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Weather in India

HOT WEATHER SEASON (March – May 2002)*

1. Introduction

Pre-monsoon rainfall, mostly due to thunderstorm activity was above normal in most parts of north India in the month of May. Season's rainfall was *excess*† in 10 meteorological sub-divisions (Gangetic West Bengal, Orissa, Bihar, east Uttar Pradesh, west Uttar Pradesh, Uttaranchal, Haryana, Chattisgarh, coastal Karnataka and Kerala); *normal* in 13 meteorological sub-divisions (Andaman & Nicobar Islands, Arunachal Pradesh, Assam & Meghalaya, Nagaland-Manipur-Mizoram-Tripura, Sub-Himalayan West Bengal & Sikkim, Jharkhand, Punjab, Himachal Pradesh, west Rajasthan, east Rajasthan, Vidarbha, south interior Karnataka and Lakshadweep); *deficient* in 8 meteorological sub-divisions (Jammu & Kashmir, west Madhya Pradesh, east Madhya Pradesh, coastal Andhra Pradesh, Telangana, Rayalaseema, Tamil Nadu and north interior Karnataka) and *scanty* in 5 meteorological sub-divisions (Gujarat Region, Saurashtra & Kutch, Konkan & Goa, Madhya Maharashtra and Marathwada). Actual rainfall and its departures for each month and season as a whole are given in Table 1 while sub-divisional rainfall departures for the season March-May 2002 are shown in Fig. 1.

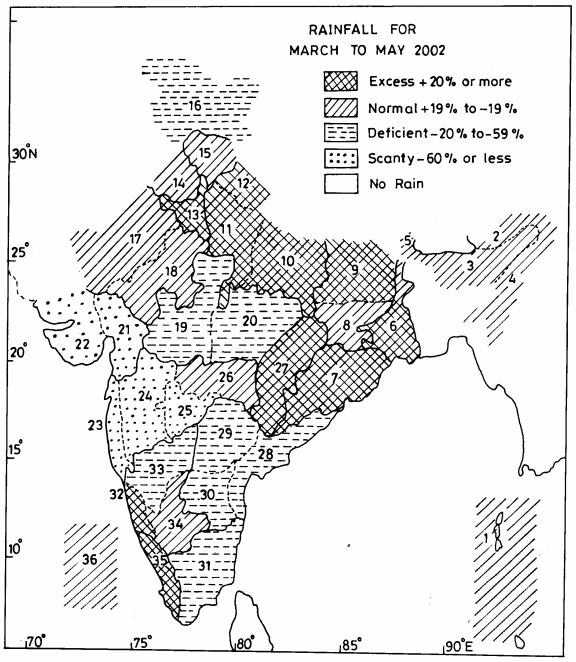

Fig. 1. Sub-divisionwise seasonal rainfall departure from normal (%) for the period 1 March – 31 May 2002. Sub-divisions are indicated by number on the maps & bold letters in legend. The rainfall anomaly values for these 36 sub-divisions are indicated below

1	–8	**7**	36	**13**	130	**19**	–32	**25**	–60	**31**	–36
2	–12	**8**	–6	**14**	–6	**20**	–28	**26**	14	**32**	45
3	–12	**9**	67	**15**	–19	**21**	–97	**27**	21	**33**	–22
4	3	**10**	37	**16**	–30	**22**	–88	**28**	–39	**34**	–19
5	10	**11**	24	**17**	–7	**23**	–87	**29**	–34	**35**	25
6	32	**12**	65	**18**	10	**24**	–78	**30**	–42	**36**	–4

2. Chief features

(*i*) A Cyclonic Storm formed over Arabian Sea during6-10 May and a Deep Depression over the Bay of Bengal during 11-12 May.

(*ii*) *Severe Heat Wave/ Heat Wave* conditions prevailed over some parts of the country during second fortnight of April and during first fortnight of May 2002.

(*iii*) Southwest monsoon advanced over the southern tip of India by the end of May 2002.

(*iv*) Good pre-monsoon thundershower activity occurred over many parts of the country.

3. Significant features during different months

3.1. *March*

3.1.1. *Weather and associated synoptic features*

Details of weather systems formed during the month are given in Table 2.

Rain/snow occurred at *most places* or at *many places* on 4 to 7 days in Uttaranchal and Jammu & Kashmir. Rain/snow also occurred *at a few places* or *at isolated places* on 1 to 3 days in Jammu & Kashmir. Rain/thundershowers occurred at most places or at many places on 4 to 7 days in Arunachal Pradesh, Assam & Meghalaya and Sub-Himalayan West Bengal & Sikkim and on 1 to 3 days in Nagaland-Manipur-Mizoram-Tripura, Gangetic West Bengal, Orissa, Bihar, Konkan & Goa, Madhya Maharashtra and Kerala. Rain/thundershowers also occurred either at a few places or at isolated places on 10 to 16 days in Andaman & Nicobar Islands, Arunachal Pradesh, Assam & Meghalaya, Sub-Himalayan West Bengal & Sikkim, Gangetic West Bengal and Orissa; 4 to 9 days in Nagaland-Manipur-Mizoram-Tripura, Jharkhand, Bihar,

† Definitions of terms given in *italics* are given in the Appendix.

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TABLE 1

Sub-divisionwise rainfall (mm) for each month and season as a whole (March-May 2002)

S. No	Meteorological sub – divisions	March			April			May			Season		
		Actual (mm)	Normal (mm)	Dep. (%)	Actual (mm)	Normal (mm)	Dep. (%)	Actual (mm)	Normal (mm)	Dep. (%)	Actual (mm)	Normal (mm)	Dep. (%)
1.	A & N Islands	43	31	39	70	85	–17	347	372	–7	460	487	–6
2.	Arunachal Pradesh	123	121	2	266	263	1	229	321	–29	619	705	–12
3.	Assam & Meghalaya	89	92	–3	286	223	28	292	441	–34	667	755	–12
4.	Naga., Mani., Mizo. and Tri.	58	65	–10	148	175	–15	341	290	18	547	530	3
5.	Sub-Himalayan West Bengal & Sikkim	93	81	14	217	139	56	235	276	–15	544	495	10
6.	Gangetic West Bengal	27	27	0	79	48	64	120	96	25	226	171	32
7.	Orissa	20	23	–12	38	30	27	81	50	62	139	102	36
8.	Jharkhand	11	18	–37	22	21	4	46	44	3	79	83	–6
9.	Bihar	3	11	–74	29	17	73	93	47	97	125	75	67
10.	East Uttar Pradesh	0	9	–99	2	5	69	39	15	154	40	29	37
11.	West Uttar Pradesh	2	11	–81	2	5	64	32	13	151	35	29	24
12.	Uttaranchal	70	44	59	65	25	158	61	50	22	196	119	65
13.	Haryana, Chandigarh & Delhi	13	14	–8	3	7	–57	67	14	363	83	36	130
14.	Punjab	12	26	–54	9	12	–30	30	16	92	50	53	–6
15.	Himachal Pradesh	78	95	–17	65	55	19	27	59	–55	170	209	–19
16.	Jammu & Kashmir	98	130	–24	69	87	–21	32	66	–51	199	283	–30
17.	West Rajasthan	1	5	–84	3	3	–16	14	11	27	17	19	–7
18.	East Rajasthan	**	4	–92	3	2	8	15	10	49	18	16	10
19.	West Madhya Pradesh	2	7	–63	4	2	121	4	7	–43	11	16	–32
20.	East Madhya Pradesh	4	15	–73	1	6	–90	16	8	104	21	29	–28
21.	Gujarat region	**	1	–87	0	1	–100	**	6	–98	**	8	–97
22.	Saurashtra & Kutch	1	1	–48	0	1	–100	0	3	–99	1	5	–88
23.	Konkan & Goa	**	0	336	**	4	–97	4	34	–87	5	38	–87
24.	Madhya Maharashtra	**	4	–92	7	10	–36	3	29	–90	10	43	–78
25.	Marathwada	**	6	–93	5	6	–16	7	20	–64	12	31	–60
26.	Vidarbha	9	12	–29	11	7	51	14	10	38	34	30	14
27	Chattisgarh	13	7	103	9	13	–27	22	18	25	44	37	21
28.	Coastal Andhra Pradesh	1	10	–87	20	31	–34	34	51	–33	56	92	–39
29.	Telangana	1	9	–86	6	26	–76	33	27	24	41	62	–34
30.	Rayalaseema	1	7	–84	6	26	–79	45	55	–19	51	88	–42
31.	Tamil Nadu	9	21	–59	17	46	–62	60	69	–12	86	135	–36
32.	Coastal Karnataka	0	7	–99	29	34	–16	233	140	67	261	180	45
33.	North interior Karnataka	1	5	–83	20	26	–21	50	59	–16	71	90	–22
34.	South interior Karnataka	3	10	–69	32	46	–31	94	103	–9	129	159	–19
35.	Kerala	35	36	–4	117	111	5	341	248	37	492	395	25
36.	Lakshadweep	7	12	–37	24	42	–44	190	178	7	221	231	–4

