Letters to the Editor

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THE EFFECT OF TOTAL SOLAR ECLIPSE OF 16 FEBRUARY 1980 ON THE SURFACE METEOROLOGICAL PARAMETERS AT VISA-KHAPATNAM

A total solar eclipse occurred over the Indian Peninsula in a belt extending from north coastal Karnataka and Goa on the west to extreme north coastal Andhra Pradesh and south coastal Orissa in the east on 16 February 1980. The effect of this eclipse on the meteorological parameters at Visakhapatnam is studied as no such study in respect of Visakhapatnam was made in the past.

Visakhapatnam is situated 40 km to the south of the belt of totality. During the maximum phase of the eclipse at 1552 IST, 98% of the sun's disc was obscured by moon at Visakhapatnam. As such, the eclipse can be considered as nearly total at this station.

2. Half-hourly surface observations were recorded at Visakhapatnam airport and Visakhapatnam observatories between 1130 and 2030 IST on the eclipse day. Similar observations were taken on the preceding and following days also to know the normal diurnal variation of various parameters at this time of the year.

3.1. *Dry bulb temperature* — The eclipse commencing from 1438 IST and ending with 1657 IST occurred during the following phase of the dry bulb temperature.

At both the observatories, the dry bulb temperature fell by about 3 deg. C from the commencement to maximum phase of the eclipse & later rose by about 0.5 deg. C before showing the normal fall after the cessation of the eclipse.

Allowing for normal diurnal cooling derived from the 15th and 16th data, the effective cooling from the commencement to maximum phase of the eclipse works out to 1 deg. C and 1.3 deg. C at Visakhapatnam A. P. & Visakhapatnam observatories respectively. The normal diurnal cooling on eclipse day as deduced from a smooth curve drawn in the dry bulb temperature curve between the times of commencement & cessation of eclipse is found to be the same as that obtained by the above method. Thus both the methods give the effective cooling of surface air due to the eclipse as 1 deg. C at Visakhapatnam A. P. and 1.3 deg. C at Visakhapatnam.

3.2. *Wet bulb temperature* — The common feature observed at both the observatories is a general rise in wet bulb temperature of about 0.5 deg. C instead of the normal fall, from the time of the maximum phase of eclipse until half an hour after the end of the eclipse.

3.3. *Relative humidity* — At both the observatories, the relative humidity on the eclipse day was higher than on the non-eclipse days from about half an hour prior to the maximum phase until practically the end phase.

3.4. *Surface wind* — The surface wind recorded at the two observatories during the eclipse phase did not show significant difference from the normal pattern both in the wind direction and speed.

3.5. *State of sea* — The state of sea as observed from the Visakhapatnam observatory which is close to the sea did not show any abnormality during the eclipse phase. The state of the sea corresponded to Beaufort Force 3 to 4.

3.6. *Atmospheric pressure* — The sea level pressure at both the observatories on eclipse day was higher than that on the non-eclipse days from about the time of commencement of eclipse till about fifteen minutes after the maximum phase. Later the rate of rise of pressure upto 1800 IST was the least on eclipse day. It is well known that the diurnal variation of atmospheric pressure in tropics consists of two major components one of which is the diurnal component brought about by the solar heating. The higher pressure on eclipse day during most of the eclipse phase can be attributed to reduced solar heating of the atmosphere. The lower rate of increase of pressure upto 1800 IST after the maximum phase of the eclipse is due to the gradual increase in solar radiation after the maximum phase. After 1800 IST, however, the rate of rise in pressure on the eclipse day was similar to that on the non-eclipse days suggesting that normal conditions were restored by then.

To find out the effect of total solar eclipse on the atmospheric pressure in the eclipse belt, available. 0900 & 1200 GMT synoptic pressure observations were examined. As the eclipse commenced over the Indian Peninsula after 0900 GMT, it can be taken that the atmospheric pressure at 0900 GMT was not affected by the eclipse. As the eclipse ended around 1130 GMT, it is reasonable to assume that the effect of
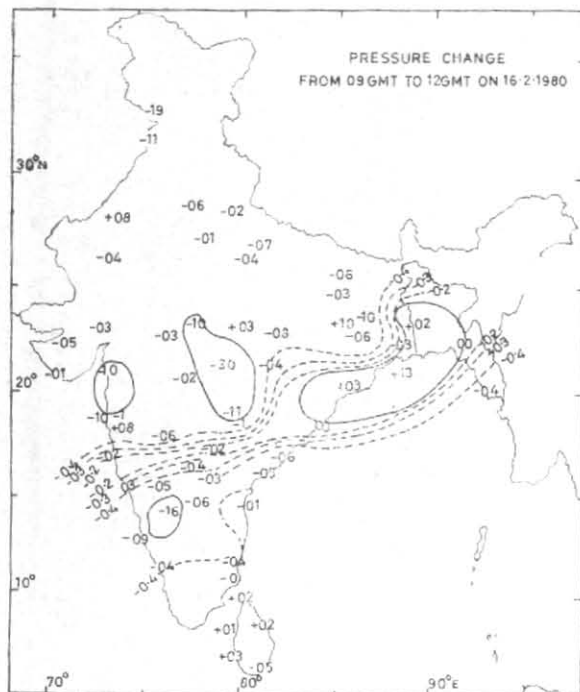
Fig. 1. M.S.L. atmospheric pressure change from 0900 to 1200 GMT on 16 Feb 1980

eclipse was present on the pressure recorded at 1200 GMT on the 16th. In view of this, an examination of the pressure differences between 0900 and 1200 GMT on the eclipse day in the eclipse belt and in the areas on either side of this belt will throw some light on the effect of solar eclipse on atmospheric pressure. The difference in the mean sea level pressure recorded at 0900 and 1200 GMT at observatory stations in Peninsular India is shown in Fig. 1. It can be seen from this figure that the track of solar eclipse coincides with the belt of minimum pressure change. Lower values of pressure recorded at stations in the eclipse belt at 1200 GMT due to reduced rate of rise of pressure soon after the maximum phase of the eclipse referred to in the preceding paragraph is responsible for the minimum pressure change in the eclipse belt.

3.7. *Other observations* — Planet *Venus* was seen at Visakhapatnam well before the maximum phase of the eclipse. Moving shadow bands were also noticed at about the time of the maximum phase of the eclipse.

4. The eclipse caused a cooling of about 1 deg. C in the surface air at Visakhapatnam. The increasing, instead of the normal decreasing, wet bulb temperature from the time of maximum phase to end phase of eclipse resulted in higher relative humidity during this period on eclipse day compared to that on non-eclipse days. The diurnal variation of pressure during the eclipse period was the least along the belt of peninsular India affected by the total eclipse.

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