MAUSAM, **61**, 4 (October 2010), 577-600

Weather in India

POST MONSOON SEASON (October-December 2009)†

1. Introduction

The cyclogenesis during the post monsoon season had been subdued as compared to last year. Only two intense low pressure systems formed over the Indian seas during the season, *viz*., the Cyclonic Storm (Phyan) over the Arabian Sea and Cyclonic Storm (Ward) formed over the Bay of Bengal. Both the systems originated in the easterly wave troughs. Their proximity to the land and other unfavourable dynamical parameters like vertical wind shear prevented further intensification into severe Cyclonic Storm. Both the systems contributed to the *normal** to *excess* rainfall activity over the south peninsula. Also during the formative stage of the Cyclonic Storm (Phyan), when it was making a northward drift in the Arabian Sea, moist maritime air from the Bay of Bengal traversed across Tamil Nadu. This resulted in very heavy to extremely heavy rainfall over the windward side of Western Ghats. An exceptionally heavy rainfall of 82 cm was reported by 'Ketti' in Tamil Nadu on 10 November.

Unlike last year, frequent easterly – westerly interactions remained a dominant feature of the season. The phenomenon caused northward extension of the northeast monsoon rains as well as enhanced rainfall activity over the central parts of the country, quite a few times. Also active western disturbances gave rise to snowfall over the higher reaches of Jammu & Kashmir, Himachal Pradesh as well as in Sikkim.

The southwest monsoon withdrew from most parts of northwest India, parts of north and central India and northern parts of peninsular India during the first fortnight of October. Subsequently it withdrew from the northeastern states and most parts of peninsular India by 20 October and from the entire country on 22 October.

There was a clear cut demarcation between the withdrawal of southwest monsoon and the commencement of northeast monsoon rains this time. With the setting in of large scale north easterlies along the east coast of Tamil Nadu, northeast monsoon rains commenced over the south peninsula on 29 October. All the meteorological sub-divisions in the northeast monsoon regime received *normal* to *excess* rainfall during the period 1 October to 31 December excluding coastal Andhra Pradesh, where the rainfall had been marginally *deficient*.

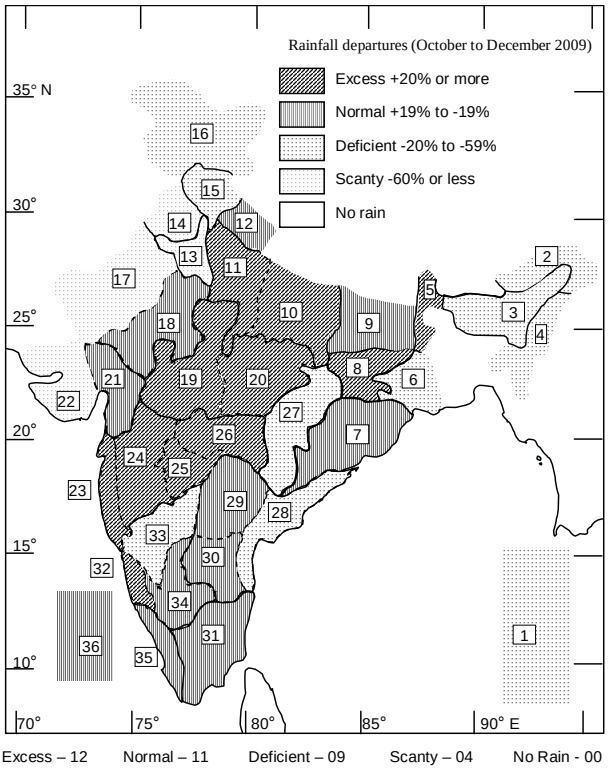

Fig. 1. Sub-division wise seasonal rainfall departure from normal (%) for Post monsoon season (October to December 2009). Sub-divisions are indicated by number on the map & bold letters in legend. The rainfall anomaly values for these 36 sub-divisions are indicated below :

1	–39	**7**	–05	**13**	–87	**19**	144	**25**	45	**31**	12
2	–39	**8**	34	**14**	–79	**20**	153	**26**	52	**32**	68
3	–25	**9**	02	**15**	–36	**21**	04	**27**	–38	**33**	110
4	–26	**10**	67	**16**	–52	**22**	–84	**28**	–20	**34**	01
5	45	**11**	53	**17**	–98	**23**	209	**29**	16	**35**	06
6	–40	**12**	12	**18**	01	**24**	111	**30**	–01	**36**	18

The frequency of *cold wave* occurrence was less, as in last year. Isolated places of central and northwestern parts of the country experienced *cold wave* from the beginning of November. Snowstorm in Himachal Pradesh caused intense cold over the northwestern parts, in November. Northwest, central, south peninsula and eastern parts of the country experienced *cold wave conditions* on a few days in December. Also chill winds blew through Himachal Pradesh at the higher reaches of Himalayas recording sub-zero temperatures over the region in December. Leh in Ladakh region recorded night temperature of minus 20° C on 29 December.

* Terms in Italics other than the sub-titles are explained in Appendix.

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TABLE 1

Sub-divisionwise rainfall (mm) for each month and season as a whole (October-December 2009)

S. No.	Meteorological Sub-divisions	October			November			December			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	276	305	-10	71	236	-70	82	159	-49	428	700	-39
2.	Arunachal Pradesh	103	166	-38	37	42	-14	9	35	-73	149	244	-39
3.	Assam & Meghalaya	129	154	-16	12	25	-54	3	11	-76	144	191	-25
4.	Naga., Mani., Mizo. and Tri.	131	145	-10	13	40	-67	0	10	-100	144	195	-26
5.	Sub-Himalayan West Bengal & Sikkim	261	155	68	2	18	-89	2	10	-78	265	183	45
6.	Gangetic West Bengal	82	130	-37	13	23	-41	**	6	-98	96	159	-40
7.	Orissa	114	121	-6	33	28	17	**	5	-92	147	155	-5
8.	Jharkhand	121	86	42	11	10	7	2	5	-55	135	100	34
9.	Bihar	74	69	6	5	5	-13	1	4	-61	80	79	2
10.	East Uttar Pradesh	92	52	78	7	4	74	4	6	-29	104	62	67
11.	West Uttar Pradesh	60	40	50	15	4	246	3	7	-51	78	51	53
12.	Uttaranchal	87	56	55	8	9	-9	2	22	-90	97	87	12
13.	Haryana, Chandigarh & Delhi	1	16	-94	2	5	-49	**	7	-97	3	27	-87
14.	Punjab	3	21	-87	6	5	16	0	15	-100	9	41	-79
15.	Himachal Pradesh	12	46	-73	46	20	133	14	46	-70	72	111	-36
16.	Jammu & Kashmir	7	36	-79	50	32	56	16	84	-81	74	153	-52
17.	West Rajasthan	**	4	-98	**	3	-99	**	2	-93	**	8.9	-98
18.	East Rajasthan	15	15	-4	11	7	52	1	4	-79	26	26	1
19.	West Madhya Pradesh	60	32	90	53	13	298	14	7	98	127	52	144
20.	East Madhya Pradesh	62	39	59	78	12	573	10	9	10	149	59	153
21.	Gujarat region	28	22	28	8	11	-25	**	2	-99	36	35	4
22.	Saurashtra & Kutch	3	14	-80	1	11	-88	**	1	-99	4	26	-84
23.	Konkan & Goa	300	105	186	118	26	354	0	4	-100	418	135	209
24.	Madhya Maharashtra	96	71	36	121	28	328	5	6	-23	222	105	111
25.	Marathawada	63	67	-7	70	22	218	7	7	1	139	96	45
26.	Vidarbha	40	53	-25	69	15	376	5	7	-27	114	75	52
27.	Chattisgarh	23	67	-66	28	10	177	**	5	-98	51	82	-38
28.	Coastal Andhra Pradesh	73	197	-63	168	104	62	20	26	-22	262	326	-20
29.	Telangana	94	84	12	32	21	53	1	5	-75	127	110	16
30.	Rayalaseema	85	121	-30	105	66	58	21	24	-15	210	212	-1
31.	Tamil Nadu	62	181	-66	314	165	90	106	85	24	482	432	12
32.	Coastal Karnataka	261	179	46	144	66	119	29	14	111	434	258	68
33.	North interior Karnataka	221	103	115	48	28	72	17	6	187	287	137	110
34.	South interior Karnataka	104	139	-25	71	48	47	27	13	111	202	200	1
35.	Kerala	210	292	-28	274	164	67	46	43	6	530	499	6
36.	Lakshadweep	89	153	-42	166	117	42	133	59	125	388	329	18

** Rainfall amount from 0.01 to 0.4 mm

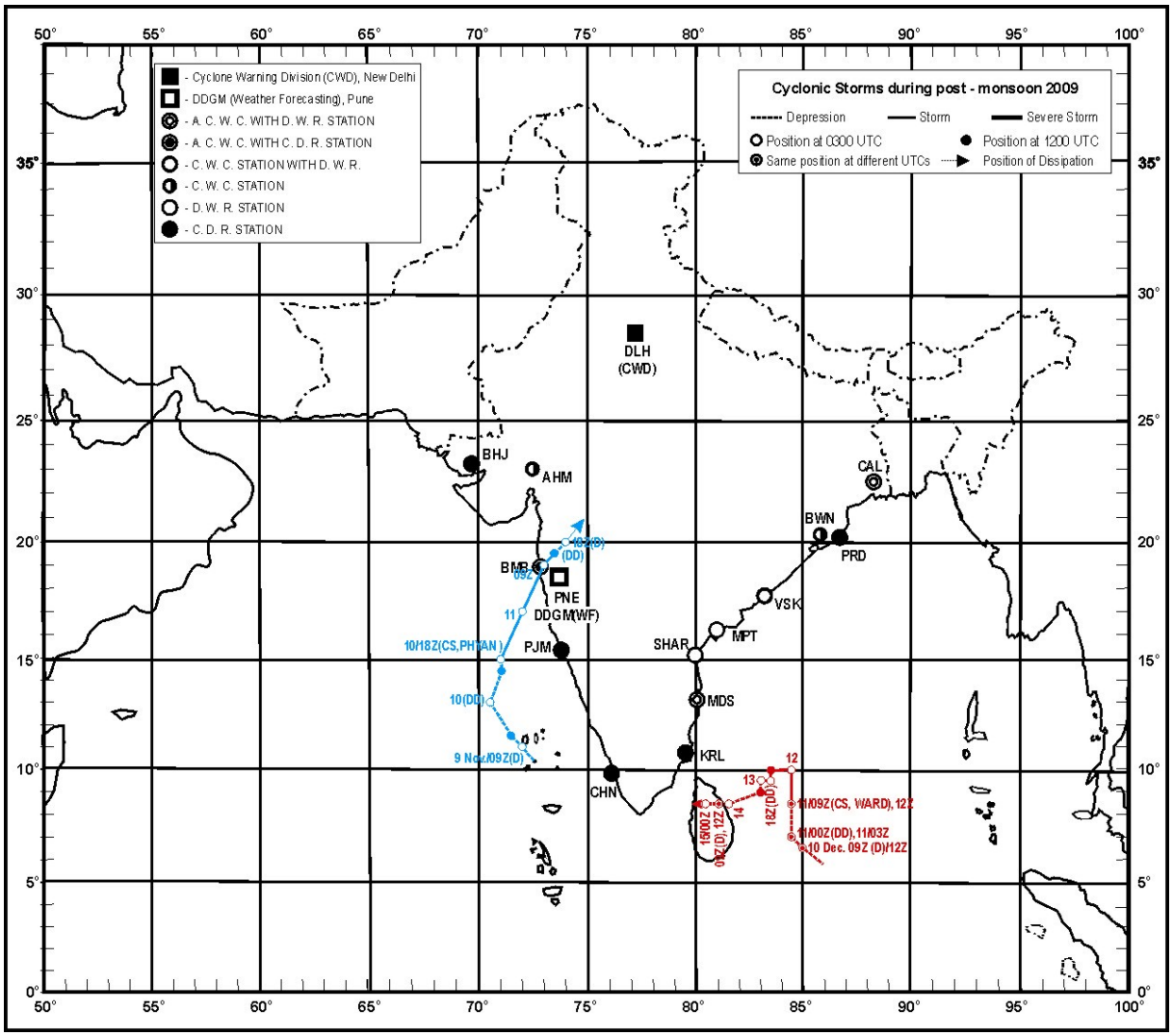

Fig. 2. Tracks of cyclonic storms and depressions during the period October to December 2009

2. Seasonal rainfall (October-December)

The meteorological sub-division wise rainfall departures from normal are given in Fig. 1 and Table 1.

Favourable easterly – westerly interactions, the rainfall associated with the Cyclonic Storm (Phyan) and troughs in easterlies contributed to the *excess* and *normal* rainfall over major parts of the country outside northwest and northeast India. Lack of formation of active secondary systems in association with the western disturbances caused rainfall to be *deficient* or *scanty* over the sub-divisions in the northwest and northeastern parts.

