MAUSAM, **56**, 2 (April 2005), 501-516

Weather in India

HOT WEATHER SEASON (March – May 2004)*

1. Chief features

(*i*) The beginning of the season in general had been warmer than normal, with *severe heat wave conditions*† prevailing over some parts of the country during March.

(*ii*) Two cyclonic storms formed over the Indian seas; one severe cyclonic storm over the Arabian Sea during 5 – 10 May and another very severe cyclonic storm over the Bay of Bengal during 17 – 19 May.

(*iii*) The formation of the latter one caused the early advance of monsoon over the main land on 18 May.

(*iv*) Southwest monsoon advanced over south Arabian Sea, parts of east-central Arabian Sea, Kerala, coastal and south interior Karnataka, most parts of Tamil Nadu, some parts of north Bay, Assam & Meghalaya, Nagaland-Manipur-Mizoram-Tripura and some parts of Sub-Himalayan West Bengal & Sikkim, by the end of May**.**

2. Seasonal rainfall

Season's rainfall was *excess* in 19 meteorological sub-divisions *viz.*, Andaman & Nicobar Islands, Assam & Meghalaya, Nagaland-Manipur-Mizoram-Tripura, Sub-Himalayan West Bengal & Sikkim, Jharkhand, Bihar, east Uttar Pradesh, west Uttar Pradesh, Haryana, Saurashtra & Kutch, coastal Andhra Pradesh, Telangana, Rayalaseema, Tamil Nadu, coastal Karnataka, north interior Karnataka, south interior Karnataka, Kerala and Lakshadweep; *normal* in 9 *viz.*, Arunachal Pradesh, Gangetic West Bengal, Orissa, Uttaranchal, Punjab, east Rajasthan, west Madhya Pradesh, Vidarbha and Chattisgarh; *deficient* in 6, *viz*., Himachal Pradesh, Jammu & Kashmir, west Rajasthan, Konkan & Goa, Madhya Maharashtra, Marathwada and *scanty* in 2 *viz.*, east Madhya Pradesh and Gujarat Region. Actual rainfall and its departures for each month and season as a whole are given in Table 1. Also the sub-divisional rainfall departures for the season March-May 2004 are shown in Fig. 1.

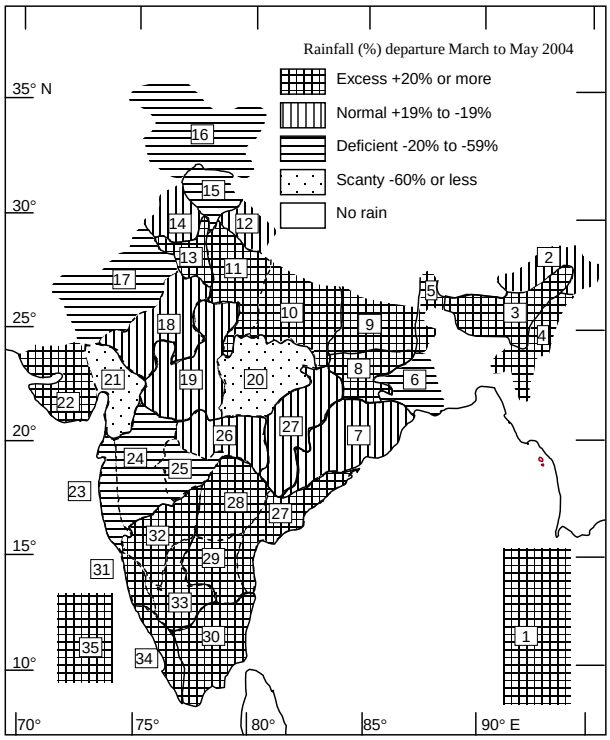

Fig. 1. Sub-divisionwise seasonal rainfall departure from normal (%) for the period (March - May 2004). 36 Sub-divisions are indicated by numbers on the map & bold letters in legend below. The rainfall anomaly values for these sub-divisions are indicated below :

1	22	**7**	4	**13**	99	**19**	–10	**25**	–50	**31**	145
2	12	**8**	62	**14**	–17	**20**	–65	**26**	–3	**32**	131
3	50	**9**	43	**15**	–55	**21**	–61	**27**	–2	**33**	48
4	21	**10**	41	**16**	–36	**22**	274	**28**	53	**34**	76
5	37	**11**	120	**17**	–54	**23**	–54	**29**	25	**35**	70
6	–6	**12**	–17	**18**	–5	**24**	–54	**30**	123	**36**	280

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 or snow occurred either at *a few places* or at *isolated places* on 4 days in Jammu & Kashmir and on

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

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TABLE 1

Sub-divisionwise rainfall (mm) for each month and season as a whole (March - May 2004)

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.	Andaman & Nicobar Islands	60	31	91	57	85	-33	481	372	29	597	488	22
2.	Arunachal Pradesh	154	153	0	271	265	2	374	297	26	799	715	12
3.	Assam & Meghalaya	111	80	38	442	202	119	462	393	18	1015	675	50
4.	Nagaland-Manipur-Mizoram-Tripura	9	65	-86	383	165	133	206	265	-22	598	495	21
5.	Sub-Himalayan West Bengal & Sikkim	48	63	-24	190	123	54	397	265	43	617	450	37
6.	Gangetic West Bengal	20	26	-24	60	47	27	79	95	-17	159	168	-6
7.	Orissa	11	24	-54	72	34	111	36	56	-36	119	114	4
8.	Jharkhand	4	18	-80	74	21	247	63	47	33	140	86	62
9.	Bihar	2	10	-81	48	17	182	59	49	21	109	76	43
10.	East Uttar Pradesh	0	9	-100	10	5	96	33	16	103	44	31	41
11.	West Uttar Pradesh	0	11	-100	25	5	428	37	12	203	62	28	120
12.	Uttaranchal	0	51	-100	40	30	31	74	57	31	114	138	-17
13.	Haryana, Chandigarh & Delhi	0	14	-100	25	8	233	46	14	224	71	36	99
14.	Punjab	0	27	-100	9	12	-25	36	16	130	45	54	-17
15.	Himachal Pradesh	**	92	-99	38	51	-24	51	58	-12	89	200	-55
16.	Jammu & Kashmir	7	132	-95	107	84	27	65	65	1	180	281	-36
17.	West Rajasthan	0	5	-100	1	3	-72	8	11	-29	8	18	-54
18.	East Rajasthan	0	4	-100	2	2	-29	14	11	36	16	17	-5
19.	West Madhya Pradesh	0	5	-100	1	2	-50	12	8	59	13	14	-10
20.	East Madhya Pradesh	0	14	-100	3	6	-44	6	8	-18	10	27	-65
21.	Gujarat region	0	1	-100	0	1	-100	3	6	-49	3	8	-61
22.	Saurashtra & Kutch	0	1	-100	0	2	-100	19	3	619	19	5	274
23.	Konkan & Goa	0	**	-100	0	4	-100	20	39	-49	20	44	-54
24.	Madhya Maharashtra	0	4	-100	1	11	-92	19	30	-35	20	44	-54
25.	Marathwada	**	6	-98	2	7	-69	14	19	-29	16	32	-50
26.	Vidarbha	**	13	-97	8	8	0	22	11	104	30	31	-3
27.	Chattisgarh	7	16	-54	24	14	65	17	19	-8	48	49	-2
28.	Coastal Andhra Pradesh	5	13	-63	43	23	86	99	60	65	146	96	53
29.	Telangana	7	10	-34	27	16	68	35	29	21	69	55	25
30.	Rayalaseema	6	7	-9	38	18	109	134	55	145	178	80	123
31.	Tamil Nadu	5	19	-74	43	42	2	259	64	304	307	125	145
32.	Coastal Karnataka	4	5	-12	24	29	-17	400	152	164	429	186	131
33.	North interior Karnataka	1	6	-77	35	28	27	102	60	70	138	94	48
34.	South interior Karnataka	9	9	2	70	45	55	190	99	91	270	154	76
35.	Kerala	35	38	-10	109	122	-11	598	276	116	742	437	70
36.	Lakshadweep	2	12	-84	8	43	-82	874	178	392	884	232	280

