MAUSAM, 49, 2 (April 1998), 269-278

Weather in India

HOT WEATHER SEASON (MARCH-MAY 1997)*

1. Introduction

Pre-monsoon thundershower activities in the country were prominent in most parts of the country. Season's rainfall was excess in 11, normal in 14, deficient in 9 and scanty in 1 meteorological sub-division. Season's rainfall was excess in Gangetic West Bengal, Orissa, plains of west Uttar Pradesh, Haryana, Punjab, Himachal Pradesh, Rajasthan, Gujarat State and Telangana and normal in Arunachal Pradesh, Nagaland, Manipur, Mizoram & Tripura, Bihar Plains, east Uttar Pradesh, hills of west Uttar Pradesh, Jammu & Kashmir, east Madhya Pradesh, Madhya Maharashtra, Marathwada, Vidarbha, coastal Andhra Pradesh, Rayalaseema and interior Karnataka. It was deficient in the remaining sub-divisions outside Konkan & Goa where it was scanty.

Actual rainfall and its departures for each month and season are given in Fig.1 and Table1.

Track of the storm is shown in Fig.2.

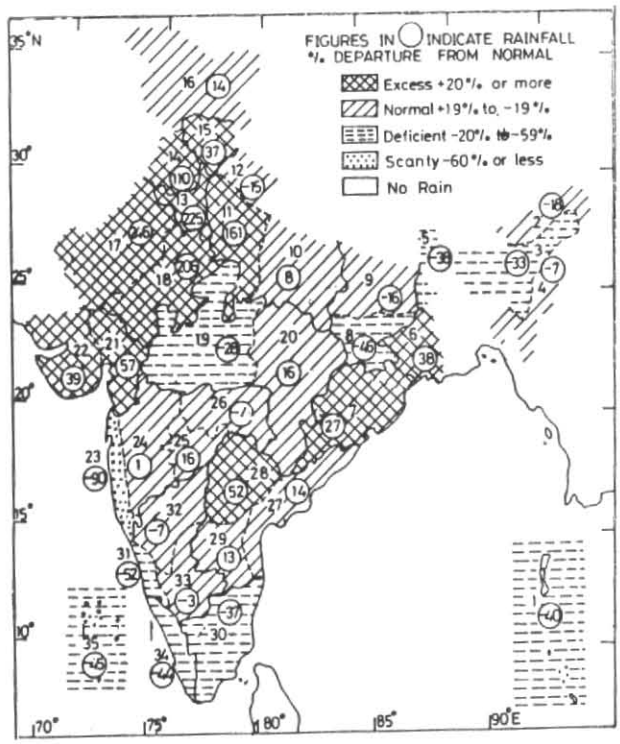

Fig.1. Rainfall percentage departures from normal for the period 1 March-31 May 1997

2. Chief features

(*i*) Severe cyclonic storm with a core of hurricane winds over Bay of Bengal (15-19 May 1997).

(*ii*) Very good pre-monsoon rainfall activity over most parts of the country.

(*iii*) No heat wave conditions over the country during the season.

3. Monthly features

3.1. *March*

3.1.1. *Weather and associated synoptic features*

During the month, 1 low pressure area, 2 induced low pressure areas, 9 western disturbances, 3 induced cyclonic circulations and 1 east-west trough affected the weather over northwest India. Details of these systems and other systems which formed during the month are given in Table 2.

Rain or snow occurred almost at all the places on 2 days in Himachal Pradesh. Rain or thundershowers occurred almost at all the places or at many places on 4 to 5 days in Himachal Pradesh and Jammu & Kashmir and on 1 to 2 days in Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura, West Bengal & Sikkim, Orissa, Haryana, South interior Karnataka and Kerala. Rainfall occurred at a few places or at one or two places on 14 to 17 days in Assam & Meghalaya, hills of west Uttar Pradesh, Himachal Pradesh, Tamil Nadu and Kerala; on 10 to 13 days in Nagaland, Manipur, Mizoram & Tripura, Sub-Himalayan West Bengal & Sikkim and coastal and north interior Karnataka; on 5 to 9 days in Gangetic West Bengal, Bihar, Haryana, Punjab, Jammu & Kashmir, Rajasthan and Andhra Pradesh and on 1 to 3 days over the rest of the country outside Andaman & Nicobar islands and west Madhya Pradesh where mainly dry weather prevailed during the month.

