MAUSAM, 48, 2 (April 1997), 329-342

Weather in India

HOT WEATHER SEASON (MARCH - MAY 1996)*

1. Introduction

During the hot weather season of 1996, there was a good thundershower activity giving rise to normal to excess rainfall in Arunachal Pradesh, Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura, Sub-Himalayan West Bengal & Sikkim and Andaman & Nicobar Islands. However, in Kerala rainfall activity was rather subdued which is in contrast to that of the last year. During the season only one depression formed over the Bay of Bengal. Sub-divisionwise seasonal rainfall and its departures from normal are given in Fig. 1 and Table 4. Monthly rainfall and its departures are also given in Table 4. Track of the cyclonic system is shown in Fig.2.

2. Chief features

(*i*) Only one depression in the month of May, during the season over Bay of Bengal.

(*ii*) Thundershower activity in north eastern regions of India and Andaman & Nicobar Islands.

(*iii*) Moderate to severe heat wave conditions on a number of days over Andhra Pradesh and north Tamil Nadu.

(*iv*) Advance of southwest monsoon over parts of Commorrin Sea, parts of Sri Lanka, parts of central Bay and northeast Bay, Nagaland, Manipur, Mizoram & Tripura, parts of Assam & Meghalaya and Arunachal Pradesh, by 31 May.

3. Seasonal rainfall

Seasonal rainfall was excess in 3, normal in 10, deficient in 15 and scanty in 6. There was no rain in meterological sub-division (Gujarat Region) (Table 4).

Rainfall was excess in Arunachal Pradesh and Rajasthan and normal in Andaman & Nicobar Islands, Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura, Sub-Himalayan West Bengal & Sikkim, Haryana, Himachal Pradesh, interior Andhra Pradesh, Tamil Nadu and south interior Karnataka. It was deficient in Gangetic West Bengal, Orissa, west Uttar Pradesh, Punjab, Jammu & Kashmir, Madhya Pradesh, Saurashtra & Kutch, Maharashtra outside Konkan & Goa, coastal Andhra Pradesh, north interior Karnataka and Kerala and scanty in Bihar, east Uttar Pradesh, Konkan & Goa, coastal Karnataka and Lakshadweep. There was no rain in Gujarat Region.

4. Monthly features

4.1. *March*

4.1.1. *Weather and associated synoptic features*

Under the influence of a cyclonic circulation (1-4) and a trough in mid and upper tropospheric westerlies (1-7) (extended up to Lat 15° N and moved eastwards upto 18°E), there was a good spell of rain in west Rajasthan, Madhya Pradesh and Orissa during 1st week of the month.

Two western disturbances (14-18 and 22-27) and a mid and upper tropospheric westerly trough (15-19) produced a good spell of rain in northwest Indian region and plains of west Uttar Pradesh during the week ending on 20 March. Details of the weather systems which formed during the month and their synoptic features are given in Table 1.

Rain or thundershowers during March occurred almost at all the places or at many places on 9 days in Jammu & Kashmir, on 7 days in Himachal Pradesh, on 3 days in Punjab and on one or two days in Assam & Meghalaya, Gangetic West Bengal, Orissa and Haryana. Rainfall occurred at a few places or at one or two places on 14 to 16 days in Assam & Meghalaya, Sub-Himalayan West Bengal & Sikkim and hills of west Uttar Pradesh on 9 to 11 days in Nagaland, Manipur, Mizoram & Tripura,

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TABLE 1

Details of the weather systems during March 1996

S. No.	System	Period	Place of first location	Direction of movement	Place of dissipation	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)
(A) *Western disturbances*						
1.	Upper air system	14-18	Afghanistan & neighbourhood	Northeasterly	Moved away across Jammu & Kashmir	
2.	Do.	20-22	North Pakistan & neighbourhood	Do.	Do.	
3.	Do.	26-27	Do.	Do.	Do.	
4.	Do.	28-30	Do.	Do.	Do.	
(B) *Induced cyclonic circulation*						
1.	Lower levels	28-30	West Rajasthan and adjoining Pakistan	Easternorth-easterly	Moved away across Punjab, Himachal Pradesh and adjoining hills of west Uttar Pradesh	
(C) *Embedded cyclonic circulations*						
1.	Lower levels	27-28	Bangladesh and neighbourhood	Stationary	Merged with the trough no.1 over the same area	
(D) *Other cyclonic circulations*						
1.	Mid-tropospheric levels	1-4	Southwest Rajasthan and neighbourhood	Northeasterly	Bihar	
2.	Do.	4-9	North Pakistan and adjoining Jammu and Kashmir	Do.	Moved away northeastwards across Jammu & Kashmir	
(E) *Troughs in the westerlies*						
1.	Mid and upper tropospheric westerlies	1-7	72°E, north of 20°N	Easterly	88°E, north of 15°N	
2.	Do.	15-19	60°E, north of 20°N	Do.	70°E, north of 20°N	
(F) *Trough in the easterlies*						
1.	Lower levels	14-16	South Tamil Nadu to south interior Karnataka	Westerly	Kerala to south Maharashtra coast	
2.	Do.	19-22	Tamil Nadu to Marathwada	Do.	Kerala to north interior Karnataka	

(Contd.)

