Mausam, (1993), **44**, 4, 395–404

Weather

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POST MONSOON SEASON (OCTOBER–DECEMBER 1992)*

1. Introduction

During the post monsoon season of 1992, four cyclonic storms (20-22 October, 3-6 November, 11-17 November and 16-21 November) and one depression (7-9 October) formed over the Bay of Bengal. There were one cyclonic storm (1-3 October) and two depressions (1-2 December and 21-24 December) over the Arabian Sea. The remnant of the Bay of Bengal storm (11–17 November) also emerged into the Arabian Sea as a deep depression. It may be mentioned that the cyclonic storm over the Arabian Sea formed after an interval of 6 years. The tracks of these systems are shown in Fig. 1.

The southwest monsoon withdrew from west Rajasthan by 17 September and from the entire country by 18 October 1992. The northeast monsoon rainfall commenced over Kerala, Tamil Nadu and adjoining Karnataka and Andhra Pradesh on 2 November 1992. Monthly and seasonal rainfall amounts and their percentage departures are given in Table 1.

2. Chief features

(*i*) Four cyclonic storms and one depression over the Bay of Bengal and one cyclonic storm and two depressions over the Arabian Sea formed during the season.

(*ii*) Northeast monsoon rains commenced on 2 November over Tamil Nadu, Kerala and adjoining areas.

(*iii*) Heavy rains during October caused floods and damages in many districts of Assam. The severe cyclonic storm of November (11-17 November) crossed south Peninsular India causing damage to life and property in Tamil Nadu, Kerala, Karnataka and Andhra Pradesh.

(*iv*) Cold wave conditions prevailed over the hills of west Uttar Pradesh, Punjab, Himachal Pradesh, Jammu & Kashmir and west Rajasthan in December.

3. Seasonal rainfall (October-December)

Seasonal rainfall was excess in 8, normal in 7, deficient in 15 and scanty in 5 meteorological sub-divisions. Rainfall was excess in Nagaland, Manipur, Mizoram & Tripura, plains of Uttar Pradesh, east Rajasthan, Karnataka and Kerala; normal in west Rajasthan, west Madhya Pradesh, Marathwada, Andhra Pradesh and Tamil Nadu; deficient in Andaman & Nicobar islands, Arunachal Pradesh, Assam & Meghalaya, West Bengal & Sikkim, Orissa, Bihar plains, Haryana, Punjab, Jammu & Kashmir, Gujarat region (Daman, Dadra and Nagar Haveli), Kondan & Goa, Madhya Maharashtra, Vidarbha and Lakshadweep and scanty in the rest of the sub-divisions, *viz.*, Bihar plateau, hills of west Uttar Pradesh, Himachal Pradesh, east Madhya Pradesh and Saurashtra, Kutch & Diu. Seasonal rainfall departures are given in Fig. 2.

4. Monthly features

4.1. *October*

4.1.1. *Withdrawal of southwest monsoon*

The southwest monsoon withdrew from the west Rajasthan on 17 September. By 23 September it further withdrew from Jammu & Kashmir, Punjab, Haryana, Himachal Pradesh, west Uttar Pradesh, Madhya Pradesh and Gujarat State. Later, it withdrew gradually from the entire country by 18 October.

4.1.2. *Onset of northeast monsoon*

The northeast monsoon rains commenced over Tamil Nadu, Kerala and adjoining areas on 2 November 1992.

4.1.3. *Storms/depressions*

(a) *Arabian Sea* — A cyclonic storm (1-3 October) formed over the west central Arabian Sea on 1 October It moved in a westnorthwesterly direction and crossed Oman coast on 3 morning and weakened rapidly by mid-night of 3 October.

(b) *Bay of Bengal* — A cyclonic storm (20-22 October) formed over the northeast Bay of Bengal on 20 October. It moved northeastwards, crossed Bangla Desh coast and dissipated by 22 October. A deep depression (7-9 October) formed over west central Bay on 8 evening. Moving in a northwesterly direction, it crossed south Andhra coast on the early morning of 9 and weakened further on 10 October.

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TABLE 1

Sub-divisional means of rainfall (mm) for each month and season as a whole (October-December 1992)