** Indicates amounts between 0.1 to 0.4 mm. (Amounts less than 0.1 is rounded off to 0)

TABLE 2

Details of the weather systems during March 2002

S. No (1)	System (2)	Duration (3)	Place of first location (4)	Direction of movement (5)	Place of dissipation (6)	Remarks (7)
(**A**)	*Western disturbances /Eastwards movings systems*					
1.	Cyclonic circulation upto lower tropospheric levels	3 – 6	North Pakistan and adjoining Jammu & Kashmir	Northeasterly		Moved away northeastwards
2.	Cyclonic circulation upto mid tropospheric levels	7 – 12	North Pakistan and adjoining Jammu & Kashmir	Do		Do
3.	Cyclonic circulation upto lower tropospheric levels	12 – 15	North Pakistan and adjoining Jammu & Kashmir	Do		Do
4.	Cyclonic circulation upto mid tropospheric levels	22 – 24	North Pakistan and adjoining Jammu & Kashmir and Punjab	Eastnorth-easterly		Moved away eastnortheastwards
5.	Cyclonic circulation upto mid tropospheric levels	25 – 27	North Pakistan and adjoining Jammu & Kashmir	Northeasterly		Moved away northeastwards
6.	Do	26 Mar – 2 Apr	Central Pakistan	Do		Do
(**B**)	*Western disturbances as an induced systems*					
1.	Induced low pressure area	1 – 3	West Rajasthan and adjoining areas	Northeasterly	West Madhya Pradesh and adjoining areas of east Rajasthan and west Uttar Pradesh	Associated cyclonic circulation extended upto 1.5 kms a.s.l. On 3, it lay over east Uttar Pradesh and neighbourhood with a trough at 1.5 kms a.s.l. upto coastal Andhra Pradesh through Chattisgarh. On 4, the system lay as a trough in lower level westerlies from Sub-Himalayan West Bengal & Sikkim to Gangetic West Bengal. On 5, it lay as a cyclonic circulation over Sub-Himalayan West Bengal & Sikkim and adjoining areas. It lay over Assam on 6 and became less marked on 7
2.	Do	8 – 9	South Pakistan and adjoining areas of west Rajasthan	Do	West Rajasthan and neighbourhood	Associated cyclonic circulation extended upto 2.1 kms a.s.l. It lay over Punjab and adjoining areas of Haryana on 10, over Uttaranchal and neighbourhood on 11 and moved away eastnortheastwards on 12
3.	Cyclonic circulation upto lower troposhperic levels	13 – 14	Central parts of Rajasthan	Easterly	Central parts of Madhya Pradesh	Became less marked on 15
4.	Cyclonic circulation upto mid troposhperic levels	20 – 23	Central Pakistan and adjoining areas of west Rajasthan	Do	West Madhya Pradesh and neighbourhood	Became less marked on 24
5.	Low pressure area	24 – 26	Central Pakistan and adjoining west Rajasthan	Northeasterly	South Uttar Pradesh and adjoining areas of Madhya Pradesh	Associated cyclonic circulation extended in the lower levels. It lay over Telangana, Marathwada and neighbouring areas on 28 and became less marked 29
6.	Cyclonic circulation mid tropospheric levels	31 Mar – 1 Apr	Central Pakistan and adjoining areas west Rajasthan and Punjab	Easterly	West Rajasthan and neighbourhood	

TABLE 2 (*Contd.*)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
(**C**) *Other cyclonic circulations*						
1.	Lower troposhperic levels	8 – 9	West Madhya Pradesh and adjoining areas of east Rajasthan	Easterly	Central parts of Madhya Pradesh	Became less marked on 10
2.	Do	7 – 8	Sub-Himalayan West Bengal & Sikkim	Stationary	*In situ*	Became less marked on 9
3.	Lower levels	11 – 13	Sub-Himalayan West Bengal & Sikkim and adjoining areas of Bihar and Gangetic West Bengal	Do	Do	It was seen as a trough in lower levels over the same region from 14 to 16
4.	Mid tropospheric levels	18 – 20	Assam & Meghalaya and neighbourhood	Do	Do	Became less marked on 21
5.	Lower tropospheric levels	15	Orissa and adjoining areas of Chattisgarh	Do	Do	
6.	Do	21 – 22	Southwest Madhya Pradesh and neighbourhood	Southeasterly	Vidarbha and neighbourhood	Became less marked on 23
7.	Lower levels	25-27	Gangetic West Bengal and neighbourhood	Quasi-stationary		It was seen as a trough from Sub-Himalayan West Bengal & Sikkim to north Bay on 28 and became less marked thereafter
(**D**) *Troughs in easterly*						
1.	Lower levels	14	Konkan & Goa to Chattisgarh through Madhya Maharashtra and Telangana	Stationary	*In situ*	Became less marked on 15
2.	At sea level	13 – 14	Lakshadweep area to south Gujarat coast	Stationary	*In situ*	
3.	Trough of low on sea level	16 – 20	Southwest Bay	Stationary	*In situ*	
4.	At sea level	17 – 20	Kerala coast to north Maharashtra coast	Do	Do	
5.	At sea level	30 Mar – 1 Apr	Kerala to Vidarbha through interior Karnataka	Quasi-stationary	Lakshadweep area to west Madhya Pradesh	Became less marked on 2 April
(**E**) *Troughs in westerly*						
1.	Lower levels	15	Uttaranchal to west Madhya Pradesh through west Uttar Pradesh	Stationary	*In situ*	Became less marked on 16
(**F**) *Other Troughs*						
1.	Lower levels	23	Sub-Himalayan West Bengal & Sikkim to Orissa	Quasi-stationary	East Uttar Pradesh to Lakshadweep area	Became less marked on 24
2.	Lower levels	28 – 29	Vidarbha to south Tamil Nadu	Quasi-stationary	Telangana and neighbourhood to Lakshadweep	Became less marked on 30

west Uttar Pradesh, Uttaranchal, Haryana, Punjab, Himachal Pradesh, west Rajasthan, Vidarbha, Chattisgarh, Tamil Nadu, south interior Karnataka and Kerala and on 1 to 3 days in east Uttar Pradesh, east Rajasthan, west Madhya Pradesh, east Madhya Pradesh, Gujarat Region, Saurashtra & Kutch, Konkan & Goa, Madhya Maharashtra, Marathwada, coastal Andhra Pradesh, Telangana, Rayalaseema, north interior Karnataka and Lakshadweep. *Heavy to very heavy rain* or snow has occurred on 1 to 2 days in Uttaranchal and Himachal Pradesh. Heavy rain also occurred on 1 day each in Assam & Meghalaya, Tamil Nadu, south interior Karnataka and Kerala.