** 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 2004

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 moving systems*						
1.	Upper air cyclonic circulation upto mid tropospheric levels	1 eve – 4	North Pakistan & neighbourhood	Northeast	North Pakistan and adjoining Jammu & Kashmir	Moved away on 5
2.	Do	9 – 13	North Pakistan and adjoining Jammu & Kashmir	Do	Jammu & Kashmir and neighbourhood	Moved away on 14
3.	Do	14 – 17	Do	Do	Do	Moved away on 18
4.	Do	18 – 22	Do	Do	Do	Moved away on 23
5.	Induced cyclonic circulation upto lower levels	22 – 27	Central Pakistan and adjoining Punjab and northwest Rajasthan	Do	Northern parts of Jammu & Kashmir	Moved away on 28
6.	Induced cyclonic circulation upto lower tropospheric levels	27 Mar – 7 Apr	Central Pakistan and adjoining west Rajasthan	East	Chattisgarh and neighbourhood	Less marked on 8
(**B**) *Other upper air cyclonic circulations*						
1.	Mid tropospheric levels	13 – 18	Bihar and adjoining Sub-Himalayan West Bengal & Sikkim	East	Sub-Himalayan West Bengal and Sikkim	It lay as a trough in westerly from Sub-Himalayan West Bengal & Sikkim to Gangetic West Bengal on 19 & 20 and became less-marked on 21
2.	Lower levels	22	South Tamil Nadu and adjoining Kerala and Commorin area	Stationary	*In situ*	Less marked on 23
3.	Do	22 – 23	Sub-Himalayan West Bengal & Sikkim and neighbourhood	East	Nagaland-Manipur-Mizoram-Tripura	Less-marked on 24
4.	Lower Levels	24 – 25	Uttaranchal and neighbourhood	Stationary	*In situ*	Less-marked on 26
5.	Do	28	Konkan-Goa and adjoining areas of south Madhya Maharashtra and Karnataka	Stationary	Do	Less-marked on 29
(**C**) *Troughs in easterly*						
1.	Trough of low at sea level	1 – 4	Southwest and adjoining southeast Bay	West	Southwest Bay	Less-marked on 5
2.	Do	5	South Andaman Sea	Do	Lakshadweep-Maldives area	Less marked on 6
3.	Do	9-16	Do	Do	Southwest Bay	Less marked on 17
(**D**) *Troughs in westerly*						
1.	Lower levels	24 – 31	Sub-Himalayan West Bengal & Sikkim to north Bay	Quasistationary	Southwest Bay	It lay as a cyclonic circulation from 1 April onwards. Details of which are given in Table 3
(**E**) *Trough / wind discontinuity*						
1.	Lower Levels	6 – 8	South Tamil Nadu to Bihar	Quasistationary	South Tamil Nadu to Gangetic West Bengal	A cyclonic circulation lay embedded on this over Vidarbha on 6. Moving northeastwards it lay over Chattisgarh and neighbourhood on 10 and became less marked thereafter

TABLE 3

Details of the weather systems during April 2004

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.	Upper air cyclonic circulation upto mid tropospheric levels	1 – 4	North Pakistan and adjoining Jammu & Kashmir	Northeast	Jammu & Kashmir and neighbourhood	Moved away on 5
2.	Do	7 – 9	Jammu & Kashmir and neighbourhood	Do	Northern parts of Jammu & Kashmir	Moved away on 10
3.	Do	10 – 12	North Pakistan and neighbourhood	Eastnortheast	Eastern parts of Jammu & Kashmir	Moved away on 13
4.	Do	12 – 16	Do	Do	Jammu & Kashmir and adjoining north Pakistan	Moved away on 17
5.	Do	17 – 18	North Pakistan and adjoining Punjab and Jammu & Kashmir	Do	Jammu & Kashmir and neighbourhood	Moved away on 19
6.	Do	19 – 24	North Pakistan and adjoining Jammu & Kashmir	Do	Eastern parts of Jammu & Kashmir	Moved away on 25
7.	Low pressure area	27 – 29	Northwest Rajasthan and adjoining Punjab and Pakistan	Do	Haryana and neighbourhood	Less marked on 30
8.	Induced upper air cyclonic circulation upto lower tropospheric levels	8 – 10	Northern parts of Rajasthan & neighbourhood	Stationary	*In situ*	Less marked on 11
9.	Induced upper air cyclonic circulation upto mid tropospheric levels	20 Apr – 1 May	Central Pakistan and neighbourhood	East	Assam & Meghalaya	Less marked on 2 May
10.	Induced upper air cyclonic circulation upto lower tropospheric levels	24 – 29	East Rajasthan	Eastnortheast	North Madhya Pradesh and adjoining parts of south Uttar Pradesh	Less marked on 30
11.	Induced low pressure area	28 – 30	Central Pakistan and adjoining west Rajasthan	Do	Haryana and neighbourhood	It was first observed as a cyclonic circulation extending upto mid tropospheric levels on 27 April. The associated upper air cyclonic circulation lay over northwest Madhya Pradesh and neighbourhood on 30 which became less marked on 2 May
(**B**) *Other upper air cyclonic circulations*						
1.	Mid tropospheric levels	1 – 3	Central Pakistan and adjoining west Rajasthan	Stationary	*In situ*	Less marked on 4
2.	Lower levels	1 – 5	Northern parts of Gangetic West Bengal and neighbourhood	Quasi stationary	Gangetic West Bengal	Less marked on 6

TABLE 3 (*Contd.*)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
3.	Lower levels	7 – 11	Gangetic West Bengal and adjoining north Bay and neighbourhood	Quasi-stationary	Bihar and adjoining Sub-Himalayan West Bengal & Sikkim	It was first observed as a trough in the lower levels from Bihar to Assam & Meghalaya through Sub-Himalayan West Bengal & Sikkim. The cyclonic circulation became less marked on 12
4.	Mid Tropospheric levels	14 – 23	Assam & Meghalaya and neighbourhood	West	Gangetic West Bengal and neighbourhood	It was first observed as a trough in westerly from Sub-Himalayan West Bengal & Sikkim to northwest Bay on 12 and 13
(**C**) *Troughs in westerly*						
1.	Lower levels	6 – 10	Central Rajasthan to Chattisgarh through Madhya Pradesh	East	Central Rajasthan to west Uttar Pradesh through Haryana	Less marked on 11
(**D**) *Other troughs*						
1.	Trough / wind discontinuity at lower levels	1 April – 5 May	Kerala to central parts of Madhya Pradesh	Quasi-stationary	From the centre of the depression over southeast Arabian Sea to Vidarbha	It remained a quasi permanent feature all through the month

1 day in Himachal Pradesh. Rain or thundershowers occurred either *at most places* or *at many places* on 4 to 7 days in Arunachal Pradesh and Sub-Himalayan West Bengal & Sikkim and on 1 to 3 days in Andaman & Nicobar Islands, Assam & Meghalaya and Chattisgarh. Rain or thundershowers also occurred either at *a few places* or at *isolated places* on 11 to 15 days in Assam & Meghalaya, Sub-Himalayan West Bengal & Sikkim, Tamil Nadu and Kerala; on 7 to 10 days in Andaman & Nicobar Islands, Arunachal Pradesh, Gangetic West Bengal, Orissa and south interior Karnataka; on 4 to 6 days in Nagaland-Manipur-Mizoram-Tripura and coastal Karnataka and on 1 to 3 days in Jharkhand, Bihar, Chattisgarh, coastal Andhra Pradesh, Telangana, Rayalaseema, north interior Karnataka and Lakshadweep.

3.1.2. *Rainfall distribution*

Month's rainfall was *excess* in 2 meteorological sub-divisions *viz.*, Andaman & Nicobar Islands and Assam & Meghalaya; *normal* in 5, *viz.*, Arunachal Pradesh, Rayalaseema, coastal & south interior Karnataka and Kerala; *deficient* in 5, *viz.*, Sub-Himalayan West Bengal & Sikkim, Gangetic West Bengal , Orissa, Chattisgarh and Telangana and *scanty* in 11, *viz.*, Nagaland-Manipur-Mizoram-Tripura, Jharkhand, Bihar, Himachal Pradesh, Jammu & Kashmir, Marathwada, Vidarbha, coastal Andhra Pradesh, Tamil Nadu, north interior Karnataka and Lakshadweep. There was no rain in 13 meteorological sub-divisions, *viz.*, east Uttar Pradesh, west Uttar Pradesh, Uttaranchal, Haryana, Punjab, east Rajasthan, west Rajasthan, east Madhya Pradesh, west Madhya Pradesh, Gujarat Region, Saurashtra & Kutch, Konkan & Goa and Madhya Maharashtra. Principal amounts of rainfall are given in Table 5.

