Mausam, (1996), **47**, 2, 205-218

Weather in India

HOT WEATHER SEASON (MARCH-MAY 1995)*

1. Introduction

During hot weather season thundershower activity in the country occurs mainly in Andaman & Nicobar Islands, Arunachal Pradesh, Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura, West Bengal & Sikkim, Kerala and parts of northwest India. However, this year it occurred only in Kerala and in the other regions it was rather subdued. During the season, three depressions formed over the Bay of Bengal in May. Sub-divisionwise seasonal rainfall and its departures from normal for the season are given in Fig. 1 and Table 1. Monthly rainfall and its departures are also given in Table 1. Tracks of cyclonic systems are shown in Fig. 2.

2. Chief features

(*i*) Three deep depressions formed in the month of May during the season over the Bay of Bengal.

(*ii*) Severe heat wave conditions prevailed over Rajasthan, parts of northwest, north and central India in May.

(*iii*) Southwest monsoon advanced over south Commorin and Maldives area, southeast Bay and southern parts of southwest Bay by 29 May.

3. Seasonal rainfall

Season's rainfall was excess in 12, normal in 7, deficient in 10 and scanty in the remaining 6 subdivisions.

Rainfall was excess in Orissa, Madhya Pradesh, interior Maharashtra, Andhra Pradesh, Tamil Nadu, coastal Karnataka and Kerala and normal in Andaman & Nicobar Islands, Gangetic West Bengal, Haryana, Himachal Pradesh, interior Karnataka and Lakshadweep. It was deficient in Arunachal Pradesh, Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura, Sub-Himalayan West Bengal & Sikkim, Bihar Plateau, Punjab, Jammu & Kashmir, Rajasthan and Konkan & Goa and scanty in Bihar plains, Uttar Pradesh and Gujarat.

4. Monthly features

4.1. *March*

4.1.1. *Weather and associated synoptic features*

Details of the weather systems which formed during the month and their synoptic features are given in Table 2. Out of these, 3 western disturbances and a deep mid and upper tropospheric westerly trough over northwest India, 3 cyclonic circulations over Rajasthan and neighbourhood and one trough in the easterlies over south Kerala and north interior Karnataka formed during the last week of the month. These systems were very active and gave excess rainfall in northwest India, central parts of India and interior parts of Peninsula.

Rain or thundershowers occurred almost at all the places or at many places on 9 days in Jammu & Kashmir, 3 or 4 days in Vidarbha and Himachal Pradesh and on 1 or 2 days in Sub-Himalayan West Bengal & Sikkim, Bihar Plateau, Haryana, Punjab, Madhya Pradesh and Telangana. Rainfall occurred at a few places or at one or two places on 23 days in hills of west Uttar Pradesh, 10 to 16 days on Sub-Himalayan West Bengal & Sikkim, Orissa, Haryana, Himachal Pradesh, Jammu & Kashmir, interior Maharashtra, coastal Andhra Pradesh and Kerala, on 4 to 9 days in Arunachal Pradesh, Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura, Gangetic West Bengal, Plains of Uttar Pradesh, Punjab, east Rajasthan, Madhya Pradesh, Rayalaseema, Tamil Nadu and interior Karnataka and on 1 to 3 days in Bihar, west Rajasthan, Gujarat, Telangana and coastal Andhra Pradesh.

*Compiled by: U. S. De, D. S. Desai & S. G. Bhandari, Meteorological Office, Pune.

