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Weather in India

POST MONSOON SEASON (October - December 2014)†

1. Introduction

In terms of the number of Cyclonic storms, the post-monsoon season 2014 was cyclogenetically less active as compared to last year. In all, three intense low pressure systems formed during the season. Of which, one each Very Severe Cyclonic Storm (VSCS) 'Hud Hud' & 'Nilofar' formed over Bay of Bengal and Arabian Sea respectively and one Deep Depression formed over the Bay of Bengal. There had been eight other years *viz*., 1902, 1909, 1960, 1963, 1967, 1971, 1982 & 1999 in the recorded history (1891-2013) during which, 2 intense low pressure systems reaching the intensity of Severe Cyclonic Storm and higher formed over North Indian Ocean during Post Monsoon Season, 2014.

Out of the three systems, only one system 'Hud Hud' crossed the Indian coast and caused death and damages to life, crops and property. The other two weakened without landfall.

Tracks of these systems are given in Fig. 2. Further details are available in the article on 'Cyclones & Depressions over the north Indian Ocean 2014' published in the July 2015 issue of Mausam.

The northeast monsoon rains commenced over Peninsular India on 18th October and ceased on 4th January 2015. The El-Nino indicators maintained a weak warm phase all through the season. A weak phase of Madden-Julian Oscillation coincided the commencement phase of Northeast Monsoon.

*Cold wave conditions** prevailed over northern and central parts of India during the second half of November and December. Also Dense fog affected normal life in parts of north India especially in the month of December.

Major weather related disasters that occurred over the country during this period were related to the VSCS 'Hud Hud' apart from Severe Cold wave and fog.

2. Seasonal rainfall (October–December)

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

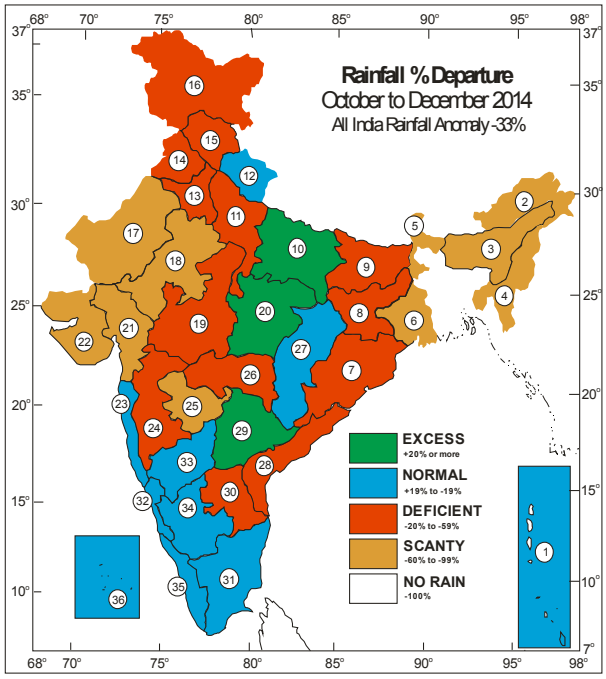

Fig. 1. Sub-divisionwise seasonal rainfall departure from normal (%) for Post monsoon season (October to December 2014). Sub-divisions are indicated by number on the map & bold letters in legend. The rainfall anomaly values for these 36 sub-divisions are indicated below :

1	1	**7**	–20	**13**	–31	**19**	–51	**25**	–63	**31**	–2
2	–76	**8**	–50	**14**	–49	**20**	–66	**26**	–68	**32**	–3
3	–80	**9**	–37	**15**	–33	**21**	–86	**27**	1	**33**	–18
4	–70	**10**	38	**16**	–58	**22**	–66	**28**	–30	**34**	–8
5	–79	**11**	–44	**17**	–92	**23**	–11	**29**	–52	**35**	4
6	–65	**12**	–5	**18**	–84	**24**	–22	**30**	–37	**36**	–13

During the season, rainfall activity over the country as a whole was *deficient*. Except for some sub-divisions of Peninsular India particularly southern tip and along west coast, eastern parts of central and northwest India & the Islands which received *excess/normal* rainfall, most parts of the country received *deficient/scanty* rainfall.

3. Monthly features

3.1. *October*

3.1.1. *Withdrawal of southwest monsoon*

The southwest monsoon withdrew from the entire country on 18th October, 3 days later than the normal date

* *Definitions of terms in italics (other than subtitles) are given in Appendix.*

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TABLE 1

Sub-divisionwise rainfall (mm) for each month and season as a whole (October-December, 2014)

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	402.6	296.7	36	201.2	253.7	-21	100.4	145.5	402.6	704.2	695.9	1
2.	Arunachal Pradesh	35.1	183.0	-81	20.1	45.8	-56	10.2	38.4	35.1	65.4	267.2	-76
3.	Assam & Meghalaya	34.7	154.8	-78	3.1	28.4	-89	0.4	11.8	34.7	38.3	195.0	-80
4.	Naga., Mani., Mizo. and Tri.	69.6	179.8	-61	3.3	50.7	-93	0.1	12.5	69.6	73.0	243.0	-70
5.	Sub-Himalayan West Bengal & Sikkim	31.2	154.2	-80	5.3	20.3	-74	2.4	10.8	31.2	38.9	185.3	-79
6.	Gangetic West Bengal	56.3	129.3	-56	0.1	23.3	-99	0.5	7.5	56.3	56.8	160.1	-65
7.	Orissa	111.8	111.6	0	2.2	27.7	-92	0.9	4.8	111.8	114.8	144.1	-20
8.	Jharkhand	44.9	75.2	-40	0.0	9.9	-100	1.2	6.5	44.9	46.1	91.6	-50
9.	Bihar	47.8	64.8	-26	0.0	6.9	-100	1.2	5.8	47.8	49.0	77.5	-37
10.	East Uttar Pradesh	74.9	49.2	52	0.0	4.5	-100	8.3	6.7	74.9	83.3	60.4	38
11.	West Uttar Pradesh	14.3	42.1	-66	0.0	4.7	-100	15.9	7.6	14.3	30.2	54.4	-44
12.	Uttarakhand	40.8	58.6	-30	0.0	9.7	-100	44.3	21.3	40.8	85.1	89.6	-5
13.	Haryana, Chandigarh & Delhi	10.5	17.6	-40	0.2	4.9	-96	9.6	6.9	10.5	20.3	29.4	-31
14.	Punjab	6.0	22.0	-73	0.7	5.7	-88	14.1	13.3	6.0	20.7	41.0	-49
15.	Himachal Pradesh	18.1	42.5	-57	3.7	20.3	-82	51.2	45.4	18.1	73.0	108.2	-33
16.	Jammu & Kashmir	32.2	38.9	-17	19.7	33.0	-40	3.2	59.9	32.2	55.0	131.8	-58
17.	West Rajasthan	0.5	5.4	-90	0.2	2.5	-92	0.0	1.6	0.5	0.7	9.5	-92
18.	East Rajasthan	3.2	16.9	-81	0.0	7.4	-100	1.1	3.3	3.2	4.4	27.6	-84
19.	West Madhya Pradesh	7.0	34.4	-80	3.0	11.0	-73	15.8	7.7	7.0	25.8	53.1	-51
20.	East Madhya Pradesh	56.4	37.5	51	1.9	9.9	-81	12.9	10.4	56.4	71.2	57.8	23
21.	Gujarat region	3.5	23.7	-85	1.5	9.5	-85	0.0	1.7	3.5	4.9	34.9	-86
22.	Saurashtra & Kutch	6.5	17.9	-64	3.3	10.3	-68	0.0	0.8	6.5	9.7	29.0	-66
23.	Konkan & Goa	111.4	121.0	-8	8.2	22.3	-63	12.0	5.3	111.4	131.5	148.6	-11
24.	Madhya Maharashtra	38.5	79.0	-51	32.8	22.7	45	13.1	6.1	38.5	84.4	107.8	-22
25.	Marathawada	14.2	72.3	-80	19.9	21.2	-6	3.3	8.1	14.2	37.4	101.6	-63
26.	Vidarbha	17.3	59.6	-71	6.2	13.2	-53	2.3	9.0	17.3	25.8	81.8	-68
27.	Chattisgarh	74.6	62.3	20	2.7	8.8	-69	0.6	5.8	74.6	78.0	76.9	1
28.	Coastal Andhra Pradesh	160.8	193.2	-17	49.5	106.6	-54	17.5	27.6	160.8	227.8	327.4	-30
29.	Telangana	43.3	92.2	-53	12.0	21.6	-44	1.5	5.5	43.3	56.8	119.3	-52
30.	Rayalaseema	101.9	129.4	-21	28.5	66.1	-57	8.3	23.7	101.9	138.7	219.2	-37
31.	Tamil Nadu	252.2	180.2	40	110.8	170.0	-35	66.0	88.0	252.2	428.9	438.2	-2
32.	Coastal Karnataka	195.5	189.5	3	32.7	59.6	-45	27.8	13.7	195.5	256.0	262.8	-3
33.	North interior Karnataka	80.3	112.0	-28	25.0	27.3	-8	14.1	6.0	80.3	119.5	145.3	-18
34.	South interior Karnataka	152.9	147.7	4	20.2	49.2	-59	18.7	12.7	152.9	191.8	209.6	-8
35.	Kerala	355.5	292.3	22	99.5	150.9	-34	47.2	37.5	355.5	502.1	480.7	4
36.	Lakshadweep	169.2	157.1	8	59.0	117.7	-50	62.3	58.8	169.2	290.5	333.6	-13

