Mausam, (1994), **45**, 2, 187-198

Weather

HOT WEATHER SEASON (MARCH-MAY 1993)*

1. Introduction

The seasonal rainfall during the hot weather season over Andaman & Nicobar islands, Arunachal Pradesh, Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura and Kerala was normal.

Monthwise synoptic features are given in Tables 1, 2 & 4 and monthly and seasonal rainfall figures in Table 3. Seasonal rainfall departures over the 35 meteorological sub-divisions are shown in Fig. 1.

2. Chief synoptic features

(a) Heat wave conditions prevailed over Rajasthan, Uttar Pradesh, Madhya Pradesh, Vidarbha and Telangana in the month of May.

(b) Onset of southwest monsoon over Indian mainland on 28 May.

3. March

3.1. *Weather and associated synoptic features*

During this month northwest India was affected by 10 western disturbances and 5 induced systems. Also there were 2 troughs in the westerlies in mid and upper troposphere moving across the country. Details of these and other low level circulations are given in Table 1. Under the influence of these systems entire north India (including northeast India) north of 20° latitude received copious rainfall.

Rain or thundershowers occurred almost at all the places or at many places on 2 to 12 days over Arunachal Pradesh, Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura, Gangetic West Bengal, Bihar, hills of west Uttar Pradesh, Punjab, Himachal Pradesh and Jammu & Kashmir. Rainfall occurred at a few places or at one or two places on 2 to 19 days in all other sub-divisions except in Saurashtra & Kutch where the weather was mainly dry.

3.2. *Month's rainfall*

Month's rainfall was in excess in 19, normal in 7, deficient in 6 and scanty in 2 meteorological sub-divisions while 1 sub-division recorded no rainfall. Rainfall was in excess in Andaman & Nicobar islands, Nagaland, Manipur, Mizoram & Tripura, Gangetic West Bengal, Bihar plains, Uttar Pradesh, Haryana, Punjab, Himachal Pradesh, Jammu & Kashmir, west Madhya Pradesh, Konkan & Goa, Madhya Maharashtra, Marathwada, Rayalaseema and Karnataka; normal in Arunachal Pradesh, Assam & Meghalaya, Bihar plateau, east Rajasthan, east Madhya Pradesh, Vidarbha and Telangana; deficient in sub-Himalayan West Bengal & Sikkim, west Rajasthan, Gujarat region, coastal Andhra Pradesh, Tamil Nadu and Kerala and scanty over Orissa and Lakshadweep. Mainly dry weather prevailed over Saurashtra & Kutch. The significant amounts of rainfall (cm) are given in Table 5.

3.3. *Temperature*

Day temperatures were below normal to markedly below normal during the first week of the month over the country outside northeast India and during the second half of the month over the country outside the Peninsular India. During the rest of the period they were normal to appreciably above normal in the respective parts of the country.

The highest maximum temperature in the plains was 41°C recorded at Bhira on 20, 21, 22, 30 and 31, Jeur and Bhavnagar on 23, Cuddapah on 19, 20, 21, 22, 24, 25 and 26, Kurnool on 24 and Nandyal on 25.

Cold wave conditions, severe on many occasions prevailed over the hills of west Uttar Pradesh, Himachal Pradesh and Kashmir and for one day each

*Compiled by: U.S. De, D.S. Desai, P.S. Sridharan, Meteorological Office, Pune.