TABLE 1

Monthly and seasonal rainfall during March to May 1995

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.	Bay Islands	14	40	−65	29	89	−67	397	377	5	440	506	−13
2.	Arunachal Pradesh	73	100	−27	104	191	−46	298	340	−12	475	631	−25
3.	Assam & Meghalaya	47	78	−40	87	188	−54	321	400	−20	455	666	−32
4.	Naga., Mani., Miz. & Tri.	48	65	−27	75	130	−42	182	234	−22	305	429	−29
5.	SHWB & Sikkim	15	53	−71	44	110	−60	224	283	−21	283	446	−37
6.	Gangetic West Bengal	8	26	−68	8	43	−81	123	98	25	139	167	−17
7.	Orissa	20	23	−10	18	32	−44	336	63	437	374	118	218
8.	Bihar Plateau	21	19	13	5	20	−74	32	52	−38	58	91	−36
9.	Bihar Plains	2	11	−81	0	14	−100	3	45	−94	5	70	−93
10.	East U. P.	4	10	−61	2	6	−69	3	16	−81	9	32	−72
11.	Plains of west U. P.	7	13	−45	3	6	−49	0	11	−100	10	30	−67
12.	Hills of west U. P.	16	60	−73	10	33	−70	11	54	−80	37	147	−75
13.	Har., Chandigarh & Delhi	19	14	36	9	7	42	1	12	−90	29	33	−11
14.	Punjab	17	26	−34	13	11	9	3	13	−79	33	50	−35
15.	Himachal Pradesh	72	81	−11	71	44	62	22	48	−53	165	173	−4
16.	Jammu & Kashmir	52	101	−48	61	76	−21	22	52	−58	135	229	−41
17.	West Rajasthan	2	5	−58	4	3	65	1	8	−84	7	16	−54
18.	East Rajasthan	10	5	76	1	2	−67	2	9	−82	13	16	−20
19.	West Madhya Pradesh	27	8	264	3	4	−34	5	8	−45	35	20	70
20.	East Madhya Pradesh	40	18	128	8	14	−42	16	15	8	64	47	37
21.	Gujrat Region	2	2	20	0	1	−75	0	7	−100	2	10	−81
22.	Saur. & Kutch	1	3	−63	0	1	−91	0	4	−98	1	8	−86
23.	Konkan & Goa	0	0	−100	6	5	18	14	42	−67	20	47	−58
24.	Madhya Maharashtra	15	4	300	19	12	54	53	29	82	87	45	93
25.	Marathwada	27	7	277	15	10	58	31	20	56	73	37	98
26.	Vidarbha	65	18	263	12	13	−5	10	14	−29	87	45	94
27.	Coastal A. P.	6	12	−49	10	25	−58	275	56	391	291	93	213
28.	Telangana	22	11	96	10	20	−48	50	26	91	82	57	44
29.	Rayalaseema	5	6	−10	4	21	−80	103	53	96	112	80	41
30.	Tamil Nadu	19	21	−7	41	49	−17	159	71	126	219	141	56
31.	Coastal Karnataka	0	5	−94	27	32	−15	188	141	33	215	178	20
32.	N. I. Karnataka	12	7	72	30	26	17	50	48	4	92	81	13
33.	S. I. Karnataka	7	7	−4	43	45	−3	96	102	−6	146	154	−5
34.	Kerala	42	40	6	152	113	34	349	257	36	543	410	32
35.	Lakshadweep	0	8	−95	18	35	−49	176	141	25	194	184	5

TABLE 2

Details of the weather systems during March 1995

S. No. (1)	System (2)	Period (3)	Place of first location (4)	Direction of movement (5)	Place of dissipation (6)	Remarks (7)
(A)	*Cyclonic circulation*					
1	Lower levels	17-20	North Madhya Maharashtra and neighbourhood	Easterly	Central parts of Madhya Maharashtra	
2.	Do.	18-20	West Rajasthan and neighbourhood	Stationary	*In situ*	
3.	Do.	21-27	Sub-Himalayan West Bengal & Sikkim	Easterly	Assam and neighbourhood	
4.	Do.	23-26	Southwest Rajasthan and neighbourhood	Northeasterly	Moved away across Himachal Pradesh	
5.	Do.	25-28	Do.	Do.	Haryana and neighbourhood	
6.	Do.	27-28	Do.	Easterly	Northwest Madhya Pradesh and neighbourhood	
(B)	*Induced cyclonic circulations*					
1.	Lower levels	4-5	South Rajasthan and neighbourhood	Easterly	West Madhya Pradesh	
2.	Do.	5-12	West Rajasthan and neighbourhood	Do.	East Madhya Pradesh	Trough from this system located over north interior Karnataka on 5 and 6. It was seen over from north interior Karnataka to Assam through east Madhya Pradesh on 7 and became less marked on 8
(C)	*Embeded cyclonic circulation*					
1.	Lower levels	13-18	South Madhya Maharashtra and neighbourhood	Northeasterly	Southwest Madhya Pradesh and neighbourhood	
(D)	*Troughs in the easterlies*					
1.	Lower levels	28 Feb-2 Mar	Andaman Sea and adjoining southeast Bay	Stationary	*In situ*	
2.	Do.	21-28	South Kerala to north interior Karnataka	Quasi-stationary	South Kerala to Marathwada	

TABLE 2 (*Contd.*)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
(E)	*Trough in the westerlies*					
1.	Mid and upper troposphere	25-28	70°E. north of 15°N	Easterly	Northeast Uttar Pradesh to Kerala across Vidarbha	
(F)	*Other troughs*					
1.	Lower levels	1-3	Bihar plateau to Vidarbha	Northeasterly	North Assam to north Bay	
(G)	*Western disturbances*					
1	Upper air systems	26 Feb-2 Mar	Jammu & Kashmir and neighbourhood	Northeasterly	Moved away across Jammu & Kashmir	
2.	Do.	2-7	North Pakistan and neighbourhood	Do.	Do.	
3.	Do.	15-17	North Pakistan and adjoining Jammu & Kashmir	Do.	Do.	
4.	Do.	18-22	North Afghanistan and neighbourhood	Easterly	Do.	
5.	Do.	22-26	Do.	Northeasterly	Do.	
6.	Low pressure area	28-30	Pakistan and adjoining parts of west Rajasthan	Do.	Western parts of Uttar Pradesh	Associated cyclonic circulation extended upto lower tropospheric levels

4.1.2. *Month's rainfall*

Month's rainfall was excess in 10, normal in 7, deficient in 8 and scanty in 9 sub-divisions. There was no rain in Konkan & Goa.