3. Monthly features

3.1. *October*

3.1.1. *Withdrawal of southwest monsoon*

Subsequent to the withdrawal that took place on 28 September, widespread rainfall occurred over central and peninsular India, due to the presence of a low pressure area and other cyclonic circulations. It withdrew from remaining parts of Uttarakhand, Rajasthan, Gujarat state, entire Uttar Pradesh, Madhya Pradesh, most parts of Bihar, north Chattisgarh, some parts of Jharkhand and

TABLE 2

Details of the weather systems during October 2009

S. No.	System	Duration	Place of first location	Direction of movement	Place of final location	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)
(**A**)	*Low pressure areas*					
1.	Low pressure area	14 - 15	East central Bay of Bengal and neighbourhood	Northnorthwest	Northeast Bay of Bengal	Less marked on 16
(**B**)	*Western disturbances/Eastward moving systems*					
(*i*)	*Upper air cyclonic circulations*					
1.	Western disturbance (upto 3.6 kms a.s.l.)	2 – 3	North Pakistan and neighbourhood	Northeast	Jammu & Kashmir and neighbourhood	Moved away on 4
2.	Do	4 – 7	North Pakistan and adjoining Jammu & Kashmir	Do	Do	Moved away on 8
3.	Do	11 – 13	North Pakistan and neighbourhood	Do	Do	Moved away on 14
4.	Do (upto 4.5 kms a.s.l.)	12 – 17	Do	Do	Do	Moved away on 18
5.	Upto mid tropospheric levels	18 – 20	Do	Do	Northern parts of Jammu & Kashmir	Moved away on 20
6.	Do	22 – 23	North Pakistan and adjoining Jammu & Kashmir	Do	Do	Moved away on 24
7.	Upto 4.5 kms a.s.l.	24 – 26	Do	Do	Do	Moved away on 27
8.	Upto mid tropospheric levels	25 – 29	North Pakistan and adjoining Afghanistan	Do	Do	Moved away on 30
9.	Do	31 Oct – 3 Nov	North Pakistan and neighbourhood	Do	Do	Moved away on 4 November
(*ii*)	*Induced cyclonic circulations*					
1.	Upto 2.1 kms a.s.l.	15 – 19	East Rajasthan and neighbourhood	Stationary	*In situ*	Less marked on 20
2.	Upto lower tropospheric levels	25 – 27	West Rajasthan and neighbourhood	Do	Do	Less marked on 28
(*iii*)	*Trough in westerlies*					
1	Mid and upper troposphere (upto 5.8 kms a.s.l.)	5 – 9	Long. 68° E, to the north of 25° N	Northeast	Long. 76° E, to the north of 30° N	Long. 74° E, to the north of 25° N on 6 & 7 and moved away on 10
2.	Lower troposphere	8 – 12	Sub-Himalayan West Bengal & Sikkim to north Bay of Bengal	Do	Assam and Meghalaya to Nagaland-Manipur-Mizoram-Tripura	Less marked on 13
3.	Mid and upper troposphere (upto 7.6 kms a.s.l.)	28 – 29	Long. 65° E, to the north of 20° N	Do	Long. 72° E, to the north of 15° N	Less marked on 30

TABLE 2 (*Contd*.)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
(C)	*Other upper air cyclonic circulation*					
1.	Upto 0.9 km a.s.l.	3 – 5	South Gujarat Region and adjoining north Konkan	Stationary	*In situ*	Less marked on 6
2.	Mid tropospheric levels	4 – 5	Southern part of Vidarbha	Northwest	West Madhya Pradesh and neighbourhood	Merged with an another cyclonic circulation on 6
3.	Between 1.5 and 5.8 kms a.s.l.	4 – 6	West Madhya Pradesh and neighbourhood	Northeast	South Uttar Pradesh	Merged with an another trough on 7
4.	Upto 4.5 kms a.s.l.	6 – 7	Interior Orissa and adjoining Jharkhand	Northwest	East Uttar Pradesh	Less marked on 8
5.	Upto 1.5 kms a.s.l.	11 – 13	Tamil Nadu and adjoining southwest Bay of Bengal	Quasi-Stationary	South Tamil Nadu and neighbourhood	Less marked on 14
6.	Between 1.5 and 4.5 kms a.s.l.	11 – 12	Coastal Karnataka and neighbourhood	Stationary	*In situ*	Merged with the above cyclonic circulation on 13
7.	Upto 2.1 kms a.s.l.	14	North Bay of Bengal	Do	Do	Merged with another cyclonic circulation over the area on 15
8.	Lower tropospheric levels	27 – 28	South Tamil Nadu and neighbourhood	Do	Do	Less marked on 29
(**D**)	*Troughs in easterlies*					
1.	Upto 1.5 kms a.s.l.	13	Lakshadweep area to south Maharashtra coast	Stationary	*In situ*	Less marked on 14
2.	Trough of low (Mean sea level)	29 Oct – 5 Nov	Southwest Bay of Bengal off south Tamil Nadu – Sri Lanka coast	Westerly	Comorin area and neighbourhood	It organized into a low pressure area and subsequently became a cyclonic storm (Phyan). Details are given in the text
3.	Do	29 – 30	Southwest Bay of Bengal and neighbourhood	Stationary	*In situ*	Less marked on 31

north Maharashtra, entire north Arabian sea and some parts of central Arabian sea on 12 October, entire northeastern states, West Bengal & Sikkim, Bihar, Jharkhand, Maharashtra and Goa states, most parts of Orissa and Chattisgarh, some parts of north Bay of Bengal, Telangana, north Interior Karnataka and some more parts of central Arabian Sea on 20 October and from remaining parts of central and peninsular India, Bay of Bengal and Arabian Sea and thus from the entire country on 22 October.

3.1.2. *Commencement of northeast monsoon rains*

With the setting in of large scale north easterlies, northeast monsoon rains commenced over Tamil Nadu, Kerala and adjoining parts of Karnataka and Andhra Pradesh on 29 October. A series of active troughs in the lower level easterlies gave rise to incessant rainfall over Tamil Nadu, subsequently.

3.1.3. *Storms and Depressions*

No Cyclonic Storm or Depression formed during the month.

3.1.4. *Other synoptic features and associated weather*

Table 2 gives the summary of synoptic features for the month of October 2009. The sub-division wise percentage departure from normal and significant amounts of rainfall are given respectively in Tables 1 & 5 and the frequency of days of vigorous/active monsoons and heavy rainfall are given in Table 10.

TABLE 3

Details of the weather systems during November 2009

S. No.	System	Duration	Place of first location	Direction of movement	Place of final location	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)
(**A**)	*Cyclonic storm*					
1.	Cyclonic Storm (Phyan)	9 – 11	East central Arabian Sea	North to northnortheast	Madhya Pradesh and adjoining north Madhya Maharashtra	Details of the system are given in the text
(**B**)	*Low pressure area*					
1.	Low pressure area	13 – 15	Southwest Bay of Bengal and neighbourhood	Northwest	Commorin-Lakshadweep areas	Commorin area and neighbourhood on 14. It became less marked on 16; however, the associated cyclonic circulation lay over Lakshadweep and neighbourhood on 16; over south Konkan-Goa on 17 & 18 and became less marked on 19
2.	Do	24 – 26	Southeast Bay of Bengal and adjoining Andaman Sea	Stationary	*In situ*	less marked on 27
(**C**)	*Western disturbances/Eastward moving systems*					
(*i*)	*Upper air cyclonic circulations*					
1.	As a cyclonic circulation (lower tropospheric levels)	1 – 2	Haryana and neighbourhood	East	West Uttar Pradesh and neighbourhood	Less marked on 3
2.	Western Disturbance (upto mid tropospheric levels)	2 – 10	North Pakistan and neighbourhood	Northeast	Eastern parts of Jammu & Kashmir	Moved away on 11
3.	Do (lower tropospheric levels)	10 – 11	Haryana and neighbourhood	Stationary	*In situ*	Less marked on 12
4.	Western disturbance (upto 4.5 kms a.s.l.)	15 – 18	North Pakistan and adjoining Jammu & Kashmir	Northeast	Jammu & Kashmir and neighbourhood	Moved away on 19
5.	Do	24 – 28	Do	Do	Do	Moved away on 29
6.	Do	28 – 30	Do	Do	Do	Moved away on 1 December
7.	Do	29 Nov - 1 Dec	Do	Do	Do	Moved away on 2 December
(*ii*)	*Troughs in westerlies*					
1.	Mid and upper tropospheric levels (upto 5.8 kms a.s.l.)	8 – 11	Long. 67° E, to the north of 20° N	East	Long. 67° E, to the north of 20° N	Long. 71° E, to the north of 20° N on 9; Long. 73° E, to the north of 25° N on 10 and Long. 75° E, to the north of 25° N on 11
2.	Do	12 – 18	Long. 65° E, to the north of 15° N	Northeast	Long. 78° E, to the north of 25° N	Long. 70° E, to the north of 25° N on 14; Long. 72° E, to the north of 20° N on 15 & 16 and Long. 73° E, to the north of 25° N on 17
(**D**)	*Other upper air cyclonic circulations*					
1.	Upto 1.5 kms a.s.l.	18 – 27	Tamil Nadu and adjoining Kerala	Northwest	Lakshadweep area and neighbourhood	Kerala and neighbourhood on 20 and over Lakshadweep and neighbourhood from 21 to 27
2.	Lower tropospheric levels	19 – 20	Chattisgarh and adjoining coastal Andhra Pradesh	Southeast	South coastal Andhra Pradesh and neighbourhood	Less marked on 21. It was first seen as an embedded cyclonic circulation in a trough of low over mean sea level from south Maharashtra coast to Chattisgarh across Vidarbha on 18 which became less marked on 19

TABLE 3 (*Contd*.)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
3.	Between 0.9 and 2.1 kms a.s.l.	28 – 30	Assam & Meghalaya and neighbourhood	Stationary	*In situ*	Less marked on 1 December
(**E**)	*Troughs in easterlies*					
1.	Trough of low (Mean sea level)	1 – 7	South Andaman Sea and adjoining southeast Bay of Bengal	West	Ccentre of the low pressure area to west central Bay of Bengal	From southeast Bay of Bengal and neighbourhood on 2; southwest Bay of Bengal and neighbourhood on 3 & 4; southwest and west central Bay of Bengal on 5; from centre of low pressure area to west central Bay of Bengal on 6 – 7 and became less marked on 8
2.	Do	6 – 7	South Andaman Sea and neighbourhood	Do	West central Bay of Bengal	Less marked on 8
3.	Do	20 – 22	Southwest Bay of Bengal and adjoining Sri Lanka	Stationary	*In situ*	Less marked on 23
4.	Do	30 Nov – 2 Dec	Southwest Bay of Bengal	Northwest	Southwest Bay of Bengal off Tamil Nadu coast	Less marked on 3 December

The well marked low pressure area formed during the end of September over the west central Bay of Bengal moved inland and caused flood situations in many parts of peninsular India during the first week of October. Subsequently heavy rains also occurred over the central and northern parts of the country due to favourable interaction between low level cyclonic circulations and upper air trough in mid-latitude westerlies. Northeastern states also received very heavy rains on a couple of days during the first week due to the presence of a trough in the lower level westerlies.

Thus, the rainfall over the north, central and west central parts of peninsular India which contributed to the excess/normal figures seen in the monthly statistics occurred in the first week of October itself, due to the afore said synoptic features. Eventhough rainfall occurred during the later part of the month, it was mainly *scanty*/*deficient* outside northeast India, where once again low level troughs in westerlies gave rise to rainfall.

3.1.5. *Temperature*

The dates on which the maximum temperature remained *appreciably to markedly above/below normal* and *above/below normal* are given in Table 6. The same date appearing in two different columns of a sub-division may be reckoned as occurrence of that category over parts of the sub-divisions. The maximum temperatures were normal for the rest of the days. *Severe heat wave/heat wave condition* occurred over Rajasthan in the beginning of the month.

The month's highest maximum temperature in the plains of the country was 42.0° C recorded at Ganganagar (west Rajasthan) on 1 October 2009 and Barmer and Bikaner (west Rajasthan) on 2 October and at Barmer on 3 October 2009.

The dates of occurrence of *cold waves* and dates on which the minimum temperature remained *appreciably to markedly below/above normal* and *below/above normal* are given in Table 7. Minimum temperatures were normal for the rest of the days. No cold wave condition occurred during the month.

The month's lowest minimum temperature in the plains of the country was 9.0° C recorded at Pachmarhi (west Madhya Pradesh) on 25 & 27 October 2009 and Karnal (Haryana) on 27 October 2009.

3.1.6. *Disastrous weather events and associated damage*

According to media and other reports from various regions, floods due to incessant heavy rains claimed 206 lives in Karnataka, 52 in Andhra Pradesh, 4 in Maharashtra and 2 in Orissa. They also caused huge damage to property and agriculture in Andhra Pradesh and Karnataka. Incessant rain triggered a sudden rise in water level in a dam under construction in Meghalaya, causing death of 9 workers. Also one person died in Tamil Nadu due to landslide.

TABLE 4

Details of the weather systems during December 2009

S. No.	System	Duration	Place of first location	Direction of movement	Place of final location	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)
(**A**)	*Cyclonic storm*					
1.	Cyclonic storm (Ward)	10 – 15	Southwest and adjoining southeast Bay of Bengal	Initially northwest, then north and then west south westward	North Sri Lanka	It was first observed as a trough of low pressure area over south Andaman Sea and adjoining southeast Bay of Bengal on 5. Under its influence, a low pressure area formed over southwest and adjoining southeast Bay of Bengal on 9. Other details of the system are given in the text
(**B**)	*Western disturbances /Eastward moving cyclonic circulations*					
(*i*)	*Upper air cyclonic circulations*					
1.	Western disturbance (upto 4.5 kms a.s.l.)	3 – 6	North Pakistan and neighbourhood	Northeast	Jammu & Kashmir and neighbourhood	Moved away on 7
2.	Do	6 – 11	North Pakistan and adjoining Jammu & Kashmir	Do	Do	Moved away on 12
3.	Do	12 – 15	North Pakistan and neighbourhood	Do	Do	Moved away on 16
4.	Do (mid tropospheric levels)	16 – 21	Do	Do	Do	Moved away on 22
5.	Do	22 – 25	North Pakistan and adjoining Jammu & Kashmir	Do	Do	Moved away on 26
6.	Do (upto 3.6 kms a.s.l.)	26 – 31	North Pakistan and neighbourhood	Do	Do	Moved away on 1 Jan 2010
(*ii*)	*Induced cyclonic circulations*					
1.	Upto 1.5 kms a.s.l.	5 – 7	West Rajasthan and neighbourhood	East	East Rajasthan and adjoining west Madhya Pradesh	Less marked on 8
2.	Upto 1.5 kms a.s.l.	15 – 16	West Rajasthan and neighbourhood	Stationary	*In situ*	Less marked on 17
3.	Lower tropospheric levels	16-17	Southwest Rajasthan and adjoining Gujarat	Stationary	*In situ*	Less marked on 18
(*iii*)	*Troughs in westerlies*					
1.	Mid and upper troposphere (upto 5.8 kms a.s.l.)	5 – 6	Long. 65° E, to the north of 25° N	Stationary	*In situ*	Less marked on 7
(**C**)	*Other cyclonic circulations*					
1.	Upto 0.9 km a.s.l.	1 – 2	Southeast Arabian Sea off Kerala coast	Northnorthwest	Lakshadweep area and neighbourhood	Less marked on 3
2.	Upto 1.5 kms a.s.l.	6 – 8	Southwest Bay of Bengal and neighbourhood	Stationary	*In situ*	Merged with the low pressure area on 9
3.	Upto 0.9 km a.s.l.	5 – 10	Kerala and neighbourhood	Northnorthwest	Lakshadweep area and neighbourhood	Less marked on 11
4.	Upto mid tropospheric levels	12 – 14	Southeast Arabian Sea and neighbourhood	Stationary	*In situ*	Less marked on 15