Sub-division	October			November			December			Season		
	Actual	Normal	%	Actual	Normal	%	Actual	Normal	%	Actual	Normal	%
1. A. & N. Islands	377	319	18	196	253	—23	9	171	—95	593	743	—20
2. Arunachal Pradesh	115	107	8	6	31	—80	12	11	3	99	149	—34
3. Assam & Meghalaya	111	159	—31	7	28	—74	8	10	—24	126	198	—36
4. Naga., Mani. & Mizo.	211	160	32	19	34	—44	28	9	212	248	203	23
5. S.H.W.B. & Sikkim	122	146	—17	3	17	—79	10	5	115	133	167	—20
6. Gangetic West Bengal	59	119	—51	5	19	—75	0	3	—97	64	141	—54
7. Orissa	73	117	—37	10	29	—67	0	6	—100	84	152	—45
8. Bihar Plateau	19	89	—79	3	13	—76	0	4	—99	22	105	—79
9. Bihar Plains	51	63	—19	2	9	—78	0	3	—96	51	74	—31
10. East Uttar Pradesh	91	48	87	6	5	24	0	6	—100	97	59	63
11. Plains of West U.P.	57	35	65	11	4	151	0	9	—100	68	48	43
12. Hills of West U.P.	13	59	—79	15	9	65	1	25	—94	29	95	—70
13. Har., Chandi. & Delhi	5	17	—73	13	4	24	0	8	—99	17	29	—40
14. Punjab	4	21	—80	17	4	305	1	15	—95	22	41	—46
15. Himachal Pradesh	6	42	—87	15	13	9	1	39	—98	21	94	—78
16. Jammu & Kashmir	13	25	—49	22	16	35	9	54	—84	44	96	—54
17. West Rajasthan	9	6	37	1	2	—32	0	3	—100	10	12	—14
18. East Rajasthan	53	18	198	11	4	171	0	4	—100	64	26	144
19. West Madhya Pradesh	51	31	62	2	14	—84	1	7	—80	55	52	4
20. East Madhya Pradesh	11	52	—79	9	12	—23	0	7	—98	21	71	—71
21. Gujarat Region	19	27	—30	3	8	—63	0	1	—100	22	37	—41
22. Saur. Kutch & Diu	10	16	—139	0	7	—100	0	2	—100	10	25	—60
23. Konkan & Goa	83	113	—26	2	25	—92	0	9	—100	86	147	—42
24. Madhya Maharashtra	70	71	—2	14	29	—52	0	7	—100	83	108	—23
25. Marathwada	54	59	—8	31	19	56	0	9	—100	85	87	—2
26. Vidarbha	37	43	—13	11	15	—27	0	15	—100	48	72	—34
27. Coastal A. P.	140	193	—28	184	101	83	1	26	—97	324	319	2
28. Telangana	53	77	—31	58	19	207	0	7	—100	109	103	6
29. Rayalaseema	83	118	—30	120	73	63	0	26	—99	204	217	—6
30. Tamil Nadu	132	195	—32	326	191	71	59	86	—32	514	471	9
31. Coastal Karnataka	130	185	—30	255	66	285	0	15	—100	385	266	45
32. N. I. Karnataka	76	93	—18	130	27	378	0	8	—100	206	127	62
33. S. I. Karnataka	124	151	—18	163	54	201	1	13	—96	287	218	31
34. Kerala	318	293	9	339	164	107	5	43	—87	662	499	33
35. Lakshadweep	122	163	—25	81	102	—21	32	69	—54	234	334	—30