TABLE 1 (*Contd.*)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
(H) *Other troughs*						
1.	Mid-tropospheric levels	8 Mar - 1 Apr	Gangetic West Bengal	Quasi-Stationary	Sub-Himalayan West Bengal to Telangana	It was seen as a cyclonic circulation over Bangladesh from 9th to 11th
2	Lower tropospheric levels	28-30	East Madhya Pradesh to south Tamil Nadu	Do.	North interior Karnataka to south Tamil Nadu	
3.	Do.	6-8	Pakistan and adjoining west Rajasthan	Easterly	West Rajasthan and neighbourhood	
4.	Mid-tropospheric levels	2-8	Assam & Meghalaya	Stationary	*in situ*	
5.	Lower tropospheric levels	8-14	North Pakistan and adjoining Jammu & Kashmir	Easterly	Moved away across Jammu & Kashmir	
6.	Lower levels	10-13	South Tamil Nadu and adjoining areas Kerala	Stationary	*in situ*	
7.	Lower tropospheric levels	18-21	Punjab and neighbourhood	Northeasterly	Hills of west Uttar Pradesh	
8.	Lower levels	21-23	Northwest Rajasthan and neighbourhood	Stationary	*in situ*	

Orissa and Kerala on 5 to 8 days in Haryana, Punjab, Himachal Pradesh, Jammu & Kashmir, Madhya Pradesh, Tamil Nadu and south interior Karnataka and on 1 to 3 days in Andaman & Nicobar Islands, Arunachal Pradesh, Gangetic West Bengal, Bihar plateau, plains of Uttar Pradesh, Rajasthan, Marathwada, Vidarbha, Andhra Pradesh, coastal and north interior Karnataka.

4.1.2. *Month's rainfall*

Rainfall activity was subdued over most parts of the country during the month. Month's rainfall was excess in 4, normal in 2, deficient in 8 and scanty in 18 met sub-divisions. There was no rain in 3 meteorological sub-divisions (Table 4).

Rainfall was excess in Arunachal Pradesh, Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura and Haryana, normal in Punjab and Himachal Pradesh, deficient in West Bengal & Sikkim, Orissa, Hills of west Uttar Pradesh, Jammu & Kashmir, Rajasthan and west Madhya Pradesh and scanty in Andaman & Nicobar Islands, Bihar plains of Uttar Pradesh, east Madhya Pradesh, Saurashtra & Kutch, Marathwada, Vidarbha, Andhra Pradesh, Tamil Nadu, Karnataka, Kerala and Lakshadweep. There was no rain in Gujarat Region. Madhya Maharashtra and Konkan & Goa. Principal amounts of rainfall are given in Table 5.

4.1.3. *Temperature*

Day temperature was 5°C or more above normal on 4 to 6 days in Himachal Pradesh, Rajasthan and Saurashtra & Kutch and on 1 to 3 days in Arunachal Pradesh, Assam & Meghalaya, Orissa, Bihar, Haryana, Jammu & Kashmir, Madhya Pradesh, Gujarat region,