3.1.3. *Temperature distribution*

Severe heat wave conditions prevailed on 7 to 8 days in Rajasthan; on 4 to 5 days in west Madhya Pradesh and Saurashtra & Kutch and on 1 to 3 days in Haryana, east Madhya Pradesh and Gujarat Region. *Heat wave* conditions also prevailed on 7 to 9 days in Orissa, Jharkhand, east Uttar Pradesh, Madhya Maharashtra, Vidarbha and Telangana; on 4 to 6 days in Bihar, east Madhya Pradesh, Gujarat Region, Saurashtra & Kutch and Chattisgarh and on 1 to 3 days in west Uttar Pradesh, east Rajasthan, west Madhya Pradesh, Marathwada, coastal Andhra Pradesh, Rayalaseema and north interior Karnataka. *Hot day* conditions prevailed on 1 to 3 days in Saurashtra & Kutch, Konkan & Goa, coastal Andhra Pradesh and coastal Karnataka. Day temperatures were generally *appreciably to markedly above normal* on many days throughout the country. During the month, the highest temperature of 45° C was recorded over Idar (Gujarat Region) on 17 & 18, consecutively.

Night temperature were *appreciably below normal* on 3 to 4 days in Orissa, Madhya Maharashtra, Chattisgarh and Tamil Nadu and on 1 to 2 days in Jharkhand, Bihar, east Uttar Pradesh, Haryana, Rajasthan, Gujarat State, Marathwada, Rayalaseema and coastal & south interior Karnataka and were *below normal* on 4 to 6 days in Orissa, Jharkhand, east Uttar Pradesh, Haryana,

Tracks of storms and depressions during Pre-monsoon season 2004

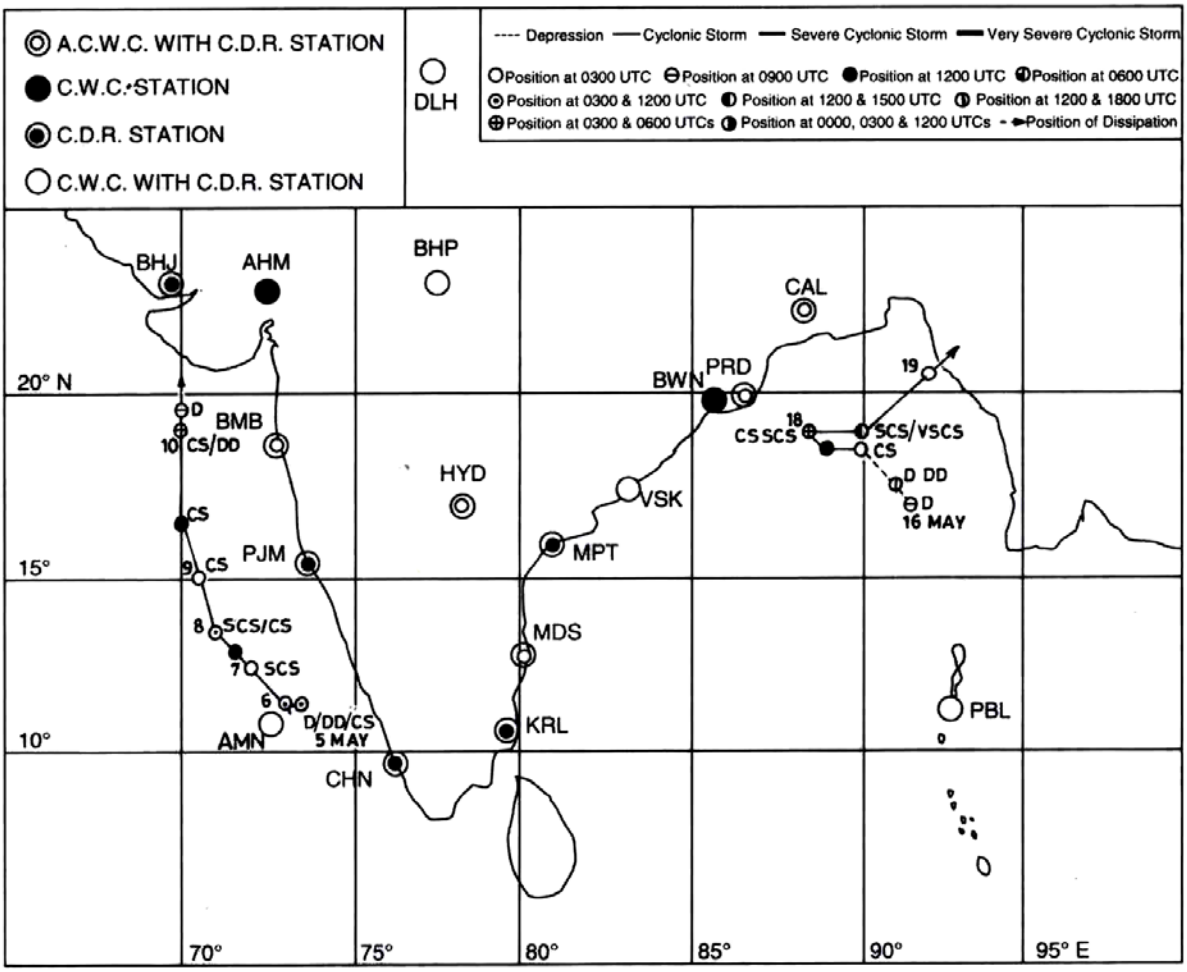

Fig. 2. Track of the cyclonic storm during March-May 2004

Punjab, Rajasthan, Gujarat Region, Madhya Maharashtra, Vidarbha, Chattisgarh, Rayalaseema and Tamil Nadu and on 1 to 3 days in Assam & Meghalaya, Gangetic West Bengal, Bihar, west Uttar Pradesh, Jammu & Kashmir, Saurashtra & Kutch, Konkan & Goa, Marathwada, coastal Andhra Pradesh, Telangana, interior Karnataka and Kerala. They were generally *appreciably to markedly above normal* on many days over the country outside peninsula. During the month, the lowest temperature of 3.0° C was recorded at Sriganganagar in Rajasthan on 6.

3.1.4. *Disastrous weather events and damage*

According to some press reports, a woman died and several trees, electric/telephone poles uprooted and dwelling houses of 200 families were destroyed due to squall in Assam. In another incidence, 2 persons died and a few were injured due to thunder/lightning and squall. One person and an elephant died due to thunderstorm in West Bengal.

3.2. *April*

3.2.1. *Weather and associated synoptic features*

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

Rain/thundershowers occurred either *at most places* or *at many places* on 16 to 20 days in Assam & Meghalaya, coastal Andhra Pradesh and Rayalaseema; 11 to 15 days in Nagaland-Manipur-Mizoram-Tripura and Chattisgarh; 6 to 10 days in Arunachal Pradesh, Sub-Himalayan West Bengal & Sikkim, Jammu & Kashmir and Telangana and on 1 to 5 days in Andaman & Nicobar Islands, Gangetic West Bengal, Orissa, Jharkhand, Bihar, Uttar Pradesh, Uttaranchal, Haryana, Punjab, Himachal Pradesh, Madhya Maharashtra, Marathwada, interior Karnataka and Kerala. Rain/thundershowers occurred either at *a few places* or at *isolated places* on 21 to 26 days in Orissa, south interior Karnataka and Kerala; on 16