TABLE 4 (*Contd*.)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
5.	Upto 0.9 km a.s.l.	17 Dec - 1 Jan10	Lakshadweep area off Kerala coast	Quasi-Stationary	Lakshadweep area and neighbourhood	Less marked on 2 Jan 2010
6.	Upto 1.5 kms a.s.l.	17 – 18	North Madhya Maharashtra and neighbourhood	Stationary	*In situ*	Less marked on 19
7.	Upto 2.1 kms a.s.l.	26 Dec - 1 Jan10	Coastal Tamil Nadu and adjoining southwest Bay of Bengal	Do	Do	Less marked on 2 Jan 2010
8.	Upto 0.9 km a.s.l.	28 – 29	East central Arabian Sea off south Maharashtra-Goa coasts	Northeast	South Konkan-Goa and adjoining south Madhya Maharashtra	Less marked on 30
(**D**)	*Troughs in easterlies*					
1.	Upto 0.9 km a.s.l.	3 – 8	Southeast Arabian Sea and neighbourhood	West	Southeast and adjoiningeast central Arabian Sea	Less marked on 9
2.	Do	17 Dec - 4 Jan 10	Commorin area to southwest Bay of Bengal off Tamil Nadu coast	Oscillatory	Lakshadweep area to south Gujarat coast	Commorin area to north Kerala on 19; Lakshadweep area to Karnataka coast from 20 to 27 and southeast Arabian Sea and neighbourhood from 28 – 30
3.	Do	19 – 30	South Andaman Sea	West	Ssouthwest Bay of Bengal and neighbourhood	Southeast Bay of Bengal and neighbourhood from 22 to 24 and merged with the above trough on 25

3.2. *November*

3.2.1. *Storms and depressions*

One Cyclonic Storms formed during the month. The details are given below.

3.2.1.1. *Cyclonic Storm (PHYAN) over southeast and adjoining east central Arabian Sea (9 – 12 November)*

Under the influence of a trough of low at sea level over Maldives-Lakshadweep, a low pressure area formed over Comorin area and neighbourhood on 6 and became well marked over there on 7. It lay over Lakshadweep area and neighbourhood on 8 & 9 morning. Subsequently, it concentrated into a Depression at 0900 UTC of 9 and lay centered over the southeast and adjoining east central Arabian Sea, near Lat. 11.0° N / Long. 72.0° E(about 70 km west of Amini Divi). It moved northwestwards and lay centered near Lat. 11.5° N / Long. 71.5° E at 1200 UTC of 9. Further moving northwestwards, it intensified into a Deep Depression over the east central Arabian sea and lay centered at 0300 UTC of 10, near Lat. 13.0° N / Long. 70.5° E(about 470 km southwest of Goa). Moving north northeastwards, it lay centered near Lat. 14.5° N / Long. 71.0° E (about 330 km west southwest of Goa) at 1200 UTC of 10. Subsequently moving northwards, it intensified into Cyclonic Storm (PHYAN) and lay centered at 1800 UTC of 10, near Lat. 15.0° N / Long. 71.0° E (about 300 km west southwest of Goa).Then it moved north northeastwards and lay centered at 0300 UTC of 11, near Lat. 17.0° N / Long. 72.0° E (about 250 km south southwest of Mumbai). Thereafter, it moved northeastwards and crossed Maharashtra coast between Alibag and Mumbai, between 1000 & 1100 UTC of 11. It weakened into a Deep Depression and lay over north Konkan, about 100 km northeast of Mumbai (near Lat. 19.5° N / Long. 73.5° E) at 1200 UTC of 11. Further moving northeastwards, it weakened into a Depression over north Madhya Maharashtra near Nashik (close to Lat. 20.0° N / Long. 79.0° E) at 1800 UTC of 11. It remained practically stationary and further weakened into a well marked low pressure area over the same region at 0000 UTC of 12. It lay as a low pressure area over southwest Madhya Pradesh and adjoining north Madhya Maharashtra at 0300 UTC of 12 and became less marked on 13. However, the associated upper air cyclonic circulation extending up to 1.5 km a.s.l. lay over Gujarat region and neighbourhood on 13 & 14 and became less marked on 15.

TABLE 5

Representative rainfall amounts in cm (October – December 2009)

Date	October	November	December
(1)	(2)	(3)	(4)
1.	Devgarh 25, Kurnool 19, Vengurla 18, Hatkanangale 17, Deverahippargi 15, Sindhanur & Ghatagaon 12 each, Almatti & Bagewadi 11 each, Shirali, Bijapur & Narayanpur 10 each, Kustagi & Gabbur 9 each, Gadag, Ilkal, Bagalkote, Nagathana & H. B. Halli 8 each, Bhatkal, Hungund, Rabkavi, Afzalpur & Raichur 7 each, Dharamshala 3	Puducherry 16, Sirkali & Cherthala 9 each, Minicoy 2, Thiruvananthapuram 1	Nagapattinam 6, Karaikal 5, Vedaranniyam & Hut Bay 1 each
2.	Karwar 18, Dharmasthala & Udala 16 each, Subramanya & Mudagal 14 each, Kayamkulam, Peermade & Punnalur 13 each, Karkala, Bhatkal, Badami, Jamkhandi & Kollam 12 each, Ilkal, Nagathana, Kakkeri, Agumbe, Haripad & Aryankavu 11 each, Honavar, Kuknoor, B. Bagewadi, Devarhippargi, Alapuzha, Mavelikara & Chengannur 10 each, Gokak, Kustigi, Tavargere, Rabkavi, Almatti, Muddebihal, Kottayam, Quilandy, Irinjalkuda & Vadakkancherry 9 each, Mani, Kundapura, Navalgund, Yedwad, Uchangidura, Cherthala, Munnar, Thiruvalla, Kunnamkulam, Amini Divi & Marmugoa 8 each, Pechipparat, Shirhatti, Hungund, Mancompu, Piravom, Thodupuzha, Kozhikode, Vadakara, Konni, Thiruvananthapuram & Varkala 7 each, Digha 6, Anantpur 4, Palampur 2, Mandi 1	Nagapattinam 2, Karaikal 1	Karaikal 12, Sirkali 7, Cuddalore 6, Nagapattinam 5, Pamban 4, Chennai 3, Kottayam, Thiruvananthapuram & Nancowry 1 each
3.	Karwar 43, Kozhikode 37, Dabholim 29, Panjim 26, Ankola & Quilandy 18 each, Kumta & Manjeri 17 each, Kannur 16, Agumbe & Mannarkad 15 each, Honavar, Sringeri & Kalinga 14 each, Kundapura 13, Vythiri 12, Bhatkal, Karkala, Bailhongal, Kalasa, Kottigehara, Thalasserry, Nilambur, Karipur, Parambikulam & Sangola 11 each, Naduvattam, Gerusoppa, Banavasi, Athani, Piravom & Maya Bandar 10 each, Hungund, Deverahippargi, Talaguppa, Kammardi & Irikkur 9 each, Dharmasthala, Kota, Shirali, Yadgir, Jayapura, Munnar & Irinjalakuda 8 each, Jagalbet, Belwadi, Shirahatti, B. Bagewadi, Almatti, Tyagarthi, Aluva, Aryankavu, Kanjirappally & Chalakudy 7 each, Sabroom 4, Agartala, Kandaghat & Dharamshala 2 each, Margherita, Aijal, Belonia & Lengpui 1 each	Chennai 4, Nellore 3, Minicoy & Tirupathi 2 each, Nancowry 1	Vallam 11, Manimuthar & Orathanadu 9 each, Tuticorin, Kollidam, Sirkali & Thoothukudi 7 each, Mavelikara & Piravom 3 each, Aryankavu, Kumarakkom, Minicoy, Nancowry, Tirupathi, Chennai, Mandy & Hassan 2 each, Vythiri & Amini Divi 1 each
4.	Gudalur & Bhagamandala 14 each, Devala 12, Ukai & Imphal 11 each, Munnar 10, Manjeri, Parambikulam & Harnai 9 each, Udupi, Kardkala, Banavasi, Agumbe, Karipur & Mahinagar 8 each, Naduvattam, Chinna Kallar, Vythiri, Maya Bandar & Kaliganj 7 each, Visakhapatnam 6, Imphal 5, Sabroom 4, Dhubri, Belonia & Pacchad 2 each, Goalpara, Barletta, Dharmatal, Gharmura, Williamnagar, Kohima, Dharamshala & Rampur Bushahar 1 each	Rameshwaram 8, Pamban & Nellore 4 each, Nagapattinam, Kavali & Tirupathi 3 each, Karipur, Nancowry & Kolkata 1 each	Barur 14, Nellore 13, Gudur 11, Kottayam 8, Sriperumbudur 7, Mancompu 5, Nancowry 4, Chengannur, Vythiri, Kavaratti, Karaikal, Pavarotti & Chennai 3 each, Piravom, Kumarakkom, Kozha, Amini Divi & Tirupathi 2 each, Kayamkulam, Mavelikara, Haripad, Aluva, Thiruvalla & Agathi 1 each
5.	Ahwa & Maya Bandar 12 each, Kamrej & Dehra Dun 11 each, Bardoli & Bilaspur 10 each, Pardi, Nanipalson, Hansot, Mahuwa & Dahanu 9 each, Williamnagar, Devala & Radhanagari 8 each, Bulsar, Dediapada, Palsana, Vapi, Sagbara, Umbergaon & Jiaganj 7 each, Mustafabad 6, Lengpui, Arundhutinagar, Sabroom, Pachhad, Ludhiana &	Nagapattinam 18, Chennai & Tozhudur 15 each, Kollidam 14, Chidambaram 13, Sirkali 11, Tarangambadi, Nannilam & Tambaram 10 each, Vandavasi, Parangipettai, Karaikal, Sethiyathore Anicut, Cuddalore, Ambasamudram, Kazhugumalai, Manimuthar, Kattumannarkoil, Maduranthagam, Tiruthuraipoondi, Chingleput,	Car Nicobar & Kuppady 4 each, Kanjirappally 3, Perinthalmanna & Vythiri 2 each, CIAL Cochi, Irikkur, Aryankavu, Angadippuram, Konni, Mananthavady, Ambalavayal, Puduchhery & Cuddalore 1 each

TABLE 5 (*Contd*.)