3.1.2. *Rainfall distribution*

Month's rainfall was *excess* in 4 meteorological sub-divisions (Andaman & Nicobar Islands, Uttaranchal, Konkan & Goa and Chattisgarh); *normal* in 9 meteorological sub-divisions (Arunachal Pradesh, Assam & Meghalaya, Nagaland-Manipur-Mizoram-Tripura, Sub-Himalayan West Bengal & Sikkim, Gangetic West Bengal, Orissa, Haryana, Himachal Pradesh and Kerala); *deficient* in 7 meteorological sub-divisions (Jharkhand, Punjab, Jammu & Kashmir, Saurashtra & Kutch, Vidarbha, Tamil Nadu and Lakshadweep) and *scanty* in 16 meteorological sub-divisions (Bihar, East Uttar Pradesh, west Uttar Pradesh, west Rajasthan, east Rajasthan, west Madhya Pradesh, east Madhya Pradesh, Gujarat Region, Madhya Maharashtra, Marathwada, coastal Andhra Pradesh, Telangana, Rayalaseema, coastal Karnataka, north interior Karnataka and south interior Karnataka). Principal amounts of rainfall are given in Table 5.

3.1.3. *Temperature distribution*

Heat Wave conditions prevailed on 1 to 3 days in west Rajasthan and Gujarat Region and Saurashtra & Kutch. *Hot Day* conditions prevailed on 2 to 3 days in Saurashtra & Kutch and Konkan & Goa. Day temperatures were *appreciably* to *markedly* above normal on 14 to 17 days in Himachal Pradesh, Jammu & Kashmir and west Rajasthan; on 11 to 13 days in east Rajasthan, east Madhya Pradesh, west Madhya Pradesh, Saurashtra & Kutch, Chattisgarh and coastal Andhra Pradesh; 6 to 9 days in Assam & Meghalaya, Orissa, Jharkhand, Haryana and Telangana; on 3 to 5 days in Nagaland-Manipur-Mizoram-Tripura, east Uttar Pradesh, Uttaranchal, Punjab, Gujarat Region, Konkan & Goa, Madhya Maharashtra, Marathwada, Rayalaseema, Tamil Nadu, coastal Karnataka, north interior Karnataka and on 1 to 2 days in West Bengal & Sikkim, Bihar, west Uttar Pradesh, Vidarbha and south interior Karnataka. They were *appreciably* to *markedly* below normal on 5 to 7 days in Assam & Meghalaya, Sub-Himalayan West Bengal & Sikkim and Gujarat Region and on 1 to 3 days in Nagaland-Manipur-Mizoram-Tripura, Orissa, east Uttar Pradesh, Uttaranchal, Haryana, Punjab, Jammu & Kashmir, Rajasthan, west Madhya Pradesh, Madhya Maharashtra, Marathwada, Vidarbha and Telangana. During the month, the highest temperature of 42° C was recorded at Surat in Gujarat Region on 19 March.

Night temperature were *appreciably* to *markedly* below normal on 4 to 6 days in Jharkhand, east Uttar Pradesh, east Rajasthan and Madhya Maharashtra and on 1 to 3 days in Assam & Meghalaya, Nagaland-Manipur-Mizoram-Tripura, Sub-Himalayan West Bengal & Sikkim, Gangetic West Bengal, Orissa, Bihar, west Uttar Pradesh, Haryana, Punjab, Himachal Pradesh, Gujarat Region, Marathwada, coastal Andhra Pradesh, Telangana, Rayalaseema and south interior Karnataka. They were *appreciably to markedly above normal* on 20 days in west Rajasthan; on 14 to 17 days in Haryana, east Rajasthan and Saurashtra & Kutch; on 11 to 12 days in east Uttar Pradesh, Himachal Pradesh, west Madhya Pradesh and Gujarat Region; on 6 to 9 days in Assam & Meghalaya, Gangetic West Bengal, Orissa, Bihar, Uttaranchal, Punjab, Jammu & Kashmir, east Madhya Pradesh, Madhya Maharashtra, Chattisgarh, coastal Andhra Pradesh and Telangana; on 3 to 5 days in Sub-Himalayan West Bengal & Sikkim, Jharkhand, west Uttar Pradesh, Marathwada, Vidarbha and Rayalaseema and on 1 to 2 days in Tamil Nadu, coastal Karnataka, north interior Karnataka and south interior Karnataka. During the month, the lowest temperature of 7.6° C was recorded at Adampur in Punjab on 7 March.

3.1.4. *Disastrous weather events and damages*

According to press reports, 5 people died in Assam due to thunder squall. In the last week of March, Nor'westers caused damage to several houses as well as standing crops and also uprooted many trees in West Bengal.

3.2. *April*

3.2.1. *Weather and associated synoptic features*

Details of weather systems formed during the month are given in Table 3.

Rain/thundershowers occurred *at most places or at many places* on 15 to 16 days in Arunachal Pradesh, Assam & Meghalaya and Sub-Himalayan West Bengal & Sikkim; on 4 to 9 days in Nagaland-Manipur-Mizoram-Tripura, Gangetic West Bengal, Jharkhand, Jammu & Kashmir and Marathwada and on 1 to 3 days in

TABLE 3

Details of the weather systems during April 2002

S. No (1)	System (2)	Duration (3)	Place of first location (4)	Direction of movement (5)	Place of dissipation (6)	Remarks (7)
(**A**) *Western disturbances /Eastward moving systems*						
1.	Cyclonic circulation upto mid tropospheric levels	4 – 7	Central Pakistan and adjoining west Rajasthan	Northeasterly	-	Moved away northeastwards
2.	Do	6 – 9	North Pakistan and adjoining areas of Jammu & Kashmir	Eastnorth-easterly	-	Moved away eastnortheastwards
3.	Do	11 – 15	North Pakistan and adjoining Jammu & Kashmir	Do	-	Do
4.	Do	15 – 19	North Pakistan and adjoining Jammu & Kashmir and neighbourhood	Do	-	Moved away northeastwards
5.	Do	22 – 24	North Pakistan and adjoining Jammu & Kashmir	Do	-	Do
6.	Low pressure area	24 – 25	North Pakistan and adjoining Jammu & Kashmir and Punjab	Easterly	Northwest Rajasthan and neighbourhood	Associated cyclonic circulation extended upto mid tropospheric levels. It lay over west Uttar Pradesh and neighbourhood on 26 and moved away northeastwards on 27
7.	Cyclonic circulation upto mid tropospheric levels	27 – 30	North Pakistan and adjoining areas of Jammu & Kashmir and neighbourhood	Easterly	Bihar	Became less marked on 1 May
8.	Do	29 Apr – 1 May	North Pakistan and adjoining Jammu & Kashmir	Northeasterly	-	Moved away northeastwards
(**B**) *Western disturbances and Induced systems*						
1.	Cyclonic circulation upto mid tropospheric levels	6	South Pakistan and adjoining Saurashtra & Kutch	Stationary	*In situ*	It lay as a trough on 7 over the same area
2.	Cyclonic circulation upto lower tropospheric levels	8 – 10	West Rajasthan and adjoining areas of south Pakistan	Northeasterly	West Rajasthan	Became less marked on 11
3.	Cyclonic circulation in the lower levels	13 – 15	Northern parts of Rajasthan and neighbourhood	Northeasterly	-	Moved away northeastwards
(**C**) *Other cyclonic circulations*						
1.	Mid tropospheric levels	1 – 12	West Madhya Pradesh and neighbourhood	Northeasterly	Assam & Meghalaya	Became less marked on 13