TABLE 4

Details of the weather systems during May 2004

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.	Severe cyclonic storm	5 – 10	Lakshadweep area	North	Off Saurashtra coast	Details of the system are given in main text in para 3.3
2.	Very severe cyclonic storm	16 – 19	East-central Bay	Northwest, east and then northeast	Myanmar coast	Details of the system are given in main text in para 3.3
(**B**) *Western disturbances /Eastward moving cyclonic circulations*						
1.	Upper air cyclonic circulation upto mid tropospheric levels	6 eve – 12	North Pakistan and adjoining Jammu & Kashmir	Eastnortheast	Eastern pars of Jammu & Kashmir	Moved away on 13
2.	Do	8 – 9	Central Pakistan and adjoining west Rajasthan	Do	Northwest Rajasthan and neighbourhood	Less marked on 10
3.	Induced upper air cyclonic circulation	13 – 16	Southwest Rajasthan and neighbourhood	Northeast	West Madhya Pradesh and adjoining East Rajasthan	Less marked on 17
4.	Upper air cyclonic circulation upto mid tropospheric levels	12 – 14	Afghanistan and adjoining Pakistan	Do	Jammu & Kashmir and adjoining Punjab	Moved away on 15
5.	Do	15 – 18	North Pakistan and adjoining Jammu & Kashmir	Do	Jammu & Kashmir and neighbourhood	Moved away on 19
6.	Do	19 – 20	Do	Do	Eastern parts of Jammu & Kashmir	Moved away on 21
7.	Do	21 – 25	Do	Do	Himachal Pradesh and neighbourhood	Moved away on 26
8.	Do	25 eve – 26	Do	Do	Eastern parts of Jammu & Kashmir	Moved away on 27
9.	Do	27 – 29	Do	Do	Do	Moved away on 30
10.	Upper air cyclonic circulation	30 May – 1 June	North Pakistan and adjoining areas of Punjab and Jammu & Kashmir	Do	Haryana and neighbourhood	moved away on 2 June
(**C**) *Other cyclonic circulations*						
1.	Mid tropospheric levels	6 – 7	South Madhya Pradesh and adjoining areas of Vidarbha	Quasi-stationary	West Madhya Pradesh and neighbourhood	Less marked on 8
2.	Lower tropospheric levels	26 May – 1 Jun	East Uttar Pradesh and neighbourhood	East	Bihar and neighbourhood	Less marked on 2 June
3.	Lower levels	20 – 23	Northeast Bay	Northwest	Jharkhand and neighbourhood	Less marked on 24

TABLE 4 (*Contd.*)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
4.	Mid tropospheric levels	24 May – 2 Jun	Northern parts of Tamil Nadu and neighbourhood	Northwest	Andhra Pradesh and neighbourhood	Less marked on 2 June
5.	Do	31 May – 1 Jun	East central Arabian Sea off Karnataka coast.	Quasistationary	*In situ*	Less marked on 2 June
(**D**) *East-west trough*						
1.	East-west shear line	10 – 15	Along 11° N	Do	-	It lay as an upper air cyclonic circulation at mid tropospheric levels over Rayalaseema and neighbourhood and became less marked on 18
(**E**) *Trough in westerly*						
1.	Lower levels	2 – 16	Sub-Himalayan West Bengal & Sikkim to northwest Bay	East	Sub-Himalayan West Bengal & Sikkim to east-central Bay	It lay as a cyclonic circulation over Jharkhand and neighbourhood on 8 and was seen as a lower level trough in westerly along Long. 88° E, north of Lat. 20° N from 10 to 12

to 20 days in coastal Andhra Pradesh, Rayalaseema and Tamil Nadu; 11 to 15 days in Andaman & Nicobar Islands, Arunachal Pradesh, Assam & Meghalaya, Nagaland-Manipur-Mizoram-Tripura, Gangetic West Bengal, Chattisgarh, coastal Karnataka and north interior Karnataka; 6 to 10 days in Jharkhand, Bihar, Uttar Pradesh, Haryana, Punjab, Himachal Pradesh, Jammu & Kashmir and Telangana and on 1 to 5 days in Uttaranchal, Rajasthan, Madhya Pradesh, Madhya Maharashtra, Marathwada, Vidarbha and Lakshadweep. *Very heavy rain* occurred on 6 days in Assam *rain* also & Meghalaya and on 1 day in Sub-Himalayan West Bengal & Sikkim. *Heavy* occurred on 1 to 4 days in Andaman & Nicobar Islands, Arunachal Pradesh, Assam & Meghalaya, Nagaland-Manipur-Mizoram-Tripura, Sub - Himalayan West Bengal & Sikkim, Orissa, Jharkhand, Rayalaseema, Tamil Nadu, south interior Karnataka and Kerala.

3.2.2. *Rainfall distribution*

Rainfall was *excess* in 18 meteorological sub-divisions *viz*., Assam & Meghalaya, Nagaland-Manipur-Mizoram-Tripura, Sub-Himalayan West Bengal & Sikkim, Gangetic West Bengal, Orissa, Jharkhand, Bihar, east Uttar Pradesh, west Uttar Pradesh, Uttaranchal, Haryana, Jammu & Kashmir, Chattisgarh, coastal Andhra Pradesh, Telangana, Rayalaseema, north interior Karnataka and south interior Karnataka; *normal* in 5, *viz*., Arunachal Pradesh, Vidarbha, Tamil Nadu, coastal Karnataka and Kerala; *deficient* in 6, *viz*., Andaman & Nicobar Islands, Punjab, Himachal Pradesh, east Rajasthan, east Madhya Pradesh and west Madhya Pradesh and *scanty* in 4, *viz*., west Rajasthan, Madhya Maharashtra, Marathwada and Lakshadweep. There was no rain in 3 meteorological sub-divisions *viz*., Gujarat Region, Saurashtra & Kutch and Konkan & Goa. The principal amounts of rainfall (cm) are given in Table 5.

3.2.3. *Temperature distribution*

Severe Heat wave conditions prevailed on 1 day in west Rajasthan. *Heat wave conditions* also prevailed on 20 days in west Rajasthan; on 14 to 16 days in Haryana and east Rajasthan; on 7 to 9 days in Jharkhand, Punjab, west Madhya Pradesh and Telangana; on 4 to 6 days in Orissa, Uttar Pradesh, coastal Andhra Pradesh, Rayalaseema and Tamil Nadu and on 1 to 3 days in east Madhya Pradesh, Marathwada, Vidarbha, Chattisgarh and north interior Karnataka. *Hot day conditions* prevailed on 2 to 3 days in Jharkhand, east Uttar Pradesh, Haryana, Rajasthan, Madhya Pradesh and Chattisgarh. Day temperatures were *appreciably to markedly above normal* on 20 days in Himachal Pradesh; 12 to 16 days in Uttaranchal, Punjab, Jammu & Kashmir, Rajasthan, West Madhya Pradesh and Tamil Nadu; on 8 to 11 days in east Uttar Pradesh, Haryana, east Madhya Pradesh, Madhya Maharashtra, Chattisgarh and coastal Andhra Pradesh; on 4 to 7 days in Orissa, Jharkhand, west Uttar Pradesh, Saurashtra & Kutch, Marathwada, Vidarbha, Telangana, Rayalaseema, interior Karnataka and on 1 to 3 days in Bihar, Gujarat Region, Konkan & Goa, coastal Karnataka and Kerala. During the month, the highest temperature of 46.0° C was recorded at Kalaikunda (Gangetic West Bengal) on 18.

TABLE 5

Principal amounts of rainfall (1 cm and above) (March, April and May 2004)