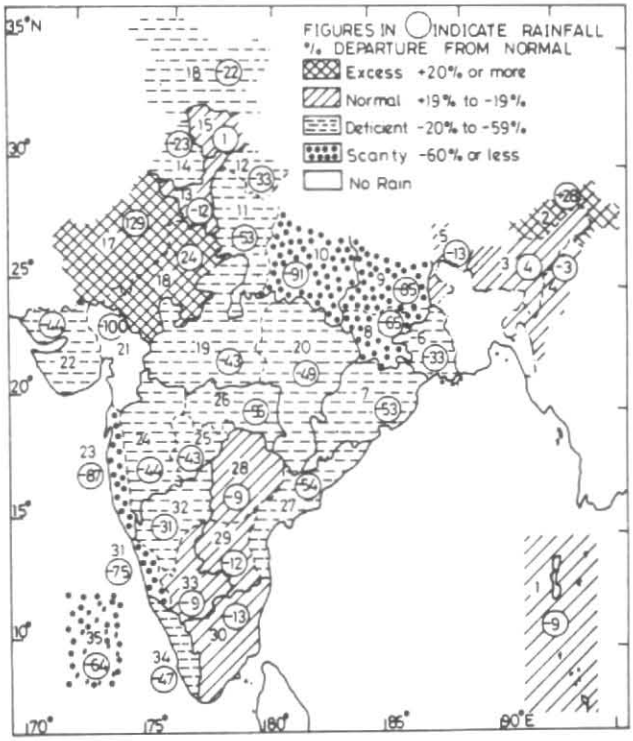

Fig. 1. Rainfall for the period 1 March to 31 May 1996

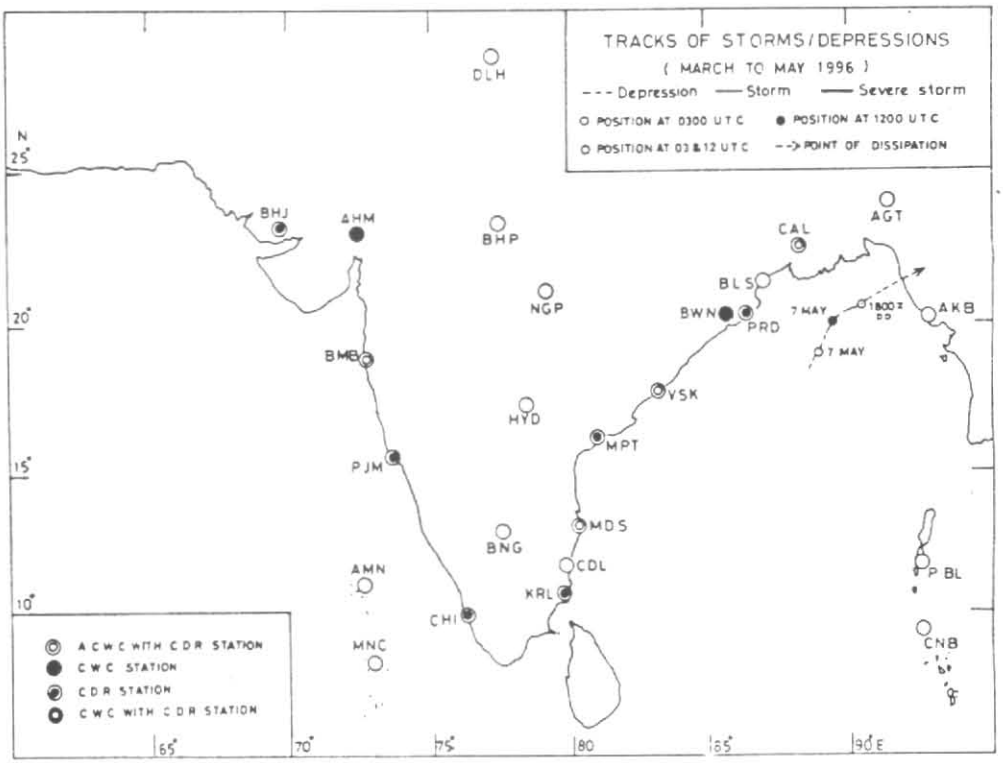

Fig. 2. Tracks of storms and depressions (March - May 1996)

TABLE 2

Details of the weather systems during April 1996

S. No.	System	Period	Place of first location	Direction of movement	Place of dissipation	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)
(A) *Western disturbances*						
1.	Upper air system	9-10	North Pakistan and neighbourhood	Northeasterly	Moved away across Jammu& Kashmir	
2.	Do.	12-13	Do.	Do.	Do.	
3.	Do.	20-22	Do.	Do.	Do.	
4.	Do.	29 Apr-2 May	Do.	Do.	Do.	
(B) *Embedded cyclonic circulations*						
1.	Lower tropospheric levels	5-8	North Bangladesh and neighbourhood	Westerly	Merged with the trough No. 2 over Bihar Plains	
2.	Lower levels	10-11	Vidarbha and neighbourhood	Stationary	*in situ*	
3.	Do.	10-11	Rayalaseema and neighbourhood	Do.	*in situ*	
(C) *Other cyclonic circulations*						
1.	Lower levels	2-3	Bangladesh and neighbourhood	Stationary	*in situ*	
2.	Do.	3-9	West Rajasthan	Northeasterly	Moved away across Punjab and Himachal Pradesh	A trough from this system to Madhya Pradesh extending upto 2.1 kms asl was seen on 5 and 6
3.	Mid-tropospheric levels	17-19	Northwest Rajasthan and neighbourhood.	Stationary	*in situ*	
4.	Do.	14-17	West Madhya Pradesh and neighbourhood	Easterly	North Vidarbha and neighbourhood	A trough from this system to south interior Karnataka was seen on 18, from Haryana to north interior Karnataka on 19, from west Madhya Pradesh to south Tamil Nadu 20 April to 7 May and became less marked on 7 May

(*Contd.*)

