

## Local temperature variation in Shillong area

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*(Received 5 September 1963)*

**ABSTRACT.** Parry's (1956) and Lysack's (1957) conclusion that substantial local variations occur due to relief of the place has been tested for local temperature variations in Shillong area for the winter season for the years 1960-62. The variation of minimum temperature is more pronounced than the maximum temperature. Parry concluded that the influence of relief will be observed when the range of altitude of observatories recording local variation of temperature is small. The present study indicates that this variation is observable even where the range of altitude is of the order of 2000 ft.

### 1. Introduction

From a study of local temperature variations in the Reading area, Parry (1956) has shown that substantial local temperature variations may occur within an area in which the range of altitude is modest and the urban pattern relatively open, regardless of the local factors other than the relief and to some extent the nature of subsoil; there is no evidence that rivers are significant on a local—as opposed to microscale.

Studies of local temperature variations both in the urban area (Parry 1956) and in the arable horizons (Lysack 1957) brought out the fact that the influences of local factors were more pronounced on the minimum than on the maximum temperatures. Moreover, they noted that the incidence of bad weather had such a great influence that it some times masked the influence of local factors like topography, urbanity, etc.

To test these conclusions, a study of the local variations of temperature during winter in the Shillong area was made. There are two observatories at Shillong, the Central Seismological Observatory in Upper Shillong, which is outside the Shillong town area and at a height of 5242 ft above sea level and the other in the Shillong Telegraph Office compound at a height of 4921 ft above sea level and is in the heart of the town. Both record temperatures at the screen height and in both cases exposures are good. But while the area surrounding the Central

Seismological Observatory is open, the town observatory is situated in an urban area. There is no river near the observatories. Both the observatories are located in clayey soil. Thus the study of temperature variation at the two observatories could reveal the relative importance of relief and urbanity. The distance between the two observatories is 3 miles.

The study was extended to a comparison of temperatures between the two departmental observatories at Central Seismological Observatory and at Umroi, separated by a distance of 14 miles. The height of the latter station is 2950 ft a.s.l. It is located in an open area and the soil is of clay. It may be mentioned that both Shillong town and Umroi are in valleys.

Comparison of data of C.S.O. and town observatories was made for January and December from January 1960 to December 1962. As Umroi observatory functioned from July 1960 to January 1962, the comparison of temperature between C.S.O. and Umroi was restricted to two winter seasons only. The months of December and January were particularly chosen as these are characterised by the fairest weather in the year. It may be mentioned here that the study by Parry pertained to a continuous period of 18 months comprising of one winter and two summers.

Shillong is a town of moderate size and variable relief.

TABLE 1  
Mean and extreme daily temperatures (°C) at Shillong observatories

Observatory	Year	Month	Mean daily temp.	Highest max. temp.	Date	Lowest min. temp.	Date
C. S. O.	1960	January	10.5	17.9	12	3.9	28
	1960	December	11.9	20.3	2	6.0	22
	1961	January	11.0	18.2	30	0.6	14
	1961	December	10.1	20.0	29	2.7	20
	1962	January	9.3	17.6	27	1.4	16
	1962	December	11.3	18.3	24	4.1	31
Shillong	1960	January	9.6	19.2	12	-0.5	19
	1960	December	11.1	20.1	1	2.8	20
	1961	January	10.2	19.5	29	0.6	7
	1961	December	9.3	19.5	29	1.1	15, 18, 23
	1962	January	8.5	18.0	27	-0.5	2
	1962	December	10.5	18.9	6, 7, 10, 23	0.7	31
Umroi	1960	December	15.2	24.2	1	4.2	11
	1961	January	13.5	24.0	26	2.3	16
	1961	December	13.5	22.5	5, 29	-0.1	25
	1962	January	11.3	22.4	23	1.5	3

TABLE 2  
Mean maximum and minimum temperatures (°C)

	1960		1961		1962	
	January	December	January	December	January	December
Mean maximum temperatures						
C. S. O.	15.2	16.1	15.8	14.5	13.8	15.6
Shillong Town	16.2	16.8	16.8	15.1	14.9	16.7
Umroi	—	21.9	21.3	22.3	19.7	—
Mean minimum temperatures						
C. S. O.	5.8	7.7	6.2	5.6	4.8	6.9
Shillong Town	3.0	5.5	3.8	3.4	2.8	4.4
Umroi	—	8.5	5.6	4.8	2.9	—