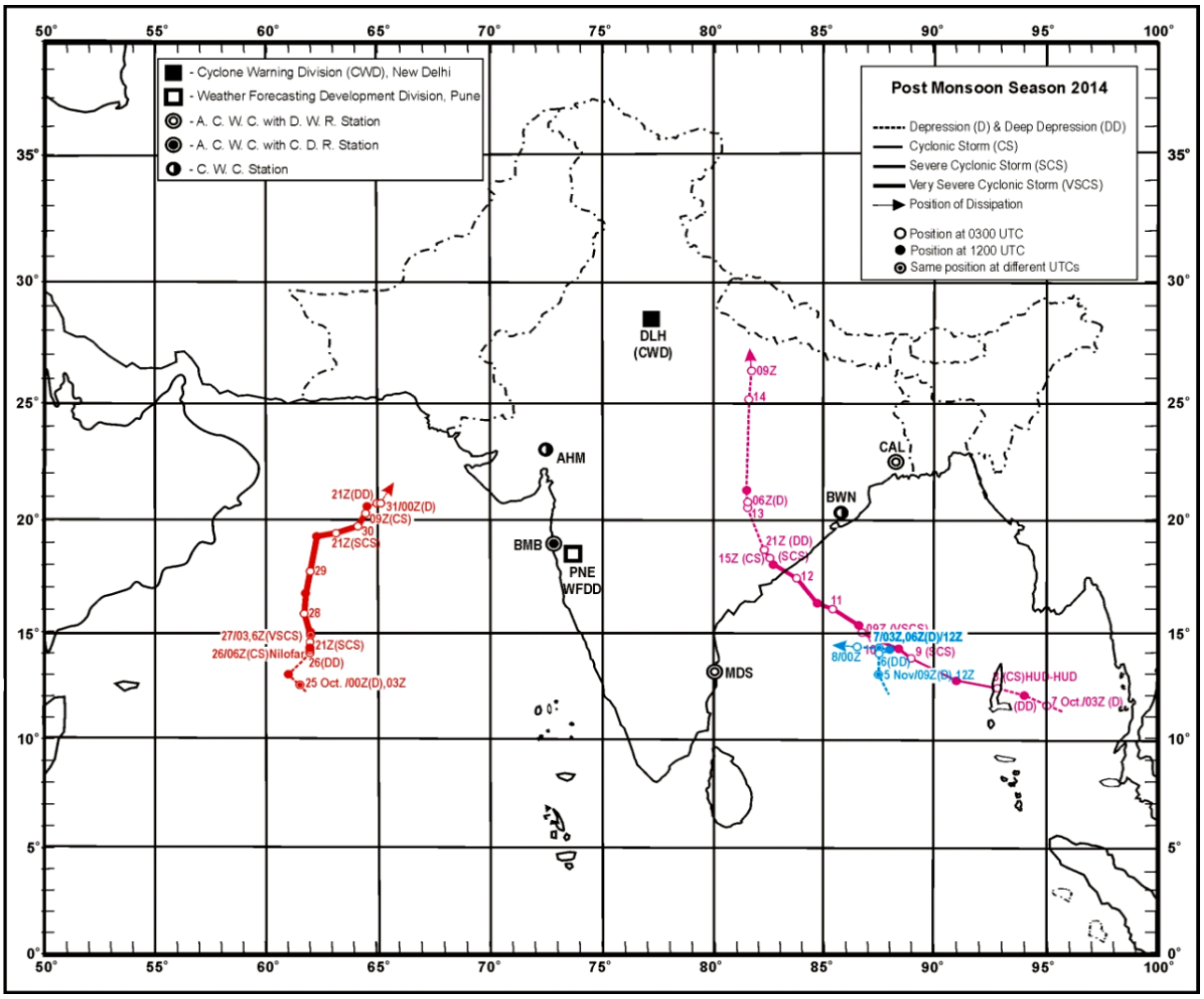

Fig. 2. Cyclones and depressions during Post-Monsoon Season 2014

of 15th October. An account on the withdrawal of southwest Monsoon 2014 is provided in the seasonal summary of Southwest Monsoon published in the last issue of Mausam.

3.1.2. *Commencement of northeast monsoon rains*

Rapid southward retreat of the Inter Tropical Convergence Zone (ITCZ) following the dissipation of the VSCS 'Hud Hud', associated reversal of lower tropospheric winds from southwesterlies to northeasterlies/easterlies and, significant increase in the rainfall activity over parts of south peninsula, led to the commencement of northeast monsoon rains on 18th October 2014, simultaneous with the withdrawal of Southwest monsoon from the entire country.

3.1.3. *Storms and depressions*

Two VSCS's, *viz*., Hud Hud (7th - 13th October) and Nilofar (25th – 31 October) formed over the Bay of Bengal and Arabian Sea respectively during the month. Of this, VSCS 'Nilofar' weakened insitu over the Sea without making landfall. Active/Vigorous northeast monsoon conditions prevailed over parts of south peninsula during the formation and intensification phase of the system. The VSCS 'Hud Hud' after crossing north Andhra Pradesh coast caused extremely heavy rainfall and flood situation over coastal Andhra Pradesh, Odisha and its neighbouring states of Chhattisgarh, Bihar, Jharkhand, Gangetic West Bengal and east Uttar Pradesh.

3.1.4. *Other synoptic features and associated weather*

Table 2 gives a summary of the synoptic features for the month of October 2014. The sub-divisionwise percentage departures of rainfall from normal and significant amounts of rainfall are given in Tables 1 & 5 respectively.