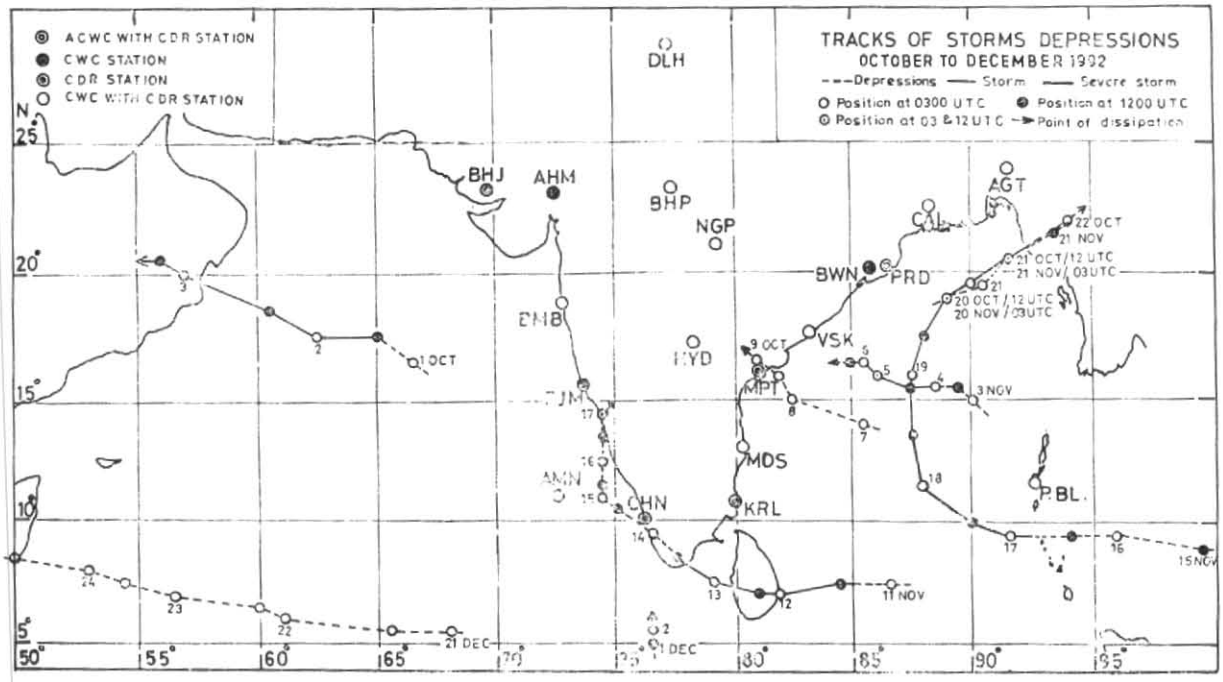

Fig. 1. Tracks of storms/depressions for the period October to December 1992

4.1.4. *Weather and associated synoptic features*

Table 3 gives the details of synoptic features for the month of October 1992.

Southwest monsoon was active to vigorous on 3 to 6 days over Kerala on 2 to 3 days in Assam & Meghalaya, West Bengal & Sikkim, Orissa, Konkan & Goa, Madhya Maharashtra and Marathwada, Andhra Pradesh and interior Karnataka and on one day in Uttar Pradesh and Vidarbha.

4.1.5. *Monthly rainfall*

Monthly rainfall was excess in 6, normal in 10, deficient in 13 and scanty in 6 meteorological sub-divisions during October 1992. Rainfall was excess in Nagaland, Manipur, Mizoram & Tripura, east Uttar Pradesh, plains of Uttar Pradesh, Rajasthan and west Madhya Pradesh; normal in Andaman & Nicobar islands, Arunachal Pradesh, Sub-Himalayan West Bengal & Sikkim, Bihar plains, Madhya Maharashtra, Marathwada, Vidarbha, interior Karnataka and Kerala; deficient in Assam & Meghalaya, Gangetic West Bengal, Orissa, Jammu & Kashmir, Gujarat State, Konkan & Goa, Andhra Pradesh, Tamil Nadu, coastal Karnataka and Lakshadweep and scanty in Bihar plateau, hills of west Uttar Pradesh, Haryana, Punjab, Himachal Pradesh and east Madhya Pradesh. The significant amounts of rainfall (cm) during the month are given in Table 2.

4.1.6. *Temperature*

Day temperatures were above normal or appreciably above normal on most of the days of the month over Orissa, Himachal Pradesh, east Madhya Pradesh, Marathwada and Andhra Pradesh. They were appreciably to markedly below normal (—5° to —9°C departure) on 7-8 days in Kashmir and Gujarat region. They were generally normal over the rest of the country.

Severe cold wave conditions prevailed over the hills of west Uttar Pradesh on 5 days and cold wave conditions on 10 days. Night temperatures were appreciably below normal to below normal on many days over Bihar, Punjab and Jammu. They were generally normal over the rest of the country.

39°C was the highest day temperature, recorded over the plains by many stations as given below :

1 Oct : Hisar, Palode and Idar

2 Oct : Hisar, Churu, Jaisalmer and Palode

5 Oct : Idar

7 Oct : Idar, Surat and

8 Oct : Parbhani

10 Oct : Bahraich

22 Oct : Baroda

The lowest day temperature of 21°C was recorded at Dibrugarh on 14. The lowest night temperature of 9°C over the plains was recorded at Adampur (21–26 October) and Umaria (30 October) and 1°C over hills at Srinagar (29 October).

4.1.7. *Disastrous weather events and associated damage*

Monsoon was active to vigorous over Assam and adjacent States (15–19), south interior Karnataka (7–10),

TABLE 2

Monthly rainfall amounts (cm)