3.1.2. *Month's rainfall*

Month's rainfall was excess in 14, normal in 5, deficient in 5 and scanty in 11 meteorological sub- divisions. Rainfall was excess in Arunachal Pradesh, Nagaland, Manipur, Mizoram & Tripura, Orissa, Haryana, west Rajasthan, Konkan

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TABLE 1

Monthly and seasonal rainfall (mm) for each month and season (March-May 1997)

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	0 *	40	-99	48	89	-46	253	377	-33	301	505	-40
2.	Arunachal Pradesh	210	105	101	108	185	-41	188	328	-43	507	618	-18
3.	Assam & Meghalaya	87	84	3	119	200	-40	255	406	-37	461	690	-33
4.	Nag. Man. Miz. & Tri.	120	74	63	91	128	-29	192	232	-17	403	433	-7
5.	SHWB & Sikkim	37	53	-30	94	109	-14	142	275	-49	272	437	-38
6.	Gangetic West Bengal	31	27	15	97	41	135	113	107	6	242	175	38
7.	Orissa	29	22	33	84	32	167	36	64	-45	149	118	27
8.	Bihar Plateau	1	19	-94	24	20	20	22	49	-54	47	87	-46
9.	Bihar Plains	2	11	-83	27	15	88	29	44	-33	58	69	-16
10.	East U.P.	2	9	-81	14	6	129	18	16	15	34	31	8
11.	Plains of west U.P.	5	13	-65	30	6	392	45	11	298	80	31	161
12.	Hills of west U.P.	19	61	-68	58	34	73	50	56	-9	128	150	-15
13.	Haryana, Chandi. & Delhi	17	14	23	42	7	545	45	12	281	104	32	225
14.	Punjab	15	26	-43	49	11	334	43	14	215	107	51	110
15.	Himachal Pradesh	65	81	-19	101	44	130	69	48	45	236	173	37
16.	Jammu & Kashmir	90	99	-9	109	74	48	56	52	9	256	225	14
17.	West Rajasthan	6	5	39	17	2	658	30	9	251	53	15	246
18.	East Rajasthan	3	5	-41	19	2	779	27	9	222	49	16	206
19.	West Madhya Pradesh	0	8	-98	8	4	130	6	9	-35	14	20	-28
20.	East Madhya Pradesh	4	18	-75	34	14	153	15	15	-2	53	46	16
21.	Gujarat Region	1	2	-56	10	1	743	6	7	-24	16	10	57
22.	Saurashtra & Kutch	1	4	-86	7	1	599	5	4	24	12	9	39
23.	Konkan & Goa	2	0	300	2	5	-55	1	42	-98	5	48	-90
24.	Madhya Maharashtra	6	4	66	26	12	117	13	29	-56	46	45	1
25.	Marathwada	12	7	74	20	10	106	10	20	-48	42	36	16
26.	Vidarbha	4	15	-72	20	12	67	15	14	10	39	41	-4
27.	Coastal A.P.	15	12	25	68	25	176	24	57	-58	107	93	14
28.	Telangana	15	11	44	55	20	177	16	26	-40	86	57	52
29.	Rayalaseema	13	6	124	38	21	85	38	52	-28	89	79	13
30.	Tamil Nadu	7	21	-67	37	49	-26	45	70	-35	89	141	-37
31.	Coastal Karnataka	21	5	329	34	32	9	30	139	-79	85	175	-52
32.	N.I. Karnataka	22	7	204	32	26	26	21	48	-56	75	81	-7
33.	S.I. Karnataka	37	8	382	39	45	-12	73	102	-28	149	154	-3
34.	Kerala	37	40	-6	63	113	-44	133	263	-50	233	416	-44
35.	Lakshadweep	5	8	-38	34	35	-3	62	141	-56	101	184	-45