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

4.1.3. *Temperature*

Day temperatures were 5°C or more above the normal on 5 days in Himachal Pradesh and 5°C or more below normal on 4 to 8 days in Bihar, Haryana, Punjab, Rajasthan, Madhya Pradesh, Gujarat region and Vidarbha. Day temperatures were mostly normal within ±3°C of normal in other parts of the country. The highest maximum temperature in the plains, of 41°C, was recorded at Banda on 25, Basti on 26 and Cuddapah & Kurnool on 31.

Night temperatures were markedly below normal on 5 to 7 days in Himachal Pradesh and Kashmir, otherwise, night temperatures were nearly normal in most parts of the country. In the plains, lowest minimum temperature of 4°C was recorded at Amritsar on 3 and Sarsawa on 6 and in the hills −5°C at Kalpa on 1 & 12.

4.1.4. *Disastrous weather events and damages*

Hailstorm caused damage to thousands of hectares of crops in parts of east Rajasthan, Punjab and Haryana. In West Bengal two children were killed and 30 persons were injured due to thundershowers.

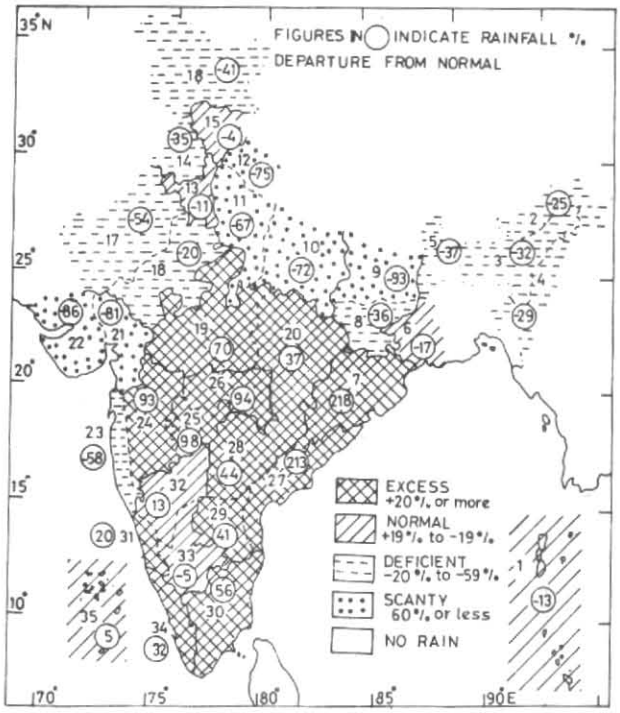

Fig. 1. Rainfall for the period 1 March to 31 May 1995

Hailstorm in Jorhat, Dhemaji and Sibsagar districts in Assam killed 5 persons and caused damage to houses and public utility services.

4.2. *April*

4.2.1. *Weather and associated synoptic features*

During this month, two low pressure areas, 8 western disturbances, 3 cyclonic circulations, 4 induced cyclonic circulations and 3 mid and upper tropospheric westerly troughs moved across northwest India. Under the influence of these systems, parts of northwest India received a good spell of rain during the period of 6 to 26 April 1995. Details of these and other systems are given in Table 3.

Rain or thundershowers occurred almost at all the places or at many places on 5 or 6 days in Pun jab, Himachal Pradesh, Jammu & Kashmir and Kerala and on 1 or 2 days in Andaman & Nicobar Islands, Sub-Himalayan West Bengal & Sikkim, Orissa, Haryana, Marathwada, south interior Karnataka and Lakshadweep and at a few places or at one or two places on 20 to 26 days in Assam & Meghalaya, Tamil Nadu and south interior Karnataka and Kerala, on 10 to 19 days in Andaman & Nicobar Islands, Arunachal Pradesh, Nagaland, Manipur, Mizoram & Tripura, Sub-Himalayan West Bengal & Sikkim, Orissa, hills of west Uttar Pradesh, Punjab, Himachal Pradesh, Madhya Maharashtra, coastal Andhra Pradesh, Telangana, coastal Karnataka and north interior Karnataka, on 1 to 9 days in Gangetic West Bengal, Bihar Plateau, plains of Uttar Pradesh, Haryana, Jammu & Kashmir, Rajasthan, Madhya Pradesh, Konkan & Goa, Marathwada, Vidarbha, Rayalaseema and Lakshadweep.

4.2.2. *Month's rainfall*

Rainfall in the month of April was excess in 6, normal in 7, deficient in 11 and scanty in 10 subdivisions of the country. There was no rain in Bihar plains.

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

4.2.3. *Temperature*

During the month, heat wave conditions prevailed on 2 to 5 days in east Rajasthan, West Bengal, Bihar plains and east Uttar Pradesh. Day temperatures were markedly below normal on 3 to 4 days in Punjab and Kashmir. Highest day temperature of 45°C was recorded at Chandrapur (Vidarbha) on 25 April and at Banda on 26 & 27 April.

4.2.4. *Disastrous weather events and damages*

Thundersquall and hailstorm during the month caused damages to a large number of houses, power lines, crops and trees in different parts of Assam. 12 persons in Assam and 12 in Khasi hills in Meghalaya died due to thundersquall and hailstorm. 2 persons died and six were injured due to thunderbolt and around 9500 houses damaged rendering 62,000 persons homeless in Jalpaiguri district (West Bengal) due to hailstorm.