TABLE 2 (*Contd.*)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
5.	Lower levels	14-18	North Bangladesh and neighbourhood	Stationary	*in situ*	
6.	Do.	22-25	West Rajasthan and neighbourhood	Easterly	Haryana and neighbourhood	
7.	Lower tropospheric levels	27-29	Northwest Rajasthan and neighbourhood	Northeasterly	Punjab and neighbourhood	A trough from this system to coastal Orissa was observed on 27 and became less marked on 29
(D) *East-west troughs*						
1.	Lower levels	3-9	Bihar Plains to northeast Assam	Stationary	*in situ*	
2.	Lower tropospheric levels	17-19	Do.	Do.	Do.	
3.	Do.	25-28	Bihar Plateau to Nagaland	Westerly	Northeast Madhya Pradesh to northeast Bay across Gangetic West Bengal	
4.	Do.	29 Apr - 1 May	Bihar Plateau to north Assam	Stationary	*in situ*	
(E) *Troughs in the westerlies*						
1.	Lower tropospheric levels	9-18	Orissa to south Tamil Nadu coast	Quasi-stationary	Marathwada to south Tamil Nadu	
2.	Mid and upper tropospheric westerlies	21-27	62°E,north of 15°N	Eastnortheasterly	95°E, north of 15°N	It was seen over Vidarbha and neighbourhood on 24
(F) *Trough in the easterlies*						
1.	Lower tropospheric levels	3-8	South Kerala coast to Marathwada	Quasi-stationary	South Kerala to north Maharashtra	
(G) *Other troughs*						
1.	Lower tropospheric levels	1-2	Orissa to south Tamil Nadu	Quasi-stationary	Orissa to south interior Karnataka and then southwards to south Tamil Nadu	
2.	Mid-tropospheric levels	9-15	Sub-Himalayan West Bengal to north Bay	Stationary	*in situ*	
3.	Lower tropospheric levels	26-29	Andaman Sea and neighbourhood	Do.	Do.	

Konkan & Goa and Marathwada and parts of Vidarbha and Rayalaseema. It was 5°C or more below normal on 2 to 4 days in Arunachal Pradesh, Assam & Meghalaya, Punjab, Haryana, Himachal Pradesh, Jammu & Kashmir. Day temperature was normal or within ± 3°C of normal on other days in these regions and almost on all days in other parts of the country. The highest maximum temperature of 43°C was recorded at Chandrapur on 26, 27 and 29, at Kurnool on 29 and at Cuddapah on 30 and 31.

Night temperature was markedly above normal on 3 to 7 days in Nagaland, Manipur, Mizoram & Tripura, Punjab, Jammu & Kashmir, Rajasthan, east Madhya Pradesh, Gujarat region and Vidarbha. Cold wave conditions prevailed on 3 days in Jammu & Kashmir and for 7 days in Himachal Pradesh otherwise night temperature was nearly normal in most parts of the country. In the plains, lowest minimum temperature of 8°C was recorded at Amritsar on 4 and 31 and in the hills of –3°C at Kalpa on 8.

4.1.4. *Disastrous weather events and damages*

During the month, three persons lost their lives in Kashmir due to heavy rain. In Himachal Pradesh 6 persons were buried alive under an avalanche. In parts of Vidarbha hail storm and squall caused damage to electric and telephone poles and agricultural crops. In Kerala 4 persons were reported dead due to lightning and high winds.

4.2. *April*

4.2.1. *Weather and associated synoptic features*

During the month, four western disturbances moved across northwest India, however, they were not very active. These resulted in subdued rainfall activity in northwest India. Two cyclonic circulations, one more cyclonic circulation over west Madhya Pradesh with trough from this system extending to southern peninsular region and a trough in westerlies, affected west Madhya Pradesh, Orissa, Maharashtra and peninsular India during 10 to 18 April and produced good spells of rain in the affected region. Details of these and other weather systems are given in Table 2.

Rain or thundershowers occurred almost at all the places or at many places on 5 or 6 days in Arunachal Pradesh, Jammu & Kashmir and Kerala and on 1 or 2 days in West Bengal, Orissa, Himachal Pradesh, Madhya Maharashtra, Marathwada, Telangana, Tamil Nadu and interior Karnataka. Rainfall also occurred at a few places or at one or two places in 22 to 28 days in Orissa, Tamil Nadu, south interior Karnataka and Kerala, on 17 to 20 days in Arunachal Pradesh, Assam & Meghalaya, Sub-Himalayan West Bengal & Sikkim, Andhra Pradesh, on 11 to 14 days in Nagaland, Manipur, Mizoram & Tripura, Himachal Pradesh, east Madhya Pradesh and north interior Karnataka, on 5 to 10 days in Gangetic West Bengal, Bihar, hills of west Uttar Pradesh, Haryana, Punjab, Himachal Pradesh, Jammu & Kashmir, west Madhya Pradesh, Konkan & Goa, Madhya Maharashtra, Vidarbha and Lakshadweep and on 1 to 3 days in Rajasthan, Saurashtra & Kutch and Marathwada.

4.2.2. *Month's rainfall*

Rainfall during April was excess in 11, normal in 6, deficient in 13 and scanty in remaining 5 meteorological sub-divisions (Table 4).

