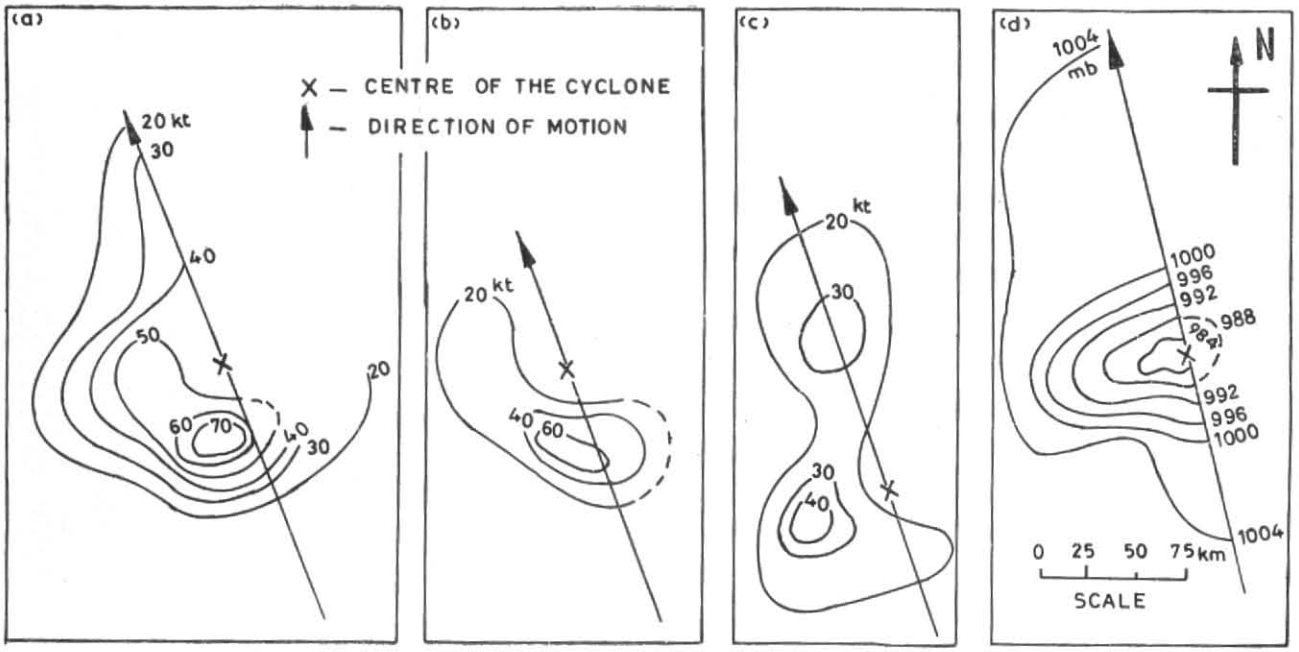
551.501.75 : 551.515.1

WIND OBSERVATIONS FROM BAY CYCLONE OF NOVEMBER 1984

It is rare to get detailed observations of surface weather from a severe cyclone field. After the documented set of data in this regard by Arakawa and Suda (1953) for a typhoon of September 1935, Mukherjee and Sivaramakrishnan (1977, 1984) presented a model for surface winds and waves based on the field observations from a severe cyclone over Arabian Sea in 1976. A severe cyclone with a core of hurricane winds over the Bay of Bengal moved close to Tamil-nadu-Andhra coasts during 12 to 14 November 1984 and crossed coast close to Sriharikota. The available ships' observations and the coastal observations from 06 U.T. of 12 November to 03 U.T. of 14 November when the cyclone was having hurricane strength were used to form the wind composite to get the picture of wind distribution in the cyclone field. The centres used were the centres fixed by the Cyclone Detection Radar, Madras.

Fig. 1 (a) presents the wind composite. The wind field is assymetric with respect to the centre of the cyclone which is expected for tropical cyclones. The core of high winds is seen to the left sector of the cyclone. The location of the core of high winds to the left sector of the storm is in agreement with the conclusion by Raghavan and Veeraraghavan (1979) who had suggested the maximum wind to be in the left sector, based on the evidence of damages and the radar observations of the Nagapattinam cyclone of November 1977. But all the earlier models of cyclones for Pacific and Atlantic Oceans (1953, 1959, 1961, 1971) and also for Arabian Sea (1984) put the core of maximum winds in the right sector of the cyclone only.

The cyclone under consideration was moving very close to the land and the land induced frictional and thermal effects influenced the turbulent structure of the cyclone. Powell (1982) and Rosenthal (1984), from the composite prepared for a hurricane while fully in water and subsequently at the time of crossing, established that the structure gets complicated due to the differential surface friction. Powell's composite does show a core of high winds to the left sector as in this case. Nevertheless, a stronger core was noticed in the right sector



Figs. 1 (a-d). Wind composites : (a) Surface, (b) Tangential, (c) Radial and (d) Pressure composite

also. Smith (1975) studied hurricane *Celia* of 1970 and his results indicate surface wind maximum on the landward left side which compared well with the results of Fujita (1980). However, it was difficult to say whether a core of high winds existed or not in the right sector as fewer observations were available to the right. Only two ships were moving in the field during this period. That is the reason that some isotachs were not closed. A recent analysis by Biswas *et al.* (1988) of the Chandbali cyclone of October 1984 also indicates high winds to the left sector. This is again a cyclone from the Bay of Bengal crossing east coast.

Figs. 1 (b & c) present the composites of tangential and radial winds. The stretched patterns establish the assymetric nature of the wind field. The streamline pattern which is not shown showed the regular convergence towards the centre of the system just like for Arabian Sea cyclone but in contrast to the observations in the Pacific cyclones (1953).

The eye passed very close to Sriharikota and the lowest pressure recorded at this place, namely 984.3 mb was taken as the central pressure (P_0) and, keeping the peripheral pressure as 1013 mb (P_n), Fletcher's formula was tried to estimate highest windspeed in the cyclone. It works out to be 84 kt which is higher than the highest recorded windspeed of 70 kt. Likewise the formulae of Mishra and Gupta (1976) as well as Kraft (1961) gave higher estimate of the wind while those of Myers (1957) and Takahashi gave lower estimates. However, Natarajan and Ramamurthy formula (1975) gives a value of 72 kt which is close to the actual value of 70 kt.

Pressure composite to the left of the cyclone based on land station observations alone was prepared which is shown in Fig. 1 (d). It is seen that the pressure gradient is not uniform in all directions which resembles the findings for the Arabian Sea cyclone (1987).

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9 November 1987