

Weather in India

POST MONSOON SEASON (October - December 2013)†

1. Introduction

The post-monsoon season 2013 was cyclogenetically active. In all, six intense low pressure systems formed during the season. These include; three Very Severe Cyclonic Storms (VSCSs) ‘Phailin’, ‘Lehar’ & ‘Madi’, one Severe Cyclonic Storm (SCS) ‘Helen’, one Deep Depression and one Depression. Except one Deep Depression formed over the Arabian Sea all other systems formed over the Bay of Bengal. There had been only two other years viz., 1922 & 1966 in the recorded history (1877-2013) during which, 4 intense low pressure systems reaching the intensity of Severe Cyclonic Storm and higher formed over Bay of Bengal during post monsoon season.

Out of the six systems, four crossed the Indian coast (of which one ‘Madi’ crossed the mainland and emerged over Arabian Sea) and caused death and damages. One system just gave the weather, except the Deep Depression (08-11 November) formed over the Arabian Sea did not affect the country.

Tracks of these systems are given in Fig. 2. Further details are available in the article on ‘Cyclones & Depressions over the north Indian Ocean 2013’ published in the July 2014 issue of Mausam.

The northeast monsoon rains commenced over Peninsular India on 21st October and ceased on 18th January 2014. The El-Nino indicators maintained a neutral phase all through the season. A weak phase of Madden-Julian Oscillations coincided the commencement phase of northeast monsoon.

Severe cold wave conditions prevailed in several parts of India during December. Also thick fog affected normal life in parts of north and central India especially in the month of December.

The Post monsoon being cyclogenetically active, major weather related disasters that occurred over the country during this period were related to intense pressure systems, apart from severe cold and fog.

* *Definitions of terms in italics other than sub-titles are given in Appendix A.*

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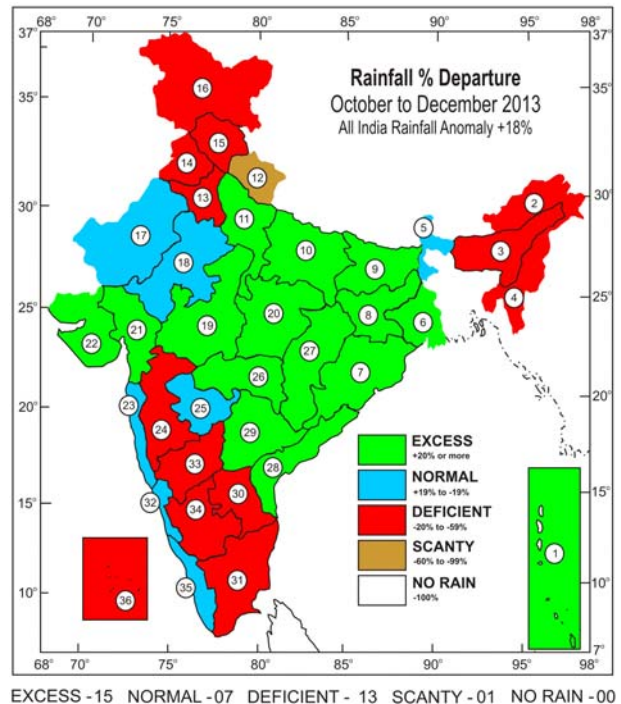


Fig. 1. Sub-divisionwise seasonal rainfall departure from normal (%) for Post monsoon season (October to December 2013). Sub-divisions are indicated by number on the map & bold letters in legend. The rainfall anomaly values for these 36 sub-divisions are indicated below :

1	30	7	172	13	-50	19	34	25	13	31	-33
2	-28	8	207	14	-30	20	118	26	63	32	7
3	-34	9	155	15	-43	21	72	27	128	33	-28
4	-48	10	64	16	-28	22	20	28	39	34	-37
5	18	11	29	17	17	23	7	29	110	35	-10
6	124	12	-60	18	17	24	-41	30	-25	36	-47

2. Seasonal rainfall (October–December)

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

During the season, rainfall activity over the country as a whole was *excess* except for the Western Himalayan region, extreme northeastern region, parts of interior peninsula and eastern parts of southern peninsula received *deficient/scanty* rainfall.

TABLE 1
Sub-divisionwise rainfall (mm) for each month and season as a whole (October-December, 2013)

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	455.8	296.7	54	354.2	253.7	40	92.3	145.5	-37	902.4	695.9	30
2.	Arunachal Pradesh	164.1	183.0	-10	13.3	45.8	-71	14.6	38.4	-62	192.0	267.2	-28
3.	Assam & Meghalaya	125.9	154.8	-19	1.1	28.4	-96	2.0	11.8	-83	128.9	195.0	-34
4.	Naga., Mani., Mizo. and Tri.	125.6	179.8	-30	0.3	50.7	-99	1.2	12.5	-90	127.1	243.0	-48
5.	Sub-Himalayan West Bengal & Sikkim	199.8	154.2	30	16.1	20.3	-21	2.7	10.8	-75	218.5	185.3	18
6.	Gangetic West Bengal	358.3	129.3	177	0.0	23.3	-99	0.0	7.5	-99	358.3	160.1	124
7.	Orissa	390.9	111.6	250	1.2	27.7	-96	0.0	4.8	-99	392.2	144.1	172
8.	Jharkhand	281.1	75.2	274	0.0	9.9	-100	0.0	6.5	-100	281.1	91.6	207
9.	Bihar	197.1	64.8	204	0.4	6.9	-94	0.0	5.8	-100	197.5	77.5	155
10.	East Uttar Pradesh	97.4	49.2	98	0.5	4.5	-89	1.1	6.7	-83	99.0	60.4	64
11.	West Uttar Pradesh	59.7	42.1	42	1.7	4.7	-63	9.0	7.6	19	70.4	54.4	29
12.	Uttarakhand	29.1	58.6	-50	3.2	9.7	-67	3.8	21.3	-82	36.2	89.6	-60
13.	Haryana, Chandigarh & Delhi	11.0	17.6	-38	1.7	4.9	-65	2.1	6.9	-70	14.8	29.4	-50
14.	Punjab	16.2	22.0	-26	6.1	5.7	7	6.6	13.3	-51	28.9	41.0	-30
15.	Himachal Pradesh	20.5	42.5	-52	15.8	20.3	-22	25.4	45.4	-44	61.6	108.2	-43
16.	Jammu & Kashmir	48.2	38.9	24	18.8	33.0	-43	28.4	59.9	-53	95.4	131.8	-28
17.	West Rajasthan	10.1	5.4	88	1.0	2.5	-61	0.0	1.6	-100	11.1	9.5	17
18.	East Rajasthan	30.5	16.9	81	1.3	7.4	-82	0.3	3.3	-90	32.2	27.6	17
19.	West Madhya Pradesh	68.7	34.4	100	0.3	11.0	-97	2.4	7.7	-69	71.4	53.1	34
20.	East Madhya Pradesh	124.2	37.5	231	0.5	9.9	-95	1.0	10.4	-90	125.7	57.8	118
21.	Gujarat region	59.9	23.7	153	0.1	9.5	-99	0.0	1.7	-100	60.0	34.9	72
22.	Saurashtra & Kutch	34.7	17.9	94	0.0	10.3	-99	0.0	0.8	-100	34.7	29.0	20
23.	Konkan & Goa	155.8	121.0	29	2.5	22.3	-89	1.3	5.3	-75	159.6	148.6	7
24.	Madhya Maharashtra	57.8	79.0	-27	4.0	22.7	-83	1.3	6.1	-79	63.1	107.8	-41
25.	Marathwada	94.3	72.3	30	7.4	21.2	-65	13.1	8.1	62	114.8	101.6	13
26.	Vidarbha	133.5	59.6	124	0.0	13.2	-99	0.0	9.0	-100	133.5	81.8	63
27.	Chattisgarh	174.6	62.3	180	0.3	8.8	-97	0.1	5.8	-99	175.0	76.9	128
28.	Coastal Andhra Pradesh	384.3	193.2	99	66.5	106.6	-38	4.2	27.6	-85	455.0	327.4	39
29.	Telangana	232.6	92.2	152	17.3	21.6	-20	1.1	5.5	-80	251.0	119.3	110
30.	Rayalaseema	140.4	129.4	8	23.6	66.1	-64	1.5	23.7	-94	165.5	219.2	-25
31.	Tamil Nadu	127.9*	180.2	-29	112.3	170.0	-34	53.2	88.0	-40	293.4	438.2	-33
32.	Coastal Karnataka	238.2	189.5	26	38.4	59.6	-36	5.3	13.7	-62	281.8	262.8	7
33.	North interior Karnataka	101.0	112.0	-10	4.2	27.3	-85	0.1	6.0	-99	105.2	145.3	-28
34.	South interior Karnataka	103.7	147.7	-30	24.9	49.2	-49	2.4	12.7	-81	131.0	209.6	-37
35.	Kerala	259.9	292.3	-11	154.9	150.9	3	17.0	37.5	-55	431.8	480.7	-10
36.	Lakshadweep	72.8	157.1	-54	78.1	117.7	-34	26.7	58.8	-55	177.6	333.6	-47

