

## CYCLONIC SYSTEMS IN THE SOUTHWEST MONSOON PERIOD MOVING TOWARDS LOWER LATITUDES

Monsoon depressions originating in the Bay of Bengal or developing over land in northern India in the mid-monsoon months July and August, normally move westnorthwestward across the country before they fill up. In the months June and September, they have occasionally a more northerly component of movement than in July and August. These well-known facts are consistent with Rossby's fundamental postulate

based on theoretical considerations (Rossby 1949) that "cyclonic vortices (warm or cold) are subjected to a resultant force which drives them poleward."

There have, however, been a small number of monsoon depressions which had initially moved at sea-level, westnorthwestwards or northwestwards across the country but *later moved southward over land itself* without subsequently taking a northerly course. These had developed especially over and near Rajasthan, *vide* Fig. 1. It is interesting to note that, of the 4 cases shown in Fig. 1 (India met. Dep. 1964, 1972), three occurred in the month of September when the cyc-

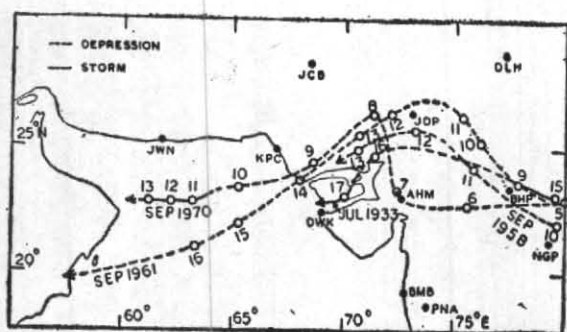


Fig. 1. Tracks of monsoon depressions moving towards lower latitudes

lonic systems normally tend to have a more northerly movement and some even recurve north-eastwards (Rao 1976).

With regard to the southwestward or even southward movement of cyclonic disturbances over the Arabian Sea, Sarma (1968) has published a list of such disturbances during the post-monsoon months October to December in the years 1891-1960. He has also analysed in detail one of these cases which was a cyclonic storm. He has produced documentary evidence to show that the southerly movement of the cyclonic storm might have been connected with high positive anomalies of sea-surface temperatures and an area of maximum energy-flux towards which the storm had actually moved.

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In the above paragraphs, we have discussed about cyclonic systems which initially moved in a westnorthwesterly direction and later moved towards lower latitudes. However, in regions east of  $80^{\circ}E$ , there were instances in which the reverse of what has been mentioned above, had taken place. In these cases, there was initially well-defined movement of the cyclonic systems towards lower latitudes, followed by the usual movement in a westnorthwesterly direction. In northeast India, in particular, there were instances in which the developments were at times more complex. For instance, in August 1926, a land-depression formed over West Bengal with centre near Berhampore ( $24^{\circ}08'N$ ,  $88^{\circ}16'E$ ) on 13th August, moved south-south-eastwards, intensified into a cyclonic storm with centre near Calcutta on 14th and after following a W-shaped track almost entirely over land as a cyclonic storm up to 17th, moved in the usual westnorthwesterly direction and disappeared over east Rajasthan on 21 August.

As far as the present writers are aware, no explanations are available in meteorological literature, for the abnormal movement of the cyclonic systems over land pointed out above. This aspect, therefore, deserves intensive study by synopticians and theoreticians who will be engaged in the Monex-1979 programme.

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