Mausam, (1987), **38**, 1, 131-138

Letters to the Editor

551.553.1 : 551.510.52 : 551.553.21

DIURNAL VARIATION OF WIND FLOW PATTERNS IN LOWER AND UPPER TROPOSPHERE OVER INDIAN REGION AS OBSERVED DURING THE SUMMER MONSOON 1979

During 1979 Monex, the data from the geostationary satellite GOES-1 positioned at 58°E, was made available to scientists. From the cloud data, the University of Wisconsin, Madison, brought out wind flow patterns (Young *et al.* 1980), for region between 40°N and 40°S latitudes and 30°E and 100°E longitudes, pertaining to levels 850 mb and 200 mb (corresponding to layers 1000-700 mb and 300-100 mb). These have been computed from the day *versus* night composite cloud observations. The night time observations, however, comprise only 35 per cent of the total 92 days of Monex period. The publication also contains day and night composite infrared pictures from TIROS-N along with the day time visual imagery on Mercater Projection. Using the above data, the general structure of the atmosphere over Indian region, both in lower and upper layers during day and night has been carefully examined on a few occasions in the months of May and June and interesting results obtained have been presented along with some tentative explanations.

2. *Lower tropospheric wind flow patterns of* 27-28 *May* 1979 -- Closed anticyclonic flow is observed at 850 mb level over the central Arabian Sea during day time on 27 and 28 May (Fig. 1). It is replaced by southerly flow turning eastward around a ridge during the night time of 27 May. This indicates the generation of cyclonic vorticity in the lower tropospheric flow over the sea area during night which results in the dissipation of the closed anticyclone over the Arabian Sea.

The sea surface water absorbs heat and transfers it to layers below during day time. During night, the atmosphere gets cooled because of the absence of solar short-wave radiations as well as emission of long wave radiation, whereas the sea surface water retains its warmth. Thus, there is a general increase in temperature lapse rate and, therefore, the generation of cyclonic vorticity in the lower layers of the atmosphere during night (Petterssen's development equation 1956).

3. *Upper tropospheric easterly flow of* 28-30 *June*— On examining the flow corresponding to the level of 200 mb, a night time strengthening of wind flow is observed in the case of upper air easterlies over Indian region particularly ahead of the easterly trough. This can be seen by comparing the satellite derived wind flow at 200 mb on the nights of 28 and 29 June with that of day time on 28, 29 and 30 June for an easterly trough formed over the Bay of Bengal (Fig. 2). A depression