(1)	(2)	(3)	(4)
	Ludhiana 5 each, Cherrapunji, Kailashahar, Agartala, Phek, Kalka, Kahu, Solang Nala, Rajgarh, Bharwain & Una 3 each, Dharmanagar, Belonia & Aijal 2 each, Basar, Tezu, Zero, Daporijo, Numaligarh, Imphal, Ambala, Chandigarh, Morni, Chhachhrauli, Gurdaspur & Dera Bassi 1 each	Anna University, Guind & Nellore 8 each, DGP Office Marina, Poonamallee, Mayiladuthurai, Puduchhery, Viralimalai, Cholavaram, Vedaranniyam & Kodavasal 7 each, Pottangi, Kavali & Mancompu 5 each, Idukki 3, Gunupur & CIAL Cochi 2 each, Car Nicobar, Nancowry & Tirupathi 1 each	
6.	Phoolbagh 14, Mahabaleshwar 13, Mukteshwar & Mumbai 11 each, Bhira & Lengpui 9 each, Umbergaon 7, Puri, Bareilly, Kampur & Aijal 4 each, Kheronighat, Shillong, Agartala & Agra 3 each, Itanagar, Kohima, Arundhutinagar & Belonia 2 each, Jia Bharali, Lakhipur, Amraghat, Cherrapunji & Hatin 1 each	Toothukudi 17, Orathanadu 15, Ramanathapuram 12, Ketty 11, Manimuthar 9, Tondi, Srivaikuntam, Muthupet, Madukur & Thiruvananthapuram 8 each, Sethiyathope Anicut, Tiruvadanai, Kandarvakottai, Vedaranniyam, Tenkasi, Paramakudi, Paramakudi & Ambasamudram 7 each, Chhatrapur & Piravom 6 each, Berhampur 5, Nancowry, Puri, Punalur, Gopalpur & Kaveli 4 each, Paralakhemundi, Tikabali & Krishanaprasad 1 each	Car Nicobar & Bhalukpong 4 each, Thiruvananthapuram & Varkala 2 each, Kanjirappally & Agathi 1 each
7.	Darjeeling 20, Gajoldoba & Bahraich 18 each, Malda & Sultanpur 11 each, Cooch Behar 9, Beki road Bridge 7, Manas NH Xing, Guwahati & Purnea 5 each, Neematighat, AIE NH Xing & Dehra Dun 4 each, Lakhipur, Panbari, Gossaigaon, Sabroom & Dharmanagar 3 each, Sepla, Karimganj, Silchar, Cherrapunji, Goalpara, Barpeta, Kokrajhar, Numaligarh & Imphal 2 each, Bhalukpong, Itanagar, Basar, Dhubri, Puthimari, Mathanguri, Nalbari, Mellabazar, Rangia, Williamnagar, Arundhutinagar, Kohima, Sonamura, Agartala, Kailashahar, Lengpui & Belonia 1 each	Kaveli 25, Red Hills 15, Ponneri 13, Maduranthagam, Cholavaram & Cuddalore 11 each, Chennai, Manimuthar, Anna University, Sirkali & Agathi 10 each, Cheyyur, Ambasamudram, Kollidam, Tiruvallur, Poonamallee & Sriperumbudur 9 each, Chidambaram, Kancheepuram, Tambaram & Visakhapatnam 8 each, Pondicherry & DGP Office Marina 7 each, Kozhikode 4, Thalasserry, Konni, Amini Divi, Ranpur, Daspalla & Barmul 3 each, Baliguda, Khandapara, Gop & Kotagarh 1 each	Car Nicobar 6, Tezu 3, Nancowry & Hut Bay 2 each, Dibrugarh, North Lakhimpur, Passighat, Itanagar & Mohanbari 1 each
8.	Jalpaiguri 26, Purnea 16, Kakardharighat 12, Gonda & North Lakhimpur 11 each, Ayodhya 8, Birdgeghat & Matheran 7 each, Passighat 6, Nimapara & Sukinda 5 each, Chiplun, Thane & Gorakhpur 4 each, Anandpur, Madhabarida, Bhanjnagar, Jeypore, Khed, Karjat, Imphal & Dharchula 3 each, Aska, Koraput, Hindol, Binika, Bonth, Athamalik, Dhenkanal, Khalapur, Purna & Mangalore 2 each, Akhuapada, Nayagarh, Pallahara, Rajkanika, Hirakud, Jamankira, Altuma, Karanjia, Reamal, Khandapara, Tensa, Balasore, Ghatgaon, Daspalla, Lahunipara, Mandira, Kakatpur, Gudari, Paradip, Joshipur, Gunupur, Swam-Patna, Tiring, Balimundali, Panposh, Mahad, Mandangad, Roha, Panjim, Malsiras & Pune 1 each	Sivagiri & Sirkali 24 each, Ketty 21, Koodalur & Coonoor 19 each, Kollidam Parangipettai 18, Chidambaram 17, Mayiladuthurai & Cuddalore 16 each, Kodaikanal, Kattumannarkoil, Karaikal & Anna University Guind 15 each, Rajapalayam & Uthamapalayam 14 each, Ponneri, Chennai, DGP Office Marina, Sithiyathope Anicut & Kollengode 13 each, Tambaram, Nannilam, Kundha, Tiruvarur & Pondicherry 12 each, Nagapattinam, Thiruvidalmarthu & Tarangambadi 11 each, Kayamkulam, Peermade, Quilandy & Ottappalam 10 each, Piravom, Kottayam, Alathur & Chittur 9 each, Alapuzha, Munnar, Idukki, Vaikom, Manjeri, Perinthalmanna, Karipur, Thrithala & Kunnamkulam 8 each, Perumbavur, Thodupuzha, Vadakara & Minicoy 7 each, Narsapur 5, Machilipatnam 4, Umarkote 2	Car Nicobar, Port Blair, Hut Bay, Passighat & Khowang 1 each
9.	Sabroom 20, Cherrapunji 19, Parangipettai 8, Passighat 6, Bijapur 3, Shirhatti 2, Sangola, Rohru, Belwadi, Tavargere, Cooch Behar, Sangola & Madurai 1 each	Coonoor 34, Uthagamandalam 18, Kodaikanal 17, Aryankavu 13, Kaveli 12, Nellore 11, Thiruvananthapuram 10, Neyyattinkara 9, Punalur 7, Kavaratti, Amini Divi & Tirupathi 4 each, Hut Bay 2, Long Islands, Port Blair, Washim & Gondia 1 each	Hut Bay 5, Port Blair 4, Patsio 1
10.	Passighat & North Lakhimpur 2 each, Yadagiri, Jayapura & Chamarajanagara 1 each	Ketti 82, Coonoor 31, Kothagiri 27, Irikkur 22, Ootacamund 19, Kundha & Vadakara 15 each, Kudulu & Kuppady 14 each, Rameshwaram & Kodaikanal 13 each, Kodaikanal, Gudalur, Maniyatchi & Orathanadu 11 each, Devala &	Maya Bandar & Dhundhi 5 each, Patsio 4, Keylong 3, Bhang, Udaipur, Long Islands, Pahalgam & Gulmarg 2 each, Banihal, Srinagar, Shalimar, Kupwara,

TABLE 5 (*Contd*.)

(1)	(2)	(3)	(4)
		Kunnur 10 each, Panchapatti, Thogamalai, Shenkottah, Mayanur, Taliparamba & Ambalavayal 9 each, Tozhudur, Mani, Bhatkal, Somwarpet, Quilandy, Mannarkad, Amini Divi & Ketty 8 each, Arantangi, Mettupalayam, Peravurani, Tenkasi, Ulundurpet, Tirukoilr, Puttur, Bhagamandala, Napoklu, Virajmet & Kozhikode 7 each, Saloni 5, Dhundhi & Srinagar 4 each, Dharamshala & Bhuntar 3 each, Car Nicobar, Kalpa, Solangnala, Udaipur, Karsog, Amraoti & Washim 2 each, Hut Bay, Port Blair & Buldana 1 each	Kukernag, Quazigund & Thoise 1 each
11.	Salem 8, Malur & Gubbi 4 each, Hiriyur & Silchar 3 each, Gokak, Tiptur & C. N. Halli 2 each, Alamatti, Soundatti & Hosadurga 1 each	Pune 13, Mahabaleshwar 10, Bhagamandala 9, Marmugoa 8, Satara 7, Alapuzha & Panjim 6 each, Kochi 5, Mumbai, Alibag & Dhundi 4 each, Aurangabad 3, Bhang 2	Bhang, Gulmarg, Kupwara & Quazigund 1 each
12.	Nagapattinam 9, Ilkal 8, K. R. Sagara 7, Tiptur 6, Hosdurg 5, Hungund, Sira, Belur & Kudaligi 4 each, Ajra, Bagalkote & Haveri 3 each, Gangtok, Birpur, Karad, Shhapura, Holalkere, Srirampura, Chitradurga, Hiriyur, Nayakanahatty, Molkalmur, K. R. Nagara, Malavalli & Hesarghatta 2 each, Chiplun & Parambikulam 1 each	Chandwad 17, Akola 14, Sinnar, Yeola, Nandgaon & Sinner 13 each, Ghodegaon 12, Mandangad & Mahabaleshwar 11 each, Sudhagad & Kopargaon 10 each, Dapoli, Harnai, Mhasala, Junnar, Edalabad, Pachora, Erandol & Paud 9 each, Bantwal, Vadgaon, Shrirampur, Chalisgaon, Shirpur, Dhulia & Soegaon 8 each, Dhone, Ranasthalam, Shriwardhan, Kalvan & Niphad 7 each, Hosdurg, Mangaon, Roha, Kankavli & Vijapur 6 each, Kannur, Mahad, Khed, Kalyan, Poladpur, Sawantwadi, Shahapur, Murbad, Sillod, Khuldabad, Kannad, Aurangabad & Jafrabad 5 each, Karjat 4, Aluva, Taliparamba & Bhopal 4 each, Piravom & Nilambur 3 each, Alapuzha, Thodupuzha, Idukki, Kumarakkom, Manjeri & Irinjalakuda 2 each, Irikkur, Kudulu, Punnalur, Kozhikode, Ponnani, Mannarkad, Ottappalam, Vellanikkara & Vythiri 1 each	Vedarnniyam & Nagapattinam 1 each
13.	Satymangalam 13, Gingee, Holur & Pandavpura 9 each, Gobichettipalaya, Belthangady, Ajjampura & Turuvekere 8 each, Sathanur Dam, Dharmasthala, Srirampura & Harihara 7 each, Roha, Jagalbet, Sirsi, C. N, Halli, Poonampet & Gubbi 6 each, Sudhagad, Kalapur, Kammardi, Hallimysore, Sargur, K. R. Pet, Malavalli& Bhadravathy 5 each, Poladpur, Phaltan, Subramanya, Londa, Byadagi, Bhagamandala, Sakaleshapura, Hunsur, Srirangapatna, Kalasa, Chikballapura & Punalur 4 each, Valpoi, Pune, Arasikere, Talaguppa, Humchadakatte, Balehonnur, Lakkavalli, Sravanbelegola, Mysore, Kollegal, Hosanagara, Tiptur, Sira, Channapatna, Hosanagara, Munnar, Idukki & Aryankavu 3 each, Mangaon, Puttur, Gerusoppa, Banavasi, Yellapura, Tarikere, Yegati, Chamaraganagara, K. R. Sagara, Holalkere, Huliyurdurga, Koratagere, K.R. Nagara, T. Narasipura, Thodupuzha, Kanjirapally, Kuppadi & Parenda 2 each, Pen, Alibag, Irikkur, Chittoor & Konni 1 each	Agra & Sheopur 3 each, Bareilly, Mukteshwar, Phoolbagh, Jhalawar, Pilani, Kota, Shivpur, Mumbai, Lanja, Rajapur, Gaganbavada, Phaltan & Mahabaleshwar 1 each	Sriperumbudur 8, Poonamallee 7, Vedarnniyam 6, Karaikal 5, Chennai & Nagapattinam 3 each, Patsio 1
14.	Kankavli 7, Sargur 6, Manjeri 5, Londa, Kalasa, Kammardi, Lakkavalli, Idukki & Punalur 4 each, Chiplun, Yellapura, Sringeri, Vellanikkara & Vijayawada 3 each, Jatha, Gerusoppa, Jagalbet, Sulya, Raibagh, Kadur, Chickmagalur, Pariyapatna,	Bhang 9, Damoh 7, Khajuraho, Raisen, Baijnath & Badarwah 3 each, Patsia, Dehragopipur, Dharamsala, Tissa, Keylong, Kathua, Hoshangabad & Veraval 2 each, Solangnala, Batote, Haripad, Chengannur,Irikkur Aryankavu,	Pamban & Puducherry 2 each, Cuddalore, Nagapattinam, Chauldhowaghat 7 Thodupuzha 1 each

TABLE 5 (*Contd*.)

(1)	(2)	(3)	(4)
	Thodupuzha, Munnar, Kottayam & Konni 2 each, Rajapur, Roha, Gaganbawada, Gargoti, Shirol, Shahuwadi, Belwadi, Kuknoor, Medikeri, Madapura, Talaguppa, Tyagarthi, Chamarajanagara, Bangalore, Channagiri, Thirthahalli, Jayapura, Hassan, T Narasipura, Devanahalli, Kanjirapally & Kuppadi 1 each	Kanjirappally, Nedumangad & Ambalavayal 1 each	
15.	Kollengode 9, Karimganj, Gharmura, Aijal, Mangaon & Mahad 4 each, CIAL Cochi & Amraghat 3 each, Lengpui 2, Damoh, Seoni, Kodaikanal, Port Blair, Dholai & Lakhipur 1 each	Chengannur 26, Gingee 18, Orathanadu, Tanjavur, Kanniyakumari & Matheran 17 each, Tiruchendur, Sathanur Dam & Sudhagad 15 each, Valangiman, Tozhudur, Ponneri & Shriwardhan 14 each, Papanasam, Tirukoilur & Mhasala 13 each, Nagarcoil, Tiruvaiyaru & Ulundurpet 12 each, Srivaikuntam, Adirampatnam, Thirumann, Parangipettai, Mylaudy, Pattukkottai & Neyyattinkara 11 each, Red Hills, Kumbakonam, Mudukulathur, Tirukkattupalli, Kadaladi, Chingleput, Thiruvananthapuram & Karjat 10 each, Kodavasal, Vriddhachalam, Madukur, Manimuthar, Sattankulam, Cheyyar, Kayamkulam, Roha, Mangaon & Murud 9 each, Gudur, Tada, Thuckalay, Muthupet, Nagapattinam, Tiruvarur, Ariyalur, Needamangalam, Cholavaram, Tarangambadi, Kollam, Kumarakkom, Varkala, Khalapur, Poladpur & Mahad 8 each, Solangnala, Sankarapuram, Thiruchirapally, Tambaram, Vandavasi, Pullambadi, Kamuthi, Cheyyur, Kallakurichi, Kuzhithurai, Peravurani, Bhoothapandi, Karambakkudi, Poonamallee, Kancheepuram, Peelamedu, Coimbatore, Chettykulam, Haripad, Vaikom, Nedumangad & Uran 7 each, Nagrota Surian, Dehragopipur, Dhundhi, Taliparamba, Irikkur & Kannad 6 each, Bhang, Dharamshala, Amb, Gangapur & Khuldabad 5 each, Ghamroor, Palampur & Nurpur 4 each, Shahpurkandi, R.S. Dam site, Pathankot & Mukerian 3 each, Tissa, Baijnath, Rampurbushahar, Keylong, Patsia, Adanoyrm Nadgioyr, Bhaderwah & Kolhapur 2 each, Kathuwa 1	Sirkali 14, Karaikal, Tarangambadi & Rameshwaram 11 each, Vedaranniyam & Kollidam 10 each, Chidambaram & Mayiladuthurai 9 each, Nagapattinam, Kodavasal & Tiruthuraipoondi 7 each, Kanjirappally 1
16.	Virudhanagar 3, Sabroom 2, Digha, Kampur, Williamnagar & Srivillaputhur 1 each	Devala 10, Mudukulathur & Siddapura 9 each, Ramanathapuram & Perinthalmanna 8 each, Perumbavur, Kozhikode, Angadippuram, Puttur, Mangalore & Kankavali 7 each, Kannur, Irikkur, Mahabaleshwar & Kannad 6 each, Kudulu, Vadakara, Chandgad, Gangapur, Matheran, Khalapur & Khuldabad 5 each, Batote, Alapuzha, Thodupuzha, Kanjirappally, Nilambur, Irinjalakuda, Chalakudy, Sholapur & Pune 4 each, Renuka, Kukernag, Pahalgam, Kochi, Taliparamba, Kollam, Kottayam & Ambalavayal 3 each, Haripad, Aluva, Thalasserry, Kumarakom, Kozha, Quilandy, Manjeri, Karipur, Kollengode, Parambikulam, Thiruvalla & Kuppady 2 each, Banthal, Quazigund, Badarwah, Anantnag, Cherthala, Piravom, Munnar, Idukki, Vaikom, Ponnani, Mannarkad, Alathur, Chittur, Thrithala, Varkala & Vythiri 1 each	Nagapattinam & Karaikal 12 each, Cuddalore 10, Tirupathi 6, Thiruvananthapuram 4, Kalpa, Pahalgam, Bareilly, Shahjahanpur, Banswara & Arogyavaram 1 each

TABLE 5 (*Contd*.)