TABLE 2

Details of the weather systems during October 2014

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.	Very Severe Cyclonic storm (Hud Hud)*	7-14 Oct	Near Lat. 11.5° N/ Long. 95.0° E 250 kms east southeast of Long Islands	Northwest and then northward	Near Lat. 26.3° N/ Long. 81.8° E at 0900 UTC	Under the influence of a cyclonic circulation extending upto mid tropospheric levels over Gulf of Siam and neighbourhood, a low pressure area formed over Tenasserim coast and adjoining Andaman Sea on 6. It lay as a well marked low pressure area over the same region in early morning of 7. The Depression weakened into a well marked low pressure area over east Uttar Pradesh and neighbourhood on 14 evening and became less marked on 15
2.	Very Severe Cyclonic storm (Nilofar)*	25-31	West central and adjoining southwest Arabian Sea near Lat.12.5° N/ Long. 61.5° E	Nearly northward, north-northeast and than northeast	Northeast Arabian Sea near Lat.20.7° N/ Long. 65.1° E at 0900 UTC	Under the influence of a cyclonic circulation over Lakshadweep area embedded in a trough of low at mean sea level which extended from southeast Arabian Sea to east central Arabian Sea off Maharashtra coast a low pressure area formed over southeast Arabian Sea and neighbourhood on 21 and became well marked over southeast and adjoining east central Arabian Sea on 23. The Depression weakened into a well marked low pressure area over northeast Arabian Sea off north Gujarat coast on 31 and as a low pressure area over northeast and adjoining northwest Arabian Sea on 1 Nov. It became less marked on 2. Associated cyclonic circulation persisted upto 2 and became less marked on 3
(**B**) *Western disturbances /Eastward moving systems*						
(*i*) *Upper air cyclonic circulation*						
1.	Upto mid tropospheric levels	6-7	North Pakistan and neighbourhood	East northeast	Jammu & Kashmir and neighbourhood	Moved away on 8
2.	Do	10-12	Do	Do	Do	Moved away on 13
3.	Upto Mid tropospheric levels	13-16	Afghanistan and adjoining Pakistan	Northeast	Jammu & Kashmir and neighbourhood	It initially lay as a trough in mid tropospheric levels with its axis at 5.8 kms a.s.l. on 12. A trough was seen aloft during 13 - 16. It moved away on 17
4.	Do	18-21	Northeast Afghanistan and adjoining Pakistan	Do	Eastern parts of Jammu & Kashmir and neighbourhood	Moved away on 22
5.	Do	22-26	Northeast Afghanistan and neighbourhood	Do	Do	Moved away on 27
6.	Do	27-30	North Pakistan and neighbourhood	Do	Do	Moved away on 31
(*ii*) *Trough in westerlies*						
1.	Upto mid tropospheric levels. (axis at 5.8 kms a.s.l.)	7-10	Along Long. 65.0° E to north of Lat. 30.0° N	East northeast	Along Long. 77.0° E to north of Lat. 30.0° N	Moved away on 11

TABLE 2 (*Contd.*)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
2.	Between 1.5 & 3.1 kms a.s.l.	17	Sub-Himalayan West Bengal & Sikkim to northwest Bay of Bengal across Gangetic West Bengal	Stationary	*In situ*	Became less marked on 18
(*iii*)	*Induced cyclonic circulation*					
1.	Upto lower tropospheric levels	8	West Rajasthan and neighbourhood	Stationary	*In situ*	Less marked on 9
2.	Lower levels	11-12	Do	Quasi stationary	Southwest Rajasthan and neighbourhood	Became unimportant on 13
3.	Upto lower tropospheric levels	24-26	Do	East	North Madhya Pradesh and adjoining south Uttar Pradesh	Became less marked on 27
4.	Upto mid tropospheric levels	27-30	Do	Northeast	North Rajasthan and neighbourhood	Became less marked on 31
(**C**)	*Other upper air cyclonic circulations*					
1.	Upto mid tropospheric levels	1-2	East Uttar Pradesh and adjoining Bihar	Stationary	*In situ*	Less marked on 3
2.	Upto lower tropospheric levels	2-4	Southwest Bay of Bengal off Sri- Lanka coast	West	Lakshadweep – Comorin area	Became unimportant on 5
3.	Lower & upper tropospheric levels	3-8	Northern parts of Gangetic West Bengal and neighbourhood	Southwest	West central Bay of Bengal off south Andhra Pradesh	Less marked on 9
4.	Upto 2.1 kms a.s.l.	4-5	Eastern parts of Assam & Meghalaya and adjoining Nagaland-Manipur-Mizoram-Tripura	Do	Tripura and neighbourhood	Less marked on 6
5.	Lower & upper tropospheric levels	5-6	Sri Lanka and neighbourhood	West	Lakshadweep area and neighbourhood	Less marked on 7
6.	Lower levels	6-9	Vidarbha and neighbourhood	Northwest	Southwest Madhya Pradesh and neighbourhood	Less marked on 10
7.	Lower & mid tropospheric levels	10	Eastcentral Arabian Sea off Karnataka-Kerala coasts	Stationary	*In situ*	Less marked on 11
8.	Upto lower tropospheric levels	14	Lakshadweep area and neighbourhood	Do	Do	Less marked on 15
9.	Do	15-19	Gujarat and neighbourhood	East	Southwest Madhya Pradesh and neighbourhood	Less marked on 20
10.	Do	22 Oct - 1 Nov	Southwest Bay of Bengal off Sri Lanka coast	West	Lakshadweep area and neighbourhood	It lay as a trough at mean sea level over south Andaman Sea and neighbourhood on 20 and over southeast Bay of Bengal on 21. The cyclonic circulation lay as trough at mean sea level over Lakshadweep area on 2 & 3 and became less marked on 3 November
11.	Upto mid tropospheric levels	25-28	South Bangla Desh and adjoining northeast Bay of Bengal	Stationary	*In situ*	Became less marked on 29
12.	Lower & mid tropospheric levels	26-27	Southwest Rajasthan and neighbourhood	Northeast	Haryana and neighbourhood	Became les marked on 28

TABLE 2 (*Contd.*)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
(D)	*Troughs in easterlies*					
1.	Lower levels	4-5	Andaman Sea and neighbourhood	Stationary	*In situ*	Became less marked on 6
2.	At mean sea level	21-22	Southeast Arabian Sea and neighbourhood to Maharashtra coast	Do	Do	Became less marked on 4
3.	Do	17-20	Southwest Bay of Bengal off Sri Lanka coast	West	Sri Lanka and adjoining areas of coastal Tamil Nadu and southwest Bay of Bengal	Initially it lay as a cyclonic circulation extending upto 1.5 kms a.s.l. over southwest Bay of Bengal off Sri Lanka coast on 16. A cyclonic circulation aloft extending upto 3.1 kms a.s.l. during 17 – 19. The trough became less marked on 21
4.	Do	16-17	South Andaman Sea and neighbourhood	Do	Southeast Bay of Bengal and neighbourhood	It merged with the above system V(3) on 18
5.	Do	24 Oct - 3 Nov	Do	Northwest	Southwest Bay of Bengal and adjoining south Tamil Nadu- Sri-Lanka coasts	A cyclonic circulation extending upto 2.1 kms a.s.l. lay embedded in the trough over same region on 2 & 3. It became less marked on 4

** - The other details of the system are given in the 'Cyclones and Depressions 2014' in the July2015 issue of 'Mausam'*

The active ITCZ and formation of VSCS 'Hud Hud' over north Andaman Sea and, its movement in northwestward with landfall at Vishakapatnam during the first fortnight caused *excess/normal* rainfall over Andaman & Nicobar Islands, Odisha, Bihar, east Uttar Pradesh, Jammu & Kashmir, east Madhya Pradesh, Chhattisgarh and Kerala and *deficient/scanty* rainfall over the rest of the country. The second half of October witnessed the change in atmospheric circulation pattern with southward retreat of ITCZ and reversal of lower tropospheric winds from southwesterly to northeasterly. The formation of a VSCS 'Nilofar' over Arabian Sea and active Western Disturbances (WD) led to significant increase in the rainfall activity over Peninsular India and western Himalayan region.

Southwest monsoon was *vigorous* on 1 to 2 days in West Bengal & Sikkim, Odisha, Jharkhand, east Madhya Pradesh and Chhattisgarh and *active* on 1 to 3 days in Arunachal Pradesh, Gangetic West Bengal, Konkan & Goa, coastal & interior Karnataka and Kerala.

The northeast monsoon was *vigorous* on 1 to 2 days in Coastal Andhra Pradesh Rayalaseema, coastal Karnataka and south interior Karnataka and *active* on 6 days in Tamil Nadu and Kerala and on 1 to 3 days in Rayalaseema and coastal & south interior Karnataka.

3.1.5. *Temperature*

Both maximum and minimum temperatures were *near normal* over most parts of the country with maximum temperature *below normal* over parts of extreme northeast India and minimum temperatures *above normal* over parts of northwest and south peninsular India.

The *active/vigorous* northeast monsoon conditions, cyclogenesis (VSCS 'Nilofar') over the Arabian Sea and passage of a series of WD's and their induced systems kept the temperatures *below/appreciably below normal* over parts of peninsular India and parts of east India, western Himalayan region respectively during the last week of the month. It was near normal over the rest of the country.

No *heat wave/cold wave* condition occurred during the month.