TABLE 1

Details of weather systems during March 1993

S. No. (1)	System (2)	Period (3)	Place of first location (4)	Direction of movement (5)	Place of dissipation (6)	Remarks (7)
(A)	*Western disturbances*					
1	Western disturbance	2-4	Northeast Afghanistan and neighbourhood	Eastwards	Moved away across western Himalayas	
2	Do.	5-7	Do.	Northeastwards	Across Jammu & Kashmir	
3	Do.	8-10	Jammu & Kashmir and neighbourhood	Do.	Moved away	
4	Do.	10-12	North Pakistan and neighbourhood	Do.	Across northern parts of Jammu & Kashmir	
5	Do.	12-15	North Afghanistan and neighbourhood	Eastwards	Moved away across western Himalayas	
6	Do.	14-17	Northwest Afghanistan and adjoining Pakistan	Northeastwards	Across Jammu & Kashmir	
7	Do.	18-20	North Pakistan and neighbourhood	Eastnortheast-wards	Do.	
8	Do.	20-23	Do.	Do.	Do.	
9	Do.	23-27	Do.	Do.	Do.	
10	Do.	28-30	Jammu & Kashmir and adjoining Pakistan	Northeastwards	Do.	
(B)	*Induced cyclonic circulation (L/L)*					
1	Induced cyclonic circulation (L/L)	12-13	Northwest Rajasthan	Eastnortheast-wards	Northeast Rajasthan and adjoining Haryana	
2	Do.	13-15	Do.	Northeastwards	Punjab and neighbourhood	
3	Do.	18-19	Northwest Rajasthan and neighbourhood	Eastnorthesterly	Do.	
4	Do.	29 - 1 Mar Apr	Southwest Rajasthan and neighbourhood	Northeastwards	East Rajasthan and neighbourhood	
(C)	*Induced low pressure area*					
1	Induced low pressure area	24-27	Northwest Rajasthan and neighbourhood	Eastwards	Bihar plains and neighbourhood	It was first observed as an induced cyclonic circulation over northwest Rajasthan and neighbourhood on 20. Moving northeastwards it became trough in the lower levels running from northwest Rajasthan to north Orissa on 24

TABLE 1 (*Contd.*)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
(D)	*Trough in the westerlies/ easterlies*					
1	Trough in the mid and upper tropospheric westerlies	2-4	Iran	Eastwards	Long. 63°E/Lat. 15°N	
2	Trough in the easterlies (LTL)	4-7	Gujarat Region to south Konkan	Do.	Gujarat Region and Madhya Maharashtra	
3	Trough in the easterlies (L/L)	4-5	Off Tamil Nadu and Andhra coast	Sationary	*In situ*	
4	Do.	7-9	South coastal Andhra Pradesh to Sri Lanka	Westwards	Western parts of Peninsula	
5	Trough in the mid and upper tropospheric westerlies	7-9	Central parts of Tibet to southeast Madhya Pradesh	Eastwards	Northeast India	
6	Trough (L/L)	15-17	Bihar plains to north Assam	Stationary	*In situ*	
7	North-south trough (L/L)	17-20	Sub Himalayan West Bengal to south Bay	Do.	Do.	
8	Trough (L/L)	11-19	South Tamil Nadu to north interior Karnataka	Do.	Do.	
9	Trough (LTL)	13-20	South Andaman sea and adjoining southeast Bay	Do.	Do.	
10	Trough (L/L)	21 - 4 Mar Apr	Coastal Orissa to coastal Tamil Nadu	Southeasterly	Southeast Madhya Pradesh to south Madhya Maharashtra	
11	Trough in the mid and upper tropospheric westerlies	24-27	Northeast Afghanistan to southwest Pakistan	Eastnortheastwards	Moved away	
(E)	*Other cyclonic circulations*					
1	Cyclonic circulation (LTL)	9-12	North Madhya Maharashtra and neighbourhood	Eastwards	Southeast Madhya Pradesh and neighbourhood	A trough from this system extended up to south Tamil Nadu in the lower level
2	Cyclonic circulation (L/L)	22-24	North Madhya Pradesh and neighbourhood	Northwestwards	—	Merged with the induced low pressure area (C)
3	Cyclonic circulation (LTL)	18-24	Assam and neighbourhood	Stationary	*In situ*	
4	Embedded cyclonic circulation	31 - 1 Mar Apr	North Kerala coast and neighbourhood	Do.	Do.	