TABLE 3 (*Contd.*)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
(**D**) *East-west troughs*						
1.	Mid tropospheric levels	16 – 18	East Uttar Pradesh to Nagaland through northern parts of Gangetic West Bengal	Quasi-stationary	Bihar to north Orissa	Became less marked on 19
2.	Lower levels	19 Apr – 12 May	Bihar to Assam & Meghalaya along Lat. 25° N	Quasi-stationary	West Uttar Pradesh to Manipur	Became less marked on 13 May
(**E**) *Troughs in westerly*						
3.	Lower tropospheric levels	6 – 9	East Rajasthan and adjoining areas of west Madhya Pradesh	Easterly	Vidarbha and neighbourhood	Became less marked on 10
(**F**) *Other troughs*						
1.	Lower levels	2 – 5	West Uttar Pradesh to south Tamil Nadu through Madhya Pradesh, Vidarbha and interior Andhra Pradesh	Quasi-stationary	Bihar to Tamil Nadu across Gangetic West Bengal, Orissa, Chattisgarh, Vidarbha and interior Andhra Pradesh	Became less marked on 6
2.	Trough/wind discontinuity	6 – 10	Eastern parts of east Rajasthan to coastal Karnataka through interior Maharashtra	Southeasterly	Interior Maharashtra to Kerala	Became less marked on 11
3.	Do	11 Apr – 13 May	Sub-Himalayan West Bengal & Sikkim to Kerala through Gangetic West Bengal, Chattisgarh and interior Karnataka	Quasi-stationary	Gangetic West Bengal to Kerala	Became less marked on 14

Andaman & Nicobar Islands, Orissa, Bihar, Uttaranchal, Himachal Pradesh, west Madhya Pradesh, Madhya Maharashtra, Kerala and Lakshadweep. Rain/thundershowers occurred at *a few places* or at *isolated place*s on 21 to 29 days in Tamil Nadu, south interior Karnataka and Kerala; on 11 to 20 days in Andaman & Nicobar Islands, Arunachal Pradesh, Assam & Meghalaya, Nagaland-Manipur-Mizoram-Tripura, Orissa, Himachal Pradesh, coastal Andhra Pradesh, coastal Karnataka and north interior Karnataka; on 4 to 10 days in Sub-Himalayan West Bengal & Sikkim, Gangetic West Bengal, Jharkhand, Bihar, Punjab, Konkan & Goa, Madhya Maharashtra, Vidarbha, Chattisgarh, Telangana and Rayalaseema and on 1 to 3 days in east Uttar Pradesh, west Uttar Pradesh, Uttaranchal, Haryana, west Rajasthan, east Rajasthan, west Madhya Pradesh, Marathwada and Lakshadweep. *Very heavy rainfall* occurred on 1 day in Assam & Meghalaya. *Heavy rainfall* also occurred on 6 days in Assam & Meghalaya and on 1 to 2 days in Arunachal Pradesh, Nagaland-Manipur-Mizoram-Tripura, Sub-Himalayan West Bengal & Sikkim, Gangetic West Bengal, Orissa, Vidarbha, coastal Andhra Pradesh and Kerala.

3.2.2. *Rainfall distribution*

Rainfall was *excess* in 8 meteorological sub-divisions (Assam & Meghalaya, Sub-Himalayan West Bengal & Sikkim, Gangetic West Bengal, Orissa, Bihar, Uttaranchal, west Madhya Pradesh and Vidarbha); *normal*

TABLE 4

Details of the weather systems during May 2002

S. No (1)	System (2)	Duration (3)	Place of first location (4)	Direction of movement (5)	Place of dissipation (6)	Remarks (7)
(**A**) *Cyclonic storms/depressions*						
1.	Cyclonic Storm	6 – 10	Southeast Arabian Sea	Northwesterly	Arabia coast	Under the influence of a trough in the easterlies a depression formed over southeast Arabian Sea, which lay centered at 0300 UTC of 6 near Lat. 11.0° N/Long. 67.0° E. It moved in a northwesterly direction, intensified into a deep depression and lay centered at 0300 UTC of 7, near Lat. 13.5° N/Long. 64.5° E. Moving westwards, it weakened into a Depression at 0300 UTC of 8 and lay near Lat. 13.5° N/Long. 62.0° E. Further, moving in a westnorthwesterly direction, it again intensified into a deep depression at 0300 UTC of 9, and further into a cyclonic storm at 0600 UTC of 9 near Lat. 14.5° N/ Long 58.5° E and crossed Arabia coast around 100900 UTC
2.	Deep Depression	11 – 12	South Andaman Sea	Northnorth-easterly	Myanmar	Under the influence of a trough in the low level easterlies, a depression formed over south Andaman Sea and lay centered at 0300 UTC of 11, near Lat. 12.5° N/Long. 96.0° E. Moving in a northnortheasterly direction, it intensified into a deep depression over north Andaman Sea and lay centered near Lat. 14.5° N/Long. 96.5° E, at 1200 UTC of 11. It crossed Tenasserim coast on 12 and lay over south Myanmar and adjoining Thailand at 0300 UTC of 12, near Lat. 17.5° N/Long. 97.0° E. Subsequently, moving in a northerly direction, it rapidly weakened into a low pressure area over Myanmar
(**B**) *Western disturbances / Eastward moving cyclonic circulations*						
1.	Western Disturbance as an upper air system (Mid tropospheric levels)	5 – 8	North Pakistan and adjoining Jammu & Kashmir	Easterly		Moved away northeastwards
2.	Do	21	Central Pakistan and adjoining areas of west Rajasthan	Northeasterly	-	Do
3.	Do	28 – 29	Jammu & Kashmir and neighbourhood	Do	-	Do
(**C**) *Induced cyclonic circulations*						
1.	Mid tropospheric level	1 – 8	Northern parts of Rajasthan	Easterly	Jharkhand and neighbourhood	Became less marked on 9
2.	Mid tropospheric levels	6 – 7	Central Pakistan and adjoining Rajasthan	Northeasterly	North Rajasthan and neighbourhood	Became less marked on 8
3.	Lower tropospheric levels	13 – 17	Central Pakistan	Eastnorth-easterly	-	Moved away eastnortheastwards
4.	Lower levels	19 – 20	Punjab and adjoining areas of Haryana and Uttaranchal	Northeasterly	-	Moved away northeastwards

TABLE 4 (*Contd.*)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
5.	Lower levels	24 May – 1 Jun	Punjab, Haryana, Himachal Pradesh	Southeasterly	Chattisgarh and neighbourhood	A trough from this system was observed at 0.9 km a.s.l. upto north Karnataka coast on 2. Details of this given in Monsoon Summary
6.	Do	25 – 30	Central Pakistan and adjoining west Rajasthan	Eastnorth-easterly	-	Moved away eastnortheastwards
7.	Do	29 May – 4 Jun	Central Pakistan and adjoining Rajasthan	Northeasterly	-	Do
(**E**) *Other cyclonic circulations*						
1.	Lower levels	9 – 15	West Uttar Pradesh and neighbourhood	Easterly	Eastern parts of Uttar Pradesh and adjoining Bihar	A trough from this system extended upto Nagaland-Manipur-Mizoram-Tripura through Bangladesh on 14 and 15
2.	Lower tropospheric levels	11 –17	Gangetic West Bengal and adjoining Jharkhand	Quasi-stationary	Chattisgarh and neighbourhood	An east-west trough at 0.9 km a.s.l. extended from this system to Assam & Meghalaya on 13 and became less marked on 14. Another trough from this system at 0.9 km a.s.l. extended upto Tamil Nadu on 15
3.	Lower Levels	23 – 26	Jharkhand and adjoining Gangetic West Bengal	Quasi-stationary	Jharkhand and adjoining Bihar	Became less marked on 27
(**F**) *East-west trough*						
1.	Mid tropospheric levels	14	Along 12° N across Peninsular India	Stationary	*In situ*	Became less marked on 15
2.	Lower levels	24 – 30	Jharkhand to Nagaland-Manipur-Mizoram-Tripura through Bangladesh	Quasi-stationary	Chattisgarh to Nagaland-Manipur-Mizoram-Tripura through Bangladesh	Became less marked on 31
(**G**) *Other troughs*						
1.	Sea level	19 – 23	Northeast Bay to north Andaman Sea across east-central Bay	Quasi-Stationary	North Bay to north Andaman Sea across east-central Bay	Became less marked on 24

in 10 meteorological sub-divisions (Andaman & Nicobar Islands, Arunachal Pradesh, Nagaland-Manipur-Mizoram-Tripura, Jharkhand, Himachal Pradesh, west Rajasthan, east Rajasthan, Marathwada, coastal Karnataka and Kerala); *deficient* in 9 meteorological sub-divisions (Haryana, Punjab, Jammu & Kashmir, Madhya Maharashtra, Chattisgarh, coastal Andhra Pradesh, north interior Karnataka, south interior Karnataka and Lakshadweep) and *scanty* in 7 meteorological sub-divisions (east Uttar Pradesh, west Uttar Pradesh, east Madhya Pradesh, Konkan & Goa, Telangana, Rayalaseema and Tamil Nadu). There was no rain in 2 meteorological sub-divisions (Gujarat Region and Saurashtra & Kutch). The principal amounts of rainfall (cm) are given in Table 5.