The month's highest maximum temperature was 42.2° C recorded at Bhuj (Saurashtra & Kutch) on 11th October 2014 and the lowest minimum temperature was 10.0° C recorded at Titlagarh (Odisha) on 27th October, 2014 in the plains of the country.

3.1.6. *Disastrous weather events and associated damage*

As per press reports, VSCS 'Hud Hud' and rain related incidents claimed 43 lives in Andhra Pradesh and 6 in Odisha. About 17.41 lakh people across 1837 villages in 4 districts *viz*., Vishakapatnam, Srikakulam, Vijayanagaram and East Godavari were affected. Around 6500 houses were partially/fully damaged and Crops

TABLE 3

Details of the weather systems during November 2014

S. No.	System	Duration	Place of first Location	Direction of movement	Place of final location	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)
(**A**) *Depression/deep depression*						
1.	Deep Depression*	5-8	Over central and adjoining southeast Bay of Bengal near Lat. 13.0° N/ Long. 87.5° E	North-northwest	Lat. 14.3° N/ Long. 86.5° E	Under the influence of a trough of low at mean sea level over south Andaman Sea and adjoining Tenasserim coast, a low pressure area formed over southeast Bay of Bengal and neighbourhood on 4. It became well marked over the same region on 5 morning. The depression weakened into a well marked low pressure area over westcentral Bay of Bengal on 8 morning and over westcentral Bay of Bengal and adjoining coastal areas of Andhra Pradesh on 9. It became less marked on 10. Associated cyclonic circulation extended upto mid tropospheric levels
(**B**) *Low pressure area*						
1.	Low pressure area	10-13	South Andaman Sea and neighbourhood	West	Gulf of Mannar and adjoining areas of south coastal Tamil Nadu and Sri Lanka	Initially it lay as a cyclonic circulation extending upto 3.6 kms a.s.l. over Gulf of Siam and neighbourhood and as a trough of low at mean sea level over Tenasserim coast and adjoining Andaman Sea on 9. The low pressure area became less marked on 14. Associated cyclonic circulation extended upto mid tropospheric levels. it lay embedded in the trough in easterlies from Lakshadweep area to south Gujarat coast off west coast on 14 and became less marked on 15
2.	Do	25-30	Southwest Bay of Bengal and adjoining Equatorial Indian Ocean	Do	Southwest Bay of Bengal and neighbourhood	It formed under the influence of a cyclonic circulation extending upto lower tropospheric levels over Equatorial Indian Ocean and adjoining southeast Bay of Bengal on 24. It lay as a trough of low at mean sea level over southwest Bay of Bengal on 1 & 2 December and became unimportant on 3. Associated cyclonic circulation extended upto mid tropospheric levels
(**C**) *Western disturbances/eastward moving systems*						
(*i*) *Upper air cyclonic circulations*						
1.	Up to mid tropospheric levels	1-5	North east Afghanistan and adjoining north Pakistan	Northeast	Northern parts of Jammu & Kashmir	Moved away on 5 evening
2.	Do	6-9	North Pakistan and neighbourhood	Do	Northern parts of Jammu & Kashmir and neighbourhood	Moved away on 10 It lay as a trough in mid & upper tropospheric westerlies with its axis at 5.8 kms a.s.l. along Long. 60.0° E/ Lat. 25.0° N on 5 and aloft during 6-9
3.	Do	18-22	Do	Do	Do	The feeble W.D. moved away on 23
4.	Do	24-25	Do	Do	Northern parts of Jammu & Kashmir	The feeble W.D. moved away on 26
5.	Do	26-28	Northeast Afghanistan and adjoining Pakistan	Do	Jammu & Kashmir and neighbourhood	Moved away on 28 evening

TABLE 3 (*Contd*.)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
6.	Do	29 Nov - 2 Dec	North Pakistan and neighbourhood	Northeast	Jammu & Kashmir and adjoining north Pakistan	Moved away on 3 Dec. A trough aloft with its axis at 5.8 kms a.s.l. extended along Long. 64.0° E/ Lat. 30.0° N on 30 November, Long. 71.0° E/ Lat. 30.0° N on 1 December & 2 December
(*ii*)	*Trough in westerlies*					
1.	Upto mid & Upper tropospheric levels (axis at 5.8kms a.s.l.)	9-11	Along Long. 60.0° E/ Lat. 20.0° N	Do	Along Long. 72.0° E/ Lat. 25.0° N	Moved away on 12
2.	Do	12-15	Along Long. 52.0° E/ Lat. 25.0° N	Do	Along Long. 65.0° E/ Lat. 35.0° N	Moved away on16
(*iii*)	*Induced cyclonic circulations*					
1.	Upto lower tropospheric levels	4	Northwest Rajasthan and neighbourhood	Stationary	*In situ*	Less marked on 5
2.	Do	7-8	Central Pakistan and neighbourhood	East	Northwest Rajasthan and neighbourhood	Became un-important on 9
3.	Do	27-29	Central Pakistan and adjoining west Rajasthan		North Rajasthan and neighbourhood	Less marked on 28 evening
(**D**)	*Other upper air cyclonic circulations*					
1.	Upto mid tropospheric levels	4-6	Tripura and neighbourhood	Stationary	*In situ*	Less marked on 7
2.	Upto lower tropospheric levels.	10-11	Do	Do	Do	Less marked on 12
3.	Between lower & mid tropospheric levels	14-16	Do	Do	Do	Less marked on 17
4.	Upto lower tropospheric levels	16-17	Saurashtra & Kutch and neighbourhood	Do	Kutch and neighbourhood	Less marked on 18
5.	Between lower & mid tropospheric levels	20-22	Northern parts of Bangla Desh and neighbourhood	East	Bangla Desh and adjoining Tripura	Less marked on 23
6.	Upto lower levels	21-26	Southwest Bay of Bengal off Sri Lanka coast	West	Lakshadweep area and neighbourhood	Less marked on 27
(**E**)	*Troughs in easterlies*					
1.	Lower levels	11-16	Comorin area to south Gujarat coast	West	Southeast Arabian Sea to south Gujarat coast across eastcentral Arabian Sea	Moved away on 17
2.	At mean sea level	17-20	South Andaman Sea and neighbourhood	East	Equatorial Indian Ocean and adjoining central parts of south west Bay of Bengal	Less marked on 21
3.	Do	19-28	Lakshadweep area and neighbourhood	Do	Southeast Arabian Sea and neighbourhood	Initially it lay as a cyclonic circulation extending upto 0.9 km a.s.l. over Lakshadweep area and neighbourhood on 18. Moved away westward on 29