Date	October 1992	November 1992	December 1992
1	Jalpaiguri 9, Rampura 7, Bombay Chikali & Rentachintala 5 each	Tenkasi 6, Punalur 5	—
2	Bhubaneshwar & Ambavalayal 8 each, Kunda Bridge 7, Arasalu 6, Minicoy 5	Alappuzha 10, Mylaudi 9, Nellore 4	Sathankulam 4, Minicoy 3
3	Kottayam 13, Tuticorin 11, Minicoy & Tadepalligudem 8 each, Humnabad 5	Srivilliputtur 9, Ammathe 5, Thrissur 4	Tuticorin 17, Kanyakumari 7, Minicoy 3
4	Thoovalai 13, Baghdogra & Peermade 7 each, Gundlupet & Koderu 6 each	Srivaikundam 10, Madras 7, Paravur 6	Tambaram 11, Madras 8
5	Dharamasthala 16, Agumbe 9, Kodangallur & Rajamundry 7 each	Kodungallur & Nagapattinam 7 each, Madurai 5, Palakkad 4	Ponneri 11, Pondicherry 10, Madras 4
6	Alur 18, Valangiman 9, Bangalore 8, Berhampore 7, Anantpur & Kochi 5 each	Ramanathapuram 9, Sompeta 8, Thanjavur 7, Gopalpur 6, Madurai 5	Parangipettai 21, Cuddalore 5
7	Arasalu 7, Balehonnur & Thenmala 5 each, Chandbali & Vellore 4 each	Kalingapatnam 14, Nagarcoil 11, Sompeta 9	Kottumannarkoil 17, Parangipettai 13
8	Sencamangalam 9, Kalingapatnam 8, Perinthalmanna 7, Gopalpur 6	Kumbakanam 18, Tiruchirapalli 8, Kakinada & Punalur 4 each	—
9	Machilipatnam 16, R. Udaigiri 13, Deulgaon Raja 12, Thiruvananthapuram 11	Ponnampet 12, Parli 11, Badvel 9, Madikeri 8, Kavali 6	—
10	Punalur 27, Buldhana & Jamner 15 each, Thuckalay 12, Karimnagar & Parbhani 10 each	Car Nicobar, Nagarcoil & Rapur 7 each, Chittur 3	—
11	Hathras 17, Taloda 15, Jabot 12, Jhalwar 11, Kundapur 8	Nancowry 7, Adoor & Nagapattinam 5 each	—
12	Chargharia 14, Bahraich 13, Dholpur, Jabhua, Koderu & Tiruchirapalli 12 each	Sirkali 6	—
13	Jhanjarpur 13, Sitapur 8, Chittor 7, Cooch Behar 5, Guwahati 4	Chidambaram 12, Aryankavu & Kavali 3 each	—
14	Veerangapattam 12, Kanchipuram & Vellapur 6 each	Ambasamudram 37, Thenmala 35, Kanyakumari 21, Punalur 16, Kavali 9	—
15	Thrissur 11, Rayakottah 7, Agumbe 4	Coonoor 43, Kunnamkulam 13, Kundukur 11, Pondicherry 9	—
16	Kasargode 9, Parangipettai 7, Arogyavaram 6, Imphal 4	Hosdurg & Mani 18 each, Mangalore 17, Madras 14, Kalingapatnam 13	Kumarakom 4 —
17	Thiruvarur 10, Kuppam 7, Channarayapatna 4	Ranebennur 32, Addani 23, Car Nicobar 22, Honavar 10	—
18	Thiruvarur 7	Maski 22, Kavali & Mangalore 16 each, Hokimpet 10, Gulbarga 7	Chidambaram 10, Tiruchirapalli 3
19	Illuppur 8, Enmackal 6	Dharamasthala & Koderu 10 each, Kannur 8, Vellore 6	—
20	Papanasam 8, Paradip 7, Ghodegaon 4	Sathanurdam 10, Udgir 8, Aliganj & Ongole 6 each, Karaikal 5	—
21	Madurai 6	Periyanaiekanpalayam 17, Ajra 10, Chikmagalur & Vellure 8 each	—
22	Thenmala 4	Coonoor & Vadakkancherry 12, Kodaikanal 11, Srinagar 3	—
23	—	Nuh & Sathanur Dam 7 each, Jagityal 6, Baila-hangal 5	—
24	Gaganbavada, Irikkur & Nagamangala 4 each	Nanguneri 6, Jagadalpur & Thiruvananthapuram 3 each	—
25	Ambalavayal 8	Palakonda 8	—
26	Kozikode 6, Dharamasthala 4	Visakhapatnam 12, Vedaranyam 6, Neelamangad 3	—
27	Bangarpet & Varkala 4 each	Neyyattinkara 5, Srivaikun Dam 4	—
28	Indi 7, Talaguppa 4	—	—
29	Neyyattinkara 6, Radhanagari 4	Coonoor & Madras 3 each	—
30	—	Thiruvadanai 5, Tondi 4	—
31	—	—	—