(1)	(2)	(3)	(4)
17.	Kailashahar & Dharmanagar 4 each, Gossaigaon, Bihubar & Lengpui 3 each, Kheronighat 2, Khonsa, Maya Bandar, Shillong, Cherrapunji, Imphal & Kolhapur 1 each	Phaltan 15, Hubli & Nargund 7 each, Sangli 6, Dahiwadi, Vaduj, Baramati & Satara 5 each, Ashti & Mandla 4 each, Kolkata, Ayanagar, Sohna, Pahalgam, Mananthavady & Raisen 3 each, Krishnanagar, Durgachak, Diamond Harbour, Silchar, Varanasi, Gurgaon, Kukernag, Dabholim, Kannad, Georai & Kallamnuri 2 each, Kharagpur, Bhaderwah, Quazigund, Hosdurg & Agathi 1 each	Orathandu & Vallam 11 each, Alangudi 10, Parangipettai 9, Vedaranniyam, Peravurani & Tirumayam 8 each, Arantangi, Cheyyar, Arimalam & Tozhudur 7 each, Ongole 5, Bhopal 4, Peermade, Idukki, Mananthavady & Indore 3 each, Konni, Quazigund, Jhalawar & Kavali 2 each, Banihal, Anantnag, Kukernag, Vallam & Thiruvananthapuram 1 each
18.	Jia Bharali 4, Naharkatia, Silchar, Chouldhowaghat, Mohanbari, Naharkatia & Itanagar 3 each, Guwahati, Agartala & Patsio 2 each, Daporijo, Basar, Tezpur, Margherita, Rangiya, Beki Road Bridge, Phek, Imphal & Tondi 1 each	Ramagundam & Passighat 11 each, Usilampatti 10, Hanamkonda 9, Amalapuram & Vallam 8 each, Adilabad & Sultanabad 7 each, Ratnagiri 6, Kudulu & Mohol 5 each, Vita, Gaganbavada, Ambad & Silchar 3 each, Kansabati Dam, Kharidwar, Mahad, Vaduj, Mangalvedha, Car Nicobar, Mahabaleshwar, Satara, Hingoli, Degloor & Kallam 2 each, Tusuma, Digha, Neora, Poladpur, Beed, Georai, Kandhar & Parbhani 1 each	Tenkasi 7, Vedarnniyam 6, Peermade, Hoshangabad & Pachmarhi 3 each, Idukki, Shajapur & Umaria 2 each, Avantipur, Narsingpur, Chennai, Udgir & Jalgaon 1 each
19.	Khonsa, Mohanbari, Dibrugarh, Vedaranniyam & Punalur 3 each, Nagapattinam 2, Changlang & Patsio 1 each	Tiruppuvanam 10, Muthupet 8, Alangudi, Adirampattinam, Dummagudem & Araku Valley 7 each, Chennai 5, Paradip 4, Car Nicobar & Puri 3 each, Passighat, Margherita, Vadakkancherry & Kolhapur 2 each, Khonsa, Hut Bay & Port Blair 1 each	Dharwar 7, Kanjirappally & Coonoor 5 each, Raipur & Seoni 2 each, Chengmari, Diana, Tangla, Jamshedpur, Ranchi & Rangiya 1 each
20.	Naharkatia 5, Vedaranniyam 4, North Lakhimpur & Lilabari 3 each, Agumbe, Long Island & Mohanbari 2 each, Thiruvananthapuram, Chouldhowaghat & Aijal 1 each	Polavaram 14, Srungavarapukota 13, Bobbili 10, Eluru & Aryankavu 8 each, Vallam, Rayakottah & Visakhapatnam 7 each, Tuticorin 5, Maya Bandar, Neyyattinkara, Idukki, Kanjirappally, Kollengode & Konni 2 each, Bhalukpong, Nancowry, Car Nicobar, Alapuzha, Perumbavur, Thodupuzha, Mannarkad, Nedumangad & Chalakudy 1 each	Agathi 2, Long Islands, North Lakhimpur, Coonoor, Karaikal & Amini Divi 1 each
21.	Port Blair, Mellabazar & Kolhapur1 each	Chinthalapudi, Subramanya & Neyyattinkara 7 each, Coonoor 6, Kanjirappally, Alathur, Thiruvalla, Machilipatnam, Kanniyakumari, Thiruvananthapuram & Nedumangad 5 each, Konni 4, Vijayawada, CIAL Cochi & Punalur 3 each, Mavelikara, Haripad, Chengannur, Aluva, Piravom, Kottayam, Perinthalmanna, Ponnani, Ottappalam, Thiruvananthapuram, Irinjalakuda, Kunnamkulam & Vellanikkara 2 each, Mancompu, Perumbavur, Peermade, Thodupuzha, Irikkur, Aryankavu, Kumarakom, Kozha, Nilambur, Angadipuram, Thrissur, Ambalavayal & Nancowry 1 each	Orathandu 12, Sirkali & Poonamallee 8 each, Chennai 4, Agathi & Nagapattinam 3 each, Tirupathi 2, Port Blair & Long Island 1 each
22.	Maya Bandar 3, Kottayam 2, Hut Bay 1	Tadepalligudem 12, Orathanadu 11, Peravurani 8, Cuddalore & Car Nicobar 5 each, Tuticorin & Thiruvananthapuram 4 each, Aluva, Perinthalmanna, Thiruvalla & Neyyattinkara 2 each, Kozhi, Kanjirapally, Angadippuram, Chalakudy & Minicoy 1 each	Vedaranniyam 19, Muthupet 9, Adirampattinam 7, Karaikal 6, Chennai 5, Kozhikode 1

TABLE 5 (*Contd*.)

(1)	(2)	(3)	(4)
23.	Car Nicobar 3	Tiruchendur, Sringeri & Piravom 8 each, Tuticorin 6, Perumbavur, Kozha, Pattambi, Thirthala, Irinjalakuda & Kodaikanal 4 each, Angadipuram, Ponnani, Chalakudy, Haripad, Kochi & Ongole 3 each, Mavelikara, Chengannur, Aluva, Perinthalmanna, Vellanikkara & Vythiri 2 each, CIAL Kochi, Kayamkulam, Aryankavu, Kottayam, Karipur, Thiruvalla, Thrissur, Minicoy, Bapatla & Kaveli 1 each	Manimuthar 16, Orathanadu 14, Ambasamudram & Vallam 12 each, Tanjavur 8, Needamangalam 7, Nagapattinam & Tondi 5 each
24.	Port Blair 5, Agathi 2, Lumding 1	Kozhikode, Ongole & Bangalore 2 each, Kaveli, Puducherry & Adirampatnam 1 each	Pamban 1
25.	Car Nicobar & Long Island 3 each, Hut Bay 2	Perinthalmanna & Amini Divi 2 each, Thirthala 1, Nancowry & Minicoy 1 each	Namaligarh & Pamban 2 each, Tezpur, Dharmatal, Sonepur & Minicoy 1 each
26.	Thiruvananthapuram 2	Kanniyakumari, Adirampattinam, Tondi & Nancowry 1 each	Agathi 2
27.	Mavelikara 13, Kayamkulam 7, Alapuzha 3, Car Nicobar 2, Chennai & Tirupathi 1 each	Nancowry & Port Blair 1 each	Panambur & Agathi 4 each, Agumbe & Medikeri 2 each
28.	Nancowry & Coonoor 2 each, Chennai, Pamban & Karaikal 1 each	Port Blair 2	Sulya 11, Mannarkad & Palakkad 10 each, Piravom 8, Ankola, Bhagamandala, Kollegal, Channapatna, Thodupuzha & Kotta-yam 7 each, Medikeri & Minicoy 4 each, Nancowry 3, Bangalore 2
29.	Kollidam 7, Cuddalore & Puducherry 5 each, Chennai 4, Kottayam 2, Mangalore, CIAL Cochi, Amini Divi, Tirupathi & Car Nicobar 1 each	Karaikal 7, Nagapattinam 4, Nancowry 3, Vedaranniyam & Hut Bay 1 each	Channagiri 9, B, Durga & Holalkere 7 each, Mangalore & Agathi 5 each, Medikeri 3, Minicoy 2, Kozhikode 1
30.	Ramanathapuram 9, Sattankulam 8, Tiruchendur & Pamban 7 each, Vedaranniyam & Kavali 4 each, Agathi 3, Alapuzha, Minicoy & Nellore 2 each	Nagapattinam 4, Karaikal 5, Vedaranniyam 2	Ajjampura 14, Tarikere 12, Bhadravathi 8, Gadag & Ron 7 each, CIAL Kochi 5, Vedaranniyam 3, Amini Divi 2, Hardoi, Gorakhpur, Gwalior & Osmanabad 1 each
31.	Coonoor 3, Puducherry 2, Chickmagalur 1	-	Nil

The maximum intensity of T 2.5 was reported by Kalpana-1 imageries from 1800 UTC of 10 to 0800 UTC of 11 November. The system made landfall with intensity T 2.5.

The lowest Estimated Central Pressure was 988 hPa. The lowest pressure of 987.9 hPa was reported by Harnai at 0500 UTC of 11. The maximum estimated wind speed was 45 kts. The departmental observatories at Pune, Goa and Colaba reported wind speed of 68 kmph, 63 kmph and 56 kmph respectively. It moved very fast prior to landfall, covering a distance of nearly 450 km during 0000 UTC to 1200 UTC of 11. Though it crossed as a Cyclonic Storm, it had slightly weakened before landfall. The rapid movement after re-curvature could be attributed to the position of the upper tropospheric ridge which ran along Lat. 14.0° N. The system moved north of the ridge line on 11 morning leading to its acceleration in a northeasterly direction.

As per press reports, heavy rain, landslides and wall collapse took a toll of 42 lives. Azhiyar Dam at Pollachi in Coimbatore district was breached due to heavy rain.

Widespread rainfall activity occurred in Konkan & Goa, Madhya Maharashtra and Marathwada during 10 to

TABLE 6

Dates of occurrence of heat wave/severe heat wave and various categories of maximum temperatures - October 2009

Sub-division		Dates (Number of days)						
No	Name	Severe Heat wave	Heat wave	Hot Day	Appreciably to markedly above normal	Above normal	Appreciably to markedly below normal	Below normal
2.	Arunachal Pradesh	Nil	Nil	Nil	26-29 (4)	31 (1)	Nil	Nil
3.	Assam & Meghalaya	Nil	Nil	Nil	23-31 (9)	22, 26 (2)	Nil	Nil
4.	Naga., Mani, Mizo. and Tri.	Nil	Nil	Nil	23, 25-30 (7)	24, 27, 31 (3)	Nil	Nil
5.	S. H. W. B. & Sikkim	Nil	Nil	Nil	24-26, 28-30 (6)	26, 27, 31 (3)	Nil	Nil
6.	Gangetic West Bengal	Nil	Nil	Nil	23, 24, 29, 30 (4)	21, 25, 26 (3)	Nil	Nil
7.	Orissa	Nil	Nil	Nil	21-23, 25, 26, 30 (6)	24, 26-31 (7)	Nil	Nil
8.	Jharkhand	Nil	Nil	Nil	19, 21 (2)	18, 23, 24, 27, 30 (5)	Nil	Nil
9.	Bihar	Nil	Nil	Nil	14, 17, 19 (3)	13-15, 17, 18, 20-24, 29, 30 (12)	Nil	Nil
10.	East Uttar Pradesh	Nil	Nil	Nil	14, 21 (2)	13, 17, 22, 23, 25, 26, 30 (7)	Nil	Nil
11.	West Uttar Pradesh	Nil	Nil	Nil	Nil	13, 23, 25, 26 (4)	Nil	Nil
12.	Uttarakhand	Nil	Nil	Nil	3, 4, 10, 14-18, 25, 26, 28, 29-31 (14)	4, 11, 12, 14, 15, 17, 21, 22, 26, 27 (10)	5 (1)	Nil
13.	Haryana, Chandigarh & Delhi	Nil	Nil	Nil	1-4, 10, 11, 13 (7)	4, 9, 11, 12, 20 (5)	5 (1)	7, 21 (2)
14.	Punjab	Nil	Nil	Nil	10 (1)	1, 2, 4, 14, 15 (5)	5, 12 (2)	13, 14, 17, 20, 21, 23, 24, 28 (8)
15.	Himachal Pradesh	Nil	Nil	Nil	1-4, 7, 10-12, 14-19, 23, 25, 26, 29, 30 (19)	4, 8, 9, 11, 13-15, 21, 26, 27, 29 (11)	Nil	Nil
16.	Jammu & Kashmir	Nil	Nil	Nil	1-4, 7, 12, 13, 15, 30 (9)	1, 3, 8, 9, 14, 15, 17, 19 (8)	Nil	11 (1)
17.	West Rajasthan	1, 2 (2)	1, 2, 3 (3)	Nil	4, 5, 8, 11, 12, 14, 15, 26, 29-31 (11)	4, 9, 13-15, 17, 18, 20, 25-30 (14)	Nil	Nil
18.	East Rajasthan	1, 2, 4 (3)	1, 2 (2)	Nil	3, 8, 10, 13-15, 26, 29-31 (10)	9, 11, 12, 14, 15, 17, 18, 20, 21, 25-30 (15)	5 (1)	6, 7 (2)
19.	West Madhya Pradesh	Nil	Nil	Nil	13-19, 21-23, 27, 31 (12)	13, 15-17, 20, 24, 25, 27, 28, 30 (10)	Nil	Nil
20.	East Madhya Pradesh	Nil	Nil	Nil	13-16, 18, 19, 21-23, 27, 31 (11)	13, 15-17, 20, 24, 25, 27-30 (11)	Nil	Nil
21.	Gujarat Region	Nil	Nil	Nil	14-17, 24, 28-31 (9)	15, 26, 27, 29 (4)	Nil	Nil
22.	Saurashtra & Kutch	Nil	Nil	Nil	17, 24-31 (9)	18, 22, 27, 29 (4)	Nil	20, 21 (2)
23.	Konkan & Goa	Nil	Nil	Nil	22-24, 27-31 (8)	21, 25, 26, 29 (4)	Nil	14 (1)
24.	Madhya Maharashtra	Nil	Nil	Nil	21-30 (10)	14, 15, 17, 18, 20, 25, 26, 29-31 (10)	Nil	14 (1)
25.	Marathwada	Nil	Nil	Nil	20, 21 (2)	14, 18, 22, 24, 25, 27, 28, 30 (8)	Nil	Nil
26.	Vidarbha	Nil	Nil	Nil	17-22, 24, 29-31 (10)	13, 14, 25-30 (8)	Nil	Nil
27.	Chattisgarh	Nil	Nil	Nil	21-26, 29 (7)	13, 14, 25, 27 (4)	Nil	Nil
28.	Coastal Andhra Pradesh	Nil	Nil	Nil	23-30 (8)	26, 29, 31 (3)	Nil	Nil
29.	Telangana	Nil	Nil	Nil	21-23, 28 (4)	24-27, 29, 30 (6)	Nil	Nil
30.	Rayalaseema	Nil	Nil	Nil	23 (1)	25-29 (5)	Nil	Nil
31.	Tamil Nadu	Nil	Nil	Nil	23-29 (7)	23, 25-27 (4)	Nil	30 (1)
32.	Coastal Karnataka	Nil	Nil	Nil	24-31 (8)	Nil	Nil	Nil
33.	North Interior Karnataka	Nil	Nil	Nil	28 (1)	Nil	Nil	Nil
34.	South Interior Karnataka	Nil	Nil	Nil	29, 31 (2)	27-29 (3)	Nil	Nil
35.	Kerala	Nil	Nil	Nil	23-29, 31 (8)	26, 29, 30 (3)	Nil	Nil