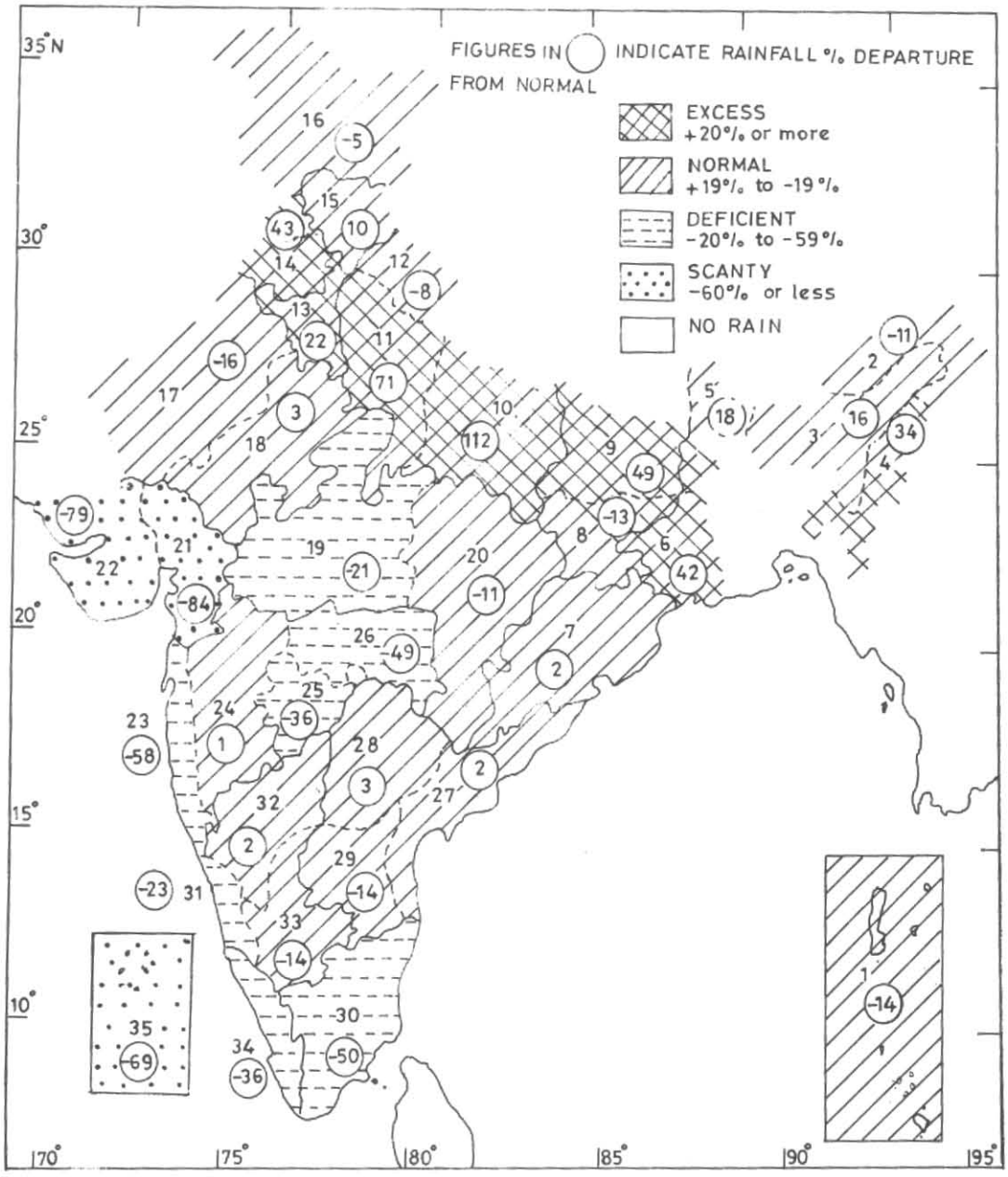

Fig. 1. Rainfall for the period 1 March to 31 May 1993

TABLE 2

Details of weather systems during April 1993

S. No. (1)	System (2)	Period (3)	Place of first location (4)	Direction of movement (5)	Place of dissipation (6)	Remarks (7)
(A)	*Western disturbances*					
1	Western disturbance	30 - 3 Mar Apr	North Pakistan and neighbourhood	Eastnortheast-wards	Across Jammu & Kashmir	
2	Do.	7-10	Do.	Northeastwards	Do.	
3	Do.	10-14	Do.	Do.	Do.	
4	Do.	14-17	North Afghanistan and neighbourhood	Do.	Do.	
(B)	*Induced cyclonic circulations*					
1	Induced cyclonic circulation (L/L)	2-3	Rajasthan and adjoining Pakistan	Stationary	*In situ*	
2	Induced cyclonic circulation (LTL)/ trough	10-14	Northwest Rajasthan and neighbourhood	—	—	It was observed as a trough running from north Rajasthan to Gangetic West Bengal from 11 to 14
3	Do.	14-16	West Rajasthan and adjoining Pakistan	Northeastwards	Northwest Rajasthan and neighbourhood	
(C)	*Trough in the westerlies/ easterlies*					
1	Trough in the mid and upper tropospheric westerlies	7-8	Long. 63°E/Lat. 20°N	Stationary	*In situ*	
2	Trough (L/L) wind discontinuity	2-28 May	South Tamil Nadu coast to Marathwada	—	—	
3	Trough (L/L)	3-5	South Andaman sea and adjoining south-east Bay	Stationary	*In situ*	
4	Trough in the mid and upper tropospheric westerlies	14-17	Long. 58°E/Lat. 25°N	Eastwards	Long. 63°E/25°N	
5	Trough (L/L)	10-14	Bihar Plains to Arunachal Pradesh	Stationary	*In situ*	
6	Do.	20-21	Northwest Rajasthan to northwest Madhya Pradesh	Do.	Do.	
7	Do.	17-22	Andaman sea	Do.	Do.	