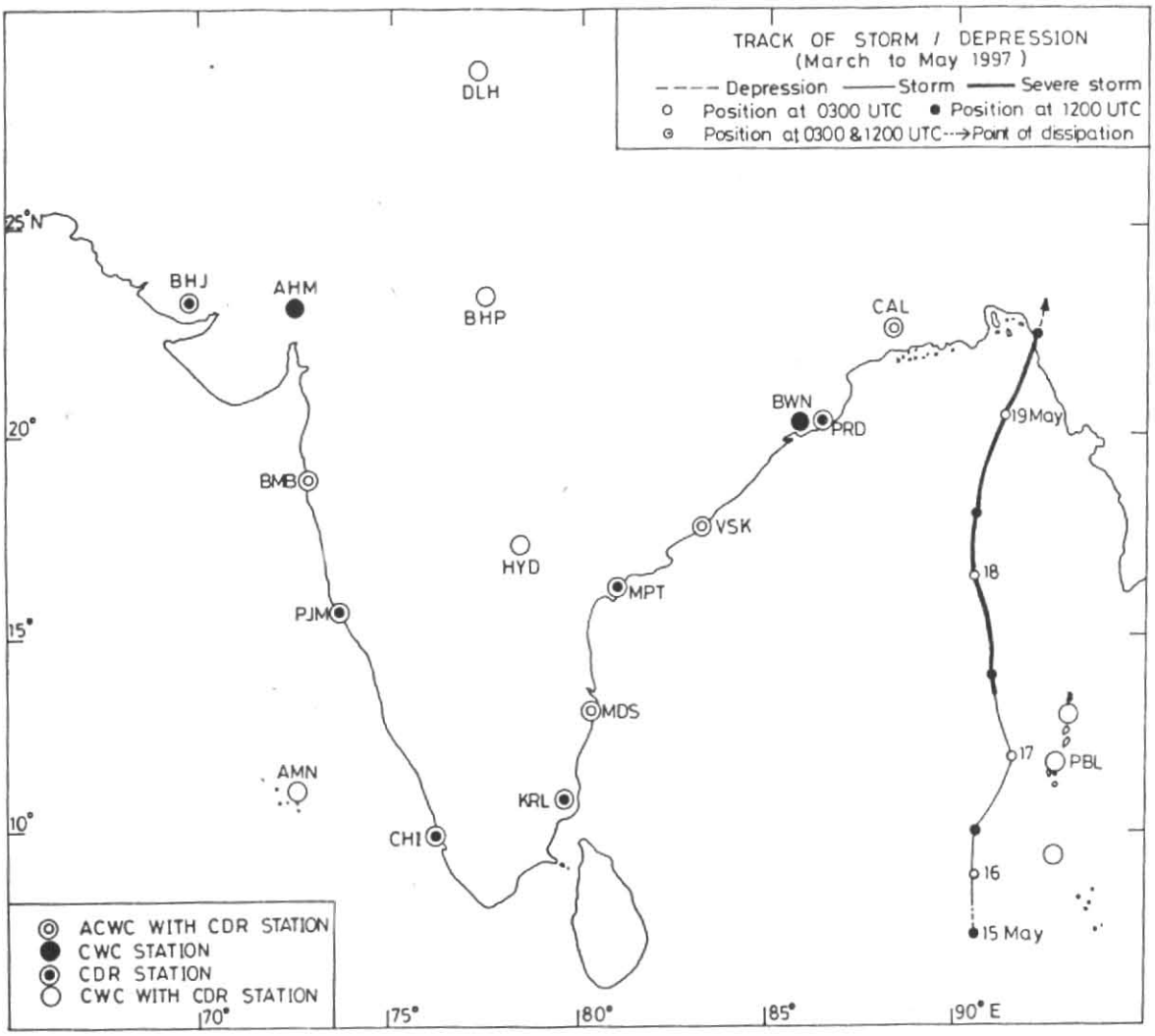

Fig.2. Track of the severe cyclonic storm (Mar-May 1997)

& Goa, Madhya Maharashtra, Marathwada, Andhra Pradesh and Karnataka, normal in Assam & Meghalaya, Gangetic West Bengal, Himachal Pradesh, Jammu & Kashmir and Kerala and deficient in Sub-Himalayan West Bengal and Sikkim, Punjab, east Rajasthan, Gujarat Region and Lakshadweep. It was scanty over the rest of the country. Principal amounts of rainfall are given in Table 5.

3.1.3. *Temperature*

Day temperatures were 5°C or more above normal on 4 days in Himachal Pradesh and Kashmir and on 1 day each in Assam & Meghalaya, Bihar Plateau, Haryana, Jammu and Madhya Pradesh in the first fortnight of the month. They were 5°C or more below normal on 3 to 4 days in Haryana, Punjab and east Rajasthan in the second fortnight of the month. The temperatures were mostly normal or appreciably above normal elsewhere in the first fortnight and normal to appreciably below normal in the second fortnight of the month. The highest maximum temperature in the plains of 43°C was recorded at Jalgaon on 11 March.

Night temperatures were markedly below normal on 4 to 5 days in Rayalaseema and south interior Karnataka. They were generally normal to appreciably above normal over most parts of the country from 6 to 20 March. They were generally below to appreciably below normal over Peninsular India in the first week and over Bihar, Uttar Pradesh, Punjab, Himachal Pradesh and south interior Karnataka in the last week of the month. In the plains, lowest minimum temperature of 5°C was recorded at Amritsar on 3 and 4 and at Kapurthala on 3 and over hills of –2°C at Kalpa on 21, 23 and 24.

3.1.4. *Disastrous weather events and damages*

One person died due to thundersquall and one more person died and many injured due to hailstorm/thunder-