TABLE 7

Dates of occurrence of cold wave/severe cold wave and various categories of minimum temperatures - October 2009

Sub-division		Dates (Number of days)						
No	Name	Severe Cold wave	Cold wave	Cold Day	Appreciably to markedly below normal	Below normal	Appreciably to markedly above normal	Above normal
2.	Arunachal Pradesh	Nil	Nil	Nil	Nil	24 (1)	Nil	Nil
3.	Assam & Meghalaya	Nil	Nil	Nil	21, 23, 27, 30 (4)	21, 24 (2)	Nil	25, 26 (2)
4.	Naga., Mani, Mizo. and Tri.	Nil	Nil	Nil	Nil	24, 27, 30 (3)	Nil	Nil
5.	S. H. W. B. & Sikkim	Nil	Nil	Nil	25, 26, 30 (3)	22, 26, 27 (3)	Nil	Nil
6.	Gangetic West Bengal	Nil	Nil	Nil	22, 23, 27, 30 (4)	26, 31 (2)	Nil	Nil
7.	Orissa	Nil	Nil	Nil	21-27, 30 (8)	22, 31 (2)	Nil	Nil
8.	Jharkhand	Nil	Nil	Nil	14, 20-28 (10)	12-14, 17, 18, 30 (6)	Nil	Nil
9.	Bihar	Nil	Nil	Nil	19-28 (10)	13, 15, 18, 21, 30 (5)	17 (1)	Nil
10.	East Uttar Pradesh	Nil	Nil	Nil	14, 21, 22, 24-30 (9)	12, 13, 17, 19, 20, 23, 30, 31 (8)	Nil	Nil
11.	West Uttar Pradesh	Nil	Nil	Nil	21-28 (8)	20, 21, 26, 30 (4)	Nil	12, 13 (2)
12.	Uttarakhand	Nil	Nil	Nil	3, 11, 12, 20, 21, 23, 24, 27 (8)	9, 10, 12-14, 16, 18, 22, 24, 26, 30 (11)	Nil	4, 30 (2)
13.	Haryana, Chandigarh & Delhi	Nil	Nil	Nil	3, 14, 20-28 (11)	9, 16, 17 (3)	1, 2, 4, 5, 11, 15, 19 (7)	6, 7, 8, 16 (4)
14.	Punjab	Nil	Nil	Nil	3, 12, 21-24, 26-28 (9)	15, 16, 19, 31 (4)	4, 11, 13 (3)	1, 2, 8, 14, 25, 26 (6)
15.	Himachal Pradesh	Nil	Nil	Nil	3, 11, 13, 14, 17, 19, 27, 30 (8)	9, 10, 13, 15-18 (7)	1, 2, 5 (3)	4, 6 (2)
16.	Jammu & Kashmir	Nil	Nil	Nil	3, 12, 14, 17, 19-27 (13)	11-13, 16-18, 21, 28 (8)	4 (1)	1, 2, 5, 8 (4)
17.	West Rajasthan	Nil	Nil	Nil	3, 17, 22, 24 (4)	23, 25-27 (4)	1, 2, 4-16, 18-20, 30, 31 (20)	8-10, 17, 18, 21, 26, 28 (8)
18.	East Rajasthan	Nil	Nil	Nil	3, 22, 24 (3)	23, 25, 26 (3)	1, 2, 4, 5, 7, 8-20, 30, 31 (20)	6, 8-10, 18, 21, 26 (7)
19.	West Madhya Pradesh	Nil	Nil	Nil	21, 22, 24 (3)	12, 17, 19, 23, 26, 28, 30 (7)	13-18 (6)	14, 17, 18 (3)
20.	East Madhya Pradesh	Nil	Nil	Nil	22, 24, 26, 28, 30 (5)	15, 23, 26 (3)	18 (1)	13-15, 18 (4)
21.	Gujarat Region	Nil	Nil	Nil	21, 22, 24-28 (7)	18, 20, 26, 31 (4)	13, 14, 17, 19, 30 (5)	26, 30 (2)
22.	Saurashtra & Kutch	Nil	Nil	Nil	12, 21, 24-27 (6)	13-15, 23, 26 (5)	30 (1)	17, 26, 30, 31 (4)
23.	Konkan & Goa	Nil	Nil	Nil	Nil	24, 26, 31 (3)	12 (1)	13, 14, 17 (3)
24.	Madhya Maharashtra	Nil	Nil	Nil	12, 14, 17, 21, 24-28, 31 (10)	13, 23, 25, 26, 30 (5)	18, 21, 22 (3)	15 (1)
25.	Marathawada	Nil	Nil	Nil	23-27, 30, 31 (7)	26 (1)	17, 21 (2)	18, 20 (2)
26.	Vidarbha	Nil	Nil	Nil	19, 23-28, 30, 31 (9)	13, 20-22, 30, 31 (6)	Nil	Nil
27.	Chattisgarh	Nil	Nil	Nil	17, 23, 24, 26, 27 (5)	15 (1)	Nil	Nil
28.	Coastal Andhra Pradesh	Nil	Nil	Nil	23, 25, 26 (3)	23, 26, 27 (3)	Nil	Nil
29.	Telangana	Nil	Nil	Nil	23-27 (5)	23, 28 (2)	Nil	30 (1)
30.	Rayalaseema	Nil	Nil	Nil	23, 25-27 (4)	23, 26 (2)	Nil	Nil
31.	Tamil Nadu	Nil	Nil	Nil	23, 24 (2)	23, 24, 30 (3)	Nil	26-28 (3)
32.	Coastal Karnataka	Nil	Nil	Nil	Nil	25, 26 (2)	30 (1)	Nil
33.	North Interior Karnataka	Nil	Nil	Nil	23-26 (4)	23, 26 (2)	Nil	Nil
34.	South Interior Karnataka	Nil	Nil	Nil	22, 23 (2)	23, 25 (2)	Nil	30 (1)
35.	Kerala	Nil	Nil	Nil	Nil	24 (1)	Nil	27, 30, 31 (3)

TABLE 8

Dates of occurrence of cold wave/severe cold wave and various categories of minimum temperatures - November 2009

Sub-division		Dates (Number of days)						
No	Name	Severe Cold wave	Cold wave	Cold Day	Appreciably to markedly below normal	Below normal	Appreciably to markedly above normal	Above normal
2.	Arunachal Pradesh	Nil	Nil	Nil	Nil	26. (1)	16 (1)	3, 12 (2)
3.	Assam & Meghalaya	Nil	Nil	Nil	1, 24 (2)	10, 20-22, 24, 25 (6)	3, 5, 15-17, 19 (6)	2, 5, 6, 8, 18, 20, 26, 27, 30 (9)
4.	Naga., Mani, Mizo and Tri.	Nil	Nil	Nil	Nil	1, 10, 23 (3)	4-6, 17, 19 (5)	2, 3, 5, 6, 8, 12, 13, 18, 20, 22, 27 (11)
5.	S. H. W. B. & Sikkim	Nil	Nil	Nil	20-22 (3)	3, 10, 23-27 (7)	5, 6, 14-18, 29, 30 (9)	2, 5, 6, 8, 10, 19 (6)
6.	Gangetic West Bengal	Nil	Nil	Nil	22 (1)	21, 28 (2)	4-6, 8, 9, 10, 12-19 (14)	2, 3, 5-7, 9, 11 (7)
7.	Orissa	Nil	30 (1)	Nil	1, 2, 22, 24-30 (10)	1, 23-26 (5)	5-10, 12-19 (14)	4-6, 9, 20, 21 (6)
8.	Jharkhand	Nil	Nil	Nil	22, 27, 28, 30 (4)	22-24, 29 (4)	5-7, 9, 10, 12-19 (13)	4, 6-8, 19 (5)
9.	Bihar	Nil	Nil	Nil	1 (1)	20-28, 30 (10)	5, 11-19 (10)	4, 6, 9, 10 (4)
10.	East Uttar Pradesh	Nil	Nil	Nil	1, 22, 25, 27 (4)	1, 20, 21, 23, 24, 28-30 (8)	4-8, 10-19 (15)	3, 5, 7, 8, 19 (5)
11.	West Uttar Pradesh	Nil	Nil	Nil	Nil	21 (1)	4, 5, 8, 10-18 (15)	2, 3, 5, 6, 8, 9, 18 (7)
12.	Uttarakhand	Nil	Nil	Nil	19 (1)	8, 20, 21, 26 (4)	14, 15 (2)	4, 5, 13, 16, 17 (5)
13.	Haryana, Chandigarh & Delhi	Nil	Nil	Nil	19, 22, 28 (3)	20, 21 (2)	1, 3, 9, 10, 12-15, 17 (9)	2, 7, 16 (3)
14.	Punjab	Nil	Nil	Nil	19, 21, 22 (3)	18, 21, 23, 27, 29 (5)	9, 10, 13, 14, 15 (5)	Nil
15.	Himachal Pradesh	Nil	24 (1)	Nil	1, 6, 15, 19, 22, 24-28 (10)	5, 7, 18, 23 (4)	1 (1)	Nil
16.	Jammu & Kashmir	Nil	Nil	Nil	2, 20, 21, 22, 27 (5)	7, 10, 13, 16-19, 22, 23, 25, 26, 29 (12)	30 (1)	3, 4, 8, 9, 15 (5)
17.	West Rajasthan	Nil	Nil	Nil	20, 21 (2)	23, 25 (2)	1-10, 12-17, 22, 26-30 (22)	2, 3, 5, 18, 19, 21, 23, 24, 26 (9)
18.	East Rajasthan	Nil	Nil	Nil	25 (1)	22, 24, 26 (3)	1-5, 7-9, 12, 13, 15-20, 27-29 (19)	4, 10, 11, 21-23, 30 (7)
19.	West Madhya Pradesh	Nil	26, 27 (2)	Nil	7, 10, 11, 23, 25-27 (7)	1, 22-24, 29 (5)	2, 3, 9, 12, 13, 15-21, 28, 30 (14)	5, 8, 10, 11, 16, 29 (6)
20.	East Madhya Pradesh	Nil	Nil	Nil	24, 26, 27 (3)	1, 22 (2)	2, 8-10, 12, 14-21, 29 (14)	6, 11, 16, 22, 28-30 (7)
21.	Gujarat Region	Nil	Nil	Nil	21, 25 (2)	14 (1)	4, 5, 12, 18-20, 22, 29, 30 (9)	4, 7, 15, 17, 21, 24, 28 (7)
22.	Saurashtra & Kutch	Nil	Nil	Nil	21, 23, 25 (3)	14, 16, 22 (3)	2-9, 13, 18-20, 28-30 (15)	1, 3, 4, 11, 21, 27 (6)
23.	Konkan & Goa	Nil	Nil	Nil	Nil	4, 6, 7, 9, 14, 26-28 (8)	12, 19-23, 29, 30 (8)	17, 20, 24 (3)
24.	Madhya Maharashtra	Nil	Nil	25 (1)	22, 24, 26 (3)	1-5, 7-9, 12, 13, 15-20, 27-29 (19)	4, 10, 11, 21-23, 30 (7)	Do
25.	Marathawada	26, 27 (2)	Nil	7, 10, 11, 23, 25-27 (7)	1, 22-24, 29 (5)	2, 3, 9, 12, 13, 15-21, 28, 30 (14)	5, 8, 10, 11, 16, 29 (6)	Do
26.	Vidarbha	Nil	Nil	24, 26, 27 (3)	1, 22 (2)	2, 8-10, 12, 14-21, 29 (14)	6, 11, 16, 22, 28-30 (7)	Do
27.	Chattisgarh	Nil	Nil	21, 25 (2)	14 (1)	4, 5, 12, 18-20, 22, 29, 30 (9)	4, 7, 15, 17, 21, 24, 28 (7)	Do
28.	Coastal Andhra Pradesh	Nil	Nil	21, 23, 25 (3)	14, 16, 22 (3)	2-9, 13, 18-20, 28-30 (15)	1, 3, 4, 11, 21, 27 (6)	Do
29.	Telangana	Nil	Nil	Nil	4, 6, 7, 9, 14, 26-28 (8)	12,19-23, 29, 30 (8)	17, 20, 24 (3)	Do
30.	Rayalaseema	Nil	Nil	25 (1)	22, 24, 26 (3)	1-5, 7-9, 12, 13, 15-20, 27-29 (19)	4, 10, 11, 21-23, 30 (7)	Do
31.	Tamil Nadu	26, 27 (2)	Nil	7, 10, 11, 23, 25-27 (7)	1, 22-24, 29 (5)	2, 3, 9, 12, 13, 15-21, 28, 30 (14)	5, 8, 10, 11, 16, 29 (6)	Do
32.	Coastal Karnataka	Nil	Nil	24, 26, 27 (3)	1, 22 (2)	2, 8-10, 12, 14-21, 29 (14)	6, 11, 16, 22, 28-30 (7)	Do
33.	North Interior Karnataka	Nil	Nil	21, 25 (2)	14 (1)	4, 5, 12, 18-20, 22, 29, 30 (9)	4, 7, 15, 17, 21, 24, 28 (7)	Do
34.	South Interior Karnataka	Nil	Nil	21, 23, 25 (3)	14, 16, 22 (3)	2-9, 13, 18-20, 28-30 (15)	1, 3, 4, 11, 21, 27 (6)	Do
35.	Kerala	Nil	Nil	Nil	4, 6, 7, 9, 14, 26-28 (8)	12,19-23, 29, 30 (8)	17, 20, 24 (3)	Do

12 November. Fairly widespread rainfall also occurred over south Gujarat region on 11. Heavy to very heavy falls occurred at isolated places in Maharashtra State excluding Vidarbha and coastal Karnataka on 12. Some chief amounts of rainfall in centimeters are:

Konkan & Goa

11 Nov : Canacona, Marmagoa, 8, Dabolim 7, Panjim 6, Mapusa 5.

12 Nov : Madangad 11, Sudhagad 10, Dapoli, Harnai, Mhasala 9, Shriwardhan 7.

Madhya Maharashtra

11 Nov : Lohegaon 13, Mahabaleswar, Bhor, Paud, Vadagaon Maval, 10, Wai, Pune 9, Ghodegaon 8, Chandwad, Satara, Uran, Islampur, Akola 7, Shirur, Kandalbavda, Karad, Kelvan,, Pernem, Dodamarg, Chandgad 6, Shahuwad, Saswad, Velhe, Rajgurunagar, Shirali, Sinner, Shrigonda, Ajra, Khed 5.

