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RADAR AND SATELLITE SIGNATURES OF MONSOON DEPRESSIONS

In a recent study, Sarker and Chowdhury (1988) have examined the diagnostic characteristics of monsoon depressions by compositing 27 monsoon depressions during the period 1961-74. The three dimensional features have been studied on the basis of spatial distribution of pressure, temperature, moisture, velocity (tangential and radial) and relative vorticity. The study shows that, from the surface pressure and vorticity points of view, monsoon depressions belong to the class of tropical systems comparable to hurricanes. A few other conclusions of this study are as follows :

- (i) The most outstanding feature is the asymmetric nature of the depression with respect to the distribution of various parameters.

- (ii) The horizontal dimension of the disturbance is about 1000 km extending in the vertical upto the mid-troposphere (about 300 hPa).
- (iii) The strongest winds, both tangential and radial, are observed southwest of the centre.
- (iv) The disturbance has a cold core structure in the lower troposphere upto 500 hPa level.

2. The characteristics of inland monsoon depressions, based on synoptic data and radar and satellite imageries, were studied by Kulshrestha and Gupta (1964) whose main conclusions were as follows :

- (i) The structure of the monsoon depression was a cyclonic circulation in the lower levels upto 500 hPa with an anticyclone aloft.
- (ii) The cloud systems associated with the depressions were very extensive, contained clouds

of both cumuliform and stratiform types, and were arranged in characteristic spiral bands.

- (iii) The area of cloud imagery in satellite picture was one order of magnitude larger than the area of the corresponding radar echoes.
- (iv) The southwest sector of the depression had the maximum amount of rainfall.

3. It is noteworthy that distinct spiral bands are often observed in radar and satellite imageries of monsoon depressions even after four to six days of travel overland. In a number of cases, a vortex is clearly visible. Such characteristics provide definitive evidence that these disturbances belong to the class of intense tropical systems next perhaps to hurricane, as concluded by Sarker and Chowdhury (1988).

4. Apart from the depressions that move overland from the Bay of Bengal during the southwest monsoon season there are instances of cyclonic disturbances forming over land area in north India during this season. This occurrence is however not very frequent.

5. Kulshrestha (1970) studied two monsoon depressions of land origin which exhibited band structure in their radar echo patterns. A vortex was either clearly observed or was apparent from the orientation of the spiral bands. The existence of spiral bands and vortex, heights of associated cloud system, and the amount of

rainfall indicated that these tropical disturbances were more intense than would have been apparent from synoptic data only.

6. The present study of Sarker and Chowdhury (1988) thus validates the earlier observations of Kulshrestha and Gupta (1964) and Kulshrestha (1970) which were based on rather limited radar and satellite imageries. Now that extensive radar and satellite imageries are available, a detailed investigation of a large number of monsoon depressions (those moving inland from the Bay of Bengal and also those of land origin) using synoptic, radar and satellite data would be highly desirable.

References

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