TABLE 2
Details of the weather systems during October 2013

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 (Phailin)	8 -14 (M) Oct	Near Lat. 12.0° N/ Long. 96.0° E	West-west, northwest and then north-northeast	Near Lat. 24° N/ Long. 84.0° E	Details are given in the article on 'Storms & Depressions over the north Indian Ocean' in the July 2014 issue of 'Mausam'
(B) Low pressure area						
1.	Well marked Low	20 - 27(M)	Central parts of south Bay of Bengal	West	North coastal Andhra Pradesh and neighbourhood	It formed under the influence of a cyclonic circulation extending upto 3.1 kms a.s.l. over southeast Bay of Bengal and neighbourhood. It became less marked in the evening of 27. However, the associated cyclonic circulation extending upto mid tropospheric levels persisted upto 30 October and became less marked on 31 October
(C) Western disturbances/eastward moving systems						
(i) Upper air cyclonic circulation						
1.	Upto Mid tropospheric levels	1 - 3	Jammu & Kashmir and neighbourhood	Northeast	Eastern parts of Jammu & Kashmir	It lay as a trough in mid & upper tropospheric levels on 4 & 5 from eastern parts of Jammu & Kashmir to east central Arabian Sea and became less marked on 6
2.	Do	18	Do	Do	Do	Moved away on 19. Initially it lay as a trough in mid tropospheric levels with its axis at 5.8 kms a.s.l. along Long. 65.0° E to north of Lat. 30° N on 16 & 17
3.	Do	26 - 28	Northeast Afghanistan and neighbourhood	Do	Northern parts of Jammu & Kashmir	A trough was seen aloft on 27. It moved away on 29
(ii) Trough in westerlies						
1.	Upto mid tropospheric levels	11	Central parts of Uttar Pradesh to east central Arabian Sea across west Madhya Pradesh, north Madhya Maharashtra and north Konkan	Stationary	<i>In situ</i>	Less marked on 12
2.	Do	13 - 14	Along Long. 65.0° E to north of Lat. 28° N (axis at 5.8 kms a.s.l.)	East	Along Long. 72.0° E to north of Lat. 28° N	Moved away on 15
3.	Upto lower levels	15	Bihar and neighbourhood to southwest Bay of Bengal	Stationary	<i>In situ</i>	Became less marked on 16. It was seen with an embedded cyclonic circulation over north coastal Andhra Pradesh and neighbourhood
4.	Mid & Upper tropospheric levels	23 - 25	Along Long. 65.0° E to north of Lat. 35° N (axis at 5.8 kms a.s.l.)	Southeast	Along Long. 82.0° E to north of Lat. 30° N	Moved away on 26
(iii) Induced cyclonic circulation						
1.	Upto mid tropospheric levels	30 Oct - 2 Nov	Central Pakistan and neighbourhood	East	Central Parts of Uttar Pradesh	Less marked on 3 November

TABLE 2(Contd.)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
(D) Other upper air cyclonic circulations						
1.	Upto 0.9 km a.s.l.	4	Gujarat region and neighbourhood	Stationary	<i>In situ</i>	Less marked on 5
2.	Upto Mid tropospheric levels	6 - 9	Assam & Meghalaya and neighbourhood	South	Bangla Desh and adjoining areas of north Bay of Bengal	Less marked on 10
3.	Do	12 - 14	West Rajasthan and neighbourhood	East	East Rajasthan and neighbourhood	Less marked on 15
4.	Upto 4.5 kms a.s.l.	16 - 19	Southwest Bay of Bengal off Tamil Nadu-south Andhra Pradesh coasts	West	Sri Lanka and neighbourhood	Less marked on 20
5.	Do	10 - 11	Saurashtra & neighbourhood	Do	Northeast Arabian Sea off Gujarat coast	Less marked on 12
6.	Upto 1.5 kms a.s.l.	30 Oct - 1 Nov	Assam & Meghalaya	East	Manipur and neighbourhood	Less marked on 2 November. It lay initially as a trough in easterlies at 3.1 kms a.s.l. from the low pressure area over Telangana and adjoining areas of coastal Andhra Pradesh and Rayalaseema on 25 and as a wind discontinuity in lower & mid tropospheric levels during 26 - 28; it then lay as a trough in westerlies extending upto 3.1 kms a.s.l. from Sub-Himalayan West Bengal & Sikkim to north Bay of Bengal on 29
(E) Troughs in easterlies						
1.	Lower tropospheric levels	20 - 22	Central parts of south Bay of Bengal to north Odisha coast	West	West central and adjoining southwest Bay of Bengal off south Andhra Pradesh - north Tamil Nadu coasts	Became less marked on 23
2.	Lower levels	31 Oct - 3 Nov	Southwest Bay of Bengal to west central Bay of Bengal	Do	Comorin area to west central Bay of Bengal across southwest Bay of Bengal	It merged with the trough of low at mean sea level from Lakshadweep-Maldives areas to east central Arabian Sea on 4
(F) East-west trough						
1.	Between 3.1 & 5.8 kms a.s.l.	7 - 12	Assam & Meghalaya to Gujarat Region across Jharkhand and Madhya Pradesh	Oscillatory	Northeast Arabian Sea to the centre of Storm 'Phailin' across Gujarat, north Madhya Maharashtra, Vidarbha and Chhattisgarh	Became less marked on 13