12 Nov : Chandwad 17, Akola 14, Sinnar, Yeola, Nandgaon, 13, Ghodegaon 12, Mahabaleshwar, Mandangad 11, Kopargaon , Sudhagad 10, Malegaon, Chiplun, Mhasala, Chopda, Edalabad, Erandol, Pachora, Harnai, Kalvan, Khandala, Paud 9, Srirampur, Shirpur, Vadgaon Maval, 8, Bahadgaon, Srivardhan, Niphad, Soegaon, Kalvan 7, Mangaon, Poladpur, Vijapur, Igatpuri, Satna, Kankavali 6, Nasik, Aurangabad, Mahad, Pen, Kannad, Khaldabad, Sillod, Jafferabad, Khed, Saswad, Navapur, Dindori, Baramati, Sawantwadi, Kalyan, Murvad, Shahapur 5.

Marathwada

12 Nov : Soegaon: 8.

Coastal Karnataka

12 Nov : Bantawal 8.

Apart from the above, during the formative stage of this system, as it was making a northward drift in the Arabian Sea, moist maritime air from the Bay of Bengal traversed across Tamil Nadu. This resulted in very heavy to extremely heavy rainfall over the windward side of Western Ghats. An exceptionally heavy rainfall of 82 cm was reported by 'Ketti' in Tamil Nadu.

Some chief amounts of rainfall in centimeters are:

9 Nov : Coonoor 34, Udhagamandalam 18, Kottagiri, Kodaikanal 17, Ketti 14, Shenkotta 13.

10 Nov : Ketti 82, Coonoor 31, Kottagiri 27, Udhagamandalam, 19, Kundha Bridge 15.

As per press reports, the cyclonic storm PHYAN claimed 15 lives (including 11 sailors) in Maharashtra. Thousands of houses were partially damaged in the coastal districts of Sindhudurg, Ratnagiri, Thane and Raigad. Many trees and electrical poles were uprooted. Massive damage to property was also reported. Grape, cotton, Mango and Cashew farms were ruined. Crops worth crores of Rupees were damaged due to heavy rain.

3.2.2. *Other synoptic features and associated weather*

A summary of the synoptic systems for the month of November 2009 is given in Table 3. The sub-division wise percentage departure of rainfall from normal and the significant amounts of rainfall during the month are given in Tables 1 and 5 respectively and the frequency of days of *vigorous/active* northeast monsoon days and heavy rainfall are given in Table 10.

A series of active troughs in the lower level easterlies gave rise to incessant rainfall over Tamil Nadu. Favourable easterly-westerly interaction caused northward extension of northeast monsoon rains up to central parts of the country. Active western disturbances gave rise to snowfall over the higher reaches of Jammu & Kashmir, Himachal Pradesh as well as in Sikkim.

3.2.3. *Temperature*

The dates of occurrence of *cold wave conditions* and the dates on which minimum temperature remained under various categories *viz*., *appreciably to markedly below normal*, *below/above normal* are given in Table 8. It may be noted that the frequency of *cold wave conditions* had been low, as the amplitude of easterly waves had been high providing moisture and associated weather.

Month's lowest minimum temperature over the plains of the country was 4° C recorded at Amritsar (Punjab) on 29 & 30 November 2009.

3.2.4. *Disastrous weather events and associated damage*

According to media reports, heavy rains and landslides claimed 94 lives in Tamil Nadu. Also 80 fishermen from Tamil Nadu went missing due to rough seas. The damage associated with the Cyclonic Storm (Phyan) is given under section 3.2.1.1. Snowstorm claimed 8 lives in Himachal Pradesh and one person died due to intense cold in Punjab. Heavy snowfall paralyzed normal life in Lahul-Spiti district of Himachal Pradesh. Fog disrupted flights in Delhi. Also one person died in West Bengal due to lightning.

3.3. *December*

3.3.1. *Storms and Depressions*

Only one Cyclonic Storm formed over the Bay of Bengal during the month. The details are given below.

3.3.1.1. *Cyclonic Storm (WARD) over southwest and adjoining southeast Bay of Bengal (10 – 15 Dec 2009.)*

Under the influence of trough of low at sea level, a low pressure area formed over the southwest and adjoining southeast Bay of Bengal on 8 and became well marked over southwest Bay of Bengal and neighbourhood on 10 morning. It concentrated into a Depression and lay centred at 0900 UTC of 10, over the southwest and adjoining southeast Bay of Bengal near Lat. 6.5° N / Long. 85.0° E and remained practically stationary over there at 1200 UTC. Moving northwestwards it intensified into a Deep Depression at 0000 UTC of 11 (centred near Lat. 7.0° N / Long. 84.5° E) and remained practically stationary over there at 0300 UTC. Subsequently, it moved northwards and intensified into Cyclonic Storm (WARD) and lay at 0900 UTC of 11, near Lat. 8.5° N / Long. 84.5° E. It remained practically stationary at 1200 UTC of 11. Further moving northwards, it lay centred at 0300 UTC of 12, near Lat. 10.0° N / Long. 84.5° E. Thereafter, it moved westwards and lay centred at 1200 UTC of 12, near Lat. 10.0° N / Long. 83.5° E. Drifting southwards, it weakened into a Deep Depression and lay centred at 1800 of 12 near Lat. 9.5° N / Long. 83.5° E. Moving westwards, it lay over the southwest Bay of Bengal centred near Lat. 9.5° N / Long. 83.0° E at 0300 UTC of 13. It further drifted southwards and lay centred near Lat. 9.0° N / Long. 83.0° E at 1200 UTC of 13 and near Lat. 8.5° N / Long. 81.5° E, close to Trincomali (Sri Lanka) at 0300 UTC of 14. It crossed north Sri Lanka coast near Trincomali between 0800 & 0900 UTC of 14, weakened into a Depression and lay centred over north Srilanka near Lat. 8.5° N / Long. 81.0° E at 0900 UTC of 14 and lay practically stationary over there at 1200 UTC. Moving westwards it lay centred near Lat. 8.5° N / Long. 80.5° E over north Sri Lanka at 0000 UTC of 15 and further weakened into a well marked low pressure area over Sri Lanka and neighbourhood in the morning of 15 and into a low pressure area in the evening. It lay over Gulf of Mannar and adjoining north Srilanka and coastal Tamil Nadu on 16 morning and became less marked in the evening.

The system was continuously tracked by satellite even after crossing the coast. The maximum intensity of T 3.0 was reported by Kalpana – 1 imageries from 2100 UTC of 11 to 0800 UTC of 12.

DWR Chennai : The system centre was at a distance more than 500 kms from DWR Chennai, throughout its course. Neither the "EYE" nor the SPIRAL bands could be seen from Chennai RADAR.

The lowest Estimated Central Pressure was 996 hPa. The maximum estimated wind speed was 45 kts. The system initially moved in a northerly direction. It then moved in a southwesterly direction and finally in a westerly direction and crossed north Sri Lanka near Trincomalee between 0800 and 0900 UTC of 14 December 2009. It weakened into a Deep Depression over the sea before landfall.

Northeast monsoon was vigorous in Tamil Nadu on 16. Heavy to very heavy rainfall occurred at many places on 16 and at isolated places on 13, 15 and 17.

Some chief amounts of rainfall in centimeters are:

13 Dec : Sriperumbudhur, Vallam 8, Poonamalle 7.

15 Dec : Sirkali 14, Tarangambadi, Rameshwaram, Karaikal 11, Kollidam, Vedaranyam 10, Mayiladuthurai, Chidambaram 9, Kodavasal, Thiruthuraipoondi, Valangaiman 7.

16 Dec : Mayiladuthurai 15, Vallam 14, Needamangalam 13, Thozhudhur, Karaikal, Thiruthuraipoondi, Nagapattinam 12, Kattumannarkoil, Orathanadu, Muthupet, Tarangambadi 11, Cuddalore, Chembarambakkam, Parangipettai, Vanur, Nannilam, Thiruvarur, Sirkali, Arakonam 10, Tiruttani, Poondi, Chidambaram, Adiramapattinam, Thanjavur, Kodavasal, Mannargudi, Kollidam, Tondi 9, Chennai, Ramakrishnarajupet, Tamaraipakkam,

TABLE 9

Dates of occurrence of cold wave/severe cold wave and various categories of minimum temperatures - December 2009

Sub-division		Dates (Number of days)						
No	Name	Severe Cold wave	Cold wave	Cold Day	Appreciably to markedly below normal	Below normal	Appreciably to markedly above normal	Above normal
2.	Arunachal Pradesh	Nil	Nil	Nil	Nil	Nil	14, 17 (2)	13, 16, 19 (3)
3.	Assam & Meghalaya	Nil	Nil	Nil	1, 26, 29, 30 (4)	11, 23, 27, 28 (4)	4-8, 13, 15-19 (11)	2, 3, 8-10, 12, 13, 23-25 (10)
4.	Naga., Mani, Mizo. and Tri.	Nil	Nil	Nil	Nil	25, 27-29 (4)	3, 6-8, 11, 13, 17-19 (9)	3, 4, 12-14 (5)
5.	S. H. W. B. & Sikkim	Nil	25, 31 (2)	Nil	26, 29 (2)	24, 27, 30 (3)	1-4, 6, 16, 17, 31 (8)	3, 7, 8, 10, 12-15, 17, 19 (10)
6.	Gangetic West Bengal	Nil	Nil	Nil	26-28 (3)	23, 24, 29, 30 (4)	3, 17, 18, 19 (4)	3, 5, 13-17, 31 (8)
7.	Orissa	Nil	Nil	Nil	1, 24-26, 28, 29 (6)	4-6, 8, 23-25, 27, 28, 30 (10)	13, 17-19, 21 (5)	9-12, 14, 22 (6)
8.	Jharkhand	Nil	28 (1)	Nil	26, 27 (2)	1, 4, 6, 23, 24, 30 (6)	8, 11, 13, 17-19 (6)	9, 12, 13, 16 (4)
9.	Bihar	Nil		Nil	25-30 (6)	1, 10, 21, 24, 30 (5)	8, 16-19 (5)	12, 13 (2)
10.	East Uttar Pradesh	Nil	26-30 (5)	Nil	26, 28 (2)	1, 10, 21, 25, 27, 29, 31 (7)	6-8, 10, 11, 13-19 (12)	3, 4, 6, 9, 13, 16, 17, 31 (8)
11.	West Uttar Pradesh	Nil	Nil	Nil	29, 31 (2)	22, 27, 28 (3)	2, 6, 8, 11-16, 18 (10)	3, 4, 6, 7, 9, 10, 13, 16, 19 (9)
12.	Uttarakhand	Nil	27 (1)	Nil	25, 26, 31 (3)	17, 26, 29 (3)	4, 11 (2)	2, 10, 12, 13 (4)
13.	Haryana, Chandigarh & Delhi	28, 30, 31 (3)	8, 26, 27, 29 (4)	Nil	9, 25, 26, 28, 29 (3)	1, 5, 14, 17-19, 22-24, 27, 30, 31 (12)	4, 6, 10-13, 15, 16 (8)	3, 14, 24 (3)
14.	Punjab	28 (1)	25-27, 29-31 (6)	Nil	8, 21, 26, 28, 29, 31 (6)	1, 7, 9, 23, 24, 27, 30 (7)	4, 6, 10-13 (6)	3, 16 (2)
15.	Himachal Pradesh	Nil	1, 8, 21, 24, 29-31 (6)	Nil	15, 18, 21, 25, 27, 31 (6)	4, 7, 14, 16, 19, 23, 24 (7)	10 (1)	3 (1)
16.	Jammu & Kashmir	Nil	21-23, 30 (4)	Nil	8, 25, 26, 31 (4)	2, 7, 19, 23, 24, 27, 31 (7)	1, 4, 9-11, 13-18, 24, 31 (13)	10, 12 (2)
17.	West Rajasthan	Nil	Nil	Nil	26 (1)	8 (1)	1-13, 15-18, 21-25, 27-30 (26)	3, 17, 19, 23, 31 (5)
18.	East Rajasthan	Nil	Nil	Nil	Nil	Nil	1, 4-18, 21, 22, 24, 25, 27-30 (24)	2, 17, 19, 26 (4)
19.	West Madhya Pradesh	Nil	Nil	Nil	Nil	23 (1)	4-19, 21, 22, 25, 26, 28-30 (23)	2, 24, 30 (3)
20.	East Madhya Pradesh	Nil	Nil	Nil	Nil	22 (1)	5, 7, 8-19, 21, 25, 28-31 (20)	4, 24, 30, 31 (4)
21.	Gujarat Region	Nil	Nil	Nil	Nil	Nil	1, 4, 6, 7, 11-19, 21-29, 31 (23)	2, 3, 5, 9, 10, 13, 18, 24, 30 (9)
22.	Saurashtra & Kutch	Nil	Nil	Nil	1, 9 (2)	7, 8, 10, 11 (4)	4, 12-14, 16, 18, 21-29 (15)	3, 5, 9, 10, 13, 16-19, 24, 30 (11)
23.	Konkan & Goa	Nil	Nil	Nil	25 (1)	26, 28, 30 (3)	11, 16, 19, 21-24, 27, 29 (9)	3, 4, 7-10, 13, 14, 15, 17, 29 (11)
24.	Madhya Maharashtra	Nil	24-27 (4)	Nil	1, 4, 27 (3)	1, 23, 25 (3)	4-9, 11-13, 15-19, 21, 22, 28-31 (20)	3, 10, 13, 14, 17, 23, 27, 30 (8)
25.	Marathawada	Nil	Nil	Nil	1, 24-27 (5)	Nil	4, 6, 8-11, 13-19, 21, 22, 28-30 (18)	10, 12 (2)
26.	Vidarbha	Nil	23-27 (5)	Nil	1-3, 26 (4)	2, 3, 5, 23-25, 31 (7)	8, 9, 12, 14-19, 21, 22, 28-31 (15)	6, 7, 10, 13, 29 (5)
27.	Chattisgarh	Nil	Nil	Nil	Nil	22, 23 (2)	10, 12-17, 19, 21, 31 (10)	16, 31 (2)
28.	Coastal Andhra Pradesh	Nil	26 (1)	Nil	1, 25-27 (4)	28, 29 (2)	3, 15-17, 21 (5)	4, 6, 11-14, 19, 22-24, 31 (11)
29.	Telangana	Nil	26 (1)	Nil	1, 24, 25 (3)	2, 3 (2)	4, 5, 10, 11, 13-19, 21, 22, 27-31 (18)	6-10, 13, 23 (7)
30.	Rayalaseema	Nil	Nil	Nil	Nil	8, 10, 11 (3)	3-5, 10, 15-17, 19, 21-24, 27-31 (17)	2, 3, 13, 14, 30, 31 (6)
31.	Tamil Nadu	Nil	Nil	Nil	Nil	6, 11 (2)	1, 3, 4, 13, 15, 19, 21, 24, 25, 27, 29 (11)	1, 3-5, 8, 9, 12-17, 18, 23-30 (21)
32.	Coastal Karnataka	Nil	Nil	Nil	13 (1)	8 (1)	1, 3, 4, 17-19, 21, 22, 25, 27, 29-31 (13)	2, 5, 6, 13-15, 17, 18, 23, 26, 28-31 (14)
33.	North Interior Karnataka	Nil	24 (1)	Nil	8, 12, 15, 25 (4)	1, 6, 8-11, 13 (7)	17-19, 28-30 (6)	4, 10, 16, 18, 21, 23, 26, 28-31 (11)
34.	South Interior Karnataka	Nil	Nil	Nil	7, 8 (2)	8, 12, 13 (3)	4, 5, 16-19, 21-24, 27, 29, 30 (13)	14, 18, 23, 24, 26, 28-31 (9)
35.	Kerala	Nil	Nil	Nil	Nil	Nil	15, 23 (2)	1-4, 6, 13, 17, 19, 21, 22, 24-27 (14)