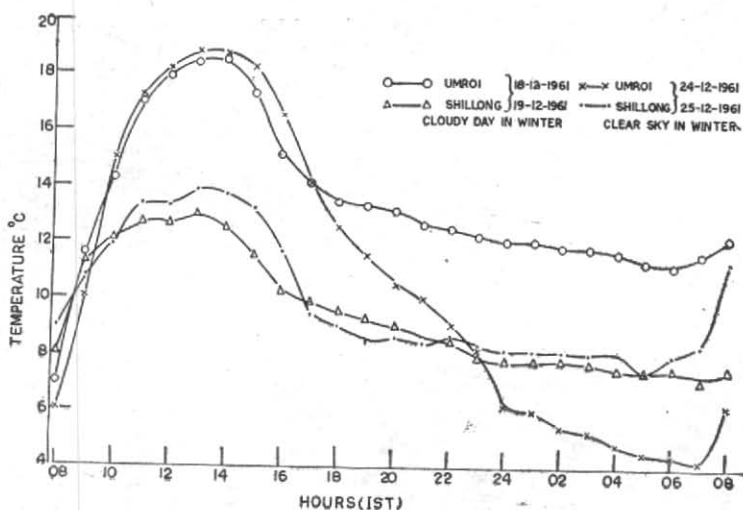


Fig. 1. Hourly temperature values for Umroi and Shillong for clear and cloudy conditions

## 2. Analysis of Data

The mean and extreme temperatures for different months under study are shown in Table 1, together with dates on which extreme temperatures were attained. The mean daily maximum and minimum temperatures of all the stations are shown in Table 2.

A comparison of mean daily temperatures at C.S.O. and the town observatory shows that in spite of the urban warmth the town is in general colder than the Upper Shillong (C.S.O.) area. It will be seen that while the maximum temperature of Shillong town is higher than that of Upper Shillong, the minimum temperature is lower. Higher cooling at night not only compensates day time warmth, but makes the town colder than Upper Shillong. The effect of relief which leads to the settling of cold air at lower altitudes, is stronger than the effect of urbanity of Shillong. The mean daily temperature at Umroi, which is more than 2000 ft lower than the C.S.O., is always higher than the latter. Here the range of altitude is not modest and the effect of relief is not apparent from the mean daily temperatures.

The highest maximum temperatures of the months under consideration for the C.S.O. and the town observatory were recorded either on the same date or with a difference of one day. The lowest minimum temperatures of these two stations were on the other hand recorded on different dates. Comparison of data of C.S.O. and Umroi shows that the dates of the highest maximum and the lowest minimum temperatures do not agree.

Highest maximum temperatures recorded at town observatory were always higher than that at the C.S.O. But the lowest minimum temperatures at town were always lower than at C.S.O. whereas C.S.O. never recorded air temperature below 0°C, the town observatory recorded such temperatures twice; even Umroi recorded such low temperature once during the four months under study.

There were a few cases of marked difference in temperature minima at the three observatories on some occasions in the winter which cannot be explained satisfactorily in terms of relief. A study of each of these individual cases has shown that they resulted from the occurrence of cloudiness, strong surface winds

and lapse rate variations associated with the passage of western disturbances.

Fig. 1 shows hourly temperature records of 18—19 and 24—25 December 1961, as picked up from thermograms. The first one represents typical cloudy condition and the second one a typical fine weather condition. It may be seen that the rates of cooling at C.S.O. during these two nights do not differ substantially whereas there is considerable variation at Umroi. This is due to drainage of cold air from peak to valley and subsequent setting up of valley inversion.

### 3. Conclusion

From the present study, we see that the conclusion, that substantial local variation of temperature may occur within an area

in which range of altitude is modest, holds good in the case of local variation of temperature at Shillong. This also agrees with the conclusions on the effect of relief arrived at by Lysack (1957) from a study of local temperature variations on arable soil of Chermasan-Demskel steppe of Baksir A.S.S.R.

The variation of minimum temperature is more prominent than that of maximum temperature. Apparently due to settling of cold air in the valleys, these differences occur so that they are more pronounced on clear nights than on cloudy nights. Comparison of minimum temperatures at Umroi and C.S.O. brings out that this influence of relief is observable even when the range of altitude is not modest.

### REFERENCES

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