TABLE 3

Details of the weather systems during November 2013

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.	Severe Cyclonic Storm (Helen)	19 - 23	Lat. 14.5° N/ Long. 86.5° E west central Bay of Bengal	West northwest and then southwest	Lat. 15.9° N/ Long. 80.4° E over Coastal Andhra Pradesh	Details are given in the article on 'Storms & Depressions over the north Indian Ocean' in the July 2014 issue of 'Mausam'
2.	Very Severe Cyclonic Storm (Lehar)	23 (eve.) - 28	Lat. 8.5° N/ Long. 96.5° E (550 kms south southeast of Port Blair)	Northwest and then west northwest	Lat. 16.0° N/ Long. 80.8° E	Do
(B) Depression/deep-depressions						
1.	Deep Depression	8 - 11 (06Z)	Lat. 8.0° N/ Long. 56.5° E	West and then northwest	Lat. 8.2° N/ Long. 49.6° E over coastal Somalia	Do
2.	Depression	13 - 16	Southwest and adjoining southeast Bay of Bengal. (Lat. 11.5° N/ Long. 86.5° E)	West	Tamil Nadu (40 kms north northeast of Tiruchirapalli). Lat. 11.0° N/ Long. 79.0° E	Do
(C) Western disturbances/eastward moving systems						
<i>(i) Upper air cyclonic circulations</i>						
1.	Up to 4.5 kms a.s.l.	1 - 2	North Pakistan and adjoining Jammu & Kashmir	Northeast	Jammu & Kashmir and neighbourhood	Moved away on 3. It lay as a trough in mid & upper tropospheric westerlies with its axis at 5.8 kms a.s.l. during 29 to 31 October
2.	Do	7 - 9	Do	Do	Northern parts of Jammu & Kashmir	Moved away on 10. It lay as a trough in mid & upper tropospheric westerlies with its axis at 5.8 kms a.s.l. during 4 to 6
3.	Do	10 - 13	North east Afghanistan and neighbourhood	Do	Northern parts of Jammu & Kashmir and neighbourhood	Moved away on 14
4.	Do	18 - 19	North Pakistan and adjoining Jammu & Kashmir	Do	Jammu & Kashmir and neighbourhood	Moved away on 20. It lay as a trough in mid & upper tropospheric westerlies on 16 & 17
5.	Do	23 - 24	North Pakistan and neighbourhood	Do	Eastern parts of Jammu & Kashmir	Moved away on 25. It lay as a trough in mid & upper tropospheric westerlies on 22
6.	Do	25 - 27	Jammu & Kashmir and adjoining north Pakistan	Do	Do	Moved away on 28. It lay as a trough in mid & upper tropospheric westerlies on 24
<i>(ii) Trough in westerlies</i>						
1.	Upto mid & upper tropospheric levels	19 - 21	Along Long. 60.0° E/ Lat. 30.0° N (axis at 5.8 kms a.s.l.)	Do	Along Long. 72.0° E/ Lat. 35.0° N	Moved away on 22
2.	Do	27 - 29	Along Long. 60.0° E/ Lat. 20.0° N (axis at 5.8 kms a.s.l.)	Do	Along Long. 70.0° E/ Lat. 30.0° N	Moved away on 30

TABLE 3 (Contd.)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>(iii) Induced cyclonic circulations</i>						
1.	Upto 2.1 kms a.s.l.	5 - 8	Central Pakistan and neighbourhood	West	Southeast Rajasthan and adjoining west Madhya Pradesh	Less marked on 9
(D) Other upper air cyclonic circulations						
1.	Upto 2.1 kms a.s.l.	12 - 16	Lakshadweep area and neighbourhood	Stationary	<i>In situ</i>	Merged with the low pressure area over Lakshadweep area and adjoining Kerala on 17
2.	Upto 0.9 km a.s.l.	28 - 30	Do	Do	Do	Less marked on 1 December
3.	Upto 1.5 kms a.s.l.	20	Comorin area and neighbourhood	Do	Do	Less marked on 21
4.	Upto 0.9 km a.s.l.	22 - 24	Lakshadweep area and neighbourhood	Do	Do	Less marked on 25
5.	Upto 2.1 kms a.s.l.	24 - 26	South Tamil Nadu and neighbourhood	East	Comorin and Adjoining Lakshadweep area	It lay as a trough in lower levels extending from Lakshadweep area to south Konkan - Goa on 27 and from cyclonic circulation over Lakshadweep area and neighbourhood to south Maharashtra coast on 28. The trough became less marked on 29
(E) Troughs in easterlies						
1.	Trough of low at mean sea level	4 - 6	Southwest Bay of Bengal to west central Bay of Bengal along Sri Lanka- Tamil Nadu coasts	West	Comorin area to southwest Bay of Bengal	Less marked on 7
2.	Do	25 - 26	South Tamil Nadu to south Madhya Maharashtra	Do	Comorin and adjoining Lakshadweep area to south Konkan & Goa across Karnataka	Less marked on 27
3.	Do	30 Nov - 2 Dec	Sri Lanka to north Tamil Nadu coast	East	Southwest & adjoining southeast Bay of Bengal to central Bay of Bengal off north Tamil Nadu - south Andhra coasts	Less marked on 3

3.1.4. Other synoptic features and associated weather

Table 2 gives a summary of the synoptic features for the month of October 2013. The sub-divisionwise percentage departures of rainfall from normal and significant amounts of rainfall are given in Tables 1 & 5 respectively.

The active ITCZ and formation of VSCS 'Phailin' over the Bay of Bengal during the first fortnight caused *excess/normal* rainfall over most parts of the country. The second half of October witnessed the change in atmospheric circulation pattern with southward retreat of ITCZ and reversal of lower winds from southwesterlies to northeasterlies added with the formation of a low pressure

TABLE 4

Details of the weather systems during December 2013

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 (Madi)	6 - 13	Lat. 10.0° N/ Long. 84.0° E (530 kms southeast of Chennai)	North-northeast- and then southwest and finally westward	Lat. 10.0° N/ Long. 78.8° E (50 kms east-northeast of Madurai)	Details are given in the article on 'Storms & Depressions over the north Indian Ocean' in the July 2014 issue of 'Mausam'
(B) Western disturbances/Eastward moving cyclonic circulations						
<i>(i) Upper air cyclonic circulations</i>						
1.	Upto mid tropospheric levels	2 - 3	North Pakistan and adjoining Jammu & Kashmir	Northeast	Eastern parts of Jammu & Kashmir	Moved away on 4. It lay as a trough in mid & Upper tropospheric levels with its axis at 5.8 kms a.s.l. extended along Long. 65° E, to the north of 25° N on 30 Nov. and along Long. 67° E, to the north of 25° N on 1 December
2.	Do	4 - 6	Along Long. 62° E, to the north of 35° N	Do	North Pakistan and adjoining Jammu & Kashmir	The WD initially as a trough lay as Upper air cyclonic circulation on 5. It moved away on 7
3.	Mid and upper tropospheric levels	7 - 10	Long. 60° E, to the north of 30° N (at 5.8 kms a.s.l.)	Do	Northern parts of Jammu & Kashmir and neighbourhood	It lay as a trough on 8. It moved away on 11
4.	Upto mid tropospheric levels	10 - 12	North Pakistan and neighbourhood	Do	North Pakistan and adjoining Jammu & Kashmir	Moved away on 12 evening
5.	Do	20 - 23	North Afghanistan and neighbourhood	Do	Eastern parts of Jammu & Kashmir	Moved away on 24. A trough aloft was seen on 21 and 22
6.	Do	23 - 28	Northeast Afghanistan and adjoining Pakistan	Do	Eastern parts of Jammu & Kashmir	Moved away on 29
7.	Do	28 Dec - 2 Jan	Central parts of Afghanistan	Do	Jammu & Kashmir and adjoining north Pakistan	Moved away on 2 January 2014
<i>(ii) Induced cyclonic circulations</i>						
1.	Upto 0.9 km a.s.l.	3	West Rajasthan and neighbourhood	Stationary	<i>In situ</i>	Less marked on 4
2.	Upto lower tropospheric levels	19 - 20	Haryana and neighbourhood	East	Haryana and adjoining west Uttar Pradesh	Less marked on 21
3.	Upto 3.1 km a.s.l.	31 Dec - 1 Jan	Haryana and adjoining Punjab	Do	Haryana and neighbourhood	Moved away on 2 January 2014
<i>(iii) Troughs in westerlies</i>						
1.	Mid and upper troposphere	16 - 18	Long. 60° E, to the north of 32° N (at 5.8 kms a.s.l.)	East	Long. 74° E, to the north of 35° N	Moved away on 19
2.	Do	24 - 28	Long. 65° E, to the north of 30° N (at 5.8 kms a.s.l.)	Do	Long. 75° E, to the north of 25° N	Less marked on 29