** - The other details of the system are given in the 'Cyclones and Depressions 2014' in the July2015 issue of 'Mausam'*

TABLE 4

Details of the weather systems during December 2014

S. No.	System	Duration	Place of first Location	Direction of movement	Place of final location	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)
(**A**) *Well marked low/low pressure area*						
1.	Well marked low	25 Dec 2014 - 1 Jan 2015	Southwest Bay of Bengal	Northwest	Westcentral Bay of Bengal and adjoining areas of north Andhra Pradesh and south Odisha	It lay as a trough of low at mean sea level over equatorial Indian Ocean and adjoining southwest Bay of Bengal off Sri- Lanka coast during 20 – 23 and over equatorial Indian Ocean and adjoining areas of Sri-Lanka and southwest Bay of Bengal on 24. Under its influence, a low pressure area formed over the same area on 25. It became well marked low pressure area over southwest Bay of Bengal off Sri Lanka coast on 26. It weakened into a low pressure area over west central Bay of Bengal and adjoining areas of north Andhra Pradesh and south Odisha on 1 January, 2015. Associated cyclonic circulation extending upto mid tropospheric levels persisted upto 4 and lay as a trough in the lower levels on 5 and became less marked on 6 January, 2015
(**B**) *Western disturbances/eastward moving cyclonic circulations*						
(*i*) *Upper air cyclonic circulations*						
1.	Upto mid tropospheric levels	11-15	Afghanistan and adjoining West Pakistan	Northeast	Jammu & Kashmir and neighbourhood	Moved away on 16
2.	Do	20-23	Northeast Afghanistan and adjoining Pakistan	Do	North Pakistan and adjoining Jammu & Kashmir	Moved away on 24
3.	Do	30 Dec 2014 - 1 Jan 2015	North Pakistan and adjoining Jammu & Kashmir	Stationary	*In situ*	The WD with a trough aloft moved away on 2 January, 2015
(*ii*) *Induced cyclonic circulations:*						
1.	Upto lower tropospheric levels	13-15	Southeast Rajasthan and neighbourhood	East	South Uttar Pradesh and neighbourhood	Less marked on 16
2.	Do	22-23	Central Pakistan and adjoining west Rajasthan	Do	West Rajasthan and neighbourhood	Less marked on 24
(*iii*) *Troughs in westerlies*						
1.	Mid and Upper tropospheric levels	3-5	Long. 60° E, to the north of 30° N (at 5.8 kms a.s.l.)	Northeast	Long. 72° E, to the north of 25° N	Moved away on 6
2.	Do	7-10	Long. 62° E, to the north of 30° N (at 5.8 kms a.s.l.)	Do	Long. 72° E, to the north of 35° N	It lay as a cyclonic circulation extending upto 3.1 kms a.s.l. over north Pakistan and adjoining Jammu & Kashmir with a trough aloft on 8 & 9. The feeble W.D. Moved away on 11
3.	Do	13-15	Long. 68° E, to the north of 25° N (at 5.8 kms a.s.l.)	Do	Long. 74° E, to the north of 25° N (at 5.8 kms a.s.l.)	It was seen aloft W.D II(a) 1. Moved away on 16
4.	Do	17-19	Long. 50° E, to the north of 25° N (at 5.8 kms a.s.l.)	Do	Jammu & Kashmir and adjoining north Pakistan	Moved away on 20. It was seen as a cyclonic circulation on 18 with a trough aloft (axis at 5.8 kms a.s.l.) along Long. 68° E, to the north of 30° N

TABLE 4 (*Contd*.)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
5.	Mid and Upper tropospheric levels	22-23	Long. 64° E, to the north of 30° N (at 5.8 kms a.s.l.)	Northeast	Long. 68° E, to the north of 35° N (at 5.8 kms a.s.l.)	Moved away on 24
6.	Mid tropospheric levels	24-26	Long. 55° E, to the north of 30° N (at 5.8 kms a.s.l.)	Do	Long. 72° E, to the north of 30° N	Moved away on 27
(**C**)	*Other cyclonic circulations*					
1.	Between lower & mid tropospheric levels	3-9	Bangla Desh and neighbourhood	East	Assam & Meghalaya and neighbourhood	Less marked on 10
2.	Upto upper tropospheric levels	4-6	South Andaman sea and adjoining Tenasserim coast	Stationary	*In situ*	Less marked on 7. It was embedded in the trough of low at mean sea level over south Andaman sea and adjoining Tenasserim coast
3.	Upto lower tropospheric levels	5-7	Comorin area and adjoining Sri-Lanka	West	Lakshadweep area and neighbourhood	Less marked on 8
4.	Do	8-10	South Andaman Sea and adjoining Malay Peninsula	Do	South Andaman Sea and neighbourhood	Less marked on 11
5.	Do	16-17	Bangla Desh and adjoining Tripura	East	Nagaland-Manipur-Mizoram-Tripura	Less marked on 18
6.	At lower levels	18	Lakshadweep area and neighbourhood	Stationary	*In situ*	Less marked on 19
7.	Between lower & mid tropospheric levels	21-23	Bangla Desh and neighbourhood	Oscillatory	Bangla Desh and neighbourhood	Became unimportant on 24
8.	Upto mid tropospheric levels	26	Bangla Desh and adjoining Tripura	Stationary	*In situ*	Less marked on 27
9.	Upto lower tropospheric levels	28-29	Lakshadweep area and neighbourhood	Do	Do	Less marked on 30
10.	Do	29-31	Bangla Desh and neighbourhood	East	Nagaland-Manipur-Mizoram-Tripura and neighbourhood	Less marked on 1 January, 2015
11.	Do	31 Dec 2014 - 3 Jan 2015	Eastcentral and adjoining northeast Arabian Sea off north Konkan and south Gujarat coast	Northwest	North Konkan and adjoining Gujarat Region	Less marked on 4 January, 2015
(**D**)	*Troughs in easterlies*					
1.	Trough of low at mean sea level	3-4	Gulf of Siam and neighbourhood	West	South Andaman Sea and adjoining Tenasserim coast	Less marked on 5
2.	Do	5-11	Central parts of south Bay of Bengal and neighbourhood	Do	Southwest Bay of Bengal off Sri- Lanka – Tamil Nadu coasts	Less marked on 12
3.	At lower levels	9-18	Southeast Arabian Sea to southwest Madhya Pradesh	Do	Southwest Arabian Sea and neighbourhood	Moved away on 19. A cyclonic circulation lay embedded at 0.9 km a.s.l. over north Madhya Maharashtra on 9 and became less marked on 10
4.	Trough of low at mean sea level	12-21	South Andaman Sea and neighbourhood	Do	Southeast Arabian Sea and neighbourhood	Became un-important on 22
5.	Do	21-26	Do	Do	Southeast Bay of Bengal	Merged with the well marked low pressure area over southwest Bay of Bengal off Sri Lanka coast