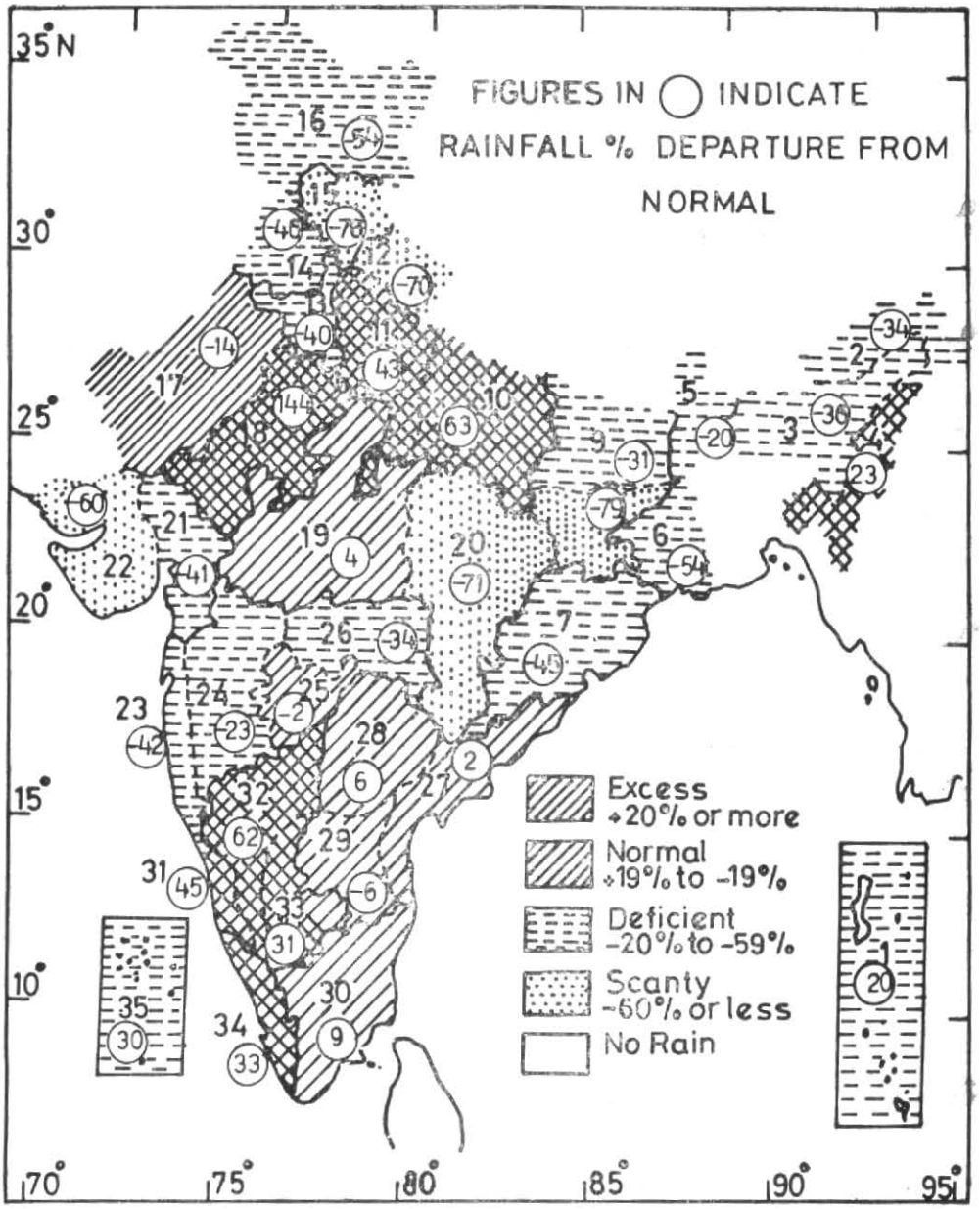

Fig. 2. Rainfall for the period 1 October to 31 December 1992

Kerala (10–11) and Tamil Nadu (9–11) and this caused disastrous weather as given below :

The following are the statistics :

Assam and adjacent States

(i)	No. of districts affected	: 7
(*ii*)	Area affected in hectares	: more than 55,000
(*iii*)	No. of villages affected	: 95
(*iv*)	Population affected	: 35,000
(*v*)	Relief camps opened	: 72

Karnataka, Kerala and Tamil Nadu

(*i*)	Loss of human life	: 70 + 19 (missing)
(*ii*)	Damage of houses	: about 5,500

4.2. *November*

4.2.1. *Storms/depressions*

(a) *Arabian Sea* — No storm/depression formed over the Arabian Sea.

(b) *Bay of Bengal* — A cyclonic storm (3–6 November) formed over the central Bay on 3. It moved westnorth-westwards slowly and dissipated over west central Bay by 6.