3.2.3 *Temperature distribution*

Severe heat wave conditions prevailed on 1 day each in west Rajasthan and east Rajasthan. *Heat wave conditions* prevailed on 12 to 14 days in west Rajasthan and east Rajasthan; on 5 to 6 days in Haryana, west Madhya Pradesh and Vidarbha and on 1 to 3 days in east Uttar Pradesh, west Uttar Pradesh, Punjab, east Madhya Pradesh, Gujarat Region, Saurashtra & Kutch and Chattisgarh. *Hot day conditions* prevailed on 1 to 3 days in Haryana, west Rajasthan, east Rajasthan, Saurashtra & Kutch and Tamil Nadu. Day temperatures were *appreciably to markedly* above normal on 15 to 18 days in Himachal Pradesh, Jammu & Kashmir, east Rajasthan, west Madhya Pradesh and east Madhya Pradesh; on 11 to 14 days in Uttaranchal, Haryana, west Rajasthan, Saurashtra & Kutch, Madhya Maharashtra, Vidarbha and Telangana; on 8 to 10 days in Gujarat Region, Chattisgarh and coastal Andhra Pradesh; on 4 to 7 days in Bihar, east Uttar Pradesh, west Uttar Pradesh, Punjab, Konkan & Goa, Marathwada, Rayalaseema, Tamil Nadu, north interior Karnataka and south interior Karnataka and on 1 to 3 days in Assam & Meghalaya, Orissa and coastal Karnataka. They were *appreciably to markedly* below

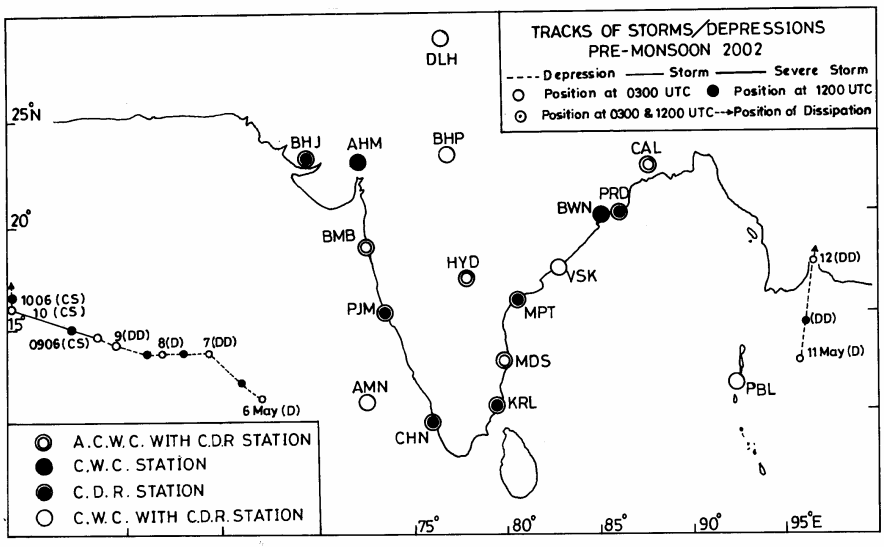

Fig. 2. Track of the cyclonic storm (March-May 2002)

normal on 12 to 13 days in Assam & Meghalaya and Sub-Himalayan West Bengal & Sikkim, on 8 days in Nagaland-Manipur-Mizoram-Tripura, Gangetic West Bengal and Bihar; on 3 to 5 days in Orissa, Jharkhand, east Uttar Pradesh, Jammu & Kashmir and Gujarat Region and on 1 to 2 days in Uttaranchal, Haryana, Punjab, Himachal Pradesh, east Madhya Pradesh, Saurashtra & Kutch, Vidarbha and Telangana. During the month, the highest temperature of 45.8° C was recorded at Pusad (Vidarbha) on 17 April.

3.2.4. *Disastrous weather events and damage*

According to press reports, 78 people (55 in northern parts of India, 13 in West Bengal, 5 in Kerala, 4 in Maharashtra and 1 in Assam & Meghalaya) died due to Heavy rain, Lightning and Thundersquall *etc.*

3.3. *May*

3.3.1. (*i*) *Cyclonic storm over the Arabian Sea (6-10 May)*

Under the influence of a trough in the easterlies a depression formed over southeast Arabian Sea, which lay centred at 0300 UTC of 6 near Lat. 11.0° N / Long. 67.0° E. Moving in a northwesterly direction it lay centred at 061200 UTC near Lat. 12.0° N / Long. 66.0° E. It further moved in a northwesterly direction and intensified into Deep Depression over southern parts of central Arabian Sea which lay at 0300 UTC of 7 near Lat. 13.5° N / Long. 64.5° E. It further moved in a westerly direction and lay over west central Arabian Sea at 071200 UTC near Lat. 13.5° N / Long. 63.0° E. It weakened into Depression at 0300 UTC of 8 near Lat. 13.5° N / Long. 62.0° E. Continuing its westward movement, it lay centred at 081200 UTC near Lat. 13.5° N / Long. 61.0° E. It once again intensified into a Deep Depression and lay at 0300 UTC of 9 near Lat. 14.0° N / Long. 59.5° E. It further intensified into a Cyclonic Storm near Lat. 14.5° N / Long. 58.5° E at 090600 UTC. The Cyclonic Storm lay at 091200 UTC near Lat. 15.0° N / Long. 57.0° E. It lay at 0600 UTC of 10 near Lat. 16.5° N / Long. 54.0° E close to Arabia coast. It crossed Arabia coast around 100900 UTC and weakened thereafter.

The system did not cause any weather or damage over the country. However, it caused heavy rainfall of the order of 6 to 7 cm in Salalah (Oman). Storm surge caused rough sea conditions raising wave height upto 4 meter. The Cyclone left 9 people dead and several injured in Arabia.

(*ii*) *Deep depression over the Bay of Bengal (11-12 May)*

Under the influence of a trough in the lower level easterlies, a depression formed over south Andaman Sea and lay centered at 0300 UTC of 11, near Lat. 12.5° N/Long. 96.0° E, about 400 km eastnortheast of Port Blair. Moving in a northnortheasterly direction, it intensified into a Deep Depression over north Andaman Sea and lay centered near Lat. 14.5° N / Long. 96.5° E, about 480 km northeast of Port Blair at 1200 UTC of 11.