Date	March	April	May
(1)	(2)	(3)	(4)
1	Gangtok 3, Chouldhowaghat 2, Tadong & Passighat 1 each	Khonsa, Narsipatnam & Ammathy 7 each, Agartala & Tuni Subramanya 5 each, Sankalan, Kailashahar & Chitradurga 4 each, Tadong, Tangla, Kottayam, Gangtok, Valparai & Kozhikode 3 each, Guwahatim & Pendra 2 each, Salem 1	Quazi Gund & Banihal 6 each, Bharatpur, Bhaderwah & Srinagar 5 each, Bhagamandala & Karnal 4 each, Ammathy, Canning Town, Mukteshwar, Dehra Dun, Ambala, Hissar, New Delhi, Patiala, Sundernagar & Bhuntar 3 each, Mathabhanga, Bareilly, Pantnagar, Chandigarh, Jammu, Pilani, Jaipur, Bidar & Belgaum 2 each, Kondul, Agra, Jagdalpur & Adirampattinam 1 each
2	Nil	Mahendragarh 5, Gadchiroli & Bangalpet 4 each, Tuljapur 3, Alland & Chitradurga 2 each, Kondul, Cherrapunji, Mungeli, Medak & Bhadrachalam 1 each	Cherrapunji 6, Khowang 5, Dibrugarh 4, Shirahatti 4, Puttur 3, Miao, Silchar, Bhuntar, Belgaum, Punalur & Thiruvananthapuram 2 each, Udhampur, Guwahati, Jamshedpur, Sundernagar, Katra, Batote, Ambikapur & Pendra 1 each
3	Nil	Chennapatna 7, Kalgi 4, Chepan, Silchar, Hanagal, Anandpur & Mandya 3 each, Aizwal, Guwahati, Kailashahar, Cuttack & Keonjhargarh 2 each, Balasore, Gangtok, Tawang, Medikeri, Mysore & Bangalore 1 each	Villupuram 19, Karaikal 14, Nagapattinam 13, Vedaranyam 12, Cochi 11, Pamban 10, Chennai 6, Thiruvananthapuram 4 Chouldhowaghat, Silchar, Tirupathi, Kozhikode, Punalur & Minicoy 3 each, Kailashahar 2, Port Blair, Dibrugarh, Roing, Nellore & Bijapur 1 each
4	Nil	Mani 6, Belonia, Bandipura & Saroda 4 each, Mellabazar & Belgaum 3 each, Ron & Hassan 2 each, Chepan, Tezpur, Silchar & Chickmaglur 1 each	Vandavasi 17, Thanjavur, Pondicherry & K. Paramathy 16 each, Cuddalore & Vellore 13 each, Kanchipuram 12, Somwarpet 11, Palamaner 10, Tirupathi 9, Pakala & Salem 8 each, Cuddapah, Mandya & Chennai 7 each, Nellore & Bangalore 5 each, Kavali, Mysore & Thiruvananthapuram 4 each, Alapuzha 3, Nancowry, Mahabaleshwar, Kakinada, Anantpur & Mangalore 1 each
5	Nil	Manvi 7, Burdhwan, Kolhapur, Haliyal, Bellary & Hyderabad 4 each, Krishnanagar, Sorada, Belgaum, Palayamkottai & Raichur 3 each, Roing, Solapur & Bidar 2 each, Anantpur, Satara, Kolkata, Chitradurga & Alapuzha 1 each	Amini Divi 43, Coonoor 27, Arani 18, Nagapattinam 14, Agathi 10, Tirukoilur 7, Narsapur & Alapuzha 6 each, Mangalore, Thanjavur, Cannur & Thiruvananthapuram 5 each, Kakinada, Machilipatnam, Ongole, Adirampattinam, Kakinada, Kodaikanal & Cochi 4 each, Shirali, Nellore, Chennai, Mangalore, Shirali, Hassan, Agumbe & Kozhikode 3 each, Ratnagiri, Arogyavaram & Pune 2 each
6	Passighat 1	Guwahati 12, Turuvelere 9, Ziro 7, Mudigere & Karipur 4 each, Kozhikode 3, Mahendragarh, Kailashahar, Anantpur, Silchar & Thiruvananthapuram 2 each, Sankalan, Kohima & Gopalpur 1 each	Amini Divi 117, Ponnani 22, Coonoor & Cochi 19 each, Manamelkudi & Alapuzha 9 each, Punalur 8, Pondicherry & Adirampattinam 7 each, Kavali, Gannavaram & Thiruvananthapuram 7 each, Nancowry & Kozhikode 6 each, Kustagi & Chickmaglur 5 each, Bantwal, Car Nicobar, Narsapur, Nellore, Chennai & Kanyakumari 3 each, Ongole 2, Gangtok, Tadong, Tirupattur, Mangalore, Karwar & Belgaum 1 each

TABLE 5 (*Contd.*)

(1)	(2)	(3)	(4)
7	Nil	Gajoldoba & Polur 8 each, Kohima 6, Dhubri 5, Canning Town & Kodaikanal 4 each, Kolkata, Agumbe & Vellore 3 each, Agartala, Tadong, Subramanya, Purnea, Bhagalpur, Diamond Harbour & Purnea 2 each, Gangtok, Jalpaiguri, Bhagalpur, Tirupathi1, Cuddapah, Coimbatore, Madurai, Kottayam, Cannanore & Minicoy 1 each	Amini 24, Vythiri 23, Karipur 21, Kozhikode 17, Kottayam 14, Alapuzha 12, Cochi 9, Holenarasipura 8, Nancowry, Kondul 7, Osmanabad 6, Jowai & Karaikal 4 each, Medikeri, Mysore & Thiruvananthapuram 3 each, Panjim, Ongole, Nellore, Bapatla, Dharmapuri, Salem, Nagapattinam & Belgaum 2 each, Khonsa, Panjim, Koregaon, Anantpur & Bangalore 1 each
8	Darjeeling 4, Champasarai 3, Baghdogra, Gopalpur, Aska & Daporijo 2 each, Sevoke, Neora & Kondul 1 each	Dhollabazar 23, Passighat 7, Khowang 6, Digha & Siddapura 5 each, Chouldhowaghat, Roing, Kuppady & Hosanagara 4 each, Kashinagar & Panchet 3 each	Kozhikode 9, Karipur 7, Valparai 6, Ongole, Kannur & Agathi 5 each, Mangalore, Gulmarg, Alapuzha & Cochi 4 each, Kondul, Osmanabad, Anantpur, Coimbatore, Mangalore & Punalur 3 each, Ratnagiri Parola, Hut Bay & Srinagar 2 each, Buldhana, Nasik, Machilipatnam, Salem, Karwar, Medikeri & Thiruvananthapuram 1 each
9	Pottangi, Kondul & Nancowry 4 each, Talcher 3	Gossaighat 11, Cherrapunji 7, Diana, Akhuapada & Quazi Gund 4 each, Ambalavayal, Jalpaiguri & Purnea 3 each, Gangtok & Kushalnagar 2 each, Bankura 1	Hosdurg 16, Kannur 15, Mangalore 13, Amalner 12, Gossaigaon 7, Itanagar & Kozhikode 6 each, Gangtok 4, Dibrugarh, Malegaon, Alapuzha & Minicoy 3 each, Ratlam, Tezpur, Tadong, Mandya & Cochi 2 each, Pahalgam, Hut Bay, Indore, Adirampattinam, Medikeri, Mysore & Punalur 1 each
10	Nancowry 2, Purusottampur 1	Kailashahar 8, Agartala 6, Gangtok 5, Kariganj & Tadong 4 each, Silchar 3, Miao, Namsai, Naraingarh 2, Naduan, Shillong & Purnea 1 each	Perumbavur & Mellabazar 10 each, Anekal 9, Khandwa & Port Blair 7 each, Tezpur 5, Changlang & Gangtok, 4 each, Kondul, Kolhapur, Rajkot, Dwarka, Salem, Nagapattinam & Mangalore 3 each, Alapuzha, Car Nicobar, Jalpaiguri, Tadong, Tiruchirapalli & Alapuzha 2 each, Dahanu, Dibrugarh, Mumbai, Dahanu, Jalgaon, Honavar, Bangalore, Chitradurga & Minicoy 1 each
11	Gheropara 8, Sriniketan 7, Diana 4, Kolkata 2, Khonsa, Lakhipur, Pahalgam & Bhagalpur 1 each	Silchar 8, Kailashahar, Imphal, Tadong & Gangtok 3 each, Punalur & Guwahati 2 each, Hassan 1	Aie N. H. xing 21, Pondicherry 11, Itanagar 10, Cuddalore 8, Gangtok 6, Dibrugarh & Tadong 5 each, Parola 4, Sulya, Long Island, Hut Bay, Kondul, Rajkot & Porbandar 3 each, Ambad, Washim & Aurangabad 2 each, Kottayam, Port Blair, Tezpur, Parbhani & Thiruvananthapuram 1 each
12	Hut Bay 7, Kondul 3, Nancowry & Quazi Gund 1 each	Gangtok 13, Tadong 12, Silchar 7, Kailashahar 6, Guwahati 4, Alapuzha & Kottayam 3 each, Balasore & Jayapura 2 each, Sulya 1	Beki Road Bridge 10, Miao 9, Yeotmal 7, Hut Bay, Billoli & Silchar 4 each, Maya Bandar, Port Blair, Dibrugarh, Tezpur & Bidar 3 each, Panjim, Sholapur, Raipur & Guwahati 2 each, Imphal, Haripad, Surada, Naliya, Nizamabad, Bijapur & Kottayam 1 each
13	Car Nicobar & Cherrapunji 1 each	Silchar 9, Tezpur & Guwahati 4 each, Konni 3, Gangtok, Passighat & Kailashahar 2 each, Tadong 1	Cherrapunji 27, Car Nicobar & Tadong 9 each, Itanagar 8, Sagar 5, Gunupur, Akola & Kumarakom 3 each, Imphal 1
14	Gangtok, Aruppukottai & Cochi 1 each	Palayamkottai 10, Silchar 9, Imphal 4, Tezpur & Passighat 3 each, Punalur & Thiruvananthapuram 2 each	Cherrapunji 17, Roing 12, Gangtok 9, Kailashahar 8, Port Blair 7, Jenapur & Malur 3 each, Pendra 2, Guna 1

