum and minimum air temperatures recorded at the observatories situated at Safdarjung (s), Lodi Road (l) and Palam (p) are given in Tables 2 and 3 in the form of differences of temperatures between (i) Safdarjung and Lodi Road, (ii) Safdarjung and Palam and (iii) Lodi Road and Palam.

An examination of Table 2 shows that the maximum temperatures at Safdarjung are higher than those registered at Lodi Road, the difference being less during the pre-monsoon (summer) months—April to June; the average excess during the year as a whole is of the order of  $0^\circ.5\text{C}$ . So far as the differences of maximum temperatures at Palam and Safdarjung are concerned,

TABLE 1

Monthly mean maximum and minimum temperatures ( $^{\circ}\text{C}$ ) at Safdarjung

	Maximum Xs	Minimum Ns	Mid- tempera- ture $\frac{1}{2}(Xs+Ns)$	Diurnal range (Xs-Ns)
Jan	20.4	8.3	14.3	12.1
Feb	24.5	9.1	16.8	15.4
Mar	30.1	16.2	23.1	13.9
Apr	35.6	18.4	27.0	17.2
May	39.5	25.0	32.3	14.5
Jun	39.9	28.7	34.3	11.2
Jul	35.3	27.5	31.4	7.8
Aug	33.5	26.1	29.8	7.4
Sep	33.5	24.5	29.0	9.0
Oct	30.8	19.4	25.1	11.4
Nov	27.6	12.1	19.9	15.5
Dec	22.9	9.1	16.0	13.8
Year	31.1	18.9	24.9	12.4

it is found that Palam is warmer than Safdarjung in the pre-monsoon (summer) months (April to June), the average excess being  $0^{\circ}.3\text{C}$ . On the other hand, Palam is colder than Safdarjung by  $0^{\circ}.3\text{C}$  during the winter months (December to March). As regards the monsoon season (July to September) and the post-monsoon period (October and November), Palam is colder than Safdarjung, the average deficit being  $0^{\circ}.2\text{C}$ . Similar analysis of the data for Lodi Road on seasonal basis indicates that the maximum temperature at Lodi Road is on the average  $0^{\circ}.4\text{C}$  lower than that at Palam, the seasonal differences ( $X_L - X_P$ ) being  $-0^{\circ}.5\text{C}$  during pre-monsoon (summer) months,  $-0^{\circ}.3\text{C}$  during winter and  $-0^{\circ}.4\text{C}$  during the monsoon season as well as the post-monsoon season.

As regards the minimum temperatures, Table 3 indicates that Safdarjung is in

TABLE 2

Differences of monthly mean maximum temperatures ( $^{\circ}\text{C}$ )

	(Xs-XL)	(Xs-Xp)	(XL-Xp)
Jan	+0.8	+0.5	-0.3
Feb	0	-0.3	-0.3
Mar	+0.7	-0.1	-0.8
Apr	+0.1	-0.4	-0.5
May	+0.1	+0.3	+0.2
Jun	+0.2	-0.9	-1.1
Jul	+0.4	-0.1	-0.5
Aug	+0.8	+0.4	-0.4
Sep	+0.7	+0.3	-0.4
Oct	+0.6	+0.3	-0.3
Nov	+0.8	+0.2	-0.6
Dec	+0.7	+0.9	+0.2
Year	+0.5	+0.1	-0.4

Xs, XL and Xp are maximum temperatures at Safdarjung, Lodi Road and Palam respectively

average excess of the order of  $0^{\circ}.5\text{C}$  and  $0^{\circ}.4\text{C}$  over Lodi Road and Palam respectively during the year as a whole and Lodi Road is, on the average, cooler than Palam by  $0^{\circ}.1\text{C}$ .

4. The following conclusions may be drawn from the study of the data—

- (i) To reduce the Lodi Road maximum and minimum temperatures to those at Safdarjung, an average correction of  $+0^{\circ}.5\text{C}$  may be applied.
- (ii) Palam is warmer by  $0^{\circ}.3\text{C}$  in summer and colder by  $0^{\circ}.3\text{C}$  in winter than Safdarjung. During the monsoon and post-monsoon months, Palam is colder than Safdarjung, the average difference being  $0^{\circ}.2\text{C}$ .
- (iii) To reduce the Palam minimum temperatures to those at Safdarjung

TABLE 3  
Differences of monthly mean minimum  
temperatures ( $^{\circ}\text{C}$ )

	(Ns—NL)	(Ns—N <sub>F</sub> )	(NL—N <sub>F</sub> )
Jan	+0.5	+0.4	-0.1
Feb	+0.5	+1.2	-0.7
Mar	+1.2	+1.4	-0.2
Apr	-1.0	-1.3	-0.3
May	+0.2	+0.3	-0.1
Jun	-0.1	+0.5	-0.6
Jul	+0.6	+0.3	-0.3
Aug	+0.3	+0.3	0
Sep	+0.6	+0.7	-0.1
Oct	+1.6	+0.4	-1.2
Nov	+1.0	+0.1	-0.9
Dec	+1.2	+0.7	-0.5
Year	+0.5	+0.4	-0.1

Ns, NL and N<sub>F</sub> are minimum temperatures at Safdarjung, Lodi Road and Palam respectively

Airport an average correction of  $+0^{\circ}.4\text{C}$  may be applied during the monsoon months (July to September) and the post-monsoon

months (October and November). During the winter period (December to March) a correction of the order of  $+0^{\circ}.9\text{C}$  appears to be necessary. In the pre-monsoon season (April to June) the mean correction works out to be  $-0^{\circ}.2\text{C}$ , the difference for the month of April being as high as  $-1^{\circ}.3\text{C}$ .

5. It may be mentioned that although the differences in the monthly mean values indicated above are not found to be considerable, the daily temperature readings at Safdarjung are sometimes found to vary considerably ( $3^{\circ}\text{C}$  or more) from those recorded at Palam. These large sporadic differences on specific days are due to special weather conditions and other factors prevailing at the time; for example, wind current from a particular direction, a specially warm dry sunny day in the summer and foggy conditions in the winter are favourable to the development of appreciable divergences in the maxima and minima of air temperatures even at short distances. It is proposed to discuss such divergences in the daily temperature readings in relation to the weather conditions and other factors prevailing on particular days in a subsequent paper.