A severe cyclonic storm (11–17 November) formed over the southeast Bay on 11. Moving in a westerly direction it crossed Sri Lanka coast on 12 noon, emerged into the Gulf of Mannar and crossed south Tamil Nadu coast on 13 evening. Weakening into a deep depression it emerged into the southeast Arabian Sea on 14. Then

TABLE 3

Details of weather systems during October 1992

S. No.	Weather system	Period	Place of first location	Direction of movement	Place of dissipation	Remarks
(A) *Cyclonic storm*						
(1)	Cyclonic storm	1–3	Central Arabian	Westnorthwest	Oman coast	It was first observed as a low pressure over east central Arabian Sea off Karnataka coast and adjoining Lakshadweep area on 30th Sep. On 1st Oct it rapidly concentrated into deep depression
(2)	Do.	21–22	Northeast Bay	Northeast	Over Bangla Desh coast near Cox's Bazar as a depression & moved away northeastwards as a low pressure area on 23rd	It was first observed as a cyclonic circulation over south central Bay on 18th. It became low pressure area over central and adjoining north Bay before concentrating into depression over central Bay on 20th. It further intensified into deep depresson on 21st over northeast Bay
(3)	Deep depression	7-9	Southeast and adjoining parts of central Bay	Initially northwest and then westnorthwestwards	Northeast Uttar Pradesh and neighbourhood	It was first observed as a low pressure area on 6th over southeast Bay and neighbourhood crossed coast between Machilipatnam and Kakinada in the morning of 9th. Moved across Telangana, Marathwada and Madhya Maharashtra as a low pressure area, it dissipated over Uttar Pradesh by 15th
(B) *Cyclonic circulation*						
(1)	Mid. trop. level	4-7	Lakshadweep and adjoining sea areas	Stationary	*In situ*	—
(2)	Lower trop. level	2-4	North Pakistan & neighbourhood	Northeastwards	Moved away	—
(3)	Lower level	5-7	South Rajasthan & neighbourhood	Stationary	*In situ*	—
(4)	Mid. trop. level	11-14	Southwest Bay off north Tamil Nadu and south Andhra coast	Do.	Do.	—
(5)	Lower level	12-14	Andaman sea and neighbourhood	Westwards	Southwest Bay merged with the above system	—
(6)	Mid. trop. level	26-28	North Andaman sea and neighbourhood	Stationary	*In situ*	
(7)	Lower trop. level	22-25	Lakshadweep area & neighbourhood	Do.	Do.	—
(C) *Western disturbance*						
(1)	Upper air system	15-20	North Pakistan and neighbourhood	Eastnortheast	Moved away across Jammu & Kashmir	—
(D) *Troughs*						
(1)	Lower level	17-20	Off Karnataka – Maharashtra coast	Stationary	*In situ*	—
(2)	Do.	27 Oct-2 Nov	Kerala–Karnataka coast		Maharashtra-Kerala coast	—
(E) *Trough in westerlies*						
(1)	Mid. and upper trop. westerlies	9-11	At 9.5 km asl along 65°E/North of 25° N	Northeast	Moved away	—

TABLE 4

Details of weather systems during November 1992

S. No.	Weather system	Period	Place of first location	Direction of movement	Place of dissipation	Remarks
(A) *Cyclonic storm*						
(1)	Severe cyclonic storm (Hurricane)	16–21	Central parts of Andaman sea	Initially westerly then westnorth-west northerly, northnortheasterly and finally north-easterly	Over Myanmar on 22nd before moving away northeast-wards	Remnants of T.S. Forrest entered into central Andaman sea. Became cyclonic storm on 17th morning, SCS on 17th evening, SCS (H) over southeast Bay on 18th. Rapidly weakend thereafter
(2)	Severe cyclonic storm	11–17	Southeast Bay	Northwesterly direction	Over north interior Karnataka	It was first observed as a low pressure area over southeast Bay and neighbourhood on 10th and rapidly concentrated into deep depression on 11th morning became cyclonic storm in the evening crossed Sri Lanka coast on 12th noon. Emerged into Gulf of Mannar on 13th morning and crossed south Tamil Nadu coast in the evening as SCS It weakened into deep depression over land and emerged into southeast Arabian Sea moving in a northnortheasterly direction over sea close to coast, it entered into-land over north Karnataka near Honavar on 17th noon. Thereafter it weakened further
(3)	Cyclonic storm	3–7	Central Bay	Westnorthwest	West central Bay	It was first observed as a low pressure area over east central Bay on 3 morning, rapidly concentrated into deep depression over the same area in the evening, weakened rapidly and became less marked over west central Bay on 7th
(4)	Well marked low pressure area	7–9	Southern parts of west central Bay	Stationary	*In situ*	Associated cyclonic circulation extended upto mid tropospheric levels
(B) *Cyclonic circulation*						
(1)	Mid. trop.	4–11	Lakshadweep area	Stationary	*In situ*	—
(2)	Lower trop. levels	11–12	Bangla Desh and neighbourhood	Do.	Do.	—
(C) *Western disturbance*						
(1)	Upper air system	21–23	North Pakistan and neighbourhood	Northnortheast	Moved across Jammu & Kashmir	
(D) *Trough in westerlies*						
(1)	Mid and upper trop. level	18–22	At 9.5 km asl along 66° E/North of 30° N	Northeast	Moved away	—
(2)	Do.	27–29	At 5.8 km asl along 60° E/North of 25° N	Stationary	*In situ*	—
(E) *Induced cyclonic circulation*						
(1)	Lower trop.	20–21	Punjab and neighbourhood	Stationary	*In situ*	—
(2)	Lower level	23–27	North Rajasthan and neighbourhood	Do.	Do.	—
(F) *Troughs*						
(1)	Lower trop.	23–25	Central parts of Uttar Pradesh to Marathwada	Eastwards	Bihar plains to south-east Madhya Pradesh	—
(2)	Lower level	21 Nov-3 Dec	Off south Maharashtra-Kerala coast	Stationary	*In situ*	—