TABLE 5 (*Contd.*)

(1)	(2)	(3)	(4)
15	Nil	Cherrapunji 19, Golaghat 10, Imphal 8, Passighat 7, Tezpur, Silchar & Tawang 6 each, Dibrugarh 3, Guwahati 2, Gangtok & Munnar 1 each	Diana 26, Jowai 22, Passighat 11, Erode 8, Hut Bay 7, Kiravati 6, Hassan 4, Sabroom, Bhubaneswar & Ratnagiri 3 each
16	Tadong, Punalur & Thiruvananthapuram 1 each	Cherrapunji 39, Lakhipur 18, Silchar 15, Imphal 11, Miao 8, Dibrugarh 7, Roing 5, Tezpur 4, Srirangapatna 3, Sankalan & Munnar 2 each, Guwahati 1	Bhatkal 19, Goalpara & Jagalur 12 each, Deodurga 11, Diana 10, Nancowry & Hosur 9 each, Roing 8, Gangtok & Balasore 4 each, Solapur 3
17	Puthimari 1	Cherrapunji 13, Lakhipur 11, Imphal 5, Parambikulam & Banihal 4 each, Gangtok, Agartala, Khonsa & Dharmapuri 3 each, Tadong 2, Gundlupet, Guwahati, Siliguri & Srinagar 1 each	Hut Bay 13, Thodupuzha 9, Bharamasagar & Vandavasi 8 each, Vijayawada & Savanur 7 each, Tuljapur & Panambur 6 each, Ratnagiri & Mythan 5 each, Sankalan 4
18	Kondul 3, Nancowry 1	Cherrapunji 18, Dharmanagar 9, Lakhipur 8, Golaghat 7, Khonsa 6, Tezpur & Kailashshahar 5 each, Tawang & Khowang 4 each, Agartala 3, Dibrugarh & Imphal 2 each, Kodaikanal 1	Bhatkal 21, Jowai 9, Munnar 8, Mathabhanga 7, Mohol & Deodurga 6 each, Roing 5, Agartala 4, Naraj 1
19	Baghdogra 9, Cherrapunji 7, Gajoldoba 3, Passighat & North Lakhimpur 2 each, Nancowry 1	Kailashahar 26, Dharmanagar 15, Cherrapunji 10, Agartala & Guwahati 8 each, Silchar 6, Shillong 4, Tadong, Jalpaiguri & K. Paramathy 3 each, Tawang & Munnar 2 each, Gangtok 1	Virajpet & Kannur 11 each, Shirali 9, Gajoldoba & Tirukoilur 7 each, Khowang 6, Lengpui 5, Maya Bandar, Khonsa & Sibsagar 4 each, Chandbali & Alibag 2 each
20	Gajoldoba 6, Alipurduar 5, Roing & Cherrapunji 4 each, Bokajan 3, Kondul 2, Passighat, Dibrugarh & Nancowry 1 each	Agartala 7, Punalur & Kailashahar 4 each, Mohanpur, Jaipur & Kuppady 3 each, Gundlupet 2, Balasore & Kottayam 1 each	Karkala 14, Gajoldoba, N. H. xing & Thalassery 9 each, Agumbe 8, Valparai 7, Roing, Kohima & Kottayam 5 each, Cochi 4, Gangtok & Honavar 3 each, Magra, Long Island, Imphal & Medikeri 2 each, Panjim & Mahabaleshwar 1 each
21	Tadong 9, Gangtok 6, Jorhat 3, Kanjirappally & Namsai 2 each, Passighat 1	Chiknayakanahalli 3, Bhuntar & Banihal 2 each, Punalur & Sedam 1 each	Haripad 10, Diana & Belonia 7 each, Seppa & Amraghat 5 each, Purnea, Guwahati, Thiruvananthapuram & Cochi 4 each, Maharajganj & Udupi 3 each, Silchar 2, Long Island & Panjim 1 each
22	Cherrapunji 5, Roing 4, Passighat & Gangtok 3 each, Dibrugarh 2, Tadong 1	Sevoke 10, Seijosa 9, Badatighat & Chaibasa 6 each, Kunnamkulam & Puthimari 5 each, Guwahati & Baghdogra 4 each, Tezpur, Chandbali & Paradip 3 each, Digha, Chickmagalur & Medikeri 2 each, Jalpaiguri, Bankura, Berhampore, Balasore & Hyderabad 1 each	Hosdurg 12, Purnea 6, Harinkhola, Roing & Mangalore 4 each, Port Blair, Tezpur, Belonia, Mython, Honavar & Cochi 3 each, Panagarh & Gorakhpur 2 each, Kailashahar, Gangtok, Medikeri & Minicoy 1 each
23	Gangtok 6, Itanagar 5, Roing & Sibsagar 4 each, Dibrugarh 3, Passighat, Tezpur & Guwahati 2 each	Tehri 14, Tadong & Salur 8 each, Cooch Behar 7, North Lakhimpur, Gangtok, Gudari & Visakhapatnam 6 each, Itanagar, Munnar & Thiruvananthapuram 4 each, Konner, Raibareilly, Baghpat, Almora, New Delhi & Bangalore 3 each, Guwahati, Patna, Purnea, Pahalgam, Banihal & Batote 2 each, Tezpur, Dibrugarh, Kalimpong, Jamshedpur, Lucknow, Karnal, Bhuntar & Srinagar 1 each	Bantwal 20, Cherrapunji 12, Roing 8, Agartala & Mangalore 6 each, Ajnala & Cochi 5 each, Maya Bandar, Tezpur, Hasimara, Dehra Dun, Berthin & Bhuntar 4 each, Dhampur, Silchar, Gangtok & Muzaffarpur 3 each, Gorakhpur & Berhampur 2 each, Jaipur, Panjim & Agathi 1 each

TABLE 5 (*Contd.*)