TABLE 4 (Contd.)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
(C) Other cyclonic circulations						
1.	Upto 3.1 km a.s.l.	8	Lakshadweep area	Stationary	<i>In situ</i>	Less marked on 9
2.	Upto mid tropospheric levels	12 - 15	Arunachal Pradesh and neighbourhood	East	Arunachal Pradesh and adjoining Nagaland-Manipur-Mizoram-Tripura	Moved away eastwards on 16
3.	Upto lower tropospheric levels	13 - 21	South Andaman Sea and neighbourhood	West	Sri-Lanka and adjoining southwest Bay of Bengal	Less marked on 22
4.	Upto 3.6 kms a.s.l.	18	Lakshadweep area and neighbourhood	Stationary	<i>In situ</i>	Less marked on 19
5.	Upto 1.5 kms a.s.l.	21 - 22	East Rajasthan and adjoining northwest Madhya Pradesh	Do	Do	Less marked on 23
6.	Upto lower tropospheric levels	22 - 26	Southeast Bay of Bengal and neighbourhood	West	Comorin-Maldives area	Less marked on 27
7.	Upto 1.5 kms a.s.l.	27 - 28	East Rajasthan and adjoining areas of west Madhya Pradesh and Gujarat region	Stationary	<i>In situ</i>	Became unimportant on 29
8.	Upto lower tropospheric levels	30 - 31	West Madhya Pradesh and adjoining east Rajasthan	Do	Do	Less marked on 1 January 2014
(D) Troughs in easterlies						
1.	Trough of low at mean sea level	2 - 8	Lakshadweep area to north Maharashtra coast	Oscillatory	Lakshadweep area to south Maharashtra coast	Less marked on 9
2.	Do	16 - 17	Andaman Sea and neighbourhood	Stationary	<i>In situ</i>	Moved away on 18
3.	Do	26 - 27	Southwest Bay of Bengal off Tamil Nadu coast	Do	Do	Less marked on 28

area led to significant increase in the rainfall activity over parts of south Peninsula.

Southwest monsoon was *vigorous* on 1 to 4 days in Assam & Meghalaya, Sub-Himalayan West Bengal & Sikkim, Gangetic West Bengal, Odisha, Jharkhand, Bihar, Uttar Pradesh, Madhya Pradesh, Gujarat State, Konkan & Goa, Vidarbha, Chhattisgarh, Telangana and coastal Karnataka and *active* on 4 to 5 days in Gangetic West Bengal, Odisha, Jharkhand, Marathwada and Kerala and on 1 to 3 days in Arunachal Pradesh, Assam & Meghalaya, Nagaland-Manipur-Mizoram-Tripura, Bihar, east Uttar Pradesh, Konkan & Goa, Vidarbha, Chhattisgarh, Coastal

Andhra Pradesh, Tamil Nadu, coastal Karnataka and south interior Karnataka.

The northeast monsoon was *vigorous* on 5 days in Coastal Andhra Pradesh and 2 days in Rayalaseema and *active* on 1 to 3 days in Coastal Andhra Pradesh, Rayalaseema, south interior Karnataka and Kerala.

Temperature

The delay in withdrawal of southwest monsoon and the formation of a Very Severe Cyclonic Storm kept the maximum temperatures generally *below/appreciably below*