TABLE 5

Principal amounts of rainfall (1 cm and above)
(March, April and May 2002)

Date	March	April	May
(1)	(2)	(3)	(4)
1.	Gangtok & Jubbal 2 each, Bhubaneswar, Pehowa & Bhuntar 1 each	Cooch Behar 3, Jubbal 2, Bhuntar, Solan & Banihal 1 each	Silchar 5
2.	Jubbal 9, Pachhad 7, Ambala 6, Shimla 5, Guhla & Dehra Dun 4 each, Manali, Bhuntar & Katra 2 each, Patiala & Jammu 1 each	Dadahu 5, Malda & Silchar 4 each, Shillong 3, Guwahati, Paonta & Jagdalpur 2 each, Tezpur, Agartala, Pantnagar, Mukteshwar, Bhuntar, Manali, Bajinath, Banihal, Srinagar, Jharsuguda & Kozhikode 1 each	Shillong 4, Silchar & Cooch Behar 2 each, Tezpur, Agartala & Sholapur 1 each
3.	Sundernagar 5, Shimla 4, Bhuntar 3, Quazigund, Batote & Dehra Dun 2 each, Agartala, Sarsawa, Ambala, Chandigarh, Patiala & Banihal 1 each	Agartala & Jalpaiguri 3 each, Malda, Silchar & Shillong 2 each, Gangtok, Diamond Harbour, Paradip & Bhagalpur 1 each	Tadong 11, Gangtok 7, Keonjhargarh & Tondi 3 each, Thiruvananthapuram 2, Kanyakumari, Shimla, Cooch Behar & Car Nicobar 1 each
4.	North Lakhimpur & Balasore 2 each, Agartala & Jalpaiguri 1 each	Digha 8, Kolkata 3, Balasore, Palayamkottai & Jalpaiguri 2 each, Guwahati, Tezpur & Gangtok 1 each	Palayamkottai 6, Tondi, Kozhikode & Nancowry 5 each, Car Nicobar, Tuticorin & Minicoy 3 each, Amini Divi, Guwahati, Shillong, North Lakhimpur, Dibrugarh & Gangtok 2 each, Pendra, Agartala, Kanyakumari, Madurai, Kochi & Thiruvananthapuram 1 each
5.	Dibrugarh 1	Visakhapatnam 7, Tuni 4, Mandya 3, Kolar Gold Field, Waltair & Kakinada 2 each, Bangalore 1	Adirampattinam, Tondi, Madurai & Kailashahar 5 each, Pamban 4, Uthagamandalam & Tuticorin 3 each, Tiruchirapalli 2, Nagapattinam, Coimbatore, Kanyakumari, Kozhikode & Agartala 1 each
6.	Nil	Agartala & Madurai 1 each	Silchar 5, Agartala, Berhampore & Patna 3 each, Bhagalpur, Kailashahar, Gangtok, Baghdogra, Shantiniketan & Minicoy 2 each, Amini Divi, Panjim & Bijapur 1 each
7.	Nil	Nasik & Satara 4 each, Pune, Aurangabad, Srinagar, Banihal & Batote 2 each, Nancowry & Bhang 1 each	Agartala & Gangtok 3 each, Balasore & Sholapur 2 each, Gopalpur, Gorakhpur, Bijapur, Thiruvananthapuram & Minicoy 1 each
8.	Kondul, Krishnanagar & Hyderabad 1 each	Indore 2, Rohtak, Banihal, Batote, Nabha & Kochi 1 each	Ananthapur 5, Shirali 4, Car Nicobar 3, Honavar 2, Bangalore, Salem, Uthagamandalam, Kondul & Ratnagiri 1 each
9.	Pahalgam 2, Katra, Banihal, Pendra & Balasore 1 each	Shantiniketan 5, Mahabaleshwar 4, Nizamabad, Berhampore, Bankura & Baghdogra 3 each, North Lakhimpur, Gangtok & Malda 2 each, Nancowry, Krishnanagar & Gwalior 1	Mysore 3, Pune & Chitradurga 2 each, Bellary 1
10.	Quazi Gund 6, Car Nicobar , Pahalgam & Srinagar 3 each, Jamshedpur, Amritsar & Shimla 1 each	Uthagamandalam 5, Silchar 4, Nancowry 2, Car Nicobar 1	Karur Paramthy 5, Salem 4, Mandya & Car Nicobar 3 each, Port Blair, Kondul, Silchar, Canning Town, Honavar & Ratnagiri 2 each, Panjim & Dharmapuri 1 each
11.	Rajgarh & Pahalgam 3 each, Bhuntar & Quazi Gund 2 each, Adampur & Shimla 1 each	Kollam 4, Alathur, Dibrugarh, Kailashahar, Gangtok & Kolkata 3 each, North Lakhimpur, Guwahati, Diamond Harbour & Punalur 2 each, Kollengode, Kolkata & Digha 1 each	Pendra 7, Tiruchirapalli 6, Jalpaiguri 5, Nancowry 4, Tezpur 3, Maya Bandar, Kondul, Guwahati, Agartala, Bhagalpur, Gadag & Mysore 1 each

TABLE 5 (*Contd.*)

(1)	(2)	(3)	(4)
12.	Nil	Thiruvalla 3, Karipur, Kollam, Gangtok, Malda, Visakhapatnam & Guwahati 2 each, Tezpur & Palayamkottai 1 each	Maya Bandar 8, Tezpur 6, Hut Bay 5, Imphal 3, Guwahati & Kolkata 2 each, Agartala, Chennai & Kochi 1 each
13.	Nil	Chikmagalur 6, Puri 3, Thiruvananthapuram 2, Shantiniketan, Cuttack, Gopalpur, Jagdalpur, Belgaum, Kochi, Madurai & Panambur 1 each	Nancowry & Port Blair 3 each, Coimbatore, Kailashahar, Thiruvananthapuram & Kochi 1 each
14.	Mumbai 1	Tuni, Coimbatore, Madurai & Palyamkottai 1 each	Kochi 11, Panambur 10, Tirupathi 9, Mangalore 8, Shirali 4, Hut Bay, Jamshedpur & Karipur 2 each, Kozhikode, Thiruvanathapuram & Minicoy 1 each
15.	Bhopal 1	Malda 6, Palayamkottai 2	Kurnool 8, Jalpaiguri 7, Pendra, Patna & Ambala 4 each, Hut Bay, Bhubaneswar, Sholapur, Nagpur, Sundernagar, Quazi Gund & Puri 3 each, Nancowry, Rentachintala, Mangalore, Paradip, Srinagar & Kolkata 2 each, Shimla, Hyderabad, Bellary, Sagar & Kochi 1 each
16.	Digha 4	Nil	Cuttack 6, Port Blair, Nancowry & Digha 4 each, Kalingapatnam 3, Canning Town, Kochi & Kodungallur 2 each, Jamshedpur, Agartala, Belgaum & Kodaikanal 1 each
17.	Nedumangad 6, Kottayam 4, Thiruvananthapuram 3, Kodaikanal & Valparai 2 each, Karaikal 1	Silchar 5, Guwahati 3, Thiruvananthapuram 1	Iirrikur 5, Nancowry, Ongole, Madurai & Mangalore 3 each, Port Blair, Nizamabad & Hyderabad 2 each, Gangtok, Canning Town, Anantpur, Chennai, Gadag, Chitradurga, Piravam & Kochi 1 each
18.	Gangtok 3	Roing & Sibsagar 5 each, Namsai & Gangtok 4 each, Chengannur 1	Cherthala 7, Kayamkulam 6, Bangalore & Coimbatore 5 each, Guwahati 4, Jagdalpur, Port Blair, Maya Bandar, Mangalore & Amini Divi 3 each, Honavar, Kozhikode & Thiruvananthapuram 2 each, Agartala, Ramgundam, Hyderabad, Pondicherry, Baghdogra & Parbhani 1 each
19.	Nil	Tezu 20, Roing 12, Pattangi 5, Cooch Behar 4, Sankeshwar & Alapuzha 2 each, Jagdalpur & Gadhinglaj 1 each	Kozhikode 21, Kudulu 19, Thodupuzha 17, Karipur 16, Houdurg, Devikulam & Perinthalmanna 15 each, Piravam 14, Alapuzha, Kochi & Vadakara 13 each, Karwar 11, Mangalore 6, Valparai & Jalpaiguri 5 each, Cooch Behar 4, Maya Bandar & Amini Divi 3 each, Honavar & Mangalore 2 each, Imphal, Agartala & Panjim 1 each
20.	Nil	Tezu 12, Kanjirapalli 7, Tadong 6, Pattangi 2, Shahuwadi 1	Cannur 15, Panambur 8, Tezpur 6, Mangalore 4, Amini Divi, Dibrugarh & Arki 3 each, Imphal, Gangtok & Karwar 2 each, Honavar, Shimla, Dehra Dun, Kozhikode & Kochi 1 each
21.	Nil	Jenapur 6, Perumbavur 5, Gangtok & Punalur 4 each, Khonsa & Mahabalsehwar 2 each	Silchar & Dibrugarh 5 each, Panambur & North Lakhimpur 4 each, Goalpara & Aluva 3 each, Agumbe, Amini Divi & Imphal 2 each, Guwahati, Gangtok, Ratnagiri, Kozhikode, Mangalore, Mysore, Kochi & Hut Bay 1 each
22.	Mavelikara 4, Gangtok & Nancowry 3 each, Kalimpong, Cherthala 2, Ranikhet 1	Chepan & Nedumangad 7 each, Shirali 6, Bhatkal & Kannur 5 each, Khonsa 4, Radhanagari 3, Bangana & Gulledagudda 2 each	Silchar 7, Kailashahar 4, Guwahati, Amini Divi, Shillong & Goalpara 3 each, Thiruvananthapuram 2, Tezpur, Agartala, Jalpaiguri & Maya Bandar 1 each
23.	Kokrajhar 6, Domohani & Hasimara 3 each, Jalpaiguri 2, Aryankavu 1	Punalur 5, Hosanagara 4, Midnapore, Roing & Sora 3 each, Patan & Sirsi 2 each	Gangtok 3, Agumbe, Port Blair & Guwahati 2 each, Tezpur, Agartala, Imphal & Cooch Behar 1 each