TABLE 5

Details of weather systems during December 1992

S. No.	Weather system	Period	Place of first location	Direction of movement	Place of dissipation	Remarks
(A) *Depression*						
(1)	Depression	1-2	Comorin Sea area	Quasi-stationary	*In situ*	It was observed as a low pressure area over north Indian Ocean in the morning on 30th Nov and became more marked in the evening
(2)	Deep depression	21-24	Southeast Arabian Sea	Initially west and then westnorthwest	Moved away west-northwest across Somalia coast	
(3)	Induced low pressure area	11-13	South Pakistan & neighbourhood	Northnortheast	Punjab and neighbourhood	
(B) *Western disturbance*						
(1)	Upper air system	4-5	North Pakistan & neighbourhood	Northeast	Moved across Jammu & Kashmir	—
(2)	Do.	6-10	Do.	Do.	Do.	
(3)	Do.	11-13	Afghanistan & adjoining Pakistan	Do.	Do.	
(4)	Do.	22-23	North Pakistan & adjoining Jammu & Kashmir	Do.	Do.	
(5)	Do.	25-26	Northern parts of Jammu & Kashmir	East	Do.	
(6)	Do.	30 - 1 Dec Jan	North Pakistan & neighbourhood	Do.	Do.	
(C) *Induced cyclonic circulation*						
(1)	Lower trop. level	4-5	Northwest Rajasthan & neighbourhood	Stationary	*In situ*	—
(D) *Troughs*						
(1)	Mid. upper trop. westerlies	10-13	At 9.5 km asl along 55° E/North of 20° N	East	Long. 68° E north of 25° N	
(2)	Lower level	29 - 11 Nov Dec	Southwest Bay off Tamil Nadu coast	Stationary	*In situ*	—
(3)	Trough of low	12-20	Southeast & adjoining southwest Bay	Initially southeast & then southwest	Southeast Arabian Sea off Kerala coast	
(4)	Lower level	16-18	Off Kerala coast	Stationary	*In situ*	—
(5)	Trough of low	20-24	Southwest Bay	Do.	Do.	
(6)	Lower level	25	Southwest Bay & neighbourhood			
(7)	Do.	29	Do.			

it moved in a northerly direction and crossed north Karnataka on 17 and weakened further over north interior Karnataka.

A severe cyclonic storm with a core of hurricane winds (16–21 November) formed on 17 over the southeast Bay and the adjoining Andaman sea out of the remnants of T.S. FORREST. Moving initially in a northwesterly direction and then recurving to north/northeast, it crossed Bangla Desh-Myanmar coast on 21 and weakened rapidly thereafter.

4.2.2. *Weather and associated synoptic features*

One western disturbance over north Pakistan and neighbourhood, two induced cyclonic circulations (one over Punjab and neighbourhood and the other over north Rajasthan and neighbourhood both in the lower levels) and two troughs in the westerlies in the middle and upper troposphere (one along Long. 66°E north of Lat. 30°N at 4.5 km asl and the other along Long. 60°E north of Lat. 25°N at 5.8 km asl) were seen during the month. Details of these and other features are given in Table 4.

Northeast monsoon was active to vigorous on 3 to 5 days (13–17 November) in Tamil Nadu and 1 to 6 days (4, 14–18 and 22 November) in Kerala during the month. Rain or thundershowers occurred either almost at all places or at many places on 3 to 9 days in Andaman & Nicobar islands, Marathwada, coastal Andhra Pradesh, Telangana, Rayalaseema, Tamil Nadu, Karnataka, Kerala and Lakshadweep and on 1 to 2 days in Punjab, Himachal Pradesh and Jammu & Kashmir. Mainly dry weather prevailed over Arunachal Pradesh, Assam, Meghalaya, Sub-Himalayan West Bengal & Sikkim, Bihar plains, Uttar Pradesh, east Rajasthan and Gujarat State and Diu.

4.2.3. *Month's rainfall*

Rainfall was in excess in 16, normal in 1, deficient in 7 and scanty in 10 meteorological sub-divisions. There was no rainfall in one meteorological sub-division.