Rainfall was excess in Andaman & Nicobar Islands, Gangetic West Bengal, Hills of west Uttar Pradesh, east Rajasthan, Saurashtra & Kutch, Madhya Maharashtra, Marathwada, interior Andhra Pradesh, Tamil Nadu and south interior Karnataka, normal in Arunachal Pradesh, west Rajasthan, east Madhya Pradesh, Vidarbha, north interior Karnataka and Kerala; deficient in Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura, Sub Himalayan West Bengal & Sikkim, Orissa, Bihar Plateau, Punjab, Himachal Pradesh, Jammu & Kashmir, west Madhya Pradesh, Konkan & Goa, coastal Andhra Pradesh, coastal Karnataka and Lakshadweep and scanty in Bihar Plains, plains of Uttar Pradesh, Haryana and Gujarat region. The principal amounts of rainfall are given in Table 5.

4.2.3. *Temperature*

Temperature during first half of April was mainly normal or within ± 3°C of normal in most parts of the country. During second half of April, heat wave conditions prevailed for 4-5 days in parts of Rajasthan and Saurashtra & Kutch and for 3-4 days in parts of Haryana, west Madhya Pradesh, Vidarbha, Marathwada and interior Andhra Pradesh. Highest temperature of 46°C was recorded at Phalodi and Churu on 27.

TABLE 3

Details of the weather systems during May 1996

S. No.	System	Period	Place of first location	Direction of movement	Place of dissipation	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)
(A) *Depressions and low pressure areas*						
1.	Deep depression	5-9	West-central & adjoining parts of east- central and southeast Bay	North to northeasterly	Myanmar and neighbourhood	First observed as a trough over Andaman Sea and neighbourhood on 30 April, became well marked low pressure area on 5 May, intensified into a depression on 7 and into a deep depression at 1800 UTC of 7, and crossed Bangladesh-Myanmar coast in the morning of 8 and weakened into a well marked low pressure area in the same morning
2.	Low pressure area	21-27	East-central Bay and neighbourhood	Northeasterly	Northeast Bay and neighbourhood	First observed as a trough in the lower levels on 19 over Andaman Sea and neighbourhood and became low pressure area on 20 Associated cyclonic circulation extended upto 2.1 km asl After 27, it was seen as a trough off Arakan coast on 28 and became less marked on 29
(B) *Induced cyclonic circulations*						
1.	Lower tropospheric levels	30 Apr - 2 May	Punjab and neighbourhood	Quasi-stationary	Punjab and adjoining Himachal Pradesh	A trough from this system to Orissa was observed on 1 and 2 May
(C) *Embedded cyclonic circulations*						
1.	Lower tropospheric levels	14-17	Bihar and neighbourhood	Southerly	Telangana and neighbourhood	Merged with the trough No. 3
(D) *Other cyclonic circulations*						
1.	Lower levels	1-2	Bangladesh and neighbourhood	Stationary	*in situ*	
2.	Do.	2-7	Northwest Rajasthan and neighbourhood	Northeasterly	Moved away across north Punjab and neighbourhood	

(*Contd.*)

TABLE 3 (*Contd.*)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
3.	Mid-tropospheric levels	10-13	Punjab and neighbourhood	Do.	Haryana and neighbourhood	
4.	Lower levels	13-16	South Pakistan and neighbourhood	Do.	Moved away across Himachal Pradesh	
5.	Mid-tropospheric levels	19-23	Do.	Do.	Central parts of Rajasthan	
6.	Lower tropospheric levels	21-24	North Rajasthan and neighbourhood	Do.	Moved away across Hills of west Uttar Pradesh	
7.	Lower levels	29 May-1 Jun	Punjab and neighbourhood	Do.	Haryana and neighbourhood	A trough from this system was observed over north Orissa on 30 and over Bihar Plateau on 31. It became less marked on 1 June
(E) *Troughs in westerlies*						
1.	Mid and upper tropospheric westerlies	4-7	65°E,north of 15°N	Easterly	73°E, north of 15°N	
2.	Do.	20-23	West Uttar Pradesh to north Konkan	Easterly	Bihar Plains to interior Karnataka	
3.	Do.	25-27	68°E,north of 20°N	Northeasterly	74°E, north of 25°N	
(F) *Other troughs*						
1.	Mid-tropospheric levels	9-19	Sub-Himalayan West Bengal to northwest Bay	Stationary	*in situ*	
2.	Lower levels	11-13	Telangana to south Tamil Nadu	Quasi-stationary	Orissa to south Tamil Nadu	
3.	Lower tropospheric levels	16-29	Bihar Plateau to south Tamil Nadu	Do.	East Madhya Pradesh to south Tamil Nadu	
4.	Mid-tropospheric levels	25-30	Sub-Himalayan West Bengal to northwest Bay	Stationary	*in situ*	An east-west shear line was seen on 29 in mid-tropospheric levels along 8°N over peninsular India and on 30 along 12°N over peninsular India