TABLE 2 *(Contd.)*

(1)	(2)	(3)	(4)	(5)	(6)	(7)
8	Well maked trough	26-12 May	Bihar plains to Nagaland across Bangla Desh	Quasi-stationary	Sub Himalayan West Bengal to northeast Assam	
9	Trough (L/L)	28 - 2 Apr May	Northwest Rajasthan	Eastwards	East Uttar Pradesh and adjoining Bihar Plains	It was first observed as a cyclonic circulation extending up to 0.9 km asl lay over northwest Rajasthan and adjoining Pakistan on 25
(D)	*Other cyclonic circulations*					
1	Embedded cyclonic circulation (LTL)	4-7	South Madhya Maharashtra and neighbourhood	Quasi-stationary	North Vidarbha and neighbourhood	
2	Cyclonic circulation (L/L)	5-8	South Tamil Nadu and neighbourhood	Westwards	South Kerala coast and adjoining Lakshadweep	
3	Cyclonic circulation (LTL)	12-14	Southeast Uttar Pradesh and neighbourhood	—	—	Merged with the induced cyclonic circulation (No. 2) on 14th
4	Cyclonic circulation (L/L)	21-27	Northwest Rajasthan and neighbourhood	Eastwards	Bihar plains and adjoining parts of east Uttar Pradesh	Associated trough running from the system to northwest Madhya Pradesh

in west Rajasthan and Marathwada. Night temperatures were normal to appreciably above normal on more than 5 days over West Bengal & Sikkim. Rajasthan, Madhya Pradesh, Andhra Pradesh and Tamil Nadu. They were generally normal to appreciably below normal over the rest of the country.

The month's lowest minimum temperature of 5°C over the plains was recorded at Adampur on 6, 17, Amritsar on 19 and Sarasawa on 6 and of —4°C over the hills was recorded at Mukteshwar on 2, 28.

3.4. *Disastrous weather events and damages*

31 persons lost their lives in Kashmir due to landslides caused by heavy rain/snow in the valley during 18 to 24 March. Also, traffic on the national highway to Jammu-Kashmir was disrupted for about 6 days during the same period.

4. April

4.1. *Weather and associated synoptic features*

During this month there were 4 western disturbances and 3 induced systems that passed through the