TABLE 5

Date	Some representative amounts of rainfall in cm for October, November and December 2013 (7 cm and above)
1 Oct	Balasore 19, Digha 16, Nilgiri 15, Contai and Bhograi 14 each, Sagar 13, Sagar Island AWS, Tikarpara, Sukinda, Nh5 Gobindpur and Krishnaprasad 12 each; Contai, Jaleswar, Reamal, Athmalik and Naktideul 11 each, Khushalgarh and Sandur 10 each, Gania ARG, Rajghat, Joshipur, Batagaon, Sonepur, Soro, Tikabali and Kuknoor 9 each, Rajkanika, Janjgir, Chandbali, Udala, Wanakbori, Siddapura, Khandapara, Patnagarh, Sajjangarh, Bayad and Jaipur 8 each, Nawarangpur, Boudhgarh, Khairamal, Rajkishorenagar, Kadana, Sabong, Fatepura, Nawana, Junagarh, Santrampur, Korba, Dharamasala, Bari ARG, Birmaharajpur ARG, Purushottampur, Bolagarh ARG and Palampur 7 each
2 Oct	Hindgir and Ramgarh 15 each, Bangana R 13, Khambhalia, Gurundia ARG and Ranchi AP 12 each, Balumath 11, Kuru and Jhalda 10 each, Bijepur, Janjgir, Pauni, Mandar, Mungeli and Nilgiri 9 each, Bhagamandala, Tiring, Pathalgaon and Balasore 8 each, Loisingha ARG, Bilaspur, Deobhog, Berhampore, Badami, Gaisilet ARG, Jaleswar, Panposh, Barmul, Mendarda, Rajghat and Raidih 7 each
3 Oct	Perur 19, Agumbe 15, Hingoli – Hydro 14, Katol, Jagtial, Kanpur AP, Siricilla, Pallipattu and Metpalli 10 each, Unnao Tehsil, Ajaigarh and Chindwara 9 each, Sultanabad, Kallamnuri, Bishalgarh and Nilgiri 8 each, Nagpur AP, Bagepalli, Wardha, Perseoni, Ramayampet, Arundhutinagar, Khowai, Kharidwar, Warora, Phulberia, Purwa and Mahagaon 7 each
4 Oct	Pendra 18, Garotha 17, Dapoli Agri and Barshitakli 15 each, Agra IAF, Bari and Chahtarpur 14 each, Guhagarh and Rath 13 each, Khajuraho and Uttoor 12 each, Rajnagar, Lakhipur, Sapau, Baseri, Wakwali Agri and Nagaon 11 each, Ajaigarh, Rupbas, Guntur and Amarkantak 10 each, Budaun, Arvi, Mangrulpir, Narsapur, Sarmathura, Shriramsag, Pocha, Kharangha, Bemetara, Guwahati AP and Jastrana 9 each, Dholpur Tehsil, Chandahandi ARG, Chanderi, Satna, Korpana, Ballarpur, Luxettipet, Rajakhera, Panna, Nandgaonkazi, Patur, Chandanpur, Huzurabad, Karhal, Mehgaon, Bhadravati, Bhimavaram, Jagtial AP and Seoni 8 each, Ashoknagar, Pusad, Gajoldoba, Jalesar, Kalmeshwar, Kaleswaram, Bapatla, Annapurnaghat, Chiplun, Pombhurna, Kalavai AWS, Rahata, Pipili, Narkheda, Uluberia, Ner, Sironcha, Manora, Perseoni, Baghdogra AP, Kathua, Hinganghat, Karimganj, Khanapur, Bareilly CWC, Joiti, Cherrapunji (RKM), Mul, Forbesganj, Kasganj, Ambah and Lanja 7 each
5 Oct	Allahabad AP 20, Kalpi Tehsil and Wakwali Agri 18 each, Cherrapunji (RKM), Cherrapunji and Chhatnag 17 each, Turtipar, Karchhana and Mhasla 16 each, Khed and Allahabad Sadar 15 each, Soraon 14, Chanderi, Mankapur, Mawsynram, Dapoli Agri, Minapur and Koraon 13 each, Pendra and Ghazipur 12 each, Amarkantak, Benibad, Meja, Aie Nh Xing, Dabholim (Goa), Beberu, Handia and Phoolpur Alb 11 each, Bara, Gonda CWC, Harnai, Buxaduar, Siswan and Ratnagiri 10 each, Guhagarh, Deogaon Lalganj, Kurkheda, Salempur, Jhansi, Mahedi / Mehshi, Jaunpur CWC, Shriwardhan, Ponda, Ayoadhya, Darauli, Mandangad and Ghazipur CWC 9 each, Chapra, Mau Tehsil, Gopalganj, Mirzapur CWC, Diu, Barobhisha, Zamania, Una, Jaunpur Tehsil, Varanasi city, Akbarpur, Lakhandur and Rajghat (VNS CWC) 8 each, Mirzapur Tehsil, Korchi, Ahirwalia, Gokarna, Garotha, Matijuri, Sheohar, Muzaffarpur, Pernem, Haraiya, Desaignanj, Margao, Datia, Sangameshwar Devrukh, Teliamura, Marmugoa, Vengurla, Ghosi and Devgarh 7 each
6 Oct	Cherrapunji 21, Shirali 20, Cherrapunji (RKM) 18, Melabazar / Matunga and Bhatkal 16 each, Saulighat 14, Buxaduar, Pattamundai and Jalpaiguri 13 each, Raiganj, Bolpur, Tantloi and Sriniketan 12 each, Manki 11, Dhubri CWC and Numaligarh 10 each, Basua, Jhanjharpur, Rangiya, Pakuria, Sankalan, Alipurduar CWC, Gheropara, Kumargram, Valpoi, Kollur, Kolkata, Bhalukpong, Barobhisha and Mudubidre 9 each, Kokrajhar, Panambur, Kannur, Karandighi, Jamtara, Chatia, Beky Rly.Bridge, Baghmara AWS, Linganamakki HMS, Mulki, Goalpara CWC, Nalhati, Mangalooru AP, Alipurduar, Dinhati and Goalpara 8 each, Dhubri, Kampur, Guwahati AWS, Puthimari, Seppa, Udipi, Guwahati AP, Gokarna, Gorakhpur, Karkala, Kathua, Gossaigaon, Kaliaganj, Taliparamba and Barkisuriya 7 each
7 Oct	Dahanu 13, Lakkanpur ARG 8, Lumding and Aroyavaram 7 each
8 Oct	Maya Bandar 24, Chikballapur 12, Puri and Ambabhona 11 each, Vythiri and Harinkhola 10 each, Port Blair, Balumath, Sarangarh and Nelamangala 9 each, Mulbagal, Dahanu, Paikmal, Vagra and Kolabira ARG 8 each, Bijepur, Champa, Kuknoor, K. Paramathy, Barrackpur IAF, Katghora, Malur, Barvala, Dhandhuka, Long Islands, Maihar and Sukinda 7 each
9 Oct	Long Islands and Maya Bandar 34 each, Marandahalli 20; Kota AP 14, Panchapatti 12, Lilia and Nagrota Surian 11 each, Mount Abu, Bangarpet, Mounnt Abu Tehsil and Abu Road 10 each, Piravam, Dharoi Colony, Deesa, Krishnagiri, Derabis ARG, Ernakulam South, Korchi, Guler, Baripada, Pattamundai, Pratapgarh and Veja 9 each, Nandigram, Amb, Paiyur AWS, Kodungallur, Dhambola, Petlawad and Kannod 8 each, Thogamalai, Port Blair, Kochi AP, Satyabadi ARG, Arantangi, Birmaharajpur ARG, Dhanera, Khedbrahma, Vadali, Pennagaram, Vyara, Hogenekal, Telkoi, Depalpur, Kadi, Chengam, Binjharpur ARG, Car Nicobar, Dahegam, Vikarabad and Keeranur 7 each
10 Oct	Vadakara 19, Maya Bandar 16, Yeotmal and Ner 14 each, Mahuva 13, Yellandu, Murtajapur, Hyderabad and Car Nicobar 10 each, Aswaraopet AP, Belaguntha ARG, Mahuva, Hyderabad AP and Jagannath Prasad ARG 9 each, Sholingur, Car Nicobar IAF, Swam-Patna, Quilandi, Vijaywada AP, Narsapur, Kothagudam, Thamaraipakkam and Srungavarapukota 8 each, Ullunda ARG, Banpur, Sirkali, Ketti, Arani, Nandgaonkazi, Kolar Gold Field, Jawhar, Dubak, Madhbun, Medchel / Manchal, K.M.Koil, R.K.Pet, Chevella, Madhira, Gudivada, Hakimpet and Koderu 7 each
11 Oct	Murtajapur 10, Pattukottai, Khambhalia and Khambha 9 each, Nandgaon 8, Gotegaon, Ariyalur, Chinnoor, Gadarwara, Kaleswaram, Malanjhand and Akot 7 each
12 Oct	Nasirabad 15, Kujanga ARG, Jagatsinghpur AWS and Deolgaon Raja 9 each, Mohanpur, Brahmagiri AWS, Korei ARG and Akhuapada 8 each, Soro, Dhamnagar ARG, Danagadi ARG, Kaptipada ARG, Puri, Alipingal, Raghunathpur ARG, Amritsar IAF, Ajnala, Mehgaon, Ghatsila and Makrana 7 each

TABLE 5 (Contd.)

