551.553.1 : 551.555.4

DIURNAL VARIATION OF TROPOSPHERIC WINDS IN WINTER

1. A diurnal trend in planetary boundary layer has been observed over the tropical latitudes (Rama and Sivaramakrishnan 1990, Sivaramakrishnan *et al.* 1993). It is of interest to investigate the diurnal trend of the winds in the entire troposphere as tropospheric winds play a dominant role in energy exchange processes in the tropics. For aerospace activities such a study is of practical importance so as to know how far we can take the measured wind-profile for a scheduled launch to a delayed launch due to any 'holds'. To plan the conducive launch time window and for the design of launch vehicles also the information will be of some help.

2. Sivaramakrishnan and Prakasam (1992) have recently reported a diurnal variation in the tropospheric winds during the southwest monsoon (SW) season over the Peninsular India. Cyclone season (October to December) follows SW monsoon and ends up in winter, which is generally considered to be the fair weather period. Is there any diurnal variation in the tropospheric winds during winter? An attempt to find an answer to this question was made by conducting a compaign in February 1990. Four hourly Rawin ascents were taken for two consecutive days at Sriharikota (13.7°N, 80.2°E) and tropospheric wind profiles were derived. The data so collected were analysed to study the diurnal trend in winds at various levels. Though ascents were originally planned for three or four days, due to logistic constraints, the campaign period was restricted to two days.

3. The wind speeds at various levels obtained are comparable to the climatological mean for the place reported earlier (Rama and Prakashrao 1989). Fig. 2 presents the climatological wind profile for February and the mean wind profiles valid for the

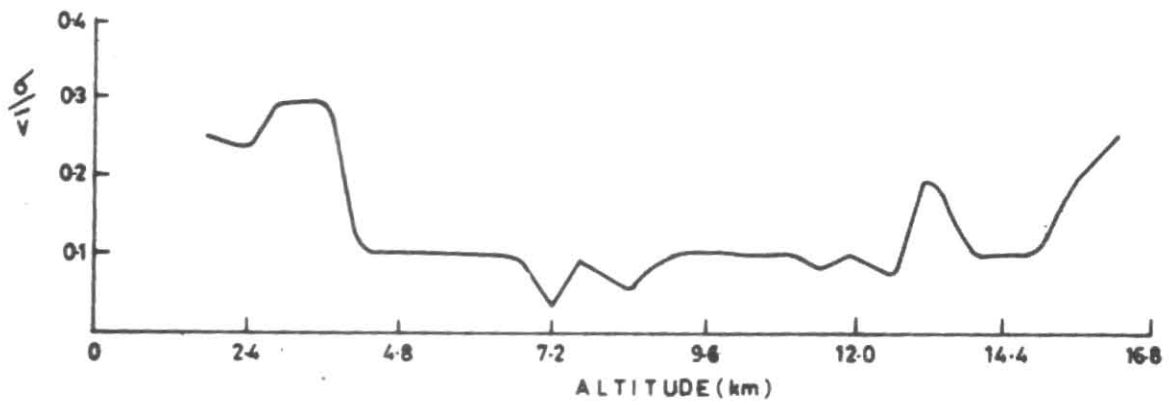

Fig. 1. Wind profiles

various times of the day as derived from the campaign. The following were noticed :

(*i*) The wind speed is less than 10 mps below 4 km altitude.

(*ii*) The speed never exceeds 30 mps at any level at any time.

(*iii*) 8 to 14 km is zone of strong winds where the windspeed can exceed 20 mps.

(*iv*) From 14 km onwards wind speed starts decreasing.

3.1 A significant feature to be noted is that all profiles are similar and the basic signature of the profiles remains the same irrespective of the time of ascent. The variability of the wind speed, which is the ratio between the standard deviation to the mean windspeed at different observations for the different parts of the day, was computed and presented in Fig. 1. It is seen that the variability rarely exceeds 0.3 and at most of the levels it is close to 0.1 only. This is in sharp contrast to what was observed during the southwest monsoon period (1992) when there is a zone of high diurnal wind variability.

3.2. Analysis of wind direction at various levels revealed that easterlies were present upto about 3.0 km and thereafter westerlies prevailed all through the troposphere. Another point which came out from the analysis was that the meridional component winds were 10 to 15 mps between levels 12 to 14 km.

3.3 A similar campaign was conducted during 20/21 March 1991 and the wind profiles obtained (though not shown here) were in general agreement with the above findings. Thus, the tropospheric

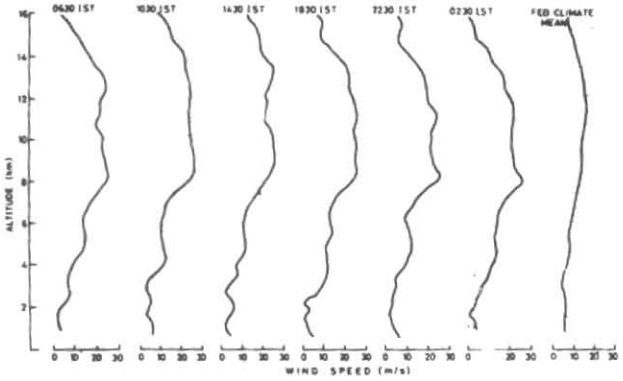

Fig. 2. Wind variability in February

windfield over these places during winter appears to be comparatively stable diurnally.

4. The author is thankful to ISRO-SHAR authorities for all the facilities provided to take the ascents and conduct the campaign.

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