TABLE 3

Monthly and seasonal rainfall during March to May 1993

S. No.	Sub-division	March 1993			April 1993			May 1993			Season		
		Actual	Normal	%Dep	Actual	Normal	%Dep	Actual	Normal	%Dep	Actual	Normal	%Dep
1	Bay Islands	86	40	117	76	88	−14	271	377	−28	433	505	−14
2	Arunachal Pradesh	97	100	−3	64	191	−67	402	339	19	563	630	−11
3	Assam & Meghalaya	84	77	8	132	188	−30	337	397	−15	553	662	−16
4	Naga., Mani. & Mizo.	84	65	29	111	130	−15	379	234	62	574	429	34
5	S.H.W.B. & Sikkim	35	51	−32	151	109	39	331	279	19	517	438	18
6	Gangetic West Bengal	46	26	79	72	43	70	103	88	17	221	156	42
7	Orissa	8	22	−63	46	31	48	65	63	3	119	117	2
8	Bihar Plateau	18	20	−9	29	20	44	32	51	−37	80	91	−13
9	Bihar Plains	27	11	147	26	15	80	51	45	15	104	70	49
10	East Uttar Pradesh	22	10	127	11	6	77	34	16	116	67	31	112
11	Plains of West U.P.	29	13	119	2	6	−67	23	12	89	54	32	71
12	Hills of West U.P.	81	60	36	8	33	−77	45	53	−14	134	145	−8
13	Har., Chandi., Delhi	20	14	44	7	7	0	13	12	8	39	32	22
14	Punjab	38	25	51	16	11	38	17	13	31	72	50	43
15	Himachal Pradesh	140	79	76	12	44	−72	38	48	−21	190	172	10
16	Jammu & Kashmir	128	97	32	29	67	−56	39	43	−9	196	206	−5
17	West Rajasthan	3	7	−54	2	3	−38	12	10	15	17	20	−16
18	East Rajasthan	6	6	9	5	3	108	7	10	−26	19	18	3
19	West Madhya Pradesh	10	8	25	1	4	−68	5	9	−42	16	20	−21
20	East Madhya Pradesh	18	17	2	6	13	−58	18	15	14	41	46	−11
21	Gujarat Region	1	2	−25	0	1	−67	0	7	−100	2	10	−84
22	Saur., Kutch & Diu	0	3	−100	1	1	50	0	3	−100	1	7	−79
23	Konkan & Goa	1	0	275	1	5	−89	18	42	−58	20	48	−58
24	Madhya Maharashtra	9	4	132	11	12	−9	26	29	−12	45	45	1
25	Marathwada	9	7	34	5	10	−50	9	20	−54	23	36	−36
26	Vidarbha	17	18	−5	2	13	−82	3	14	−75	23	44	−49
27	Coastal A. P.	7	12	−42	22	24	−8	66	56	16	94	92	2
28	Telangana	9	10	−8	17	20	−16	32	27	21	58	57	3
29	Rayalaseema	8	6	31	9	21	−57	54	55	−2	72	83	−14
30	Tamil Nadu	12	21	−42	12	49	−76	46	70	−34	70	140	−50
31	Coastal Karnataka	7	5	44	47	31	50	82	140	−42	136	176	−23
32	N. I. Karnataka	11	7	45	24	27	−11	49	48	3	84	82	2
33	S. I. Karnataka	10	8	28	37	45	−18	87	103	−15	134	156	−14
34	Kerala	21	37	−43	71	113	−38	169	257	−34	261	407	−36
35	Lakshadweep	0	8	−98	0	35	−99	56	141	−60	57	184	−69

TABLE 4

Details of weather systems during May 1993

S. No. (1)	System (2)	Period (3)	Place of first location (4)	Direction of movement (5)	Place of dissipation (6)	Remarks (7)
(A)	*Western disturbances*					
1	Western disturbance	1-2	North Pakistan and neighbourhood	Northeastwards	Across Jammu & Kashmir	
2	Do.	8-11	Do.	Eastwards	Do.	
(B)	*Induced cyclonic circulation (LTL)*					
1	Induced cyclonic circulation (LTL)	9-11	Northwest Rajasthan	Northeastwards	-	Merged into cyclonic circulation over southwest Rajasthan from 10 to 13 May
(C)	*Trough in the westerlies/easterlies*					
1	Trough (L/L)	28 - 7 Apr May	Andaman sea	Stationary	*In situ*	
2	Trough in the mid and upper tropospheric westerlies	29 - 3 Apr May	East Uttar Pradesh to coastal Karnataka	Eastwards	Moved away (90°E/15°N)	
3	Trough (L/L)	11-18	Andaman sea	Westwards	Southeast Bay and neighbourhood	
4	Do.	18-24	Do.	Quasi Stationary	Southeast Bay and adjoining Andaman sea	
5	Do.	24 - 1 May June	Northwest Uttar Pradesh to Orissa	Stationary	*In situ*	
6	East-west trough (L/L)	21-24	Northern parts of east Uttar Pradesh to northeast Assam	Do.	Do.	
(D)	*Other cyclonic circulations*					
1	Cyclonic circulation (L/L)	29 - 3 Apr May	Bihar plains and neighbourhood	Do.	Do.	
2	Do.	29 - 2 Apr May	West Rajasthan and adjoining Pakistan	Northeastwards	Punjab and neighbourhood	
3	Cyclonic circulation (LTL)	3-4	Punjab and neighbourhood	Do.	Moved away across Himachal Pradesh	
4	Do.	10-13	Southwest Rajasthan and neighbourhood	Do.	Himachal Pradesh and adjoining parts of hills of west Uttar Pradesh	