TABLE 2

Details of the weather systems during March 1997

S. No.	System	Period	Place of first location	Direction of movement	Place of dissipation	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)
(A) *Low pressure areas*						
1.	Low pressure	14-17	West Rajasthan & neighbourhood	East- northeasterly	Moved away across Haryana, Himachal, Pradesh & neighbourhood	Associated cyclonic circulation (Cycir) extended upto 1.5 km a s l
(B) *Induced low pressure areas*						
1.	Induced low pressure area	6-9	South Pakistan & neighbourhood	Northeasterly	Haryana and adjoining hills of west Uttar Pradesh	Associated cyclonic circulation extended upto 1.5 km a s l
2.	Do	9-12	Do	Do	Northwest Rajasthan & neighbourhood	It lay as a cycir over west Rajasthan and adjoining parts of Pakistan on 10
(C) *Western disturbances*						
1.	Upper air system	28 Mar-1Apr	North Pakistan & adjoining Jammu & Kashmir	Northeasterly	Moved away across Jammu & Kashmir	
2.	Do	1-4	North Pakistan & adjoining Afghanistan neighbourhood	Do	Do	
3.	Do	5-9	North Afghanistan & neighbourhood	Do	Do	
4.	Do	9-13	North Pakistan & neighbourhood	Do	Do	
5.	Do	13-16	Do	Do	Moved away across Punjab & Himachal Pradesh	
6.	Do	16-18	Do	Do	moved away across Jammu & Kashmir	
7.	Do	18-20	North Pakistan & Afghanistan	East-northeasterly	Do	
8.	Do	19-24	North Pakistan & neighbourhood	Northeasterly	Do	
9.	Do	30 Mar-6Apr	Afghanistan & neighbourhood	Do	Moved away across Himachal Pradesh	
(D) *Induced cyclonic circulations*						
1.	Lower levels	28 Feb-2 Mar	Southeast Pakistan & adjoining west Rajasthan	Stationary	*In situ*	
2.	Lower tropospheric levels	18-23	Central parts of Pakistan	Northeasterly	Northwest Rajasthan	It lay as a trough in lower levels from Punjab to northwest Madhya Pradesh on 19 and became less marked on 20
3.	Lower uroposphere levels	30 Mar-2 Apr	Southwest Rajasthan & adjoining Pakistan	North-northeasterly	Northwest Rajasthan & neighbourhood	A trough was seen from this system to west Madhya Pradesh on 31 March and became less marked on 2 April
(E) *Other cyclonic circulations*						
1.	Lower tropospheric levels	26 Feb-9 Mar	Bihar & neighbourhood	Easterly	Assam & neighbourhood	
2.	Lower levels	5-7	North Vidarbha & adjoining west Madhya Pradesh	North-northeasterly	Central parts of Madhya Pradesh	
3.	Do	13-16	West Madhya Pradesh & neighbourhood	Southeasterly	Orissa & neighbourhood	A trough from north Assam to west Madhya Pradesh was seen from 13 to 14. However, another trough from the system in lower levels to south Tamil Nadu on 14
4.	Lower tropospheric levels	16-19	Sub-Himalayan West Bengal and Sikkim & neighbourhood	Stationary	*In situ*	A trough from this system was observed from this system to south coastal Andhra Pradesh on 19

TABLE 2 (*Contd.*)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
5.	Lower tropospheric levels	19-20	Rayalaseema & neighbourhood	Stationary	*In situ*	
6.	Do	24-26	Southeast Madhya Pradesh	Easterly	Orissa & neighbourhood	
7.	Do	25-27	Madhya Maharashtra & neighbourhood	Stationary	*In situ*	A trough from this system to south Tamil Nadu to 26 and became less marked on 27
8.	Do	27-28	South Pakistan & neighbourhood	Northeasterly	Haryana & neighbourhood	It was seen as a trough from Haryana to Gujarat Region at 2.1 km a s l. It became less marked on 30
9.	Lower levels	30-31	Bihar Plains & neighbourhood	Do	Assam & neighbourhood	
10.	Do	31 Mar-1 Apr	North Orissa & adjoining Gangetic West Bengal	Stationary	*In situ*	
(**F**) *Troughs in the easterlies*						
1.	Lower levels	3-5	South Tamil Nadu to south Madhya Maharashtra	Quasi-stationary	South Kerala to south Madhya Maharashtra	
2.	Lower troposphere levels	27-31	Marathwada to south Tamil Nadu	Northeasterly	Coastal Orissa to south Tamil Nadu	
(**G**) *East-West trough*						
1.	Lower levels	26-29	Bihar Plains- to northeast Assam	Stationary	*In situ*	
(**H**) *Other troughs*						
1.	Mid tropospheric levels	17-19	Sub-Himalayan West Bengal and Sikkim to north Bay	Stationary	*In situ*	
2.	Lower levels	17-19	Telangana to south Tamil Nadu	Quasi- stationary	North interior Karnataka to south Tamil Nadu	
3.	Lower tropospheric levels	19-24	Bihar Plains to Orissa	Northeasterly	Assam to northeast Bay	
4.	Do	24-26	Southeast Madhya Pradesh & neighbourhood	Easterly	Orissa & neighbourhood	
5.	Lower levels	26-27	South Pakistan to Gulf of Cambay	Stationary	*In situ*	

storm. Widespread damage was caused to standing crops in West Bengal.

3.2. *April*

3.2.1. *Weather and associated synoptic features*

During this month, 7 western disturbances, 7 induced cyclonic circulations caused weather over northwest India and 3 troughs in the westerlies and many other system affected the weather over India. Under the influence of these systems, good spell of rain occurred in different parts of the country. Details of these and other systems are given in Table 3.