Date	Some representative amounts of rainfall in cm for October, November and December 2013 (7 cm and above)
13 Oct	Banki ARG 38, Balimundali 31, Ranpur 30, Bangiriposi 28, Jaipur and Kalinga 26 each, Mundali 25, Nilgiri, Hindol and Kaptipada ARG 23 each, Soro and Odagaon ARG 21 each, Banpur, Nawana, Parjang ARG, Chaibasa, Mohana and Itchapuram 20 each, Kantamal, Korei ARG, R.Udaigiri, Nuagada ARG, Joda ARG and Danagadi ARG 19 each, Purushottampur, Nayagarh and Keongjigarh 18 each, Khandapara, Bhubaneswar AP, Samakhunta AWS, Balipatna ARG, Bolagarh ARG, Daringibadi, Pallahara and Tikarpara 17 each, Daitari, Phiringia ARG and Tangi 16 each, Betanati ARG, Udala, Raikia ARG, Nimpara, Chandikhol ARG, Basudevapur AWS, Tiring and Pattamundai 15 each, Rairangpur, Phulbani, K Nuagaon ARG, Jhumpura, Daspalla, Akhuapada, Baripada, Rambha AWS, Ghatagaon and Narsinghpur 14 each, Naraj, Dhenkanal, Nh5 Gobindpur, Tikabali, Thakurmunda, G Udayagiri AWS, Barmul, Kankadahad ARG and Narla ARG 13 each, Chandbali, Gania ARG, Bari ARG, Talcher, Lanjigarh, Puri, Athgarh and Dhamnagar ARG 12 each, Mandar, Anandpur, Nischintakoili ARG, Angul, Batagaon, Balasore, Cuttack, Kendrapara, Sompeta, Derabis ARG, Jamsolaghat, Athmalik, Madanpur Rampur, Jujumura ARG, Rairakhol and Salepur ARG 11 each, Jenapur, Mandasa, Alipingal, Swam -Patna, Palasa and Telkoi 10 each, Bhadrak AWS, Reamal, Kaniha ARG, Mahanga ARG, Rajkanika, Sukinda, Boudhgarh, Champua, Rajghat, Bhuban ARG, Niali ARG, Dumri, Mohanpur, Tirtol ARG, Bijaypur (Adp), Joshipur, Tigiria ARG, Jaleswar, Baliguda, Binjharpur ARG and Jagatsinghpur AWS 9 each, Banarpal ARG, Kotagarh, Balikuda ARG, Bonth, Muniguda ARG, Tihidi ARG, Sarath, Chendipada, Karanjia and Paradip 8 each, Altuma CWC, Bijepur, Kamakhyanager, Tenughat, Ranchi AP, Harichandanpur ARG, Thrissur, Jajpur, Raghunathpur ARG, Phulberia, Papunki, Ghatsila, Gumla, Hiranpur, Belgaon, Kantapada ARG, Jammu IAF, Kalingapatnam, Kharsema and Gurundia ARG 7 each
14 Oct	Kodawanpur / C.Bii 22, Purihansa 18, Godda and Both Gaya 17 each, Sarath, Hasanpur, Papunki, Korei ARG and Barkisuriya 16 each, Tenughat, Chakradharpur, Gomia, Bokaro, Udai Kishanganj, Simula, Jamtara, Tusuma, Koderma and Gaya AP 15 each, Jhajha, Rosera, Tilaiya and Hayaghat 14 each, Jamsolaghat, Banka, Kharidwar, Topchanchi, Monghyr, Garhi, Sahebpur Kanal and Panki 13 each, Arwal, Colgaon, Mehgawan, Asansol CWC, Jamui, Baltara and Ekangersarai 12 each, Kinjar, Japla, Bhagalpur, Muzaffarpur, Nandadih, Benibad, Bangiriposi, Tensa, Samastipur, Purnea, Baripada, Chapra and Jarmindi 11 each, Bankura CWC, Katihar, Basua, Araria, Kuratha, Sheikhpura, Sirmari B.Pur, Deoghar, Khagadia, Putki, Kamtaul, Bankura, Hindgir, Samakhunta AWS, Manihari, Murliganj, Jamshepur AP, Sukiapokhri, Panchet, Jamshepur, Jhanjharpur and Salempur 10 each, Rajauli, Phulberia, Barhi, Balimundali, Chandil, Thakurmunda, Sabour, Bihar Shrif, Palmerganj, Jahanabad, Minapur, Maithon, Sono, Rewaghat, Pathargama, Belsand, Jaipur, Bagati (Magra), Chandikhol ARG, D.P.Ghat, Dehri, Sripalpur, Vaishali, Koilwar, Salepur ARG, Hiranpur and Islampur 9 each, Kolkata, Kundapura, Mahedi / Mehshi, Siswan, Bhimnagar, Makhdumpur, Dumka, Barrackpur IAF, Amrapara, Maheshpur, Barbigha, Dhanbad, Sahebganj, Zamania, Nimdih, Nirmali, Saraiya, Patna AP and Ghazipur CWC 8 each, Ramgarh, Jashpurnagar, Nawana, Kansabati Dam, Forbesganj, Churk, Ratua ARG, Bonth, Pakur, Hisua, Ballia, Pakuria, Palkot, Hariharganj, Madhwapur, Nawada, Gopalganj, Mohammedabad (Y), Baigania, Krishnanagar, Mukutmonipur ARG, Karanjia, Simdega, Daltonganj, Madhupur, Gobindpur, Ghazipur and Moharo 7 each
15 Oct	Katihar and Kursela 24 each, Purnea 23, Gangarampur ARG 22, Maheshpur 19, Darjeeling 18, Madhipura 17, Murliganj and Bagrakote 16 each, Barahara and Chargharia 15 each, Udai Kishanganj and Bhagalpur 14 each, Champasari, Murti, Kalingpong, Pedong, Malda and Siliguri ARG 13 each, Jalpaiguri, Dinhati ARG, Colgaon, Gajoldoba and Namchi AWS 12 each, Domohani, Gangtok, Araria, Sevoke, Manihari, Sabour and Soreng ARG 11 each, Chanpatia, Gorakhpur, Baghdogra AP and Damthang 10 each, Pakur, Khanitar, Neora, Mekhliganj ARG, Hiranpur, Astaranga ARG, Mathabhanga and Singla Bazar 9 each, Tadong, Chepan, Mehgawan, Nagarkata, Sukiapokhri, Deoria, Phulparas and Gyalsing AWS 8 each, Koilwar, Cooch Behar, Khalilabad, Rannagar, Regoli, Pundibari AWS, Narayanpur, Taibpur, Jainagar, Dumka, Godda, Basua, Deogaon Lalganj, Virudachalam and Mukhlisur 7 each
16 Oct	Usilampatti and Sholavandan 12 each, Anekal 8, Tirumangalam, Nilakottai and Kalasa 7 each
17 Oct	Punalur 19, Enamakal, Kurudamannil and Thrissur 16 each, Parumbikulam 14, Dharapuram and Vadipatti 13 each, Mulanur, Bhavanisagar and Sholavandan 12 each, Hosahalli 11, Annur, Kovilankulam and Avinasi 10 each, Irinjalakuda, Gobichettipalayam, Sathyamangalam, Chengannur and Tirumangalam 9 each, Kangeyam and Mavelikara 8 each, Thodupuzha, Andipatti, Mettupalayam, Rasipuram, Vilathikulam, Ambalavayal, Periyakulam AWS and Piravam 7 each
18 Oct	Siswan 8, Devakottai 7
19 Oct	Darauli 20, Kottayam 11, Watrap and Pollachi 10 each, Vellanikkara 8, Sivakasi, Aranmanaiapur, Pamban and Kovilankulam 7 each
20 Oct	Thalasserry 15, Thiruvananthapuram and Kanjirappally 14 each, Bapatla AP 11, Tindivanam, Perinthalamanna, Nedumangad, Madurai AP, Napoklu, Mani and Manjeri 9 each, Papanasam, Thanjavur, Konni, Marsrakh and Konanur 8 each, Parangipettai, Mavelikara, Punalur, Natham, Barahara, Arantangi, Mandya, Bhagamandala and Muthupet 7 each
21 Oct	DGP Office 10, Sriharikota AP and Madavaram AWS 9 each, Muniguda ARG, Tikabali and Chennai city 8 each, Kotagarh, Chennai AP, Yerragondapalem, Cholavaram, Anna University and Red Hills 7 each
22 Oct	Kaveli 13, Kavali AP 12, Kanjirappally 11, Kalingapatnam 10, Cuttack, Nellore, Rajampet, Proddatur and Pattamundai 9 each, Kuchinda and Pulivendla 8 each, Salepur ARG, Itchapuram, Anakapalli, Kadamdeuli ARG, Banaigarh AWS, Anakapalle AP, Ongole, Amalapuram, Avaniigadda, Bari ARG, Nischintakoili ARG, Sullurpet, Utukuru AP and Narsapur 7 each
23 Oct	Palakkad 30, Mandasa 17, Basudevapur AWS, Palasa, Sompeta, Itchapuram and Berhampur 15 each, Krishnaprasad, Anakapalli, Prathipadu, Chodavaram, Kakinada and Banpur 12 each, Kalingapatnam, Khandapara, Chandbali, Tihidi ARG and Gopalpur 11 each, Bhimavaram, Tuni, Binjharpur ARG, Srungavarapukota, Amalapuram, Narsapur, Ranpur, Bantwal, Nischintakoili ARG and Porumamilla 10 each, Araku Valley, Banki ARG, Mahendragarh, Peddapuram, Kaveli, Visakhapatnam AP, Dhamnagar ARG, Peddapuram AP, Tirupathi AP, Enamakal,

