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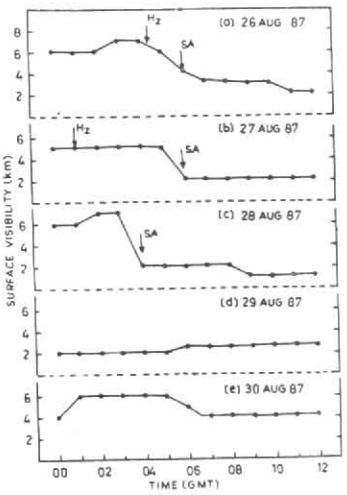
A SEVERE DUSTY WEATHER OVER BHUJ — A CASE STUDY

1. Dust raising winds normally blow over larger part of Kutch during pre-monsoon months. The frequency and severity of dust occurrence ceases or rather becomes very low in the monsoon months. However, it was observed that a severe dusty weather occurred over Bhuj and its surrounding areas on 28 and 29 August 1987. The dust was so thick in the atmosphere that most of the people preferred indoor on these days. The day time visibility became poor. In this note, the surface visibility and wind profile in the lower atmosphere over Bhuj during the occurrence of dusty weather have been described.

2. During daytime period of pre-monsoon, strong surface heating takes place over this region. The mean monthly maximum temperature at Bhuj during pre-monsoon months has been found above 40°C. The surface winds are also strong in daytime. These conditions lead to the development of turbulent eddies in the lower atmosphere very close to the ground surface. These eddies are responsible for mixing heat and water vapour in the atmosphere. When moisture content is very low, as is the case in this area before monsoon, strong surface winds over dry and desert land cause dust raising condition. However, as season progresses and moisture content in the atmoshpere starts increasing, these dust raising conditions no longer remain afterwards. During pre-monsoon season of 1987 too, occurrence of dust raising winds were very frequent over the area. Such winds, however, disappeared later in July and clear weather conditions were present till last week of August when an intense dust raising situation again occurred at the station.

3. Figs. 1(a-e) represent hourly daytime variation of surface visibility at Civil Aerodrome, Bhuj during the period from 26 to 30 August 1987. On the 26th surface visibility which was of the order of 6 to 7 km in the morning hours, started reducing at 05 UTC due to haze. At about 06 UTC, dust raising winds started blowing over the station. The visibility then started reducing and became 2 km in the evening. On the 27th, a sudden reduction in the visibility from 5 km to 2 km was observed within an hour from 05 to 06 UTC. Similar sudden fall



Figs. 1 (a-e). Hourly variation of surface visibility

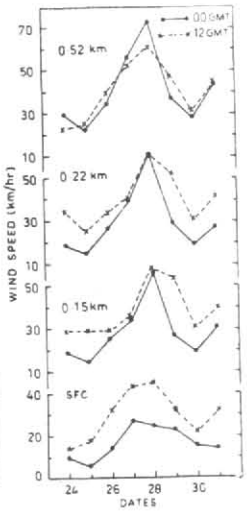


Fig. 2. Variation of westerly winds at 00 and 12 UTC

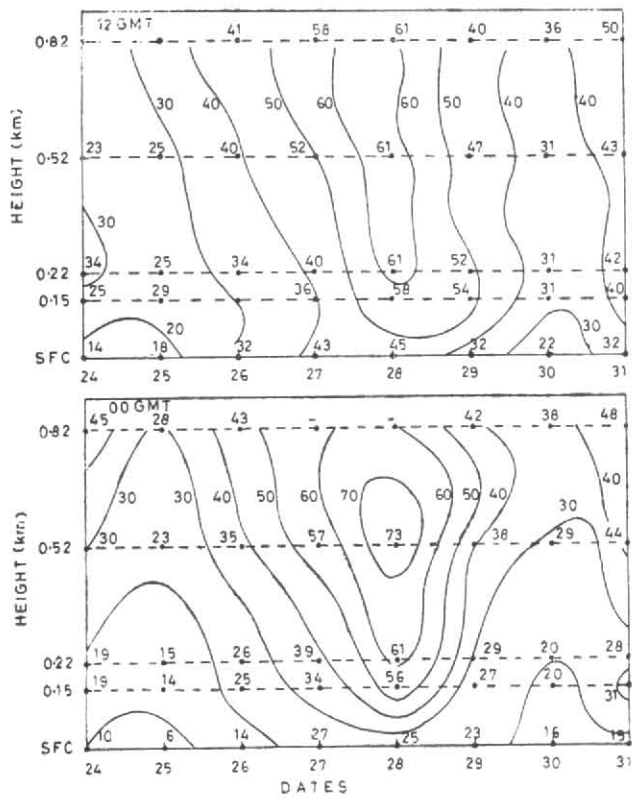


Fig. 3. Time-height section of westerly wind components at 00 and 12 UTC

of visibility from 7 km to 2 km was also noticed on the 28th. On this day the surface visibility became very poor about 1 km from 09 UTC onward. Strong dusty winds were practically present throughout night of 28th and 29th. On the 29th morning, visibility was hardly 2 km and there was no significant improvement throughout the day. Surface winds were very strong and dusty conditions were so severe that most of human being preferred indoor. Due to very poor surface visibility on 28th and 29th, the flight from Bombay was also affected.

4. In the present study, the surface winds observed with cup anemometer and low level winds (<1 km height) obtained from pilot balloon measurements over station have been utilized. Wind components in west direction were calculated and their values in km/hr obtained. Fig. 2 shows variation of westerly winds at 00 and 12 UTC during 24 to 31 August 1987. From the figure, following points have been noticed :

(*i*) At surface level, wind speed started increasing from 25 August and became very strong (>20 km/hr) on 27th, 28th and 29th. Wind speeds at 12 UTC on 27th and 28th were very strong (>40 km/hr).

(*ii*) Wind speeds at 12 UTC on all the days were greater than those observed at 00 UTC. The difference is appreciable at surface level and is less marked as the height increases. At about 0.52 km the difference between wind speeds at 00 UTC and 12 UTC has become insignificant.

(*iii*) Considerable increase in the wind speed at all the four levels with similar trend was observed on 28 August.

5. Fig. 3 depicts time-height section of westerly winds at 00 and 12 UTC. Contours at interval of 10 km/hr wind speed have been drawn by interpolation. Wind speeds in km/hr observed at different heights and dates are also mentioned in the diagram. It is seen that on the 28th morning, a core of high winds (>70 km/hr) was blowing at a height of about half a km over Bhuj and a steep vertical wind gradient was also present between surface and 0.22 km height.

6. It is seen that du/dz on the 28th in the layer between surface and 0.15 km is remarkably large as compared to other days. This steep gradient and strong surface winds have resulted large frictional velocity in this layer and caused dust to blow in the atmosphere.

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