TABLE 4
Monthly and seasonal rainfall (mm) during March to May 1996

S. No.	Meteorological sub-division	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	6	40	–84	156	89	76	299	377	–21	461	506	–9
2.	Arunachal Pradesh	178	101	77	225	235	–4	134	324	–59	845	660	28
3.	Assam & Meghalaya	151	80	88	121	196	–38	439	407	8	711	683	4
4.	Nag., Mani., Miz. & Tripura	142	65	118	59	121	–51	207	234	–12	408	420	–3
5.	SHWB & Sikkim	23	52	–56	64	110	–42	302	283	7	389	445	–13
6.	Gangetic West Bengal	10	26	–59	56	43	31	46	98	–53	112	167	–33
7.	Orissa	9	22	–59	24	32	–23	22	63	–65	55	117	–53
8.	Bihar Plateau	8	20	–62	9	20	–52	14	52	–74	32	92	–65
9.	Bihar Plains	0	11	–99	2	14	–83	9	45	–80	11	71	–85
10.	East U.P.	1	10	–87	2	6	–60	0	16	–100	3	32	–91
11.	Plains of west U.P.	4	13	–66	1	6	–81	9	11	–25	14	30	–53
12.	Hills of west U.P.	40	60	–33	52	33	–58	7	55	–87	99	148	–33
13.	Har., Chandigarh & Delhi	18	14	33	2	7	–75	10	12	–20	29	33	–12
14.	Punjab	29	26	11	5	11	–53	6	14	–57	40	52	–23
15.	Himachal Pradesh	94	81	17	30	44	–31	50	48	5	174	173	1
16.	Jammu & Kashmir	66	99	–34	36	74	–52	72	52	40	174	224	–22
17.	West Rajasthan	3	4	–39	2	2	4	4	8	–53	32	14	129
18.	East Rajasthan	4	6	–30	4	2	95	2	9	–81	21	17	24
19.	West Madhya Pradesh	6	8	–23	2	4	–43	4	9	–49	12	21	–43
20.	East Madhya Pradesh	5	18	–71	12	14	–14	7	15	–52	24	47	–49
21.	Gujarat Region	0	2	–100	0	1	–98	0	7	–100	0	10	–100
22.	Saur. & Kutch	0	4	–99	5	1	390	0	4	–99	5	9	–44
20.	East Madhya Pradesh	5	18	–71	12	14	–14	7	15	–52	24	47	–49
21.	Gujarat Region	0	2	–100	0	1	–98	0	7	–100	0	10	–100
22.	Sar. & Kutch	0	4	–99	5	1	390	0	4	–99	5	9	–44
23.	Konkan & Goa	0	0	–100	3	5	–51	3	42	–92	6	47	–87
24.	Madhya Maharashtra	0	4	–100	15	12	23	10	29	–67	25	45	–44
25.	Marathwada	0	7	–98	18	10	91	3	20	–82	21	37	–43
26.	Vidarbha	6	18	–69	13	12	8	1	14	–91	20	45	–56
27.	Coastal A.P.	2	13	–82	19	25	–23	22	56	–61	43	94	–54
28.	Telangana	1	10	–89	41	19	113	8	26	–70	50	55	–9
29.	Rayalaseema	0	6	–98	40	20	99	29	52	–44	69	78	–12
30.	Tamil Nadu	3	21	–86	88	50	76	33	72	–54	124	143	–13
31.	Coastal Karnataka	0	5	–90	16	32	–48	27	141	–81	44	178	–75
32.	N.I. Karnataka	0	7	–95	27	26	5	29	48	–39	56	81	–31
33.	S.I.Karnataka	2	8	–71	74	45	65	63	99	–37	139	152	–9
34.	Kerala	14	40	–66	134	114	18	71	257	–72	219	411	–47
35.	Lakshadweep	1	8	–86	16	35	–55	50	141	–65	67	184	–64

4.2.4. *Disastrous weather events and damages*

Heavy rains, lightning and strong winds caused loss of human lives and damage to houses in Tamil Nadu. In Mahabubnagar and Rangareddy districts of Andhra Pradesh, due to adverse weather, 1900 acres of rice and hundreds of hectare of vegetables and horticultural crops and 710 houses were damaged and 78 cattle heads also perished. Total damage of about 4 crores is reported. In Assam & Meghalaya, hailstorm and squall caused damage to crops and property. The adverse weather also caused death of 5 persons in Assam and 2 in West Bengal.

4.3. *May*

4.3.1. *Weather and associated synoptic features*

One depression formed in the Bay of Bengal during the month (Fig. 1)

(a) *Depression over the Bay of Bengal (7 and 8 May 1996)*

A well-marked low pressure area formed over west-central and adjoining east-central Bay on evening of 5 May. It concentrated into a depression on 7 morning and lay over northwest Bay with centre near 19° N/89°E. The system, then, moved in a northeasterly direction and intensified into a deep depression by 1800 hr UTC of 7. The system moving in a northeasterly direction crossed Bangladesh-Myanmar coast on the early morning of 8 and weakened rapidly into a well-marked low pressure area over Myanmar and adjoining parts of Mizoram and became less marked by 9 morning.

Seven cyclonic circulations and 3 mid and upper tropospheric westerly troughs, affected northwest India. Under the influence of these systems 6 out of 7 sub-divisions received excess or normal rainfall during the month. Details of these and other weather systems formed during the month are given in Table 3.