TABLE 5 (Contd.)

Date	Some representative amounts of rainfall in cm for October, November and December 2013 (7 cm and above)
	Visakhapatnam, Mundali, Purushottampur, Kavali AP, Soro, Yellamanchili, Puri, Bolagarh ARG and Rajkanika 9 each, Koderu, Nimpara, Salepur ARG, Nayagarh, Tirtol ARG, Akhuapada, Belaguntha ARG, Kurugodu and Tekkali 8 each, Y N Hoskote, Brahmagiri AWS, Macharla, Dhadesugur ARG, Balasore, Devarkonda, Bargur, Nilgiri, Naraj, Paradi, Yerragondapalem, Tangi, Bapatla, Mudubidre, Chhatrapur, Kakatpur, Achampet, Pipili, Astaranga ARG, Jajpur, Gajapathinagaram, Bari ARG, Cuttack, Bhadrak AWS, Korei ARG, Thyagarathi and Venkatagiri Town 7 each
24 Oct	Kalingapatnam 32, Ongole 31, Aska 28, Digapahandi ARG 26, Mahendragarh and Achampet 22 each, Belaguntha ARG and Jagannath Prasad ARG 21 each, Kakinada, Paralakhemundi and Tekkali 20 each, Mohana, Sorada and Darsi 18 each, Hindol 16, Darsi AP, Madhabarida, Prathipadu and Bhanjnagar 15 each, Addanki, Mandasa, R.Udaigiri and Odagaon ARG 14 each, Piduguralla, Palasa, Devarkonda and Devala 13 each, Bapatla, Bhimunipatnam, Itchapuram, Purushottampur, Balasore and Macharla 12 each, Sompeta, Vijayanagaram, Avanigadda, Ranpur and Thalasserry 11 each, Mannarkad, Nuagada ARG, Visakhapatnam, Pathapatnam, Kalwakurthi, Seetharampuram and Chevella 10 each, Kashinagar, Nayagarh, Banki ARG, Mudigere, Anakapalli, Basudevur AWS, Nilgiri and Jaipur 9 each, Atmakur, Udala, Khandapara, Visakhapatnam AP, Berhampur, Nagarkurnool, Ranasthalam, Gajapathinagaram, Banpur, Sathenapalli, Bhubaneshwar AP, Palakonda, Hounsabhavi and Sultanabad 8 each, Chhatrapur, Tangi, Therlam, Kalinga, Mundali, Salepur ARG, Betanati ARG, Guntur, Nalgonda, Cuttack, Cheepurupalli, Dhenkanal, Kantapada ARG, Narsinghpur, Bangiriposi, Pipili, Haunsbhavi ARG, Koderu, Kollapur, Gooty, Machilipatnam, Peddapuram, Bolagarh ARG and Medak 7 each
25 Oct	Hindol 30, Prathipadu 26, Kendrapara 25, Ranpur 24, Aska and Chhatrapur 22 each, Garadapur ARG, Khandapara and Derabis ARG 20 each, Odagaon ARG and Tirtol ARG 19 each, Mundali, Marsaghai ARG, Nimpara and Jagatsinghpur AWS 17 each, Visakhapatnam AP, Binjharpur ARG, Digapahandi ARG, Bari ARG and Alipingal 16 each, Kalwakurthi, Daspalla, Amrapara, Tekkali, Bolagarh ARG, Pattamundai, Rajkanika, Kollapur, Pakuria and Rentachintala 15 each, Avanigadda, Chandbali, Astaranga ARG and Banpur 14 each, Nischintakoili ARG, Cuttack, Yerragondapalem, Akhuapada, Dhenkanal, Dhamnagar ARG, Naraj, Koderu and Jagannath Prasad ARG 13 each, Nayagarh, Athgarh, Raghunathpur ARG, Bhubaneshwar AP, Achampet, Belaguntha ARG and Nagarkurnool 12 each, Narsapur, Kalingapatnam, Kandukur, Nilgiri, Gudivada, Chandikhol ARG, Madhabarida, Macharla, Yellamanchili, Balikuda ARG, Gania ARG, Kaikalur and Krishnaprasad 11 each, Banki ARG, Narsinghpur, Paralakhemundi, Mandasa, Tangi, Danagadi ARG, Mahanga ARG and Eluru 10 each, Salepur ARG, Devarkonda, Purushottampur, Sathenapalli, Kaptipada ARG, Pipili, Udala, Hiranpur, Gop, Joda ARG, Cheepurupalli, Jajpur, Tigiria ARG, Visakhapatnam, Jenapur, Ibrahimpatnam, Niali ARG, Hanamkonda, Kantapada ARG and Balimundali 9 each, Ranasthalam, Balipatna ARG, Jaipur, Sompeta, Kakatpur, Puri, Sorada, Ottapal, Machilipatnam, Bhuban ARG, Belthangady, Gopalpur, Rampurhat (DRMS) and Bhadrak AWS 8 each, Wanaparthi, CIAL Kochi, Palakonda, Pathapatnam, Tada, Kujanga ARG, Kodungallur, Barmul, Peddapuram, Salur, Devala, Banarpal ARG, Ramannapet, Aluva PWD, Sukinda and Bhimadole 7 each
26 Oct	Diamond Harbour and Durgachak 21 each, Nalgonda 20, Samakhunta AWS and Baripada 19 each, Sathenapalli 18, Contai 17 Tiruvuru 15, Bhongir, Midnapore CWC, Raghunathpur ARG and Phulberia 14 each, Bhograi, Midnapore, Balimundali, Rajghat, Ramannapet, Peddapuram and Kharagpur (I.I.T) 13 each, Nandigama, Mohanpur, Kadamdeuli ARG and Jaleswar 12 each, Chandanpur, Jamsolaghat, Tuni, Tamluk AWS, Kolkata, Kothagudam, D. P. Ghat and Bangiriposi 11 each, Durgapur and Jaipur 10 each, Jangaon, Kansabati Dam, Baruiapur AGRO - AWS, Narsipatnam, Peddapuram AP, Kailashahar, Prathipadu, Hanamkonda, Kolkata AP, Kalaikunda and SagarIsland AWS 9 each, Ponnani, Dummugudem, Barrackpur IAF, Tusuma, Betanati ARG, Tirupathi (AGR), Hiranpur, Ghatsila, Paderu, Panagarh AP and Tekkali 8 each, Arki, Kharidwar, Chintapalli, Gopalpur, Chintalapudi, Salur, Garadapur ARG, Poondi, Digha, Simula, Krishnaprasad, Mulug, Rabkavi, Canning Town, Purihansa, Jagatballavpur ARG, Krishnanagar, Bargur and Asansol CWC 7 each
27 Oct	Yelamanchili AP 32, Ranasthalam 22, Anakapalle AP 20, Anakapalli 17, Srungavarapukota, Chintapalli and Nawarangpur 15 each, Gokarna and Tentulikhunti ARG 13 each, Sangli, Paderu, Khandapara and Daspalla 10 each, Venkatapuram, Kosagumda, Nuzvidu, Jaipatna, Cheepurupalli, Huzurabad, Tadevalligudem and Vijayanagaram 9 each, Narsipatnam, Angul, Jajpur, Rayagada and Hindol 8 each, Bhimadole, Kakinada, Kunavaram, Prathipadu, Patnagarh, Dabugan ARG, Kalingapatnam, Eturnagaram, Visakhapatnam AP, Tuni, Konta, Banarpal ARG, Nischintakoili ARG, Sindhanur and Deodurg 7 each
28 Oct	Ranasthalam 16, Komarada 13, Tekkali and Mahabalipuram 11 each, Anakapalli, Munirabad and Paralakhemundi 8 each, Gangtok, Parvatipuram, Kashinagar, Uthiramerur and Munirabad ARG 7 each
29 Oct	Harur 12, Tuting 9, Anini AWS and Miao 7 each
30 Oct	Chalakudi 14, Piravam and Usilampatti 8 each
31 Oct	Rapalle 8
1 Nov	Perinthalamanna and Kurudamanni 9 each, Angadipuram 8, Perumpavur 7
2 Nov	Nil
3 Nov	Ramanathapuram 10, Mylaudy and Mahbubabad 9 each, Satankulam and Cheranmahadevi 8 each, Tiruchendur, Papanasam and Kumta 7 each
4 Nov	Papanasam 10, Tiruvadana 8
5 Nov	Sethiathope 13, Ramanathapuram 11, Kodavasal and Papanasam 9 each, Palani and Muthupet 8 each, K.M.Koil and Parangipettai 7 each