TABLE 4 *(Contd.)*

(1)	(2)	(3)	(4)	(5)	(6)	(7)
5	Do.	7-9	Northwest Rajasthan and adjoining Pakistan	Do.	Moved away across Himachal Pradesh	
6	Do.	15-17	West Rajasthan and neighbourhood	Do.	Punjab and neighbourhood	
7	Cyclonic circulation (LTL)	18-21	Northwest Rajasthan and neighbourhood	Northeastwards	North Rajasthan	
8	Do.	13-16	East Uttar Pradesh and adjoining Bihar	Stationary	*In situ*	The east-west trough from this system to Nagaland from 13
9	Cyclonic circulation (L/L)	22-24	Northwest Rajasthan and adjoining Pakistan	Northeastwards	Punjab and neighbourhood	
10	Do.	26-28	Northwest Rajasthan and neighbourhood	Do.	Punjab and neighbourhood	
11	Cyclonic circulation (MTL)	26-28	Northeast Madhya Pradesh and neighbourhood	Southeastwards	North coastal Andhra Pradesh	
12	Do.	30 - 1 May Jun	Northwest Rajasthan and adjoining Pakistan	Eastnortheastwards	Southwest Uttar Pradesh and adjoining Haryana	A trough from this system observed in the lower level running from northeast Bay and adjoining Bihar Plateau from 30 May to 1 June

country. 2 troughs in the westerlies in the mid and upper troposphere and 4 cyclonic circulations in the lower levels and a wind discontinuity line are the other synoptic features. Details of the same are given in Table 2.

Rain/thundershowers occurred almost at all the places and at many places on 2 to 11 days in Arunachal Pradesh, Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura, West Bengal & Sikkim, Orissa, Bihar and Jammu & Kashmir and at a few places or at one or two places on 1 to 28 days over the entire country.

4.2. *Month's rainfall*

Rainfall was in excess in 10, normal in 8, deficient in 7 and scanty in 10 of the 35 meteorological subdivisions.

Rainfall was in excess in West Bengal & Sikkim, Orissa, Bihar, east Uttar Pradesh, Punjab, east Rajasthan and Saurashtra & Kutch; normal in Andaman & Nicobar islands, Nagaland, Manipur, Mizoram & Tripura, Haryana, Madhya Maharashtra, coastal Andhra Pradesh, Telangana and interior Karnataka; deficient in Assam & Meghalaya, Jammu

TABLE 5

Principal amounts of rainfall (cm)

