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A NOTE ON VERTICAL VISIBILITY

It is often observed that under certain conditions horizontal visibility shows improvement while the vertical visibility deteriorates. As is well known, these conditions are— (1) Marked atmospheric pollution, (2) Temperature inversion aloft, but not on the ground, (3) Turbulence at the ground due to strengthening of surface winds and (4) Illumination of the top of the dust cover. The last factor is important particularly from the point of view of an aircraft flying above the dust cover.

The conditions over Jodhpur on the night of 26-27 May 1959, which are briefly described below, serve as a typical illustration of all these four factors.

Jodhpur is situated about 220 m a.s.l. and lies within the Rajasthan desert. Throughout the day preceding the night of 26-27 May, there was widespread dust haze and the atmosphere was already dust laden. The wind speed was of the order of 8 kt for some time prior to 2200 IST when it suddenly increased to 15 kt and continued to increase thereafter throughout the night (Table 1). Although the Tephigram of 26th evening does not show any marked upper air inversion, that of the next morning does show a well marked inversion with adiabatic lapse rate in the surface layer. Thus, it would appear that sometime during the night and probably soon after the wind strengthened, inversion aloft set in mainly due to turbulent mixing below. If the fall in temperatures from the evening to the morning at various layers (as seen from the Tephigrams) as also the ground temperature, say, at 2400 IST (two hours after the surface wind strengthened), are considered, it is possible to 'construct' a Teph'gram for this hour. In Figs. 1 and 2 are given the actual Tephigrams. The 'constructed' dry bulb curve is also indicated in Fig. 1 (curve B). Only the lower layers have been considered. The 'constructed' curve shows the probable existence of inversion at this

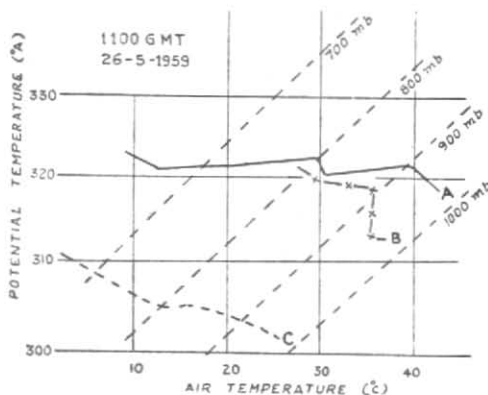


Fig. 1

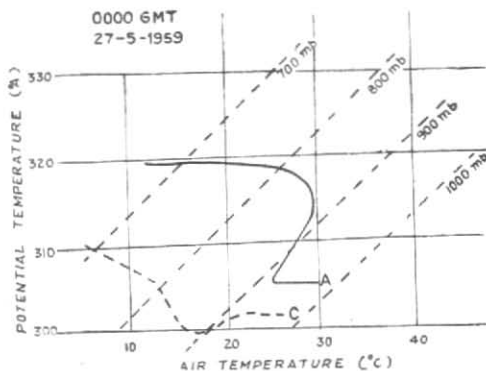


Fig. 2

time with base at about 700 m a.s.l. The sudden increase of wind caused turbulence resulting in upward transfer of dust particles which were already present in abundance. A dense dust cover at this level was, therefore, probably formed sometime after 2200 IST and before this time. Further, it being only the 5th night after the full moon, the upper surface of the dust cover was under the moon's bright illumination after 2310 IST (the time of moonrise), causing optical effect for an observer above the dust cover.

Table 1 gives the hourly temperature and wind speed from 26th evening to 27th morning.

TABLE 1

	Time (IST)	Surface temp. (°C)	Surface wind (kt)	
			Min.	Max.
26 May 1959	1600	42.0	09	15
	1700	42.5	10	14
	1800	41.6	09	13
	1900	41.0	07	11
	2000	39.8	05	07
	2100	38.8	05	06
	2200	38.0	08	15
	2300	37.5	13	22
	2400	36.0	12	18
27 May 1959	0100	34.8	13	21
	0200	33.3	12	21
	0300	32.3	14	19
	0400	30.6	10	15
	0500	29.5	11	15
	0600	29.0	12	17
	0700	29.0	14	20

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