Rain or thundershowers occurred almost at all the places or at many places on 22 days in Assam and Meghalaya and Sub-Himalayan West Bengal & Sikkim, on 10 to 13 days in Andaman & Nicobar Islands and Arunachal Pradesh, on 6-8 days in Nagaland, Manipur, Mizoram & Tripura and Jammu & Kashmir and on one or two days in Gangetic West Bengal, Orissa, Himachal Pradesh, Rayalaseema, interior Karnataka, Kerala and Lakshadweep. Rainfall occurred at a few places or at one or two places on 29 days in Tamil Nadu, on 23 days in Orissa, on 15-20 days in Andaman & Nicobar Islands, Nagaland, Manipur, Mizoram & Tripura, Haryana, Madhya Pradesh, coastal Andhra Pradesh, south interior Karnataka and Kerala, on 9 to 14 days in sub-Himalayan West Bengal & Sikkim, Bihar Plateau, Punjab and Rayalaseema, on 4 to 8 days in Arunachal Pradesh, Assam & Meghalaya, Bihar Plains, Jammu & Kashmir, Rajasthan, Madhya Pradesh, Madhya Maharashtra, Marathwada, Telangana, coastal Karnataka and north interior Karnataka and on 1 to 3 days in west Uttar Pradesh, Konkan & Goa, Vidarbha and Lakshadweep.

4.3.2. *Month's rainfall*

Rainfall during May was excess in 1, normal in 4, deficient in 13, scanty in 15 meteorological sub-divisions. There was no rain in two sub-divisions (Table 4).

Rainfall was excess in Jammu & Kashmir; normal in Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura, Sub-Himalayan West Bengal & Sikkim and Himachal Pradesh; deficient in Andaman & Nicobar Islands, Arunachal Pradesh, Gangetic West Bengal, plains of west Uttar Pradesh, Haryana, Punjab, west Rajasthan, Madhya Pradesh, Rayalaseema, Tamil Nadu and interior Karnataka and scanty in Orissa, Bihar, Hills of West Uttar Pradesh, east Rajasthan, Kutch, Maharashtra, coastal Andhra Pradesh, Telangana, coastal Karnataka, Kerala and Lakshadweep. There was no rain in east Uttar Pradesh and Gujarat region. The principal amounts of rainfall (cm) are given in Table 5.

4.3.3. *Advance of southwest monsoon*

Southwest monsoon advanced into south Andaman Sea and adjoining southeast Bay on 17 May. By 31 May, it advanced into some parts of southwest and southeast parts of Commorin Sea, some parts of Sri Lanka, parts of west-central, east-central and northeast Bay, Nagaland, Manipur, Mizoram & Tripura, parts of Assam & Meghalaya and Arunachal Pradesh. Southwest monsoon advanced over Kerala and south Tamil Nadu on 3 June.

4.3.4. *Temperature*

Severe heat wave conditions prevailed for 3 to 4 days in parts of Andhra Pradesh and north Tamil

TABLE 5

Principal amounts of rainfall (cm) for the months of March, April and May 1996

Date	March	April	May
(1)	(2)	(3)	(4)
1	Nil	Chenagannur 3	Cooch Behar 11, Thalassery 9, Nancowry 5, Kavali & Sivaganga 3 each
2	Nil	Nil	Tadong 9, Madurai 5, Nancowry & Silchar 4 each, Bhagalpur 3
3	Nil	Nil	Nancowry 6, Minicoy 4, Alapuzha 3
4	Nil	Nil	Gangtok 9
5	Nil	Nil	Gangtok 6, North Lakhimpur 5, Dibrugarh 4
6	Nil	Nil	Gangtok 7, Tezpur 4
7	Nil	Periyakulam 5, Jogindernagar & Srinagar 3 each	Gangtok & North Lakhimpur 3 each
8	Nil	Mannarkad 4, Gangtok & Manali 3 each	Gangtok 10, Car Nicobar 3
9	Nil	Sathankulam 3	Gangtok 9, Silchar 7, Usilampatti 4, Hut Bay & Sattenapali 3 each
10	Nil	Alapuzha 7, Kottayam 6, Kondul 3	Dibrugarh 21, North Lakhimpur 10
11	Nil	Adirampattinam 5, Vaimpalli 3	Gangtok & Guwahati 4 each, Imphal & Port Blair 3 each
12	Nil	Rayadurg & Vikarabad 5 each, Chitradurg 4, Thodupuzha 3	Agartala 10, Berhampore 8, Bhagdogra & North Lakhimpur 5 each, Bhuntar & Kollengode 3 each
13	Nil	Madurai 11, Gubbi 7, Hangal 6, Sholapur 5, Ongole 3	Silchar 12, Imphal 6, Maya Bandar 3
14	Dibrugarh 4, Tezpur 3	Hanamkonda 7, Usilampatti 6, Kollengode 5, Anantpur & Tumkur 3 each	Silchar 10, North Lakhimpur 5, Car Nicobar 4
15	Gangtok 3	Thiruvaiyuru 9, Tiruchirapalli 7, Madurai 6, Konni 3	Gangtok 9, North Lakhimpur & Srinagar 4 each
16	Bhuntar & Kalpa 4 each, Dibrugarh 3	Aryankavu 6, Nagpur 4, Chickmaglur 3	Agartala 14, Sankalan 11, Guwahati 6, Nancowry 5, Pasighat 4, Manali 3
7	Narwana & Pehowa 4 each, Avantipur 3	Dindigul 8, Dibrugarh 5, Channapatna & Tadong 3 each	Kondul 9, Dhubri & Hut Bay 7 each, Agartala 6, Pasighat 4, Chepan 3
8	Bhuntar 6, Udhampur 5, Aryankavu 3	Porumamilla 8, Arogyavaram 6, Kondul 5, Palakkad 4, Mysore 3	Dibrugarh 8, Pasighat 6, Car Nicobar 4, Sevoke 3