Date (1)	March 1993 (2)	April 1993 (3)	May 1993 (4)
1	Vedasandur 8. Sabour & Bhind 3 each	Ambalavayal & Chimur 3 each	Agartala 10. Nanjangudu 5. Car Nicobar 5
2	Usilampatti 10. Yerragondapalle 6	Bubaneswar 3	Car Nicobar 5. Addor 4. Keonjhargarh 3
3	Yemminganur 10. Coonoor 6. Akola 4	Perinthalmanna 5. Hiriur 3	Tezpur 7. Car Nicobar 6. Tezu & Konni 5 each. Agartala 4. Tirupur 3
4	Lingadahalli 5	—	Rangia 8. Agartala 7. Dibrugarh & Tadong 6 each
5	—	Akhyapada 5	Dibrugarh 11. Tandong 5. Konni 3
6	Nagpur 3	Kanyakumari & Thumba 4 each	Guwahti 4. Chengannur 3
7	—	Kuzithurai 6. Kottayam 3	Agartala 10. Kodungallur 3
8	—	Cherammandevi 5	Balurghat 8. Kodungallur 3
9	Kondul 7	Tikarpara 7. Karimganj 3	Ambalavayal 7. Kodungallur 5. Barailly 4. Agartala, Bharmour & Shirol 3 each
10	Madikeri 4. Hubli 3	Kalimpong 10. Chaparmukh 7. Munnar 5. Imphal & Salem 3 each	Champua 6. Angul 4. Nawashahar & Dibrugarh 3 each
11	Hanagal 4. Chopal. Mangalore & Kasargode 3 each	Denkanikottai 4.	Agartala & Sankalan 7 each. Silchar & Bharmour 3 each
12	Batote 8. Bharmour 6	Kailashahar 9. Virajpet 8. Kannara 6. Silchar 5. Dharapuram 4. Haridharbati 3	Cooch Behar 11. Narsipatnam 7. North Lakhimpur 3
13	Kondul 9. Batote 6. Bharmour 5. Dibrugarh 4. Malakpur & Ambalavayal 3 each	Anakapalli 8. Domohani & Dimond Harbour 7 each. Kotraguda, Peermade & Mandsaur 3 each	Silchar 7
14	Kondul 7. Nedumangad 5. Chamba 4. Ambala, Chandigarh & Gundlupet 3 each	Vishakhapatnam 9. Bhubaneswar 6. Punalur 3	Tezu 5. Chengannur 4. Silchar, Krishnagar & Swampatna 3 each
15	Bharmour and Karimganj 5 each	Koderu 10. Tissa. Nugehalli & Garhshankar 5 each. Perinthalmanna & Shillong 4 each	Avanigadda 10. Khammam 8. Thenmala 7. Gangtok 6. Belthangady 4
16	Karimganj 3	Afzalpur 4. Champua & Cochi 3 each	Nancowry 8. Perinthalmanna 4. Uppinaangaddy. Silchar & Agartala 3 each
17	—	Agartala & Dandeli 6 each. Gargoti & Hangal 4 each	Narsipura & Thalasarry 7 each. Gangtok 6. Car Nicobar, Jaipur & Hirekerur 3 each
18	—	Dandeli & Nancowry 7 each. Dibrugarh 5. Passigaht & Kasargod 4 each. Bhgamandala 3	N. K. Halli 12. Agartala, Almatti. Silchar & Champua 5 each. Alapuzha 3
19	—	Kondul & Gangtok 9 each. Jagdalpur 4	Vadakancherry & Kundal 8 each. Baripada 4. North Lakhimpur & Purulia 3 each
20	—	Mulki 3	Kalimpong 10. Tenali 8. Bantwal 5. Maya Bandar & Passighat 3 each
21	Kondul 9. Kailashahar & Bharmour 3 each	—	Port Blair & North Lakhimpur 3 each
22	Dibrugarh 4. Passighat & Thuckalay 3 each	Balasore 5. Imphal & Shillong 3 each	Sankalan 8. Panjim 5. Ajra & Madhabarida 3 each
23	Bharmour & Banihal 6 each. Piravom 3	—	Alapuzha 8. Port Blair & Chalisgaon 3 each

TABLE 5 *(Contd.)*

Date (1)	March 1993 (2)	April 1993 (3)	May 1993 (4)
24	Guwahati, Imphal, Konni, Gunupur & Kangra 3 each	Badami & Tasgaon 3 each	Chandgad 6, Belgaum & Port Blair 4 each, Panambur & Hassan 3 each
25	Jogindernagar 9, Patiala 7, Karnal 6, Karimganj & Dehra Dun 5 each, Batote & Dhamarpuri 4 each	Tezpur 5, Osmanabad & Punalur 4 each	Yaval 4, Jenapur, Bhagalpur & Car Nicbar 3 each
26	Dharamnagar 7, Una 6, Passighat & Nangal 5 each, Karimganj & Contai 4 each, Malda & Hardoi 3 each	Goalpara & Mulki 8 each, Balehonnur 6, Konni 5	Mangalore & Gopalpur 4 each
27	Shriniketan 6, Shillong, Gobindpur & Maheshi 3 each	Aryankavu 9, Nedumangad 8 Karimganj & Chandgad 4 each	Kumarakom 10, Bhimunipatnam & Digha 9 each, Yelhanka 7, Paradip 6, Jamshedpur 5
28	North Lakhimpur 3	Kuzhithurai 5	Kalimpong 19, Bhagmandala, Nedumanged & Balasore 7 each, Sultanpur & Panbari 5 each
29	—	Cooch Behar 6, Maharajganj & Sandhads 4 each, Hut Bay & Kadur 3 each	Koddungallur 18, Amethi 6, Bihar Sherif 5, Jharsuguda & Guwahti 4 each, Ranchi 3
30	—	Dum Dum 5, Keonjhargarh 3	Gharmura 10, Purnea 5, Bilgram & Barailly 4 each, Kashipur & Dhubri 3 each
31	Hosdurg 9	—	Tezpur 7, Muktsar 5, Aizwl 4, Kondul, Baripada & Pandoh 3 each

& Kashmir, west Rajasthan, east Madhya Pradesh, Marathwada, Rayalaseema and Kerala and scanty over the rest of the country.