TABLE 5

Date	Some representative amounts of rainfall in cm for October, November and December 2014 (7 cm and above)
1 Oct	Saulighat 11, Annigere ARS 10, Tirumangalam and Visavadar 7 each.
2 Oct	Ayikudi 8, Perumpavur 7
3 Oct	Jamshedpur 7
4 Oct	Maya Bandar 25, Kollam Rly 14**,** Port Blair 13, Mannarkad and Thiruvananthapuram AP 7 each
5 Oct	Maya Bandar 14, Nimpara 7
6 Oct	Sarguru, Sankaridurg and Tiruchengode 10 each, Poonampet PWD 9, Begur and Kodungallur 8 each, Pappireddipatti, Dharmapuri, Dharmapuri PTO, Devala, Thali, Punalur and Sendamangalam 7 each
7 Oct	Tarikere, Angadipuram and Shimoga 9 each, Marandahalli and Perinthalamanna 8 each, Papanasam, Chittapur and Hosadurga 7 each
8 Oct	Port Blair 21, Long Islands 15, Karipur 14, Bankura CWC 12, Kollam Rly 11, Kota, Davangere PTO and Attur 10 each, Irinjalakuda 9, Maya Bandar, Thodupuzha, Kottayam, Joshipur and Mavelikara 8 each, Kayamkulam, Aluva PWD, Kunigal ARG, Kochi AP, Dharmapuri, Dharmapuri PTO, Rayakottah, Kanjirappally, Vaikom and Nagarjunsagar 7 each
9 Oct	Mannarkad 12, Omalur, Harapanahalli and Bengaluru AP 7 each
10 Oct	Kottayam 16, Kozhikode and Chalakudi 11 each, Sawantwadi and Kunnamkulam 9 each, Kayamkulam 7
11 Oct	Soro 12, Nischintakoili ARG 9, Tundi, Basudevpur AWS and Gharmura 7 each
12 Oct	Itchapuram 14, Mahendragarh, Visakhapatnam AP and Kalingapatnam 12 each, Basudevpur AWS and Visakhapatnam 11 each, Tihidi ARG, Pusapatirega, Vijayanagaram, Marsaghai ARG, Sagar, Jarmindi and Ranasthalam 10 each, Tekkali, Nellimarla, Garadapur ARG, Paradip and Palasa Mandal (ARG) 9 each, Paralakhemundi, Sompeta, Palasa, Udala and Cheepurupalli 8 each, Tirtol ARG, Mandasa, Denkada, Garividi, Jaipur, Berhampur, Nischintakoili ARG and Bhuban ARG 7 each
13 Oct	Yellamanchili 47, Visakhapatnam AP 40, Paderu 39, Gantyada 38, Srungavarapukota 34, R. Udaigiri 26, Pottangi, Nellimarla and Kalinga 24 each, Mahendragarh, Araku Valley and Chintapalli 23 each, Gajapathinagaram and Mohana 22 each, Similiguda AWS and Bhimunipatnam 21 each, Visakhapatnam 20, Pusapatirega, Bondapalle, Garividi, Palakonda and Denkada 19 each, Malkangiri, Anakapalle AP and Salur 18 each, Tikarpara, Nuagada ARG, Chandanpur, G Udayagiri AWS, Daringibadi, Anakapalli and Sukma 17 each, Belaguntha ARG, Khandapara and Vepada 16 each, Kashipur, Jhorigam ARG, Mentada, Raikia ARG, Jamshedpur and Barmul 15 each, Seethanagaram, Tikabali and Merakamudidam 14 each, Banki ARG, Araku Valley (ARG), Rayagada, Vijayanagaram, Parvatipuram and Chodavaram 13 each, Jiyyamma Valasa, Hazaribagh, Bobbili, Jhumpura, Palasa and Jamshedpur AP 12 each, Bhanjnagar, Ranasthalam, Digapahandi ARG, Cheepurupalli, Ghatagaon, Danagadi ARG, Veeragattam, Nayagarh and Garugubilli 11 each, Tentulikhunti ARG, Kantapada ARG, Jagannath Prasad ARG, Madhabarida, Keongjhargarh, Banpur and Daspalla 10 each, Narsinghpur, Balajipeta, Phiringia ARG, Rajkishorenagar, Odagaon ARG, Hindol, Bissem-Cuttack, Aska, Paralakhemundi, Nawana, Joda ARG, Koraput, Betanati ARG, Therlam, Pathapatnam, Mandasa, Ramgarh, Sorada, Ghatsila and Tekkali 9 each, Komarada, Chandikhol ARG, Ranchi AP, Palasa Mandal (ARG), Narayanpur, Jagdalpur, Jeypore, Chandil, Angul, Bangiriposi, Tuni and Jhalda 8 each, Gunupur, Rairakhol, Kashinagar, Nimdih, Gania ARG, Chandahandi ARG, Kurupam, Harabhanga, Tigiria ARG, Umarkote, Kalingapatnam, Kondagaon, Sukinda, Naktideul, Talcher and Samakhunta AWS 7 each
14 Oct	Amarkantak 28, Denkada, R. Udaigiri, Sidhi and Sidhi – AWS 19 each, Kotma and Hanumana 18 each, Manendragarh and Pendra 17 each, Pushparajgarh, Maihar and Deogaon Lalganj 16 each, Pali 15, Patti, Anuppur - AWS, Pratapgarh T and Chhatnag 13 each, Bara, Koraon, Salempur, Karchhana, Kawardha and Cheepurupalli 12 each, Rewa, Rewa - AWS, Kunda, Phoolpur Alb, Janakpur, Katghora, Sohagpur - AWS, Allahabad Sadar, Gudh, Paralakhemundi and Akbarpur 11 each, Bhamragad, Garividi, Allahabad AP, Jaithari, Bichhia, Satna and Satna – AWS 10 each, Simga, Soraon, Mungeli, Mau Tehsil, Pathapatnam, Handia, Meja, Sultanpur, Dindori - AWS, Gyanpur and Jaunpur Tehsil 9 each, Faizabad, Malanjkhand, G Udayagiri AWS, Bilaspur, Varanasi AP, Jaunpur CWC, Karnal Rev, Nuagada ARG, Bemetara, Mirzapur Tehsil and Haraiya 8 each, Rae Bareli CWC, Beberu, Fursatganj, Ayoadhya, Basti, Sultanpur CWC, Janjgir, Durg, Nagode, Tarabganj, Nakur, Umaria and Umaria - AWS 7 each
15 Oct	Motihari 19, Tribeni / Balmiki 18, Sheohar 17, Sonbarsa 16, Dhengbridge and Maharajganj 15 each, Gaunaha, Bagaha and Sursand 14 each, Bansi CWC, Lalbegiaghat, Regoli, Pharenda and Saulighat 12 each, Gorakhpur, Myladumpara Agri, Hata, Kakrahi, Ramnagar, Jaley and Chanpatia 11 each, Kamtaul, Birdghat, Madhwapur and Chatia 10 each, Domeriaganj, Basti CWC, Utarala, Bansgaon and Belsand 9 each, Khalilabad, Sardanagar, Biswan, Baghdogra AP, Hathwa and Chanderdeepghat 8 each, Ambasamudram, Ayoadhya, Sathyamangalam, Muhammadbad (G), Jainagar, Mukhlispur, Chandauli, Kangeyam, Ahirwalia, Bambasa, Mukteswar, Bhore, Katerniaghat and Kamudhi 7 each
16 Oct	Kalugumalai 9, Nanguneri 8, Kamudhi and Matijuri 7 each
17 Oct	Banki ARG 17, Mahanga ARG 7
18 Oct	Dgp Office 18, Kochi AP 17, Chennai city 16, Papanasam, Puducherry, Sirkali, Anna Uty ARG and Parangipettai 13 each, Thoothukudi, Vedaranniyam and Ramnad Nicra 12 each, Chennai AP, Kolapakkam ARG and Thoothukudi Port AWS 11 ech, Nanguneri, Vynthala, Tambaram, Ramanathapuram and Sethiathope 10 each, Chembarabakkam, Satyabama Uty ARG, Chembarambakkam ARG, Kurudamannil, Angadipuram and Kannur 9 each, Muthupet 8, Punalur, Irikkur, Cuddalore, Pamban, Thiruvidaimaruthur, Sathupalle, Anna University, K. M. Koil, Thippagondanahalli, Anaikaranchatram (Kollid), Kayamkulam Agri, Ambasamudram, Palayamkottai, Chengannur, Mayanur, Thiruvalangadu, Puzhal ARG, Chidambaram, Radhapuram and Srivaikuntam 7 each

TABLE 5 (*Contd.*)