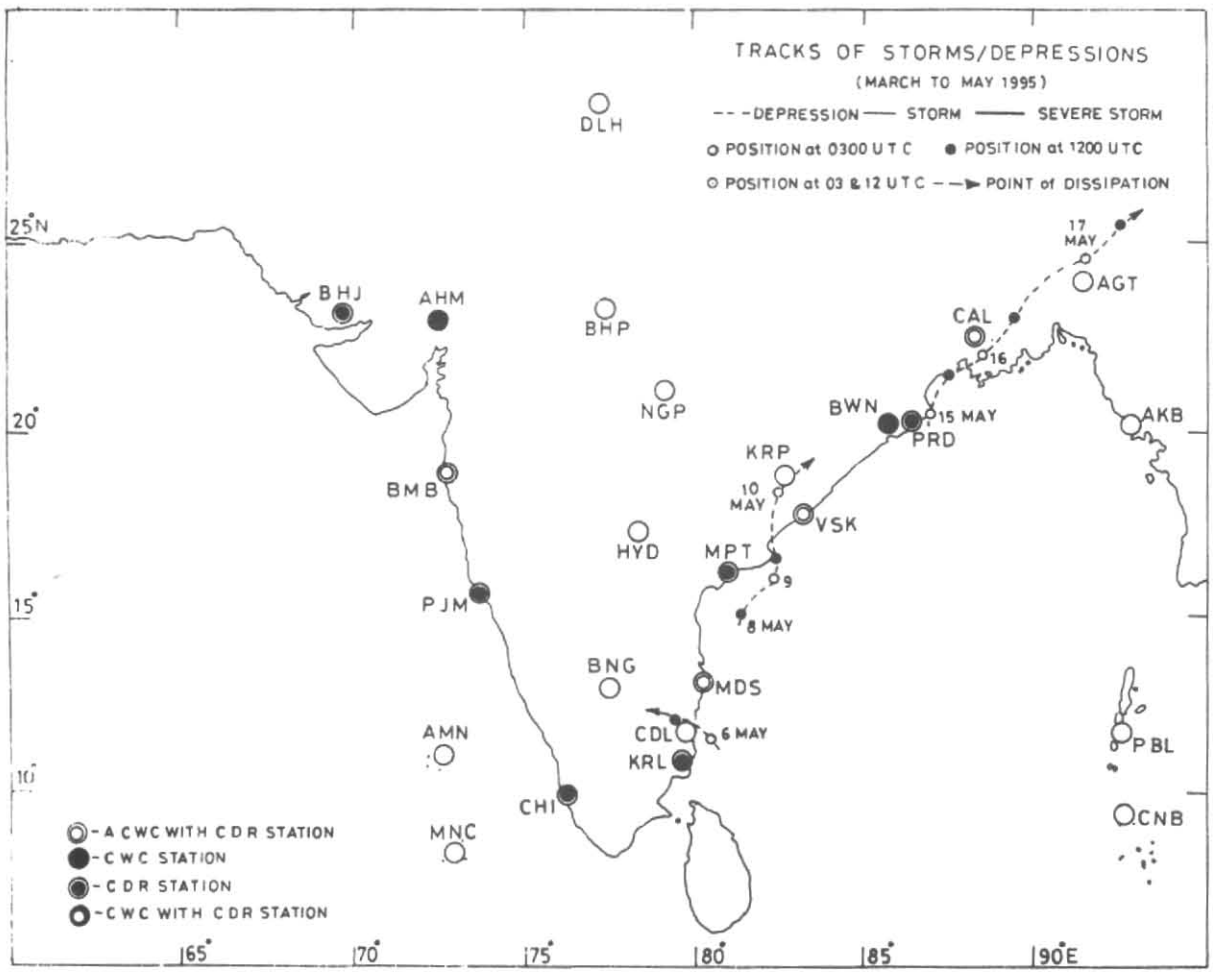

Fig. 2. Tracks of storms and depressions (March-May 1995)

4.3. *May*

4.3.1. *Weather and associated synoptic features*

Three deep depressions formed in the Bay of Bengal during the month (Fig. 2).

(*i*) *Deep depression over the Bay of Bengal (5 and 5) May 1995*

A depression formed over the southwest Bay on the night of 5 and was centred about 70 km southeast of Pondicherry (11.5°N/80.5°E) on 6 morning. The system intensified into a deep depression at 0900 UTC, crossed the north Tamil Nadu coast near Cuddalore at 1100 UTC and was centred near 12.0°N/79.5°E at 1200 UTC of 6. The system then weakened over northern parts of Tamil Nadu and adjoining Karnataka on 7 morning. The system caused heavy rains on 5, 6 and 7 in Tamil Nadu and Kerala and on 6 and 7 in Andhra Pradesh.