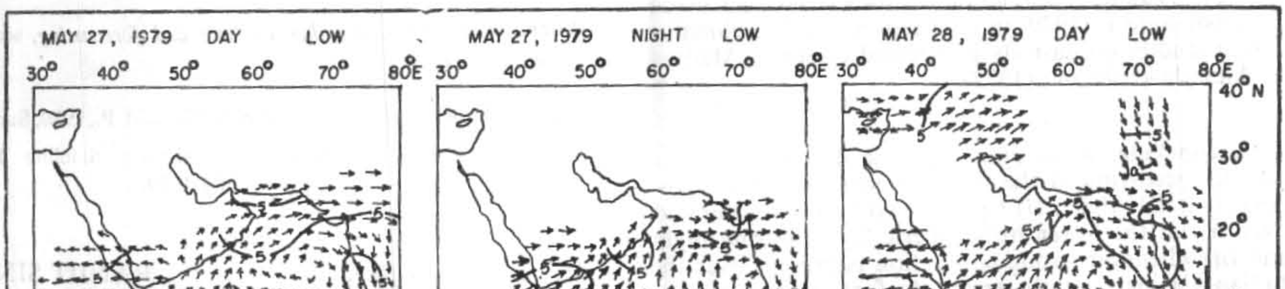

Fig. 1. Satellite composite wind flow patterns at 850 mb over the Arabian Sea

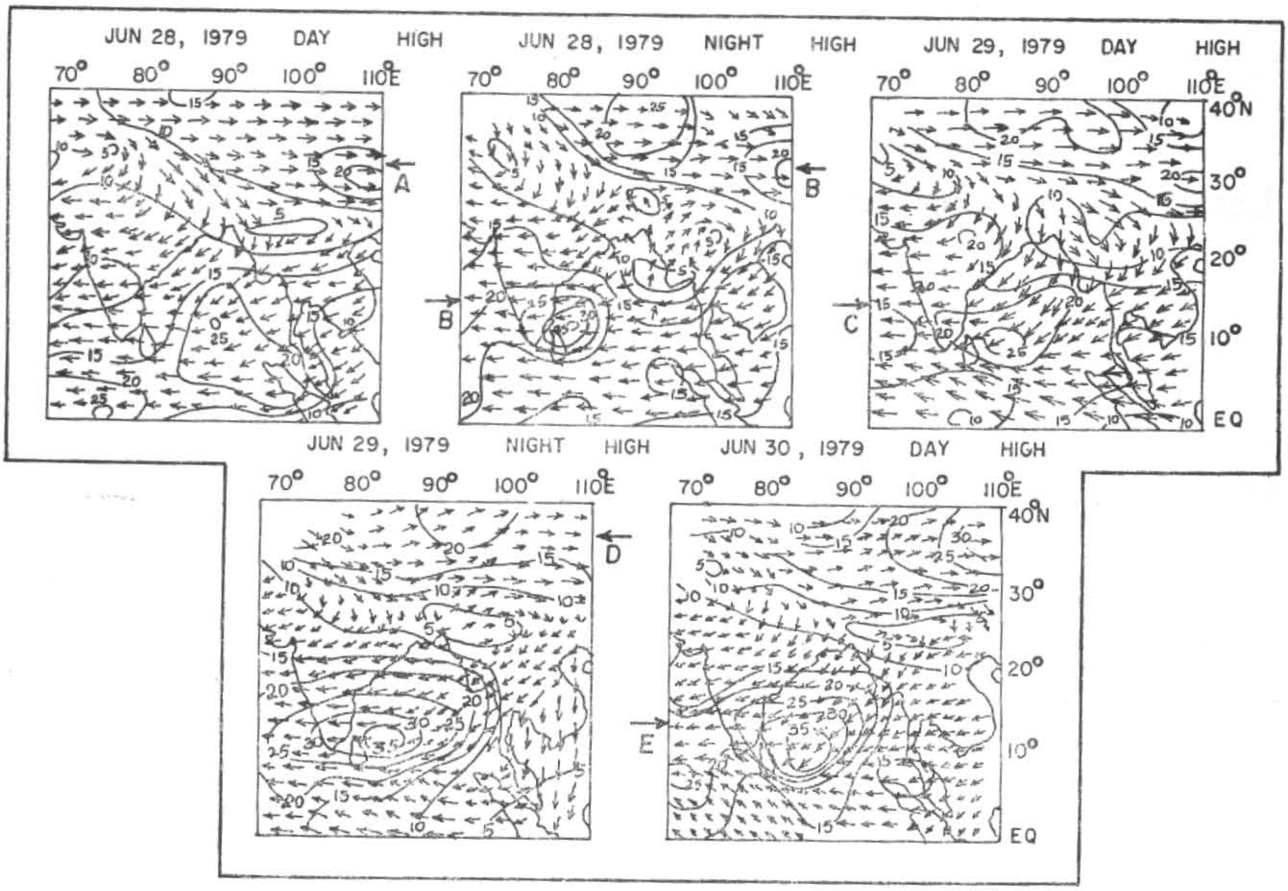

Fig. 2. Satellite composite wind flow patterns at 200 mb

formed over the north Bay of Bengal off Bangladesh coast on 28 June. Moving northward it became deep over Bangladesh on the morning of 30 June. Night time intensification of convection in the monsoon depression and outflow from the *Cb* clouds has caused the strengthening of easterly flow observed on the night of 28 and 29 June. Similar observations have been made by Krishnamurti (1979) in connection with the climatological studies on easterly jet located closer to Madras by Ananthakrishnan (1977).

To conclude, while discussing the day *versus* night changes occurring in the flow patterns over Indian region, it is felt that, (*i*) Cyclonic vorticity is generated over sea in the lower tropospheric layers during night and (*ii*) whenever strong convection is present over the Indian seas particularly during the formation of a monsoon depression, the upper air easterlies strengthen during night ahead of the easterly trough.

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8 April 1983