(1)	(2)	(3)	(4)
24	Itanagar 8, Konni 6, Roing & Mellabazar 5 each, Passighat 4, Dibrugarh & Chengannur 2 each, Tezpur & CIAL Cochi 1 each	Hassan 8, Sabour, Sankalan, Alipingal, Hanamkonda & Mancompu 5 each, Belonia, Maharo, Almora, Shantiniketan, Haldia, Mysore & Kozhikode 4 each, Paradip, Cuttack, Puri, Kashinagar, Tenughat, Korba, Agartala, Jalpaiguri, Kolkata, Berhampore, Uluberia, Bihubar & Adirampattinam 3 each, Shardhana, Anantnag, Umaria, Armori, Tadong, Gangtok, Mehbubnagar, Chickmagalur & Mandya 2 each, Car Nicobar, Guwahati, Shillong, Kailashahar, Malda, Allahabad, Sultanpur, Mukteshwar, New Delhi, Pendra & Kurnool 1 each	Siddapura 12, Sankalan & Roing 9 each, Biswan & Deoband 7 each, Thanesar, Mangalore & Kannur 6 each, Kashipur, Khanna & Patiala 5 each, Ambala, Hut Bay & Nadaun 4 each, Dhollabazar, Jaipur, Canning Town & Medikeri 3 each, Amritsar, Gangtok, Sarsawa, Pant Nagar & Amini Divi 2 each, Muzaffarpur, Lucknow, Tirupathi & Tirupattur 1 each
25	Kayamkulam 8, Punalur 5, Passighat, North Lakhimpur & Alapuzha 4 each, Itanagar 3, Thiruvananthapuram & Cochi 1 each	Kurnool 9, Hassan 8, Kashinagar, Tenughat, Korba & Bellary 3 each, Cherrapunji, Sakti, Damoh & Armori 2 each, Kondul, Nancowry, Silchar, Gopalpur, Tuni, Tondi & Kodaikanal 1 each	Maya Bandar 11, Neelamangala 10, Sevoke 9, Chouldhowaghat & Kondul 8 each, Gheropara 7, Baripada 6, Kailashahar & Raibareilly 5 each, Khonsa 4, Dibrugarh, Bankura, Balasore, Gorakhpur & Alapuzha 3 each, Seepa 2, Hapur 1
26	Roing & Mysore 2 each	Varkala 7, Hindol 6, Kalimpong, Bhubaneswar, Palayamkottai & Punalur 4 each, Mungeli & Kodaikanal 3 each, Muzzaffarnagar, Chennai & Cochi 2 each, Deoria, Amgoan, Hut Bay, Gangtok, Tadong, Ranchi, Purnea, Coonoor, Valparai, Mandya & Karipur 1 each	Kokrajhar 13, Polur 10, Dharmasthala 9, Hoskote 7, Udupi 6, Nagrakata, Paradip & Kotdwar 5 each, Mani 4, Passighat & Sriganganagar 3 each, Pendra, Panagarh, Patna & Coonoor 2 each, Udhampur, Kavali & Amini Divi 1 each
27	Passighat 4, Roing 3, Konni 2, Phulbani 1	Idukki 6, Jenapur & Madurai 5 each, Bolangir 4, Mython 3, Keonjhargarh & Cochi 2 each, Car Nicobar, Baramulla, Pendra, Gopalpur, Cuttack, Bhubaneswar, Ranchi & Gadag 1 each	Aryankavu 15, Honavar 11, Avinashi 10, Port Blair 8, Karimganj, Sundernagar & Linganmakki 7 each, Anantpur & Nagapattinam 5 each, Port Blair, New Delhi & Forbesganj 4 each, Gulmarg, Vengurla, Jalpaiguri, Varanasi, Ganganagar & Alapuzha 3 each, Tehri, Katra, Medikeri & Minicoy 1 each
28	Dibrugarh 7, Ottappalam 4, Roing & Thiruvananthapuram 3 each	Kutraguda 9, Amraghat 4, Roing, Anantnag, Ponnani, Silchar, Quazi Gund, Coimbatore & Karipur 2 each, Hut Bay, Kohima, Almora, Guler, Kondul, Srinagar & Banihal 1 each	Omalur & K. R. Pet 8 each, Uluberia 5, Malda & Koppal 4 each, Purnea, Meerut, Kashipur & Pilani 3 each, Rengali, Jind & Shimla 2 each
29	Roing & Khowang 7 each, Thodupuzha 5, Parambikulam 4, CIAL Cochi 3, Imphal, Dibrugarh & Punalur 2 each, Imphal & Tiruchirapalli 1 each	Kondul & Shenkottah 9 each, Jalpaiguri 8, Purnea 5, Balimundali, Guwahati & Pendra 4 each, Kaithal, Pahalgam & Malda 3 each, Changlang, Gangtok, Tadong, Jharsuguda, Srinagar, Bapatla & Vellore 2 each, Baghdogra, Keonjhargarh, Cuttack, Bhubaneswar, Puri, Moradabad, Mukteshwar, Shimla, Sundernagar, Bhuntar, Quazi Gund & Salem 1 each	Bhalukpong & Bihubar 10 each, Kundapura 8, Domohani 5, Bankura 3, Barkote & Bhinga 2 each
30	Agumbe & Chittur 5 each, Roing 4, Durgachak, Dillighat, Medikeri & Valparai 2 each, Rajghat, Baripada Vedaranyam & Punalur 1 each	Dharmanagar 9, Alapuzha 8, Katra 7, Alur & Batote 6 each, Banihal, Srinagar, Tissa & Sunnibhajji 5 each, Agartala, Gulbarga, Gunupur, Jamshedpur, Bareilly, Jammu, Pahalgam, Pendra & Medikeri 4 each, Hissar, Port Blair, Kolkata, Puri, Balasore & Hindon 3 each, Mahuva, Maya Bandar, Ranchi, Ambala, Bhuntar & Palayamkottai 2 each	Bhatkal 19, Hanagal 14, Kannur 13, Kunigal 10, Amraghat 8, Madurai 7, Chepan 6, Ratnagiri 4, Gudari 3
31	Sankalan & Thodupuzha 4 each, Roing, Hyderabad, Cuddapah & Pendra 3 each, Bangalore, CIAL Cochi & Mahendragarh, 2 each, Imphal, Passighat, Kavali & Nizamabad 1 each	–	Jalpaiguri 15, Nargund 10, Cherrapunji 8, Kiravati 3, Kolhapur & Gangtok 2 each, Baripada 1

3.2.4. *Disastrous weather events and damage*

According to some press reports, 34 (27 in Uttar Pradesh, 6 in Rajasthan and 1 in Punjab) people died due to hailstorm/lightning. Though no casualties were reported from Assam & Meghalaya, 5 lakh people were badly affected due to squall/hailstorm in these states. Lok Sabha Vote Polling Centre also was affected due to squall. Also, an educational institution was blown away and several valuable trees were uprooted due to squall in the state.

3.3. *May*

3.3.1. There were two cyclonic storms as mentioned in the beginning, the details of which are given below-

3.3.1.1. *Severe cyclonic storm over the Arabian Sea (5-10 May 2004)*

A trough in the easterlies at sea level lay over southeast Bay on 29 & 30. It organised into a low pressure area over southeast and adjoining southwest Bay on 30 evening and persisted there on 1 May; became well marked over there in the same evening and lay over southwest Bay off Sri Lanka coast on 2. It moved over to northern parts of Sri Lanka and adjoining south Tamil Nadu, Commorin area and southwest Bay on 3 and lay over Kerala and adjoining areas of Tamil Nadu, south interior Karnataka and southeast Arabian Sea on 4. Moving westwards, it emerged into the Arabian Sea and concentrated into a Depression over Lakshadweep area, adjoining Kerala coast and southeast Arabian Sea and lay centred at 0300 UTC of 5, near Lat. 11.5° N / Long. 73.5° E. It remained practically stationary over there, intensified into a Deep Depression in the forenoon and further into a Cyclonic Storm in the evening of 5. Moving slightly westwards, it lay centred near Lat. 11.5° N / Long. 73.0° E, about 50 km northeast of Amini Divi at 0300 UTC of 6 and remained practically stationary over there until the evening. Subsequently, moving in a northwesterly direction, it intensified into a Severe Cyclonic Storm and lay centred near Lat. 12.5° N / Long. 72.0° E, at 0300 UTC of 7; near Lat. 13.0° N / Long. 71.5° E, at 1200 UTC of 7 and near Lat. 13.5° N / Long. 71.0° E, at 0300 UTC of 8. Thereafter, it remained practically stationary over there and weakened into a Cyclonic Storm at 1200 UTC of 8. Moving in a northnorthwesterly direction, it lay centred near Lat. 15.0° N / Long. 70.5° E at 0300 UTC of 9 and near Lat. 16.5° N / Long. 70.0° E at 1200 UTC of 9. Thereafter, it moved in a northerly direction and lay centred near Lat. 19.0° N / Long. 70.0° E at 0300 UTC of 10. It weakened into a Deep Depression over there at 0600 UTC of 10 and further into a Depression and lay centred near Lat. 19.5° N / Long. 70.0° E at 0900 UTC of 10. It subsequently weakend into a well-marked low pressure area off Saurashtra coast in the same evening. It lay as a low pressure area over Saurashtra & Kutch coast on 11 morning, over south Pakistan and adjoining Kutch on 11 evening and became less marked on 12. Track of the system is shown in Fig. 2.

The system did not cause any damage over the main land, as it dissipated over the sea. But in its formative stage it caused widespread damage to Lakshadweep islands. Amini recorded an unprecedented rainfall of 116.8 cm on 5.

3.3.1.2. *Very severe cyclonic storm over the Bay of Bengal (16-19 May 2004)*

Under the influence of a trough of low at sea level, a low pressure area formed over east-central Bay and adjoining north Andaman Sea on 15, which became well marked on 16 morning. Subsequently, it concentrated into a depression and lay centred near Lat. 17.0° N / Long 91.5° E and near Lat.17.5° N / Long. 91.0° E at 0900 UTC and 1200 UTC of 16 respectively. Remaining practically stationary over there, it intensified into a deep depression by 1800 UTC of 16 and further into a cyclonic storm near Lat. 18.5° N / Long. 90.0° E, at 0300 UTC of 17. It lay centred at 1200 UTC of 17, near Lat. 18.5° N / Long. 89.0° E and remained practically stationary over there for some time. Slowly moving westwards, it lay centred at 0300 UTC near Lat. 19.0° N / Long. 88.5° E and intensified into a severe cyclonic storm over there at 0600 UTC of 18. It subsequently drifted eastwards and lay centred at 1200 UTC of 18, near Lat. 19.0° N / Long. 90.0° E and intensified into a very severe cyclonic storm over there by 1500 UTC of the same day. Further moving northeastwards, it lay centred near Lat. 20.5° N / Long. 92.0° E, at 0300 UTC of 19 and crossed Myanmar coast north of Akyab between 0400 and 0500 UTC of 19. Track is shown in Fig. 2.