(*ii*) *Deep depression over the Bay of Bengal (8 to 10) May 1995*

A depression formed over the west central Bay and adjoining southwest Bay at 0900 UTC of 8 and was centred about 120 km southeast of Machilipatnam near Lat. 15°N/Long. 81.5°E on the evening of 8. The system moved initially in a northeasterly direction and intensified into a deep depression at 0900 UTC of 9 and lay centred near 16.5°N/82.5°E at 1200 UTC. The system then moved in a northerly direction and crossed the Andhra Pradesh coast near Tuni around 1700 UTC of 9. Later the system weakened into a depression on 10 morning and further weakened into a low pressure area by 10 evening over Orissa and adjoining north coastal Andhra Pradesh. The system caused heavy rainfall on 8, 9, 10 and 11 in Andhra Pradesh.

TABLE 3

Details of the weather systems during April 1995

S. No. (1)	System (2)	Period (3)	Place of first location (4)	Direction of movement (5)	Place of dissipation (6)	Remarks (7)
(A)	*Low pressure area*					
1.	Low pressure area	5-8	North Pakistan and adjoining east Rajasthan	Easterly	Rajasthan and neighbourhood	It was first observed as a western disturbance over north Pakistan and neighbourhood on sea level chart on 5. Associated cyclonic circulation extended upto 1.5 km a s l. The low pressure area was then seen as a cyclonic circulation over Rajasthan and neighbourhood on 6, weakened over the same area on 7 and became less marked on 8
2.	Do.	7-10	Afghanistan and adjoining Pakistan	Do.	West Uttar Pradesh and neighbourhood	It was first observed as a western disturbance. Associated cyclonic circulation extended upto mid-tropospheric levels, moved northeasterly as cyclonic circulation and became less marked on 10
(B)	*Cyclonic circulations*					
1.	Lower tropospheric levels	1-6	North Gujarat and neighbourhood	Easterly	South Konkan to Kerala	A low level trough from this system to south Tamil Nadu was observed on 4 and to coastal Karnataka on 5 moving eastwards
2.	Do.	8-9	Bihar and adjoining West Bengal	Stationary	*In situ*	
3.	Lower levels	12-13	Assam and neighbourhood	Do.	Do.	
4.	Do.	28-30	Southwest Rajasthan and neighbourhood	Quasi-stationary	Central parts of Rajasthan	
(C)	*Induced cyclonic circulations*					
1.	Lower tropospheric levels	14-15	Northwest Rajasthan and neighbourhood	Northeasterly	Moved away across Punjab, Haryana and west Uttar Pradesh	A trough in the lower levels appeared from the system to Nagaland across Uttar Pradesh on 15 and became less marked thereafter
2.	Do.	17-18	West Rajasthan and adjoining Pakistan	Stationary	*In situ*	

TABLE 3 (*Contd*)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
3.	Lower levels	22-24	East Rajasthan and neighbourhood	Northeasterly	Haryana and neighbourhood	
4.	Lower tropospheric levels	23-27	Southwest Rajasthan and neighbourhood	Do.	Southern parts of Haryana and neighbourhood	
(D)	*Troughs in the westerlies*					
1.	Mid and upper tropospheric westerlies	31 Mar-2 Apr	65°E. north of 25°N	Quasi-stationary	65°E. north of 20°N	
2.	Lower levels	Do.	North Assam to Telangana across Bihar plateau	Stationary	*In situ*	
3.	Mid and upper tropospheric westerlies	20-21	75°E. north of 25°N	Easterly	79°E. north of 25°N	
(E)	*Other troughs*					
1.	Lower levels	7-10	Southeast Arabian Sea and adjoining southwest Arabian Sea	Stationary	*In situ*	
2.	Do.	11-12	Bihar Plains to Nagaland across Meghalaya	Do.	Do.	
3.	Trough of low	12-19	Southeast Bay off Bengal coast	Do.	Do.	
4.	Do.	13-16	Southeast Bay	Quasi-stationary	Southeast and adjoining southwest Bay	
5.	Lower levels	18-25	Bihar Plateau to Assam	Stationary	*In situ*	
6.	Do.	19-30	South Kerala to south Madhya Maharashtra	Do.	Do.	
7.	Do.	19 Apr-3 May	South Kerala to south Maharashtra coasts	Do.	Do.	
8.	Mid tropospheric levels	26 Apr-6 May	Sub-Himalayan West Bengal to north Bay	Do.	Do.	
(F)	*Western disturbances*					
1.	Upper air system	31 Mar-3 Apr	North Pakistan and neighbourhood	Northeasterly	Moved away across Jammu & Kashmir	
2.	Do.	10-12	North Pakistan	Do.	Moved away across Punjab and adjoining Jammu & Kashmir	

TABLE 3 (*Contd.*)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
3.	Upper air system	14-17	North Pakistan and neighbourhood	Northeasterly	Moved away across Jammu & Kashmir	
4.	Do.	17-20	Do.	Do.	Moved away across Punjab and neighbourhood	
5.	Do.	20-22	Do.	Eastnorth-easterly	Moved away across Himachal Pradesh	
6.	Do.	23-25	Do.	Northeasterly	Moved away across Jammu & Kashmir	
7.	Do.	25-27	Do.	Do.	Do.	
8.	Do.	29 Apr-2 May	Do.	Eastnorth-easterly	Do.	

