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Letters to the Editor

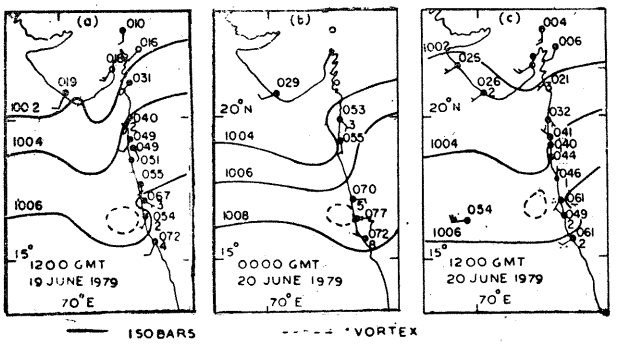
551.515.3 : 551.578.1(267)

THE DYNAMICS OF AN OFF-SHORE VORTEX IN THE EAST ARABIAN SEA AND ITS ASSOCIATED RAINFALL

One of the causes of heavy rain over the west coast of India, is the influence of off-shore vortices (George 1956, Mukherjee *et al.* 1978, Mukherjee & Shah 1981). During MONEX a small vortex was detected off Ratnagiri on 20 June 1979. Electra aircraft of National Science Foundation, USA, went on a probing mission and two sets of dropwindsonde data in the area were helpful in determining the horizontal and vertical dimensions of the vortex (Mukherjee 1980). It was found that the vortex had a diameter of about 150 km and thickness of 1 km from the ground. It was also found that the winds to the west of the off-shore vortex were strong southwesterlies.

Using these winds at 16 deg. 48′N, 71 deg. 59′E and at 16 deg. 52′N, 70 deg. 36′ E and the wind at Goa (15 deg. 29′N, 73 deg. 49′ E) the vorticity and divergence were calculated by Bellamy's method. Figs. 1 (a-c) show the off-shore vortex at various times. Tables 1 (a-c) give the wind data at the three locations. It was assumed that wind was steady in the interval between the successive observations. The vorticity and divergence were computed at 25 mb interval and are given in Table 2. Using equation of continuity vertical velocities were calculated and are given in Fig 2.

Sarker (1967) used terrain induced vertical velocity profile to compute rainfall rate. The same method was tried here. The computed rainfall rate is found as 1.4 mm per hour. Considering the rainfall along the



Figs. 1 (a-c). Off-shore vortex : (a) 12 GMT of 19 June, (b) 00 GMT of 20 June and (c) 12 GMT of 20 June 1979

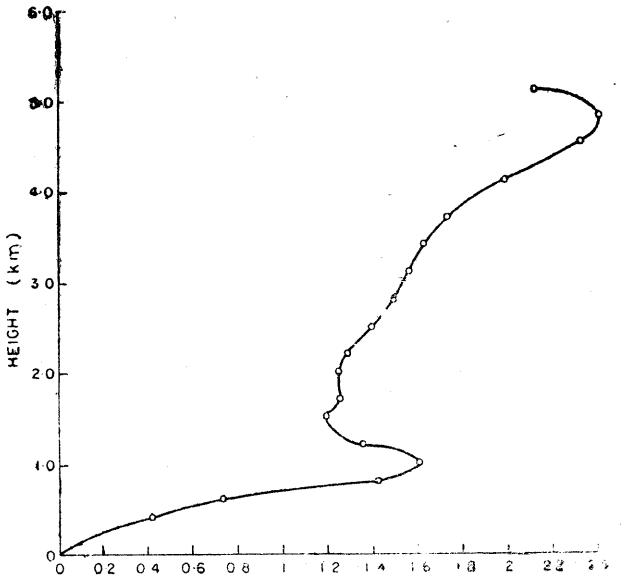


Fig. 2. Vertical velocity (w) in cm/sec (16° 24′N, 72° 06′E)

TABLE 1 (a)

Dropwindsonde, 1st Launch, A/c Electra
Lat. 16° 48′N, Long. 71° 59′E, Date : 20 June 1979)

Time (GMT)	Pressure level (mb)	Wind components (mps)	
		u W'ly+ve	*v* S'ly+ve
0433	810	3.47	1.47
0434	825	3.66	2.01
0434	840	3.17	1.78
0435	854	2.01	0.96
0435	870	18.10	24.4
0436	885	9.94	11.3
0436	900	1.17	2.94
0437	915	—0.65	—1.96
0437	931	0.84	—4.05
0438	946	0.60	—5.45
0438	961	4.87	—5.200
0439	976	1.63	—3.39
0439	992	4.55	—2.58

TABLE 1 (b)

Dropwindsonde, 4th Launch, A/c Electra
(Lat, 16° 52′N, Long. 70° 36′E, Date : 20 June 1979)

Time (GMT)	Pressure level (mb)	Wind components (mps)	
		u W'ly+ve	*v* S'ly+ve
0913	807	6.41	—1.18
0913	827	9.64	0.59
0914	844	10.0	0.98
0914	858	7.20	0.69
0915	873	9.95	0.70
0915	886	10.2	1.35
0916	902	11.8	2.27
0916	916	12.1	1.93
0917	931	10.2	1.47
0917	946	12.7	1.73
0918	960	14.0	2.06
0918	974	13.1	3.00
0919	990	15.8	2.75

coast, *i.e.*, for Goa, Vengurla, Devgarh and Ratnagiri, we find the average rainfall rate was 2.8 mm per hour for the 24-hour period ending on 0300 GMT of 21st. Thus the dynamical consideration can account for 50% of the rainfall. The rest of the rainfall may be due to coastal convergence and influence of orography.

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TABLE 1 (c)

Radiosonde, 00 GMT Goa
Lat. 15°29′N, Long. 73°49′E Date: 20 June 1979

Pressure level (mb)	Wind components (mps)	
	W'ly+ve	S'ly+ve
1000	—2.1	+2.1
950	9.8	1.7
900	9.8	—1.7
850	8.9	—1.6
800	13.0	0.0
750	13.9	1.2
700	10.0	0.9
650	10.0	0.9
600	12.0	—1.0
550	12.8	—2.3

TABLE 2

Lat. 16° 48′N, Long. 72° E, Date : 20 June 1979

Pressure (mb)	Divergence in 10^{-5} sec^{-1}	Vorticity in 10^{-5} sec^{-1}
1000	—15.64	—8.53
975	—20.13	10.93
950	—22.18	13.32
925	—16.73	13.98
900	3.22	14.10
875	19.73	7.97
850	—3.87	13.38
825	0.55	11.76
800	1.89	13.50
775	—2.28	5.74
750	—2.61	15.47
725	—1.01	13.21
700	—0.39	8.70
675	0.18	7.18
650	— 3.62	9.40
625	—6.19	6.54
600	—6.47	4.97
575	6.26	—10.97
550	13.09	—17.64

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A. K. MUKHERJEE
U. S. DE
K. C. SINHA RAY

Meteorological Office, Pune
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