TABLE 5 (*Contd.*)

(1)	(2)	(3)	(4)
24.	Sangraha 5, Halflong 2, Gangtok & Shimla 1 each	Nedumangad 4, Karipur 3, Nancowry, Gangtok, Pahalgam & Mangalore 2 each, Srinagar 1	Port Blair 6, Hut Bay 5, Shillong, Kolkata & Kolar Gold Field 2 each, Purulia, Bhopal, Mysore, Minicoy, Silchar & Imphal 1 each
25.	Kailashahar 6, Agartala 4, Gangtok, Passighat & Mellabazar 3 each, Baghdogra, Tezpur & Mandi 2 each	Shimla 5, Bhuntar 4, Sundernagar & Berhampore 3 each, Agartala, Jalpaiguri & Midnapore 2 each, Shillong 1	Puri 9, Bhubaneswar & Digha 5 each, Keonjhargarh 4, Gopalpur, Guwahati, Dibrugarh, Khammam & Shantiniketan 3 each, Cuttack, Bhagalpur, Bapatla & Diamond Harbour 2 each, Kolkata, Imphal, Visakhapatnam, Chickmagalur & Paradip 1 each
26.	Silchar 7, Kondul 1	Arki & Mukteshwar 5 each, Dehra Dun 4, Bhuntar & Dharmapur 3 each, Shimla, Pahalgam, Alapuzha, Chandigarh & Bareilly 2 each, Ludhiana, Guwahati, Imphal & Srinagar 1 each	Bangalore 12, Dhubri 8, Gadag 7, New Delhi 5, Goalpara 4, North Lakhimpur, Imphal, Mandya, Cherthala & Cooch Behar 3 each, Car Nicobar, Dibrugarh, Bhagalpur, Ambala, Chandigarh, Varanasi, Nandyal, Shimla & Kolkata 2 each, Tezpur, Gangtok, Nahan, Allahabad, Agartala, Allahabad, Chitradurga, Hindon, Jagdalpur, Cuddapah, Arogyavaram & Belgaum 1 each
27.	Gangtok & Alapuzha 5 each, Agartala, Daporijo & Sibsagar 4 each, Jamsolaghat 2, Aryankavu 1	Kondul, Tezpur & Guwahati 5 each, Car Nicobar, Cooch Behar, Bhagalpur, Minicoy, Shillong & Krishnanagar 3 each, Berhampore, Kochi, Jalpaiguri, Dibrugarh & Agartala 2 each, Imphal, Gangtok, Darjeeling & Malda 1 each	Cannur 15, Maya Bandar 6, Jalpaiguri 5, Tadong, Gangtok, Kolkata & Canning Town 4 each, Minicoy & Agartala 3 each, Jamshedpur, Agra, Karipur & Jagdalpur 2 each, Berhampore, Midnapore, Allahabad, Rampur, Bushar, Panjim, Port Blair, Silchar, Medikeri, Kozhikode, Alapuzha & Cochin 1 each
28.	Cooch Behar 3, Tezpur, Silchar & Diamond Harbour 2 each, Kolkata, Varanasi, Pendra & Dibrugarh 1 each	Port Blair 6, Maya Bandar & Cooch Behar 2 each, Dibrugarh & Gadag 1 each	Port Blair & New Delhi 8 each, Ludhiana, Kolkata & Allahabad 4 each, Churu, Hindon, Bhiwani, Gannavaram, Karwar & Kochi 3 each, Patiala, Suratgarh, Hissar, Ghumarwin, Sundernagar, Maya Bandar, Hut Bay, Jalpaiguri, Krishnanagar, Bhagalpur, Varanasi & Honavar 2 each, Bareilly, Pantnagar, Nahan, Midnapore, Dibrugarh, Guwahati, Amritsar, Jaipur, Agumbe, Punalur, Kurnool & Jharsuguda 1 each
29.	Keonjhargarh 4, Dibrugarh, Ranchi, Jharsuguda, Pendra & Salem 2 each, North Lakhimpur, Jalpaiguri, Paradip, Cuttack, Raipur, Mana & Minicoy 1 each	Dibrugarh 5, Nancowry & Guwahati 3 each, Kondul, Imphal, Dehra Dun, Pahalgam & Palayamkottai 1 each	Kochi 11, Piravom 9, New Delhi & Thiruvalla 8 each, Munnar & Hissar 7 each, Thiruvananthapuram City 6, Bhiwani, Kalingapatnam, Adirampattinam, Perinthalmanna, Chalakudy & Honavar 5 each, Rohtak & Churu 4 each, Suratgarh, Sriganganagar, Chandigarh, Aluva, Hut Bay, Bangalore & Nancowry 3 each, Pilani, Alapuzha, Kottayam, Minicoy, Port Blair, Halwara, Pandoh, Jalpaiguri, Kaithal & Bhubaneshwar 2 each, Mangalore, Car Nicobar, Maya Bandar, Silchar, Baghdogra, Amritsar, Patiala, Bikaner, Shimla, Srinagar, Punalur & Ambala 1 each
30.	Purulia & Nancowry 2 each, Shillong, Agartala & Gangtok 1 each	Jalpaiguri & Shillong 4 each, Guwahati, Tezpur, North Lakhimpur & Hut Bay 3 each, Port Blair & Gangtok 2 each, Dibrugarh & Imphal 1 each	Honnali 9, Kota, Kurnool & Vythiri 7 each, Nahan 5, Jamshedpur 4
31.	Kondul, Tezpur, Kolkata, Palayamkottai & Kakinada 1 each		Mangalore 11, Machilipatnam 9, Vaikom 8, Kozhikode 7, Muzaffarnagar & Aska 5 each

It crossed Tenasserim coast on 12 and lay over south Myanmar and adjoining Thailand at 0300 UTC of 12, near Lat. 17.5° N/Long. 97.0° E. Subsequently, moving in a northerly direction, it rapidly weakened into a low pressure area over Myanmar. Track of the system is given in Fig. 2.

The system did not cause any or damage over India except heavy rains in Andaman & Nicobar Islands on same days.

3.3.2. *Advance of southwest monsoon*

Southwest monsoon arrived over south Andaman Sea and parts of southeast Bay on 14 May 2002. It set in over main land over south Kerala and south Tamil Nadu on 29 May. By the end of May, it covered some parts of south Arabian Sea, entire Lakshadweep area, Kerala, most parts of Tamil Nadu and parts of central Bay.