(*iii*) *Deep depression over the Bay of Bengal (14 to 17) May 1995*

A depression formed over the northwest Bay and adjoining Orissa coast on 14 night and intensified into a depression on 15 morning with centre near 20.5°N/87.0°E. Moving in a northeasterly direction and skirting the coast it was centred close to the coast near 21.5°N/87.5°E at 1200 UTC of 15. The system crossed the West Bengal coast near Sagar Islands on 16 morning and lay centred near 22.0°N/88.5°E at 0300 UTC of 16. The system continued to move in a northeasterly direction and lay centred near 24.5°N/91.5°E about 160 km north of Agartala at 0300 UTC of 17. The system, then weakened into a depression by 17 evening and further weakened into a low pressure area over north Assam by 18 morning. The system caused heavy rainfall from 13 to 16 in Orissa and from 15 to 17 in West Bengal.

During the month, 6 western disturbances and 2 mid and upper tropospheric westerly troughs moved over northwest India. Details of these and other weather systems formed during the month are given in Table 4.

Rain or thundershowers occurred almost at all the places or at many places from 10 to 16 days in Andaman & Nicobar Islands, Sub-Himalayan West Bengal & Sikkim, coastal Karnataka and Kerala, from 5 to 9 days in Gangetic West Bengal, Orissa, Madhya Maharashtra, coastal Andhra Pradesh, Tamil Nadu and Lakshadweep and for 1 to 3 days in Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura, Bihar Plateau, Jammu & Kashmir, Marathwada, Telangana, Rayalaseema and interior Karnataka. Rainfall occurred at a few places or at one or two places on 22 to 26 days in Assam & Meghalaya and interior Karnataka, on 10 to 19 days in Andaman & Nicobar Islands, Arunachal Pradesh, Nagaland, Manipur, Mizoram & Tripura, Sub-Himalayan West Bengal & Sikkim, Himachal Pradesh, east Madhya Pradesh, Maharashtra, Andhra Pradesh, Tamil Nadu, coastal Karnataka, Kerala and Lakshadweep and on 2 to 9 days in Gangetic West Bengal, Orissa, Bihar Plateau, Bihar Plains, Haryana, Punjab, Jammu & Kashmir, Rajasthan and west Madhya Pradesh.

4.3.2. *Month's rainfall*

Rainfall during May was excess in 11, normal in 5, deficient in 8 and scanty in 9 sub-divisions. There was no rain in remaining 2 sub-divisions.

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

TABLE 4

Details of the weather systems during May 1995

S. No. (1)	System (2)	Period (3)	Place of first location (4)	Direction of movement (5)	Place of dissipation (6)	Remarks (7)
(A)	*Depressions*					
1.	Deep depression	5-6	Southwest Bay off Sri Lanka coast	Initially in a northwesterly direction and then in a west-northwesterly direction	Northern parts of Tamil Nadu	It was first observed as a cyclonic circulation in the lower levels on 2. Became low pressure area on 5 over southwest Bay off Sri Lanka coast, concentrated into depression on 6 near 11.5°N/80.5°E (about 70 km southeast of Pondicherry), further intensified into deep depression in the afternoon of 6 and crossed north Tamil Nadu coast near Cuddalore at 1630 IST of 6. Weakened into well marked low pressure area on 7 and became less marked on 8
2.	Do.	8-10	West Central and adjoining southwest Bay off south coastal Andhra-north Tamil Nadu coast	Initially northeasterly and then northerly	Southern parts of Orissa and adjoining south east Madhya Pradesh	It was first observed as a trough in the lower levels on 7 over west central and adjoining southwest Bay off south coastal Andhra-north Tamil Nadu coast. A well marked low pressure area formed over the same area on 8 morning concentrated into depression and lay centred near 15.0°N/81.5°E (about 120 kms southeast of Machilipatnam) on 8 evening. Moving in a northeasterly direction, it further intensified into a deep depression in the evening of 9, near 16.5°E/82.5°N (about 50 kms southsoutheast of Kakinada). Crossed coast near Tuni and weakened into depression on 10 morning and further weakened into well marked low pressure area over southern parts of Orissa and adjoining southeast Madhya Pradesh and became less marked on 12. Associated cyclonic circulation extended upto mid tropospheric levels