Rain or snow occurred almost at all the places on two days and at a few places on one day in Himachal Pradesh. Rain or thundershowers occurred almost at all the places or at many places on 6 to 8 days in Assam & Meghalaya, West Bengal & Sikkim, Orissa and Jammu & Kashmir, on 3 to 4 days in Nagaland, Manipur, Mizoram & Tripura, Haryana, Punjab, Himachal Pradesh, Madhya Maharashtra, Marathwada and coastal Andhra Pradesh and on 1 to 2 days in Andaman & Nicobar Islands, Rajasthan, Madhya Pradesh, Gujarat State, Vidarbha, Telangana, Rayalaseema and coastal & north interior Karnataka and at a few places or at one or two places on 21 to 26 days in Sub-Himalayan West Bengal & Sikkim, Orissa, Bihar Plateau, coastal Andhra Pradesh, Telangana, Tamil Nadu, South interior Karnataka and Kerala; on 15 to 20 days in Arunachal Pradesh, Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura, Gangetic West Bengal, Bihar Plains, hills of west Uttar Pradesh, Himachal Pradesh and Rayalaseema; on 10 to 14 days in Andaman & Nicobar Islands, Punjab, east Madhya Pradesh, Madhya Maharashtra, and coastal & north interior Karnataka; on 5 to 9 days in plains of west Uttar Pradesh, Jammu & Kashmir, Rajasthan, west Madhya Pradesh, Ma-

TABLE 3

Details of the weather systems during April 1997

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	6-10	North Afghanistan & neighbourhood	East-northeasterly	Moved away across Jammu & Kashmir	
2.	Do	12-14	North Afghanistan & adjoining Pakistan	Do	Do	
3.	Do	14-17	North Pakistan & neighbourhood	Do	Do	
4.	Do	18-20	Do	Do	Do	
5.	Do	20-23	Do	Do	Do	
6.	Do	26-30	Do	Do	Do	
7.	Do	29 Apr-6 May	Do	Do	Do	
(B) *Induced and cyclonic circulations*						
1.	Lower tropospheric levels	4-6	West Rajasthan & neighbourhood	East-northeasterly	Southeast Rajasthan	
2.	Lower levels	7-10	Do	Northeasterly	Punjab & neighbourhood	
3.	Do	10-13	Southwest Rajasthan	Do	west Uttar Pradesh	
4.	Do	14-16	Punjab & neighbourhood	Do	Haryana & neighbourhood	It was seen as an Induced low pressure area from 15
5.	Lower tropospheric levels	18-20	South Rajasthan & neighbourhood	Easterly	Southeast Rajasthan	
6.	Lower levels	20-22	Southwest Rajasthan & neighbourhood	Northeasterly	Central parts of Rajasthan	
7.	Lower tropospheric levels	26-29	West Rajasthan & adjoining Pakistan	Do	Moved away across Punjab & neighbourhood	A trough from this system was seen to east Madhya Pradesh across Uttar Pradesh on 27,it became less marked on 29
(C) *Embedded cyclonic circulations*						
1.	Lower levels	17-18	Telangana & neighbourhood	Stationary	*In situ*	
2.	Do	19-20	Do	Do	Do	
(D) *Other cyclonic circulations*						
1.	Lower tropospheric levels	2-6	Southeast Rajasthan & adjoining Gujarat Region	East-northeasterly	Madhya Pradesh	A trough from this system was seen on 3 to north interior Karnataka. It became less marked on 6
2.	Lower levels	7-9	Bangladesh & neighbourhood	Stationary	*In situ*	
3.	Lower tropospheric levels	10-17	East Madhya Pradesh & neighbourhood	Do	Do	A trough from this system to Manipur was seen on 10
4.	Do	11-17	East Madhya Pradesh & adjoining Orissa	Do	Do	
5.	Do	16-17	East Uttar Pradesh	Do	Do	
6.	Do	18-21	North Bangladesh & neighbourhood	Northeasterly	Assam & neighbourhood	
7.	Lower levels	22-25	East Uttar Pradesh & neighbourhood	East-northeasterly	Bihar & neighbourhood	A trough from this system to Mizoram was seen across Bangladesh. It persisted upto 30