Rainfall was in excess in Uttar Pradesh, Haryana, Punjab, Jammu & Kashmir, east Rajasthan, Marathwada, Andhra Pradesh, Tamil Nadu, Karnataka and Kerala; normal in Himachal Pradesh; deficient in Andaman & Nicobar islands, Nagaland, Manipur, Mizoram & Tripura, west Rajasthan, east Madhya Pradesh, Madhya Maharashtra, Vidarbha and Lakshadweep and scanty over the rest of the country except Saurashtra, Kutch & Diu where there was no rain.

4.2.4. *Temperature*

Severe cold wave conditions prevailed over the hills of west Uttar Pradesh on 2 days and cold wave conditions on 15 days. Cold wave conditions on 1 to 5 days also prevailed over Jammu & Kashmir. Night temperatures were appreciably below normal to below normal on more than 7 days over Assam, Meghalaya, Sub-Himalayan West Bengal & Sikkim, Punjab, Saurashtra, Kutch & Diu. They were above normal or appreciably above normal on many days over the plains of Uttar Pradesh, Haryana, Rajasthan, Madhya Pradesh, Maharashtra, Andhra Pradesh, coastal and north interior Karnataka. They were generally normal over the rest of the country.

The lowest night temperature of 3°C over the plains was recorded at Adampur on 24 and 25 and at Churu on 25. Over the hills the lowest temperature was recorded at Srinagar on 24 (—3°C).

4.2.5. *Disastrous weather events and associated damage*

The severe cyclonic storm in November (11–17 November) caused extreme damage in the four southern States of Andhra Pradesh, Tamil Nadu, Kerala and Karnataka. In all about 380 people died, about 180 were missing. Thousands of houses collapsed. Huge area of agricultural land was submerged in flood water. Estimated loss in Karnataka and Tamil Nadu was around Rs. 680 crores.

4.3. *December*

4.3.1. *Storms and depressions*

(a) *Arabian Sea* — A depression (1-2) formed over the Comorin Sea area on 1st. It was quasi-stationary and dissipated *in situ* on December 2. A deep depression (21-24) formed over the southeast Arabian Sea on 21. It moved away westnorthwestwards to the Somalia coast by 24 and dissipated thereafter.

4.3.2. *Weather and associated synoptic features*

Six western disturbances over Pakistan and neighbourhood, one induced cyclonic circulation over northwest Rajasthan and neighbourhood and one trough in the middle and upper tropospheric westerlies (at 9.5 km asl along Long. 55°E north of Lat. 20°N) were observed during the month. 6 troughs in the lower levels over southwest Bay and off Kerala or Tamil Nadu coasts were also seen. Details of these and other features are given in Table 5.

Rain or thundershowers have occurred at many places or at a few places on 2 to 8 days in Nagaland, Manipur, Mizoram & Tripura, Sub-Himalayan West Bengal & Sikkim, Tamil Nadu and Lakshadweep. They have also occurred at almost all the places on 1 day over Jammu & Kashmir. Mainly dry weather prevailed over Gangetic West Bengal, Orissa, Bihar, Uttar Pradesh, Haryana, Punjab, Himachal Pradesh, Rajasthan, Madhya Pradesh, Gujarat State, Maharashtra, Telangana and Karnataka.

4.3.3. *Month's rainfall*

The month's rainfall was in excess in 2, normal in 1, deficient in 3 and scanty in 15 meteorological sub-divisions. The remaining 14 meteorological sub-divisions had no rainfall during the month. Rainfall was in excess in Nagaland, Manipur, Mizoram & Tripura and Sub-Himalayan West Bengal & Sikkim; normal in Arunachal Pradesh; deficient in Assam & Meghalaya, Tamil Nadu and Lakshadweep; scanty in Andaman & Nicobar islands, Gangetic West Bengal, Bihar, the hills of west Uttar Pradesh, Haryana, Punjab, Himachal Pradesh, Jammu & Kashmir, Madhya Pradesh, coastal Andhra Pradesh, Rayalaseema, south interior Karnataka and Kerala. The rest of the sub-divisions did not record any rainfall during the month.

4.3.4. *Temperature*

Severe cold wave conditions prevailed over hills of west Uttar Pradesh for 7 days and cold wave conditions on 1 to 4 days prevailed over Nagaland, Manipur, Mizoram & Tripura, hills of west Uttar Pradesh, Jammu and west Rajasthan. Night temperatures were appreciably below normal or below normal on some days over Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura, West Bengal & Sikkim, Orissa, Bihar, Madhya Maharashtra, Telangana, Rayalaseema and interior Karnataka. They were generally normal or above normal over the rest of the country.

The lowest night temperature over plains was 1°C at Adampur on 7 occasions during 14 to 23.

4.3.5. *Disastrous weather events and associated damage*

Barring the damage to crops from hailstorm over Gohapur areas of Sonitpur district in Assam, no disastrous weather event was reported during the month.