TABLE 4—(*Contd.*)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
3.	Deep depression	15-17	Northwest Bay and adjoining Orissa	Initially north-northeasterly and then northeasterly	Assam and neighbourhood	A low pressure area formed over central Bay off north Andhra-south Orissa coast. Associated cyclonic circulation was extended upto mid tropospheric levels. Became well marked on 13 and rapidly concentrated into deep depression on 15 morning near 20.5°N/87.0°E. Moving in a northnorth easterly direction and skirting the coast it crossed West Bengal coast near Sagar Islands in the morning of 16 with centre near 22.0°N/88.5°E at 0300 UTC of 16. It moved in a northeasterly direction and weakened into depression on 17 evening and further weakened into a low pressure area on 18 over Assam and neighbourhood and moved away in northeasterly direction in the same evening
(B)	*Cyclonic circulations*					
1.	Lower levels	7-10	West Madhya Pradesh	Eastnortheasterly	West Uttar Pradesh	A trough from this system was extended upto Assam on 7
2.	Do.	9-11	East Rajasthan and adjoining parts of west Madhya Pradesh	Northeasterly	West Uttar Pradesh and north Madhya Pradesh and east Rajasthan	
3.	Lower tropospheric levels	10-15	East Rajasthan and adjoining areas of Gujarat and west Madhya Pradesh	Do.	Southwest Uttar Pradesh and neighbourhood	
4.	Lower levels	12-14	South Pakistan & adjoining west Rajasthan	Stationary	*In situ*	
5.	Mid tropospheric levels	25-30	Southwest Bay & neighbourhood	Westerly	Coastal Karnataka	
(C)	*Induced cyclonic circulations*					
1.	Lower levels	22-23	Southwest Rajasthan & neighbourhood	Quasi-stationary	Northwest Rajasthan & neighbourhood	
(D)	*Troughs in the westerlies*					
1.	Mid and upper tropospheric westerlies	1-3	68°E. north of 20°N	Easterly	73°E. north of 20°N	

TABLE 4—(*Contd.*)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
2.	Do.	23-26	65°E. north of 25°N	Northeasterly	70°E. north of 20°N	
(E)	*Other troughs*					
1.	Lower tropospheric levels	18-22	Sub-Himalayan West Bengal and Sikkim to north-west Bay	Stationary	*In situ*	
2.	Lower levels	21-31*	Lakshadweep & neighbourhood	Quasi-stationary	Maharashtra to Lakshadweep	*The trough also persisted throughout the next month (June)
3.	Lower levels	24-25	Andaman Sea & neighbourhood	Stationary	*In situ*	
4.	Lower levels	27-29	Marathwada to south Kerala	Do.	Do.	
5.	Lower levels	29 May-2 June	Andaman Sea and neighbourhood	Westerly	Southeast Bay and neighbourhood	
(G)	*Western disturbances*					
1.	Upper air system	12-15	North Pakistan & adjoining Jammu & Kashmir	Northeasterly	Moved away across Jammu & Kashmir	
2.	Do.	18-21	North Pakistan & neighbourhood	Do.	Moved away across Himachal Pradesh	
3.	Do.	21-24	Do.	Do.	Moved away across Jammu & Kashmir	
4.	Do.	25-27	Do.	Do.	Do.	

region. The principal amounts of rainfall are given in able 5.

4.3.3. *Advance of southwest monsoon*

Southwest monsoon advanced over the Andaman & Nicobar Islands and adjoining southeast Bay on 15 May. It further advanced over south Comorin & Maldives area, southeast Bay and southern parts of southwest Bay on 29 May 1995. Southwest monsoon in 1995 advanced over Kerala on 8 June as against the normal date of 1 June, making a delay of one week.

4.3.4. *Temperature*

Severe heat wave conditions prevailed for 7 days in west Rajasthan and for 3 days in the plains of northwest and north India. Heat wave conditions also prevailed on 4 to 7 days in Rajasthan, north Gujarat, plains of Uttar Pradesh and West Bengal. Day temperatures were markedly below normal on 8 days in Orissa, coastal Andhra Pradesh and Telangana and on 3 days in Rayalaseema, Tamil Nadu and north interior Karnataka. Temperatures were otherwise normal or within 3 to 4°C of normal. Highest maximum temperature of 49°C was recorded at Anupgarh on 16 May and at Dholpur on 31 May.

4.3.5. *Disastrous weather events and damages*

The two deep depressions in the Bay of Bengal which crossed Tamil Nadu and Andhra Pradesh coast respectively claimed 12 lives in Tamil Nadu, 22 in Andhra Pradesh and 5 in Kerala. Also due to heavy rains and floods 400 houses and standing crops were damaged and low lying areas were submerged during the period of 5 to 10 May. In Andhra Pradesh 10 districts in coastal and adjoining

TABLE 5

Principal amounts of rainfall (cm)