(Contd.)

TABLE 5 (*Contd.*)

(1)	(2)	(3)	(4)
19	Nagrota Surian 5, Dharmasala 4	Hasimara 7, Dibrugarh 4, Rajkot 3	Long Island 8, Maya andar, Tadong 6, Badatighat 4
20	Nil	Mavelikara 4, Gangtok & Tadong 3 each	Koilkuntala 6, Nannilam 5, Manjeri 4, Tadong 3
21	Nil	North Lakhimpur & Tadong 4 each, Car Nicobar, Diana & Hasimara 3 each	Maya Bandar 7, Champasarai 5, Ambasamudram 4, Canning Town 3
22	Dharampur 3	Tiruchirapalli 5, Jammalamadugu & Mahabubnagar 3 each	Hut Bay & Thamanpattai 4 each, Nagarakata 3
23	Baijnath 3	Sankalan 5, Kondul 3	Dharampuri 7, Pennagaram 6, Port Blair 5, Jaisalmer & Srinagar 3 each
24	Nil	Agartala 5, Gheropara, North Lakhimpur & Sunnibhaji 4 each, Cooch Behar, Long Island & Thiruvanathapuram 3 each	Cooch Behar 17, Goalpur 9, Dhubri 5
25	Gangtok 3	Manjeri & Mathabhanga 6 each, Magra (Bagati) 4, Hut Bay & Hyderabad 3 each	Jalpaiguri 11, Champasarai 10, Tumkur 6, Nanvowry 4, Gheropara & Ranibennur 3 each
26	Gangtok 1	Tilpara 12, Hut Bay 6, Krishnanagar 5, Nancowry & Suri 4 each, Balurghat & Jagdalpur 3 each	Barobisha 11, Hasimara 9, Palacode 5, Paderu 3
27	Agartala 4	Kodumudi 6, Tiruchengode 5, Kondul 4, Calcutta 3	Pasighat 9, Namsai & Tiruchengode 7 each, Cooch Behar 6, Amarghat 5, Kalwakurthy 4, Bagalkote, Banglore, Kolhapur, Thiruvananthapuram & Vaimpalli 3 each
28	Kozhikode 5, Uthagamandalam 3	Berhampur 8, Hut Bay 3	Saralpara 20, Pasighat 9, Sathanur, Dam 8, Punalur 6, Gangtok 3
29	Nil	Magra (Bagati) 10, Shillong 3	Bahalpur 13, Pasighat 9, Sankalan & North Lakhimpur 8 each, Piravam 4
30	Nil	Diamond Harbour 9, Mysore 7, Durgachak 4, Gangtok, Maya Bandar & Naduvattam 3 each	Banglore, Berhampur, Cooch Behar, Polur & Silchar 3 each
31	Nil	Nil	Shantiniketan & Chengannur 7 each, Balasore 6, Agartala, Dholai & Gangtok 3 each

Nadu and heat wave conditions prevailed for many days in interior Andhra Pradesh. Heat wave conditions also prevailed for 5-8 days in Bihar, Orissa, east Uttar Pradesh, east Madhya Pradesh, Gujarat, Vidarbha, parts of coastal Andhra Pradesh, north Tamil Nadu and north interior Karnataka. Highest

temperature of 47°C was recorded at Chandrapur (Vidarbha) at Banda (Uttar Pradesh) on 29 and 30 and at Dholpur (Rajasthan) on 30.

4.3.5. *Disastrous weather events and damages*

Sunstroke and thunderbolt caused death of 13 persons in Chittoor and Mahabubnagar districts of Andhra Pradesh. Due to thunderstorm and lightning 8 persons died in Madhya Maharashtra and 3 in Tamil Nadu. In Assam & Meghalaya, hailstorm and squall caused varying amount of damage to crops and houses and disrupted communication in different areas of Assam & Meghalaya and neighbouring states. Adverse weather also took lives of 7 persons in Tripura.