Date	Some representative amounts of rainfall in cm for October, November and December 2014 (7 cm and above)
19 Oct	Karaikal 12, Radhapuram 11, Papanasam 10, Anna University, Ramanathapuram, Sirkali, Nagapattnam, Kelambakkam, Ennore AWS, Anna Uty ARG, Tiruchendur and Ramnad Nicra 9 each, Tada and Thiruvananthapuram 8 each, Mylaudy, Kolapakkam ARG, Chennai AP, Ambasamudram, Rangiya, Thoothukudi, Nuzvidu, Cuddalore, Chidambaram, Tondi, Poonamallee, Puzhal ARG, R.S.Mangalam and Kodungallur 7 each
20 Oct	Kodavasal 12, Mayiladuthurai, Anaikaranchatram (Kollid), K. M. Koil, Tiruchendur, Sirkali, Cuddalore and Pamban 11 each, Papanasam, Vedaranniyam and Red Hills 9 each, Thiruthuraipoondi, Pandavaiyar Head, Tiruvarur, Jayamkondam, Aduthurai AWS, Kumarakom, Chidambaram AWS, Parangipettai and Nannilam 8 each, Nagapattnam, Mani, Needamangalam, Papanasam, Chidambaram, Kumbakonam, Trangambadi or Tranqueb, Nimpara, Kottayam, Rameswaram and Kodaikanal 7 each
21 Oct	Palani 20, Chatrapatti (Odanchatra) 15, Mayiladuthurai 13, Thiruvidaimaruthur 12, Karaikal and Kodavasal 11 each, Aduthurai AWS, Ayikudi and Ottapadiram 10 each, Coonoor, Coonoor PTO and Vedaranniyam 9 each, Cuddalore, Nannilam, Nagapattnam, Kozha and Pandavaiyar Head 8 each, Papanasam, Thiruthuraipoondi, Anaikaranchatram (Kollid), Kodaikanal and Thenkasi 7 each
22 Oct	Papanasam, Cumbam and Thoothukudi 9 each, Tirumalla AP and Thoothukudi Port AWS 8 each, Coonoor and Coonoor PTO 7 each
23 Oct	CIAL Kochi 12, Nanguneri 11, Cheranmahadevi 10, Cherthala 9, Kunnamkulam 7
24 Oct	Bantwal, Satyabama Uty ARG, Chennai AP and Avinasi 9 each, Vadakkancherry, Perundurai, Karipur, Chennai city and Kolapakkam ARG 8 each, Manjeri, Poonamalle ARG, Puzhal ARG, Panchapatti, Anna University, Dgp Office, Ponneri, Panambur, Cholavaram, Anna Uty ARG and CIAL Kochi 7 each
25 Oct	Margao and Siddapura 12 each, Kudathini and Gorsoppa 9 each, Amarapuram 8, Linganamakki HMS, Kalyandrug and Tenali 7 each
26 Oct	Macharla and Margao 29 each, Udayagiri 21, Jangameshwarapuram (ARG) 19, Rentachintala 15, Marmugoa, Mapusa and Panjim (Goa) 14 each, Bevoor 13, Ponda and Karwar 12 each, Bapatla, Dodamarg, Dabholim (Goa), Bapatla AP, Nagarjuna Sagar (ARG), Quepem, Koppal PTO and Koppal R 11 each, Sanguem, Yerragondapalem, Yerragondapalem (ARG), Mulakalapalle, Malvan, Joida, Karamchedu, Sawantwadi and Valparai Taluk Office 10 each, Santebennur, Nandyal, Kushtagi, Addanki, Jammalamadugu and Proddatur 9 each, Hidkal Dam, Ilkal, Honavar, Pernem, Kudulu, Hagaribommanahalli, Miryalaguda, Kampasagar AP, Hosahalli, Nagarjunsagar and Chandrugonda 8 each, Gokarna, Kollamkode, Darsi, Kadra, Kundapura, Sankeshwar, Belgaum, Londa, Koilkuntla, Devgarh, Vengurla, Thodupuzha, Kusumanchi, Nalgonda, Jamkhandi, Munirabad ARG, Ankola, Kanjirappally, Porumamilla, Manchal, Jagalbet, Avanigadda, Kankavli, Kaladgi, Mudubidre, Namakkal, Mudagal, Ajjampura R, Chimakurthi, Chandgad and Belgaum (Sambra) 7 each
27 Oct	Pavagada 19, Y N Hoskote 12, Kavali AP 10, Tada, Ajjampura R, Kaveli, Yegati, B. Durga, Bhadravati and Chitradurga 9 each, Chandrugonda, C N Halli, Ottapadiram and Krishnarajpet 8 each, Jammalamadugu, Arsikere R, Sathupalle, Devala, Pennagaram, Panchanhall, Thippagondanahalli, Bargur, Avinasi, Konijerla, Tadpatri and Peermade To 7 each
28 Oct	Samayapuram 18, Gobichettipalayam 13, Chatrapatti (Odanchatra) 12, Mettupatti and Bhavanisagar 11 each, Palani, Sankarapuram, Uthangarai, Aravakurichi and Punganur 10 each, Perundurai, Sholavandan, Shivani, Kayamkulam and Idukki 9 each, Bangarpet, Palamner, Marandahalli, Vedasandur, Kangeyam, Kodumudi, Periyakulam AWS and Venbavur 8 each, Palacode, Virinjipuram AWS, Kamatchipuram, Aranmanaipudur, Sathyamangalam, Paiyur AWS, Bhavani, Parumbikulam and Kayamkulam Agri 7 each
29 Oct	Rajapalayam 11, K. Paramathy 9, Irikkur and Paramathivelur 8 each, Karur and Mattanur 7 each
30 Oct	Natham 8, Vadipatti 7
1 Nov	Thiruvananthapuram AP 7
2 Nov	Madurai AP and Srivilliputhur 13 each, Sivakasi 11, Peraiyur and Vadakara 9 each, Tirumangalam, Ponnani and Thiruchuzhi 8 each, Gudalur, Uttamapalayam, Kozhikode and Karipur 7 each
3 Nov	Nil
4 Nov	Long Islands and Nancowry 7 each
5 Nov	Nil
6 Nov	Nil
7 Nov	Kanjirappally 9
8 Nov	Nil
9 Nov	Nil
10 Nov	Nil
11 Nov	Osmanabad 15, Kothagiri 8, Ponnani 7
12 Nov	Coonoor, Coonoor PTO and Papanasam 7 each
13 Nov	Rameswaram 15, Thiruthuraipoondi 14, Cholavaram and Muthupet 11 each, Kavali AP, Vedaranniyam, Thamaraipakkam, Atmakur, Kaveli and Poondi 10 each, Gudur, Madukkur, Mahabalipuram, Ponneri, Poonamallee, Chengalpattu, Puzhal ARG, Red Hills, Nagapattnam, Piravam, Tambaram and Kozha 9 each, Karaikal, Chembarabakkam, Taramani ARG, Nellore, Tada, Sullurpet, Chennai city, Konni, Kvk

TABLE 5 (*Contd.*)

Date	Some representative amounts of rainfall in cm for October, November and December 2014 (7 cm and above)
	Kattukuppam ARG, Kelambakkam, Avanigadda, Anna University, Chennai AP, Kalavai AWS, Madavaram AWS and Mayiladuthurai 8 each, Uthiramerur, Anaikaranchatram (Kollid), Golkonda ARG, Papanasam, Anna Uty ARG, Chembarambakkam ARG, Hvf Avadi ARG, Nelogi, Satyavedu and Chidambaram AWS 7 each
14 Nov	Ongole 15, Vilupuram 14, Neyveli AWS and K. M. Koil 12 each, Sethiathope, Coonoor, Coonoor PTO and Uthagamandalam 10 each, Chimakurthi, Parangipetta, Kothagiri, Puducherry, Chidambaram, Panruti and Peravurani 8 each, Adirampattinam, Kodavasal, Cuddalore, Perungalur, Kandukur, Ulundurpet and Ketti 7 each
15 Nov	Chikhli and Satankulam 9 each, Amini Divi, Haliyal, Ramnad Nicra, Hangal, Nanguneri, Ramanathapuram, Kanyakumari and Karkala 7 each
16 Nov	Nil
17 Nov	Nil
18 Nov	Nil
19 Nov	Pamban 10, Madukkur and Rameswaram 7 each
20 Nov	Nil
21 Nov	Tiruchendur and Satankulam 19 each, Nanguneri 17, Radhapuram 14, Papanasam 13, Manamelkudi 11, Ambasamudram, Cheranmahadevi and Thoothukudi 9 each, Thoothukudi Port AWS, Nagercoil, Manimutharu u u and Kanyakumari 8 each, Srivaikuntam, Thuckalay, Colachel, Palayamkottai and Bhoothapandy 7 each
22 Nov	Nanguneri 11, Ramanathapuram 9, Papanasam, Radhapuram and Satankulam 7 each
23 Nov	Car Nicobar 11
24 Nov	CIAL Kochi 7
25 Nov	Hut Bay 7
26 Nov	Nil
27 Nov	Nil
28 Nov	Vedaranniyam 13, Rameswaram 10, Tiruchendur 9, Pamban 8, Nanguneri and Tondi 7 each
29 Nov	Nil
30 Nov	Ayikudi 8, Bhoothapandy 7
1 Dec	Nil
2 Dec	Vedaranniyam 11, Muthupet 8
3 Dec	Nil
4 Dec	Nil
5 Dec	Nil
6 Dec	Nil
7 Dec	Nil
8 Dec	Nil
9 Dec	Nil
10 Dec	Nellore 13, Nellore AP 11, Sullurpet 9, Coonoor and Coonoor PTO 7
11 Dec	Papanasam 16, Sriharikota AP 13, Neyyattinkara 10, Coonoor, Coonoor PTO and Piravam 9 each, Avinasi and Perumpavur 7 each
12 Dec	Ongole 7
13 Dec	Hadagalli 10, Mhasla 9, Siddapur 8, Erandol, Bellatti, Amini Divi, Kirwati, Bhira and Jalgaon 7 each
14 Dec	Gohar 11, Dharampur 10, Arki, Thirukoilur ARG, Tirukoilur and Kandaghat 9 each, Kasauli, Hoshiarpur AWS, Bhuntar AP and Nawanshahr 8 each, Dayalpura ARG, Sangraha, Chandigarh, Chandigarh Sase AWS, Naraingarh, Panchkula AWS, Karsog, Mahroni, Nahan, Nilambur, Tirupathi AP, Kahu, Rampur Bushar, Chhibramau, Kelambakkam and Poondi 7 each
15 Dec	Kurudamannil 11, Renuka / Dadhau 10, Arki 9, Mukteswar, Bajaura AGRO and Papanasam 7 each
16 Dec	Nil