TABLE 10

Frequency of heavy rainfall events and monsoon activity (October-December 2009)

S. No.	Sub-division	South-West Monsoon		North-East Monsoon					North-East Monsoon					North-East Monsoon					North-East Monsoon				
		Vigorous	Active	Vigorous	Active	Extr. Heavy Rain	Very Heavy Rain	Heavy Rain	Vigorous	Active	Extr. Heavy Rain	Very Heavy Rain	Heavy Rain	Vigorous	Active	Extr. Heavy Rain	Very Heavy Rain	Heavy Rain	Vigorous	Active	Extr. Heavy Rain	Very Heavy Rain	Heavy Rain
		October		October					November					December					Post Monsoon season				
1.	Andaman & Nicobar Islands	-	-	-	-	-	-	3	-	-	-	-	-		-	-	-	-	-	-	-	-	3
2.	Arunachal Pradesh	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1
3.	Assam & Meghalaya	2	-	-	-	-	1	3	-	-	-	-	-	-	-	-	-	-	2	-	-	1	3
4.	Naga. Mani. Mizo. & Trip.	-	6	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	6	-	1	1
5.	Sub–Himalayan W B & Sikkim	2	-	-	-	1	1	1	-	-	-	-	-	-	-	-	-	-	2	-	1	1	1
6.	Gangetic West Bengal	-	3	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	3	-	-	1
7.	Orissa	1	3	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	1	3	-	2	1
8.	Jharkhand	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3	-	-	-
9.	Bihar	2	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	2	-	-	1	-
10.	East Uttar Pradesh	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1
11.	West Uttar Pradesh	1	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	1	-	-	1
12.	Uttarakhand	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
13.	Haryana Chnd. & Delhi	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
14.	Punjab	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15.	Himachal Pradesh	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	2
16.	Jammu & Kashmir	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17.	West Rajasthan	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18.	East Rajasthan	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19.	West Madhya Pradesh	3	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	3	-	-	-	2
20.	East Madhya Pradesh	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
21.	Gujarat Region	1	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-	3
22.	Saurashtra & Kutch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23.	Konkan & Goa	4	1	-	-	2	-	6	-	-	-	1	2	-	-	-	-	-	4	1	2	1	8
24.	Madhya Maharashtra	1	4	-	-	-	1	3	-	-	-	2	-	-	-	-	-	-	1	4	-	3	3
25.	Marathwada	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	1
26.	Vidarbha	1	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	1	-	-	1
27.	Chattisgarh	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-
28.	Coastal Andhra Pradesh	-	3	-	-	-	-	-	3	1	1	1	6	-	-	-	1	-	3	4	1	2	6
29.	Telangana	2	2	-	-	-	-	-	1	-	-	-	2	-	-	-	-	-	3	2	-	-	2
30.	Rayalaseema	2	-	-	-	-	1	-	1	2	-	-	2	-	2	-	-	-	3	4	-	1	2
31.	Tamil Nadu & Puducherry	-	-	-	2	-	2	8	5	6	1	6	9	5	1	-	5	10	10	9	1	13	27
32.	Coastal Karnataka	2	1	-	-	1	1	2	-	-	-	-	4	-	-	-	-	-	2	1	1	1	6
33.	North interior Karnataka	3	1	-	-	-	2	1	-	-	-	-	1	-	-	-	-	2	3	1	-	2	4
34.	South interior Karnataka	1	3	-	-	-	2	2	-	-	-	-	3	-	-	-	-	-	1	3	-	2	5
35.	Kerala	2	1	-	-	1	2	2	4	4	1	3	6	-	-	-	-	1	6	5	2	5	9
36.	Lakshadweep	-	-	-	-	-	-	1	-	-	-	-	3	-	-	-	-	-	-	-	-	-	4
Total		36	35	-	2	5	17	45	14	13	3	13	43	5	3	-	6	13	55	53	8	36	101

Puducherry Airport, Thiruvidaimarudhur, Thiruvaiyaru, Sholingur 8, Pallipattu, Cholavaram, Redhills, Sethiyathope, Ulundurpet, Kumbakonam, Madukkur, Papanasam, Pattukottai, Valangaiman, Aranthangi, R. S. Mangalam, Ramanathapuram, Sathanur dam Ariyalur 7.

17 Dec : Orathanadu, Vallam 11, Alangudi 10, Parangipettai 9, Peravairani, Vedaranayam, Tirumayam 8, Tozhudur, Arimalam, Cheyyar, Arantangi 7.

As per press reports, normal life was disrupted in coastal Tamil Nadu due to incessant rains. Continuous rains also inundated several low lying areas and gusty winds uprooted trees.

3.3.2. *Weather and associated synoptic features*

Table 4 gives the summary of synoptic systems during the month of December 2009. The subdivision wise percentage departure of rainfall and the significant amounts of rainfall during the month are gives in tables 1 & 5, respectively. The frequency of the northeast monsoon activity and heavy rainfall events are given in Table 10.

During the first week of December, the rainfall was mainly confined to north east India and extreme south peninsula. Confluence of easterly and westerly winds over central parts of the country gave rise to precipitation over the region during the later part. Cyclonic shear zone generated by an amplified trough in the easterlies and the winds from the sub-tropical high caused isolated rainfall over the central and adjoining peninsular India towards the end of the month. As depicted above, the rainfall due to Cyclonic Storm (Ward) has been mainly confined to Tamil Nadu alone.

3.3.3. *Temperature*

It is evident from Table 9 that, the frequency of *Severe Cold Wave conditions* was less during the month *and the Cold Wave conditions* were restricted to north western parts of the country.

The month's and season's lowest minimum temperature in the plains of the country was -1° C recorded at Amritsar (Punjab) on 31 December 2009.

3.3.4. *Disastrous weather events and associated damage*

According to media reports, cold wave claimed 18 lives so far in Uttar Pradesh. High altitude areas of Sikkim reported heavy snowfall and several tourists had to be rescued from this area. Higher reaches of Himachal Pradesh remained cut off due to snowfall. Heavy snow fall also paralysed life in Ladakh region of Jammu & Kashmir. Dense fog disrupted air traffic in Agartala. Fog disrupted the morning flights from Kolkata and Mumbai International Airports. Also it affected the air and rail traffic in Chattisgarh. Lightning claimed 3 lives in Madhya Pradesh. Hailstorm led to massive crop damage in some areas of Maharashtra.

Appendix

Definitions of the terms given in *'Italics'*

Rainfall

Excess	- percentage departure from normal is + 20% or more.
Normal	- percentage departure from normal is –19 % to + 19 %.
Deficient	- percentage departure from normal is –20 % to –59 %.
Scanty	- percentage departure from normal is –60 % to –99 %.
Heavy rain	- rainfall amount from 6.5 cm to 12.4 cm.
Very heavy rainfall	- rainfall amount 12.5 cm to 24.4 cm.
Extremely heavy rain	rainfall amount 24.5 cm and above.
At most places	- 76 % or more stations of a meteorological sub-division reporting at least 2.5 mm rainfall.
At many places	- 51% to 75 % stations of a meteorological sub-division reporting at least 2.5 mm rainfall.
At a few places	- 26 % to 50% stations of a meteorological sub-division reporting at least 2.5 mm rainfall.
At isolated places	- 25% or less stations of a meteorological sub-division reporting at least 2.5 mm rainfall.

Monsoon activity

(a) Southwest monsoon

Vigorous	- rainfall exceeding 4 times the normal with, at least two stations reporting rainfall more than or equal to 8 cm along the west coast and 5 cm elsewhere. Rainfall in that sub-division should be fairly widespread or widespread.

Active - rainfall more than 1½ to 4 times the normal, with at least two stations reporting rainfall more than or equal to 5 cm along the west coast and 3 cm elsewhere. Rainfall in that sub-division should be fairly widespread or widespread.

(b) Northeast monsoon

Vigorous - rainfall exceeding 4 times the normal with at least two stations reporting rainfall more than or equal to 5 cm in coastal Tamil Nadu and south coastal Andhra Pradesh and 3 cm elsewhere in the northeast monsoon region. Rainfall in that sub-division should be fairly widespread or widespread.

Active - rainfall more than 1½ to 4 times the normal, with at least two stations reporting rainfall more than or equal to 3 cm in coastal Tamil Nadu and south coastal Andhra Pradesh and 2 cm elsewhere in the northeast monsoon region. Rainfall in that sub-division should be fairly widespread or widespread.

Temperatures

(a) Maximum / Day temperature

According to the revised criteria, since 1 March 2002, Heat Wave will be declared only when the maximum temperature of a station reaches at least 40° C for plains and at least 30° C for Hilly regions.

Severe heat wave conditions - Departure of maximum temperature from normal is +6° C or more for the regions where the normal maximum temperature is more than 40° C and +7° C or more for regions where the normal maximum temperature is 40° C or less.

Heat wave conditions - + 4° C to + 5° C for the regions where the normal maximum temperature is more than 40° C and departure of maximum temperature from normal is + 5° C to + 6° C for regions where the normal maximum temperature is 40° C or less. (declared only when the maximum temperature of a station reaches at least 40° C for Plains and at least 30° C for Hilly region)

Markedly above normal - departure from normal is +5° C to +6° C (where the normal maximum temperature is 40° C or less).

Appreciably above normal - departure from normal is +3° C to +4° C (where the normal maximum temperature is 40° C or less).

Above normal - departure from normal is +2° C.

Normal - departure from normal is +1° C to –1° C.

(b) Minimum / Night temperature

Severe cold wave conditions - departure of WCT_n from normal minimum temperature is –7° C or less for the regions where normal minimum temperature is $\underline{\geq}$ 10° C and –6° C or less elsewhere

Cold wave conditions when the wind chill effective minimum temperature (WCT_n) is 10° C or less: For stations whose normal minimum temperature is ≥ 10° C, when the departure from normal is –5° to –6° C, and for stations whose normal minimum temperature is less than 10° C when the departure from normal is –4° to –5° C. Also when WCT_n is ≤ 0° C, cold wave is declared irrespective of the departure for those stations whose normal minimum temperature is greater than 0° C.

Cold day conditions For inland plain stations, when the day temperature is less than or equal to 16° C.

Markedly below normal - departure from normal is –5° C to –6° C (where the normal minimum temperature is 10° C or more).

Appreciably below normal - departure from normal is between –3° C to –4° C (where the normal minimum temperature is 10° C or more).

Below normal - departure from normal is –2° C.

Normal - departure from normal is +1° C to –1° C.