The significant amounts of rainfall (cm) during the month are given in Table 5.

4.3. *Temperature*

Day temperatures were below normal to appreciably below normal on 5 to 15 days over the country north of 20°N during the first half of the month and over northeast India including West Bengal during the second half of the month. Heat wave conditions prevailed over Kashmir during the last 10 days of the month. Otherwise day temperatures were normal to appreciably above normal.

Highest day temperature of 47°C was recorded at Dholpur on 28 and Khajuraho on 29.

4.4. *Disastrous weather events and damages*

According to Press reports, a tornado hit Murshidabad in West Bengal on 11, killing more than 100 people, injuring about 200 more and damaging a large number of houses in the vicinity. Thundersqualls of speed 27 to 60 kt were reported from the following places (dates have been indicated in brackets) New Delhi (14, 24), Dibrugarh (17), Agartala (20, 25), Imphal (21), Hyderabad (22, 26), Pune (24) and at Ranchi (26).

5. May

5.1. *Weather and associated synoptic features*

2 western disturbances, 1 induced cyclonic circulation, 1 trough in the westerlies in the mid and upper troposphere, 12 cyclonic circulations and 5 troughs in the lower levels comprise the synoptic features of the month, the details of which are given in Table 4.

Rain/thundershowers occurred almost at all the places or at many places on 2 to 20 days in Andaman & Nicobar islands, Arunachal Pradesh, Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura, West Bengal & Sikkim, Orissa, Bihar, Himachal Pradesh, Jammu & Kashmir, east Madhya Pradesh, Madhya Maharashtra, Marathwada, coastal and south interior Karnataka, Kerala and Lakshadweep and at a few places or at one or two places on 3 to 31 days over the rest of the country outside Gujarat State where there was no rainfall.

5.2. *Month's rainfall*

Rainfall of this month was in excess in 5, normal in 16, deficient in 10 and scanty in 2 meteorological

sub-divisions, while 2 sub-divisions recorded no rainfall.

Month's rainfall was in excess in Nagaland, Manipur, Mizoram & Tripura, plains of Uttar Pradesh, Punjab and Telangana; deficient in Andaman & Nicobar islands, Bihar plateau, Himachal Pradesh, east Rajasthan, west Madhya Pradesh, Konkan & Goa, Marathwada, Tamil Nadu, coastal Karnataka and Kerala; scanty in Vidarbha and Lakshadweep and normal over the rest of the country outside Gujarat State where there was no rainfall.

The significant amounts of rainfall (cm) are given in Table 5.

5.3. *Advance of southwest monsoon*

Southwest monsoon advanced into south Andaman sea and adjoining southeast Bay on 17. It further advanced into Comorin area and some more parts of south Andaman sea on 23. Onset of southwest monsoon over Indian mainland took place on 28 when it advanced into southeast Arabian sea, south Kerala, south Tamil Nadu, remaining parts of south Andaman sea and some parts of north Andaman sea. On the last day of the month, the northern limit of monsoon passed through 8°N/60°E, Amini, Kannur, Vedaranyam, 15°N/85°E, 20°N/90°E, Shillong and Rangiya.

5.4. *Temperature*

Heat wave conditions prevailed over the plains of west Uttar Pradesh, Rajasthan, Madhya Pradesh, Vidarbha and Telangana on 2 to 15 days. The day temperatures were normal to markedly above normal on most days over the whole of the country barring the northeastern States where it was below normal to markedly below normal on as many as three continuous weeks.

Highest maximum temperature of 48°C was recorded in Rajasthan at Dolpur 28, Churu 28 and Jhalawar 29.

5.5. *Disastrous weather events and damages*

According to Press reports 28 persons died due to hailstorm at Vaishali and Begusarai in Bihar on 9 and 3 died and 4 affected by sunstroke in Andhra Pradesh on 7.