TABLE 5 (*Contd.*)

Date	Some representative amounts of rainfall in cm for October, November and December 2014 (7 cm and above)
17 Dec	Parangipettai 15, Anaikaranchatram (Kollid) 8, Chidambaram AWS 7
18 Dec	Muthupet 11, Adirampattinam 8, Anaikaranchatram (Kollid), Kamudhi, Peravurani, Manamelkudi, K. M. Koil and Tiruvarur 7 each
19 Dec	Nil
20 Dec	Peravurani 8
21 Dec	Nil
22 Dec	Nil
23 Dec	Nil
24 Dec	Nil
25 Dec	Nil
26 Dec	Car Nicobar IAF 13, Car Nicobar 7
27 Dec	Nil
28 Dec	Nil
29 Dec	Trangambadi (Or) Tranqueb and Vedaranniyam 7 each
30 Dec	Ennore AWS and Kelambakkam 10 each, Satyabama Uty ARG, Dgp Office, Madavaram AWS, Chennai city, Anna University and Taramani ARG 9 each, Puzhal ARG, Anna Uty ARG and Red Hills 8 each, Chennai AP and Mahabalipuram 7 each
31 Dec	Nil

over 1.80 lakh hectares were damaged. Around 3000 animals and 24.43 lakh poultry perished. Flash flood and rain related incidents claimed 9 lives in Karnataka, 5 in Haryana Chandigarh & Delhi, 4 in Tamil Nadu and 1 in Meghalaya. Thunderstorm/Hailstorm/Lightning claimed 5 lives each in Andhra Pradesh, Tamil Nadu and Karnataka, 3 in Maharashtra and 1 in Manipur.

3.2. *November*

3.2.1. *Storms and depressions*

One intense low pressure system as Deep Depression formed over the Bay of Bengal during the month.

3.2.2. *Other synoptic features and associated weather*

A summary of the synoptic systems for the month of November 2014 is given in Table 3. The sub-divisionwise percentage departure of rainfall from normal and the significant amounts of rainfall during the month are given in Tables 1 & 5 respectively.

The rainfall activity remained subdued and confined to southern parts of Peninsular India despite the formation of Deep Depression over southeast Bay of Bengal, whereas the passage of active WD caused precipitation over Western Himalayan region and adjoining plains during the initial half of the first fortnight. A high amplitude trough in the lower tropospheric easterlies super-posed by favourable upper level divergence extended the rainfall belt to western and central parts of India during initial half of second fortnight. Thereafter the feeble nature of WD and tropical easterlies remain confined to the equatorial latitudes kept the rainfall activity subdued over the country as a whole.

The northeast monsoon was *active / vigorous* over the sub-divisions of the northeast monsoon regime *viz*., : Coastal Andhra Pradesh, Rayalaseema, Tamil Nadu, coastal Karnataka and Kerala during last few days of first fortnight.

3.2.3. *Temperature*

Cold wave conditions prevailed on 4 to 5 days over Jammu & Kashmir, east Madhya Pradesh and on 1 to 3 days over east Uttar Pradesh, Jharkhand, west Rajasthan and west Madhya Pradesh.

Maximum temperature were *above normal* over most parts of the country outside parts of east India where it were *below normal*. Minimum temperatures were *below normal* over parts of east, northeast and peninsular India and *above normal* over western parts of central India and adjoining areas of northwest India.

The month's lowest minimum temperature over the plains of the country was 2.6 °C, recorded at Muzaffarnagar (west Uttar Pradesh) on 25th November, 2014.

3.2.4. *Disastrous weather events and associated damage*

Rain related incidents/lightning claimed 4 lives in Tamil Nadu, 3 each in Madhya Pradesh and Andhra Pradesh and 2 in Maharashtra. Avalanche in Jammu & Kashmir claimed 3 lives. A 'cloud burst' as reported by press occurred in a village Patti Samdal in Kukernag (Anantnag district) on 9th November damaged property worth lakhs of rupees and injured 14 people.

3.3. *December*

3.3.1. *Storms and depressions*

No intense low pressure system formed during the month.

3.3.2. *Weather and associated synoptic features*

Table 4 gives a summary of the synoptic systems during the month of December 2014. The sub-divisionwise percentage departure of rainfall from normal and the significant amounts of rainfall during the month are given in Tables 1 & 5 respectively.

The presence of a deep trough in mid & upper tropospheric westerlies and high amplitude easterly wave in the lower levels led to moisture incursion and thus enhanced the northeast monsoon activity over the northeast monsoon regime. The constructive interference of these troughs caused *widespread to fairly widespread* rainfall with heavy rain and hailstorm at isolated places over peninsular India and adjoining parts of central India during mid December and towards the end of the month. This caused *active/vigorous* northeast monsoon conditions over Tamil Nadu, coastal Karnataka and Kerala.

Further, the active WD's also caused heavy snow fall over western Himalayan region and *scattered to fairly widespread* rainfall over the northern plains during this period. Subsequent to the northeastward movement of WD, the remnant moisture, in the presence of cold air advection from the north, manifested in the form of persistent dense fog over northwest India and along the Indo-Gangetic plains. Thus *cold wave/severe cold wave* conditions prevailed over north, northwest and central India for most of the days of the second fortnight of the month.

No intense low pressure system formed during the month. However, a well marked low pressure area formed over southwest Bay of Bengal which moved along the east coast during the last week of the month caused *isolated to scattered* rainfall with *isolated* heavy rainfall over parts of sub-divisions along the east coast of south peninsular India.

3.3.3. *Temperature*

Maximum temperatures were *appreciably to markedly below normal* over parts of northwest and adjoining east India and *below normal* over parts of central India outside extreme north and northeast and rest of the country, where it was *above normal*. Minimum temperatures were *below normal* over parts of extreme north, east and central India and *above normal* over western parts of northwest India and parts of extreme south peninsula & northeast India. They were *near normal* over the rest of the country.

Severe cold wave conditions prevailed on 1 to 2 days over Madhya Pradesh, Vidarbha and north interior Karnataka. *Cold wave* conditions prevailed on 5 to 7 days over Odisha, east Uttar Pradesh, Madhya Pradesh and Vidarbha; on 1 to 4 days over Jharkhand, Bihar, west Uttar Pradesh, Haryana, Chandigarh & Delhi, Himachal Pradesh, Jammu & Kashmir, Rajasthan, Gujarat State, Marathwada, Chhattisgarh and Telangana.

Cold day conditions prevailed on 13 days over Punjab; on 8 to 9 days over west Uttar Pradesh and Haryana, Chandigarh & Delhi; on 5 days over east Uttar Pradesh and 1 to 2 days over Bihar and Jammu & Kashmir.

'Leh' town recorded minimum temperature of *minus* 17.0 °C on 28th December.

The month's and season's lowest minimum temperature in the plains of the country was *minus* 0.5° C recorded at Bikaner (west Rajasthan) on 25th December 2014.

3.3.4. *Disastrous weather events and associated damage*

According to media reports, severe cold and dense fog affected the normal life in north India such that it claimed 163 lives in Uttar Pradesh, 11 in Uttarakhand, 5 in Punjab, 2 in Haryana Chandigarh & Delhi and 1 in Rajasthan. Rain/snow claimed 23 lives in Uttarakhand. Flashflood and lightning claimed 1 life each in Andhra Pradesh and Tamil Nadu respectively.

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 from 12.5 cm to 24.4 cm.
Extremely heavy rain	- rainfall amount 24.5 cm and above.
Heavy snowfall	- 35.6 cm to 64.4 cm.
At most places (Widespread)	- 76% or more stations of a meteorological sub-division reporting at least 2.5 mm rainfall.
At many places (Fairly widespread)	- 51% to 75% stations of a meteorological sub-division reporting at least 2.5 mm rainfall.
At a few places (Scattered)	- 26% to 50% stations of a meteorological sub-division reporting at least 2.5 mm rainfall.
At isolated places (Isolated)	- 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

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 $\leq$ 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 °C to –6 °C, and for stations whose normal minimum temperature is less than 10 °C when the departure from normal is –4 °C to –5 °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.