TABLE 3 (*Contd.*)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
8.	Lower tropospheric levels	24-26	Central parts of Madhya Pradesh	Stationary	*In situ*	A trough in the westerlies to Sikkim from the system at 0.9 km as I was seen to on 24. It was seen to Tamil Nadu from 26 to 29 and became less marked thereafter
(D) *Troughs in the westerlies*						
1.	Mid and upper tropo sphere	3-5	72°E, north of 15°N	Easterly	75°E, north of 15°N	
2.	Do	15-17	66°E, north of 25°N	Do	73°E, north of 25°N	
3.	Lower levels	22-25	Bihar Plains to Vidarbha	Stationary	*In situ*	
(E) *Other troughs*						
1.	Lower levels	2-4	Punjab to Southeast Uttar Pradesh	Stationary	*In situ*	
2.	Lower tropospheric levels	9-10	East Madhya Pradesh to Gangetic West Bengal	Southeasterly	Southeast Madhya Pradesh to south Tamil Nadu	Merged with the trough cyclonic circulation no.3
3.	Do	7-10	South Madhya Pradesh to south Tamil Nadu across south interior Karnataka	Stationary	*In situ*	
4.	Lower levels	8-10	Andaman Sea	Do	Do	
5.	Do	16-17	plains of west Uttar Pradesh to Manipur across Bihar	Do	Do	
6.	Do	17-22	East Madhya Pradesh to south Tamil Nadu	Southwesterly	South Vidarbha to Lakshadweep	
7.	Lower levels (in the easterlies)	23-24	East Madhya Pradesh to South Tamil Nadu	Stationary	*In situ*	
8.	Lower tropospheric levels	28-29	Maharashtra to north Kerala	Do	Do	

rathwada, Vidarbha and Lakshadweep and on 1 to 4 days over the rest of the country.

3.2.2. *Month's rainfall*

Rainfall was excess in 24, normal in 4 and deficient in 7 meteorological sub-divisions. Rainfall was excess in Gangetic West Bengal, Orissa, Bihar Uttar Pradesh, Haryana, Punjab, Himachal Pradesh, Jammu & Kashmir, Rajasthan, Madhya Pradesh, Gujarat State, Madhya Maharashtra, Marathwada, Vidarbha, Andhra Pradesh and north interior Karnataka and normal in Sub-Himalayan West Bengal & Sikkim, coastal & south interior Karnataka and Lakshadweep. It was deficient over the rest of the meteorological sub-divisions. The principal amounts of rainfall (cm) are given in Table 5.

3.2.3. *Temperature*

Day temperatures were 5°C or more below normal on many days in northern parts of the country in the first fortnight and in the first week in central and west India. They were generally appreciably below normal in many days over most parts of the country except Peninsular India. They were 5°C or more above normal on 2 days in Kashmir and were generally normal almost throughout the month in Peninsular India. The highest maximum temperature in the plains was 43°C recorded at several stations in Rajasthan, Haryana, Uttar Pradesh, Madhya Pradesh, Maharashtra and Andhra Pradesh during last week of the month.

3.2.4. *Disastrous weather events and damages*

About 58 people in Bihar, 31 in Gangetic West Bengal, 4 in Rajasthan and 20 in Maharashtra lost their lives in heavy rains, severe hailstorm and strong winds. Damages to properties worth more than 60 lakhs rupees were also reported.

3.3. *May*

3.3.1. *Severe cyclonic storm with a core of hurricane winds[SCS(CHW)]*

Well-marked low pressure area over southeast Bay of Bengal and adjoining south Andaman Sea concentrated into a depression probably deep, at 15/0900 UTC. It lay as a deep depression centred at 15/1200 UTC within half a degree of Lat. 7.5°N/Long. 90.5°E, about 570 km southsouthwest of

TABLE 4

Details of the weather systems during May 1997

S. No.	System	Period	Place of first location	Direction of movement	Place of dissipation	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)
(A) *Cyclonic storm*						
1.	Severe cyclonic storm with a core or hurricane winds	14-21	Southeast Bay & adjoining Andaman sea	Initially northerly and then north-northeasterly	Nagaland & adjoining Manipur	It was first located as a low pressure area over southeast Bay and adjoining Andaman Sea on 14. It became well marked low pressure area on 15. Further,it concentrated into a depression and deep depression in the same day. It intensified into a cyclonic storm on 16 and became severe cyclonic storm with a core of hurricane winds on 18 and cross Bangladesh coast close to Chittagong on 19. Then it weakened rapidly into a well marked low pressure area over Nagaland and adjoining Manipur on 20 and became less marked on 21
(B) *Western disturbances*						
1.	Upper air system	7-10	North Pakistan & neighbourhood	East-northeasterly	Moved away across Jammu & Kashmir	
2.	Do	12-15	Do	Do	Do	
(C) *Induced cyclonic circulations*						
1.	Lower tropospheric levels	1-9	West Rajasthan & adjoining Pakistan	Northeasterly	Haryana & neighbourhood	Trough from the system was seen upto north Gujarat Region between 1.5 and 3.1 km a.s.l on 4 and to south Tamil Nadu through west Madhya Pradesh and Vidarbha on 5 & 6
(D) *Other cyclonic circulations*						
1.	Lower tropospheric levels	3-4	North Assam & neighbourhood	Stationary	*In situ*	Merged with the trough over Bihar Plains to northeast Assam
2.	Lower levels	4-6	Comorin-Maldiv area & adjoining parts of south Kerala coast	Do	Do	
3.	Lower tropospheric levels	7-8	South Pakistan & adjoining west Rajasthan	Do	Do	
4.	Lower levels	11-13	Southwest Rajasthan & neighbourhood	Do	Do	
5.	Do	9-12	Sub-Himalayan West Bengal & neighbourhood	Easterly	Assam & neighbourhood	
6.	Lower levels	23-27	Bihar & neighbourhood	Southeasterly	Orissa & neighbourhood	A trough from the system to south Tamil Nadu was seen on 24. It persisted upto 28 and became less marked on 29
7.	Lower tropospheric levels	28-30	Northwest Rajasthan & neighbourhood	Northeasterly	Punjab & neighbourhood	
(E) *Troughs in the westerlies*						
1.	Mid and upper tropo sphere	4-8	70 °E, north of 15°N	Easterly	Sub-Himalayan West Bengal and Sikkim to northwest Bay	
2.	Lower levels	26-27	Bihar Plains to Telangana	Do	Do	
3.	Upper tropospheric levels	30 May-1 Jun	74°E, north of 30°N	Do	Moved away	
4.	Lower levels	13-15	West Rajasthan to northeast Assam across north Madhya Pradesh and Bihar	Southeasterly	Southeast Rajasthan to northeast Assam	