3.3.3. *Weather and associated synoptic features*

Details of the weather systems formed during the month are given in Table 4.

There was good pre-monsoon thundershower activity over northeast and peninsular India during the month of May. Thundershower activity was subdued in western parts of India) Rain/thundershowers occurred *at most places or at many places* on 10 to 15 days in Andaman & Nicobar Islands, Arunachal Pradesh, Assam & Meghalaya, Nagaland-Manipur-Mizoram-Tripura, Sub-Himalayan West Bengal & Sikkim, coastal Karnataka and Kerala; on 4 to 9 days in Gangetic West Bengal, Orissa, Uttaranchal and Lakshadweep and on 1 to 3 days in Jharkhand, Bihar, east Uttar Pradesh, west Uttar Pradesh, Haryana, Punjab, Himachal Pradesh, Jammu & Kashmir, east Madhya Pradesh, Konkan & Goa, Madhya Maharashtra, Rayalaseema, north interior Karnataka and south interior Karnataka. *Very heavy rainfall* occurred on 3 to 4 days in coastal Karnataka and Kerala and on 1 to 2 days in Andaman & Nicobar Islands, Assam & Meghalaya, Sub-Himalayan West Bengal & Sikkim, Tamil Nadu, north interior Karnataka and south interior Karnataka. *Heavy rainfall* also occurred on 4 to 7 days in Assam & Meghalaya, Sub-Himalayan West Bengal & Sikkim, Rayalaseema, Tamil Nadu, coastal Karnataka and Kerala and on 1 to 3 days in Andaman & Nicobar Islands, Arunachal Pradesh, Nagaland-Manipur-Mizoram-Tripura, Gangetic West Bengal, Orissa, Bihar, Haryana, coastal Andhra Pradesh, north interior Karnataka and south interior Karnataka.

3.3.4. *Rainfall distribution*

Rainfall during May was *excess* in 16 meteorological sub-divisions (Gangetic West Bengal, Orissa, Bihar, east Uttar Pradesh, west Uttar Pradesh, Uttaranchal, Haryana, Punjab, west Rajasthan, east Rajasthan, east Madhya Pradesh, Vidarbha, Chattisgarh, Telangana coastal Karnataka and Kerala); *normal* in 9 meteorological sub-divisions (Andaman & Nicobar Islands, Nagaland-Manipur-Mizoram-Tripura, Sub-Himalayan West Bengal & Sikkim, Jharkhand, Rayalaseema, Tamil Nadu, north interior Karnataka, south interior Karnataka and Lakshadweep); *deficient* in 6 meteorological sub-divisions (Arunachal Pradesh, Assam & Meghalaya, Himachal Pradesh, Jammu & Kashmir, west Madhya Pradesh and coastal Andhra Pradesh) and *scanty* in the remaining 5 meteorological sub-divisions (Gujarat region, Saurashtra & Kutch, Konkan & Goa, Madhya Maharashtra and Marathwada). The principal amounts of rainfall are given in Table 5.

3.3.5. *Temperature distribution*

Severe heat wave conditions prevailed on 4 to 6 days in west Rajasthan, east Rajasthan and coastal Andhra Pradesh and on 1 to 2 days in Orissa, Gujarat region and Saurashtra & Kutch. *Heat wave conditions* prevailed on 21 days in west Rajasthan; on 12 days in Haryana and 15 days in east Rajasthan; on 7 to 8 days in Punjab, west Madhya Pradesh, Vidarbha and coastal Andhra Pradesh; on 3 to 5 days in Orissa, Jammu & Kashmir, east Madhya Pradesh, Gujarat Region, Saurashtra & Kutch, Madhya Maharashtra and Tamil Nadu and on 1 to 2 days in Gangetic West Bengal, Jharkhand, east Uttar Pradesh, west Uttar Pradesh and Telangana. Day temperatures were *appreciably* to *markedly* above normal on 14 to 18 days in Punjab, Himachal Pradesh, Jammu & Kashmir and Tamil Nadu; on 8 to 12 days in Assam & Meghalaya, Haryana, west Madhya Pradesh, Chattisgarh and coastal Andhra Pradesh; on 5 to 7 days in Orissa, Uttaranchal, east Rajasthan, Saurashtra & Kutch, Konkan & Goa, Vidarbha and Telangana; on 3 to 4 days in Sub-Himalayan West Bengal & Sikkim, west Uttar Pradesh, west Rajasthan, east Madhya Pradesh, Gujarat region, Madhya Maharashtra, Marathwada and Rayalaseema and on 1 to 2 days in Gangetic West Bengal, Jharkhand, east Uttar Pradesh, coastal Karnataka, north interior Karnataka and Kerala. During the month, the highest temperature of 49.0° C was recorded at Gannavaram in coastal Andhra Pradesh on 10 May. This has broken the previous record of highest maximum of Gannavaram *viz*., 47.6° C on 23 May 1966. The highest temperature recorded so far during May, is 50.6° C, reported by Alwar in Rajasthan on 10 May 1956.

3.3.6. *Disastrous weather events and damage*

According to press reports, during the month, severe heat wave/heat wave conditions took a toll of 600 people in the country. Madhya Pradesh experienced a dust storm taking 20 human lives. Stormy winds took a toll of 10 persons, and 9 people died due to severe lightning in Maharashtra (Vidarbha).

Appendix

Definitions of the terms given in '*Italics*'

Rainfall

Excess - percentage departure from normal rainfall is +20% or more.

Normal - percentage departure from normal rainfall is between –19 % to +19 %.

Deficient - percentage departure from normal rainfall is between –20 % to –59 %.

Scanty - percentage departure from normal rainfall is between –60 % to –99 %.

Most places - 75 % or more stations of a meteorological sub-division reporting at least 2.5 mm rainfall.

Many places - 51% to 74 % stations of a meteorological sub-division; reporting at least 2.5 mm rainfall.

Few places - 26 % to 50% stations of a meteorological sub-division reporting at least 2.5 mm rainfall.

Isolated places - 25% or less stations of a meteorological sub-division; reporting atleast 2.5 mm rainfall.

Heavy rain - rainfall amount from 6.5 cm to 12.4 cm over one or two stations in the sub-division.

Very heavy rainfall - rainfall amount more than 12.5 cm over one or two stations in the sub-division.

Monsoon activity

Vigorous - Mean rainfall more than 4 times the normal with minimum 7 cm along the west coast and 5 cm elsewhere in atleast two stations in the sub-division.

Active - Average rainfall of a sub-division is more than 1½ to 4 times the normal with minimum 5 cm along the west coast and 3 cm elsewhere in atleast two stations in the sub-division.

Maximum/day temperatures

According to the new criteria, since 1 March 2002, Heat Wave are declared only when the maximum temperature of a station reaches atleast 40° C for plains and atleast 30° C for Hilly regions.

Severe heat wave - departure of maximum temperature from normal is + 6^o C or more for the regions where the normal maximum temperature is more than 40^o C and departure of maximum temperature from normal is + 7^o C or more for the regions where the normal maximum temperature is 40^o C or less.

Heat wave conditions - departure of maximum temperature from normal is between + 4^o to + 5^o C or more for the regions where the normal maximum temperature is more than 40^o C and departure of maximum temperature from normal is +5^o to + 6^o C for the regions where the normal maximum temperature is 40^o C or less.

Hot day conditions - Whenever the maximum temperature remains 40^o C or more and minimum remains 5^o C or more above normal, provided, it is not satisfying the heat wave criteria.

Markedly above normal - departure of maximum temperature from normal is between +5^o C to +6^o C for the regions where the normal maximum temperature is 40^o C or less.

Appreciably above normal - departure of maximum temperature from normal is between +3° to +4° C for the regions where the normal maximum temperature is 40° C or less.

Appreciably below normal - departure of maximum temperature from normal is between –3° C to –4° C.

Markedly below normal - departure of maximum temperature from normal is between –5° C or less.