The system showed characteristics of a monsoon system in the initial stages, like southwestward tilt with height, more cloud cover in the southwest sector etc. But the features changed drastically, subsequent to recurvature. No damage was reported over the country.

3.3.2. *Advance of southwest monsoon*

The southwest monsoon advanced over parts of Andaman Sea and of southeast Bay on 13; some parts of southwest Bay, some more parts of southeast Bay and of Andaman Sea on 14 and over most parts of south Arabian

Sea, Lakshadweep area, Kerala and of Tamil Nadu, entire south Bay, parts of central Bay and entire Andaman Sea on 18. Though the advance over mainland was declared as temporary onset on operational basis, owing to the cyclonic storm influencing wind patterns, the synoptic features prevailed during the subsequent days after the dissipation of the storm, suggested the prevalence of monsoon current over the region. It further advanced into some more parts of central Bay, some parts of north Bay, entire Arunachal Pradesh and Nagaland-Manipur-Mizoram-Tripura and some parts of Assam & Meghalaya on 21; into entire south Arabian Sea, some parts of east-central Arabian Sea and of coastal and south interior Karnataka, some more parts of Tamil Nadu and of north Bay, entire Assam & Meghalaya and some parts of Sub-Himalayan West Bengal & Sikkim on 23. After 23 May, there was no progress in advancement of monsoon till 1 June.

3.3.3. *Weather and associated synoptic features*

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

Southwest monsoon has been *active* on 5 days in Kerala and on 1 to 2 days in Arunachal Pradesh and Nagaland-Manipur-Mizoram-Tripura.

Rain/thundershowers occurred either *at most places* or *at many places* on 19 to 21 days in Andaman & Nicobar Islands, Sub-Himalayan West Bengal & Sikkim, coastal Karnataka and Kerala; on 9 to 13 days in Konkan & Goa, Madhya Maharashtra, south interior Karnataka and Lakshadweep; on 4 to 8 days in Nagaland-Manipur-Mizoram-Tripura, Gangetic West Bengal, Marathwada, Rayalaseema, Tamil Nadu and on 1 to 3 days in Orissa, Jharkhand, Bihar, west Uttar Pradesh, Uttaranchal, Haryana, Punjab, Himachal Pradesh, Jammu & Kashmir, east Rajasthan, coastal Andhra Pradesh and north interior Karnataka. Rain/thundershowers also occurred either *at a few places* or *at isolated places* on 21 to 26 days in Orissa, Tamil Nadu and interior Karnataka; on 14 to 18 days in Konkan & Goa, Madhya Maharashtra, Vidarbha, coastal Andhra Pradesh, Telangana, Rayalaseema, on 9 to 13 days in Andaman & Nicobar Islands, Arunachal Pradesh, Assam & Meghalaya, Nagaland-Manipur-Mizoram-Tripura, Gangetic West Bengal, Jharkhand, east Uttar Pradesh, Jammu & Kashmir, Marathwada, Chattisgarh, coastal Karnataka, Kerala and Lakshadweep and on 2 to 8 days in Sub-Himalayan West Bengal & Sikkim, Bihar, west Uttar Pradesh, Uttaranchal, Haryana, Punjab, Himachal Pradesh, Rajasthan, Madhya Pradesh and Gujarat State. *Very heavy rainfall* occurred on 4 to 6 days in Assam & Meghalaya, Tamil Nadu, coastal Karnataka and Kerala and on 1 to 3 days in Andaman & Nicobar Islands, Arunachal Pradesh, Sub-Himalayan West Bengal & Sikkim, north interior Karnataka and Lakshadweep. *Heavy rainfall* also occurred on 9 to 12 days in Assam & Meghalaya, Sub-Himalayan West Bengal & Sikkim, Tamil Nadu, south interior Karnataka and Kerala; on 4 to 7 days in Andaman & Nicobar Islands, Arunachal Pradesh and coastal & north interior Karnataka and on 1 to 3 days Nagaland-Manipur-Mizoram-Tripura, Uttar Pradesh, Himachal Pradesh, Madhya Maharashtra, coastal Andhra Pradesh and Rayalaseema.

3.3.4. *Rainfall distribution*

Rainfall during May was *excess* in 23 sub-divisions, *viz*., Andaman & Nicobar Islands, Arunachal Pradesh, Sub-Himalayan West Bengal & Sikkim, Jharkhand, Bihar, east Uttar Pradesh, west Uttar Pradesh, Uttaranchal, Haryana, Punjab, east Rajasthan, west Madhya Pradesh, Saurashtra & Kutch, Vidarbha, coastal Andhra Pradesh, Telangana, Rayalaseema, Tamil Nadu, coastal Karnataka, north interior Karnataka, south interior Karnataka, Kerala and Lakshadweep; *normal* in 6 *viz*., Assam & Meghalaya, Gangetic West Bengal, Himachal Pradesh, Jammu & Kashmir, east Madhya Pradesh, Chattisgarh and *deficient* in 7, *viz*., Nagaland-Manipur-Mizoram-Tripura, Orissa, west Rajasthan, Gujarat Region, 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 1 day in Gujarat State. *Heat wave conditions* prevailed on 16 days in west Rajasthan; on 10 days in Punjab and east Rajasthan; on 4 to 7 days in Orissa, Bihar, east Uttar Pradesh, Haryana and Gujarat State and on 1 to 3 days in Jharkhand, west Uttar Pradesh, west Madhya Pradesh and Vidarbha. *Hot day* conditions prevailed on 1 to 3 days in Jharkhand, Haryana, east Rajasthan, Madhya Pradesh and coastal Andhra Pradesh. Day temperatures were *appreciably* to *markedly above normal* on 12 to 15 days in Uttaranchal, Himachal Pradesh and Jammu & Kashmir; on 8 to 10 days in West Bengal & Sikkim and Haryana; on 4 to 7 days in Assam & Meghalaya, Nagaland-Manipur-Mizoram-Tripura, Orissa, Punjab, west Rajasthan, Saurashtra & Kutch, Konkan & Goa, Madhya Maharashtra and coastal Andhra Pradesh and on 1 to 3 days in Arunachal Pradesh, Jharkhand, Bihar, Uttar Pradesh, east Rajasthan, Madhya Pradesh, Gujarat Region, Chattisgarh, Telangana and coastal & south interior Karnataka.

The month's as well the season's highest temperature of 47.6° C was recorded at Jhalwar (east Rajasthan) on 18.

3.3.6. *Disastrous weather events and damage*

According to some press reports, *severe heat wave/heat wave* conditions took a toll of 26 people in Uttar Pradesh and 4 in Gujarat State during this month. Lightning and heavy downpour took a toll of 34 people (11 each in Uttar Pradesh and Jammu & Kashmir, 6 in Uttaranchal, 5 in Saurashtra and 1 in Madhya Maharashtra) during this month.

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 from –19 % to +19 %.

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

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

At most places - 75 % or more stations of a meteorological sub-division reporting atleast 2.5 mm rainfall.

At many places - 51% to 74 % stations of a meteorological sub-division reporting atleast 2.5 mm rainfall.

At a few places - 26 % to 50% stations of a meteorological sub-division reporting atleast 2.5 mm rainfall.

An isolated places - 25% or less stations of a meteorological sub-division reporting at least 2.5 mm rainfall.

Heavy rain - rainfall amount from 6.5 cm to 12.4 cm.

Very heavy rainfall - rainfall amount 12.5 cm or more.

Monsoon activity

Active - Average rainfall of a sub-division is more than 1 ½ to 4 times the normal with minimum 5 cm along the west coast and 3 cm elsewhere in at least two stations in the sub-division.

Temperature

(a) Maximum/day temperatures

According to the new criteria, since 1st March 2002, Heat Wave will be declared only when the maximum temperature of a station reaches at least 40° C for plains and at least 35° C for Hilly regions.

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

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

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

Markedly above normal - departure of maximum temperature from normal is –5° C to –6° C for the region where the normal maximum temperature is 40° C or less.

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

(b) Minimum/night temperatures

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

Below normal when the departure of minimum temperature from normal is –2° C.

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

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