Date (1)	March (2)	April (3)	May (4)
1	Aryankavu 3	Nil	Dibrugarh & Punalur 8 each, Mangalore 4, Palayamkottai 3
2	Nil	Nil	Dibrugarh 7, Tadong 5, Madikeri 3
3	Nil	Nil	Kondul 6, Varkala 3
4	Nil	Medak 6	Nil
5	Nil	Palakkad 4	Madurai 11, Thiruvananthapuram 5, Amini Divi, Dibrugarh & Madikeri 3 each
6	Nil	Idukki 7, Madurai 5, Kottayam 4	Karaikal 8, Pondicherry 7, Nellore 6, Kodungallur 5, Belgaum & Hassan 3 each
7	Balasore 5	Thiruvananthapuram & Pamban 3 each	Tambaram 37, Kanyakumari 18, Tirupathi 15, Paravur 13, Kozhikode 10, Kodungallur 5
8	Nil	Agartala 8	Ongole 21, Madras 11, Vellore 10, Thiruvananthapuram 8, Bangalore 3
9	Nil	Punalur 5	Kakinada 22, Kodungallur & Machilipattinam 11 each, Kottayam 9, Malda 4
10	Bhopal 3	Gangtok & Kangra 4 each, Alapuzha & Srinagar 3 each	Koderu 29, Prathipadu 25, Kochi & Gopalpur 15 each, Kodungallur & Mangalore 12 each
11	Jabalpur 3	Suni 4, Shimla 3	Sandheads 27, Bhubaneswar 25, Jagdalpur & Visakhapatnam 12 each, Sundernagar 4, Hut Bay 3
12	Alapuzha 12, Punalur 5, Palayamkottai 4	Dibrugarh & Punalur 4 each	Peermade 18, Puri 11, Maya Bandar 6, Pandoh & Shillong 5 each, Kakinada 3
13	Alapuzha 12, Kottayam 6, Bhubaneswar 3	Diamond Harbour 7	Sandheads 25, Port Blair 15, Balasore 11, Munnar 4 & Kalingapatnam 3
14	Parbhani 3	Nil	Maya Bandar 9, Gopalpur & Nidadavole 8 each, Car Nicobar 7, Jalgaon 4, Raichur 3
15	Nil	Rampur, Bushar & Salem 3 each	Puri 21, Chauldhaghat 12, Nalgonda 9, Calcutta 5, Passighat & Kannur 4 each
16	Bhopal, Jalgaon & Nagpur 3 each	Srinagar 3	Paradip 15, Maya Bandar 7, Agartala & Numaligarh 6 each, Tezu 5, Calcutta 5
17	Parbhani 3	Haripad 8, Gangtok, Salem & Shimoga 3 each	Sandheads 61, Shillong 13, Calcutta 9, Agartala 6, Balasore 5, Guwahati 4
18	Nil	Kalimpong 6, Thiruvananthapuram 4, Khamta 3	Amraghat 14, Imphal 9, Car Nicobar & Sankalan 7 each, Agartala 6, Siliguri 3

TABLE 5 (*Contd.*)

Date (1)	March (2)	April (3)	May (4)
19	Nil	Qulandy 6, Kozhikode & Pandoh 3 each	Sankalan 7, Gangtok 5, Long Island & Tadong 4 each
20	Nil	Nil	Sevoke 18, Chauldhaghat 15, Maya Bandar 11, Vellore 6, Kolar Gold Fields 4
21	Nil	Bangana 4, Yelhanka 3	Mysore 10, Kochi, Diana & Vellore 5 each, Maya Bandar 3
22	Nil	Tuticorin 4	Sankalan 8, Hasimara 7, Adirampattinam, Bangalore & Port Blair 3 each
23	Nil	Punalur 4	Gangtok, Gannavaram & Nancowry 6 each
24	Nil	Nil	Punalur & Sibsagar 6 each, Chottabekra 4, Maya Bandar & Uthagamandalam 3 each
25	Nil	Thiruvananthapuram 5	Hut Bay 12, K. Paramathi 6, Maya Bandar 5, Gangtok & Hyderabad 4 each, Alapuzha 3
26	Manali 6, Jagadhari 5, Hyderabad 4, Ludhiana 3	Nil	Tadong 7, Panbari 4, Cooch Behar 3
27	Nagapattinam 9, Hyderabad, Nagpur & Sunnibhaji 3 each	Hasimara 10, Guwahati & Tezpur 3 each	Panbari 7, Beki Road Bridge 5, Chickmaglur 4, Bangalore 3
28	Palakkad 5	Nil	Hut Bay 4, Tezpur 3
29	Ghumarwin & Punalur 4 each, Kodaikanal & Siliguri 3 each	Paravur 9, Kodaikanal 8, Hut Bay 4, Kalimpong 3	Minicoy 6, Cherthala & Hut Bay 3 each
30	Patiala 4	Gangtok 5, Diana & Thiruvananthapuram 3 each	Cooch Behar 11, Car Nicobar 7, Chauldhaghat 6 Minicoy 5, Gadag & Tiruvalla 3 each
31	Dibrugarh 6, Thenmala 5		Cooch Behar, Long Island & Tadong 6 each, Gadag & Saralpara 4 each

interior areas were affected by the disastrous weather caused by deep depression. 40,000 houses were damaged, thousands of hectares of crops were destroyed and lakhs of people had to be evacuated due to heavy rains and floods. Total estimated damage in Andhra Pradesh is reported to be of the order of Rs. 470 crores.

The deep depression which crossed West Bengal coast, caused heavy damages in north paraganas, south paraganas and Midnapore districts of West Bengal. Tidal waves and heavy rains caused breaches in a number of embankments, floods and damages to 20,000 houses affecting 65,000 people. Vast low lying areas were submerged and standing crops were also destroyed. In Calcutta one person was killed and 20 were injured due to collapse of an overbridge. In Mizoram 34 people were killed in a massive land slide and 500 houses were damaged.