TABLE 5

Principal amounts of rainfall(cm) for the months of March, April and May 1997

Date	March	April	May
1	Nil	Ghumarwin 3	Gannavaram 6, Shimla &Punalur 4 each
2	Nil	Rohtak 6, Perinthalmanna 5, Madikeri 3	Mathabhanga 5, Durgapur 4, Shillong, Bellary & Kottayam 3 each
3	Nil	Chepan 9, Ellenabad 5, Durgachak, Amb & Pendra 4 each, Ludhiana & Ramagundam 3 each	Jalakuda 9, Canning Town 5, Erinpura Road, Nandyal & Adoor 4 each, Dehra Dun 3
4	Kollam 4	Bapatla 9, Kangra 6, Jammu & Kanyakumari 5 each, Bhubaneswar & Khammam 4 each, Gorakhpur, Ballabhgarh & Gurudaspur 3 each	Tadong 5, North Lakhimpur 4, Ellenabad 3
5	Nil	Jagdalpur & Mavelikara 4 each, Anandpur Sahib & Palayamkottai 3 each	Gangtok 5, Samrala, Sikar & Alathur 4 each, Kangra, Deesa, Ramgundam, Tondi & Bangalore 3 each
6	Nil	Arogyavaram 5, Ongole & Karaikal 4 each, Bangalore, Thiruvananthapuram & Minicoy 3 each	Car Nicobar, Rewari, Kavali & Madurai 6 each, Raya & Cuddapah 4 each, North Lakhimpur & Barobisha 3 each
7	Nil	Car Nicobar 6, Contai, Bangalore & Minicoy 3 each	Sevoke 10, Bharari 5, Dibrugarh 4, Thiruvananthapuram 3
8	Nil	Car Nicobar 4, Agartala 3	Kottyam 9, Sundernagar 7, Malda 6, Nangal, Batote & Palayamkottai 4 each, Shillong 3
9	Nil	Baijnath 5, Talwadi Sahib 3	Piravom 11, Dehra Dun 6, Purulia 5, North Lakhimpur 4
10	Nil	Gangtok & Uluberia 5 each, Kathua 4, Nangal & Bharari 3 each	Nil
11	Nil	Calcutta 5, Gopalpur, Purnea & Palayankottai 3 each	Nil
12	Nil	Kalingapatnam & Chennai 3 each	Nil
13	Nil	Gangtok 5	Gangtok 5, Guwahati 4, Punalur 3
14	Nil	Calcutta 3	Nil
15	Nil	Srinagar 6	Minicoy & Kunnamkulam 4 each, Kondul & Mathabhanga 3 each
16	Jammu 3	Bharari 9, Contai 5, Nangal 3	Tiruvadanai 8, Kohza 4, Port Blair 5, Cooch Behar 3
17	North Lakhimpur & Bhuntar 3 each	Gopalpur 5, Gangtok 3	Port Blair 9, Sankalan 7, Mananthavady 5, Durgachak 3
18	North Lakhimpur & Bharari 3 each	Kodaikanal 7, Nellore & Mancompur 5 each, Dibrugarh & Mahabubnagar 4 each	Maya Bandar & Hut Bay 8 each, Kalingapatnam & Dharamapuri 3 each
19	Sarkaghat 4	Ramgundam 4, Tadong & Cuddapah 3 each	Maya Bandar 5
20	Rattia 5	Mandya 3	Aizawal 8, Port Blair 6, Passighat & Silchar 3 each
21	Chengannur 6	Gargoti 9, Kottyam 4	Silchar 8, Cooch Behar 5, Passighat & Agartala 3 each
22	Palakad 3	Kolhapur 4	Gangtok 10, Saralpara 7, Seppa 4
23	Agartala 3	Shillong 5, Kailashahar & Calcutta 3 each	Tezpur 5, Kalimpong 3
24	Dibrugarh 3	Nil	Calcutta 6, Gangtok 4
25	Digha 10, Balasore8	Nil	Dibrugarh 5, Khajuraho 4, Calcutta, Chandbali & Shimla 3 each
26	Jagdalpur 7, North Lakhimpur 3	Tezpur 4	Krishnanagar 7, Matizuri, Jalpaiguri 3
27	Nil	Guwahati 9, Bhagalpur 3	Dhubri & Kunnamkulam 5 each
28	Nil	Kasauli 9, Tezpur 4, Bhubaneswar 3	Chauldhowaghat 8, Agartala & Baghdogra 4 each, Gurgaon & Minicoy 3 each
29	Banihal 9, Bhuntar& Punalur 3 each	Shimoga 7, Balasore & Bikaner 4 each, Balurghat & Kochi 3 each	Darjeeling 6, Shillong 4, Krishnanagar & Balasore 3 each
30	Kasauli 6, Cooch Behar, Paradip & Mysore 4 each	Malegaon 7, Shillong 3	Dholai, Krishnanagar, Patna & Lucknow 3 each

Port Blair. It intensified into a cyclonic storm and lay centred at 0300 UTC of 16 within half a degree of Lat. 9.0°N/Long. 90.5°E, about 400 km southwest of Port Blair. Moving in a northerly direction, it intensified into a severe syclonic storm at 17/0900 UTC and was near Lat. 13.5°N/Long. 91.0°E and at 17/1200 UTC within half a degree of Lat. 14.0°N/Long.91.0°E, about 300 km northwest of Port Blair. Moving northwards, it further intensified into a severe cyclonic storm with a core of hurricane winds and lay centered at 18/0300 UTC within half degree of Lat. 16.5°N/Long. 90.5°E, about 700 km south southeast of Calcutta. It, then, moved in a northnortheasterly direction and lay centered at 19/0300 UTC near Lat. 20.3°N/Long. 91.2°E, about 380 km southeast of Calcutta. It crossed Bangladesh coast and lay centered at 19/1200 UTC close to Chittagong. It weakened rapidly into a well-marked low pressure area and lay over

Nagaland and Manipur area on 20 and became less marked on 21. This system did not cause any damage in India, but northeast India received widespread rain in the last week of the month.

3.3.2. *Weather and associated synoptic features*

During this month, 2 western disturbances, 1 induced cyclonic circulation and one trough in the westerlies moved across northwest India. In addition, 5 other cyclonic circulations and 3 troughs in the westerlies also affected during the month.

Rain or thundershowers occurred almost at all the places or at many places on 8 to 10 days in Andaman & Nicobar Islands, Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura and Sub-Himalayan West Bengal & Sikkim; on 3 to 6 days in Arunachal Pradesh, Gangetic West Bengal, Himachal Pradesh, Jammu & Kashmir and Kerala and on 1 to 2 days in Bihar Plains, Haryana, Punjab, Madhya Maharashtra, Marathwada and Rayalaseema. Rainfall occurred at a few places or at one or two places on 7 to 27 days in most parts of the country outside Maharashtra, Gujarat State and Goa where it was on 2 to 6 days.

3.3.3. *Month's rainfall*

Rainfall during May was excess in 7, normal in 7, deficient in 19 and scanty in 2 meteorological sub- divisions. Month's rainfall was excess in plains of west Uttar pradesh, Haryana, Punjab, Himachal Pradesh, Rajasthan and Saurashtra & Kutch and normal in Nagaland, Manipur, Mizoram & Tripura, Gangetic West Bengal, east Uttar Pradesh, hills of west Uttar Pradesh, Jammu & Kashmir, east Madhya Pradesh and Vidarbha. It was deficient over the rest of the country outside Konkan & Goa and coastal Karnataka where it was scanty. The principal amounts of rainfall are given in Table 5.

3.3.4. *Advance of southwest monsoon*

Southwest monsoon advanced over south Andaman Sea and adjoining southeast Bay on 16 May. It further advanced over north Andaman Sea, parts of southeast Bay and southwest Bay on 18 May.

3.3.5. *Temperature*

Day temperatures were 5°C or more above normal on 3 to 5 days in coastal Andhra Pradesh and Rayalaseema and on 1 to 2 days in plains of west Uttar Pradesh, Tamil Nadu and Kerala. Temperatures were generally above to appreciably above normal in Peninsular India from 21 to 31 May. Day temperatures were appreciably to markedly below normal over most parts of the country from 1 to 10 May. Season's highest temperature of 47°C was recorded at Jharsuguda in Orissa on 29 May.

3.3.6. *Disastrous weather events and damages*

About 400 people lost their lives and property worth crores of rupees were damaged in Bangla Desh during the passage of severe cyclonic storm on 19 May.

Seven people lost their lives in Kerala due to heavy rains and hailstorm accompanied by strong winds on 8 May.

Two persons died due to thunderstorm and squall in Assam in first and second wee of the month.