TABLE 5 (Contd.)

Date	Some representative amounts of rainfall in cm for October, November and December 2013 (7 cm and above)
6 Nov	Kumbakonam 11, Aduthurai AWS and Tranganbadi 9 each, Thiruvaidaimaruthur 8, Sirkali, Mayiladuthurai and Papanasam 7 each
7 Nov	Tranganbadi (Or)Tranqueb 12
8 Nov	Maya Bandar 9, Arki 7
9 Nov	Nil
10 Nov	Nil
11 Nov	Nil
12 Nov	Kanjirappally 8
13 Nov	Colachel 10, Thiruvananthapuram AP, Aryankavu, Thiruvananthapuram and Eraniel 9 each, Thuckalay, Kayamkulam, Neyyattinkara, Piravam and Nedumangad 8 each, Kurudamannil and Chengannur 7 each
14 Nov	Srivaikuntam 7
15 Nov	Kanjirappally 10, Kurudamannil and Piravam 8 each
16 Nov	Chidambaram AWS 7
17 Nov	Mayiladuthurai 22, Tiruchirapalli AP 14, Sathanur Dam, Vandavasi and Chembarabakkam 13 each, Chennai AP, Trichy town and Poonamallee 12 each, Tiruvallur, Maduranthagam, Musiri, Gingee and Harur 11 each, Tindivanam, Upper Anaicut, Puducherry, Tiruttani and Pullambadi 10 each, Tada, Uthangarai, Poondi, Pochampalli, Tirumalla AP, Mylam AWS, Dharmapuri, Dharmapuri PTO, Thiruvalangadu, Thogamalai, Lalgudi and Penucondapuram 9 each, Panchapatti, Chettikulam, Thuraiyur, Venbavur, Thuvakudi Imti, Vanur, Anaikaranchatram (Kollid), Chennai city, Samayapuram, Tozhudur, Barur and Tiruvannamalai 8 each, Anna University, Chengam, Mayanur, Perambalur, DGP Office, Atmakur, Jayamkondam, Thammampatty, M M Hills, Sriharikota AP, Thathiengrpet, Padalur, Virudachalam, Tirukoilur, Coonoor, Coonoor PTO, Pallipattu, Grand Anaicut, Ulundurpet, Alangayam, Palacode, Sirkali, Chidambaram, Thiruvaidaimaruthur, Tranganbadi and Uthiramerur 7 each
18 Nov	Long Islands 14, Maya Bandar 13, Kaveli, Amini Divi, Vadakkancherry, Irinjalakuda and Nellore 7 each
19 Nov	Sankarapuram 10, Piravam and Mayiladuthurai 8 each, Karaikal, Kodavasal and Maya Bandar 7 each
20 Nov	Nil
21 Nov	Colachel 12, Thuckalay 9, Eraniel 8
22 Nov	Visakhapatnam 11, Sivagiri 9, Nedumangad and Alappuzha 7 each
23 Nov	Gudivada 13, Vijaywada AP and Visakhapatnam AP 10 each, Machilipatnam 9, Visakhapatnam 7
24 Nov	Watrap 15, Rajapalayam 14, Narayan Khed 12, Bengaluru CO 11, Nanguneri 10, Kayamkulam Agri, Devanhalli, Sivakasi, Punalur and Kurudamannil 9 each, Sivagiri and Colachel 8 each, K.R.Nagara, Kottigehara, Uttamapalayam, Arkalgud, Sankarankoil and Dharmasthala 7 each
25 Nov	Maya Bandar 24, Port Blair 21, Long Islands 11, Aurangabad AP 9
26 Nov	Thiruvananthapuram AP 10, Kumarakom 9, Alappuzha 8, Cherthala 7
27 Nov	Nil
28 Nov	Angadipuram 8
29 Nov	Macharla 7
30 Nov	Nil
1 Dec	Tiruchendur 11
2 Dec	Ennore AWS 10, Pamban 9, Kochi AP and Sulya 7 each

TABLE 5 (Contd.)

Date	Some representative amounts of rainfall in cm for October, November and December 2013 (7 cm and above)
3 Dec	Kodavasal and Chidambaram AWS 12 each, Chidambaram, Nannilam, Rameswaram, Pamban and Papanasam 10 each, Sirkali 9, Anna University 8, Anaikaranchatram (Kollid), Ambejogai / Mominabad, Manimutharu and Ambasamudram 7 each
4 Dec	Rameswaram 8, Muthupet 7
5 Dec	Sirkali 9, Karaikal 8, Trangambadi (Or)Tranqueb and Valangaiman 7 each
6 Dec	Nil
7 Dec	Nil
8 Dec	Nil
9 Dec	Port Blair 10
10 Dec	Nil
11 Dec	Nil
12 Dec	Nil
13 Dec	Colachel, Tindivanam, Kallakurichchi, Eraniel and Cheyyur 11 each, Puducherry 10, Ulundurpet and Virudhunagar 9 each, Attur 8, Madurai AP, Tirumangalam and Vilupuram 7 each
14 Dec	Nil
15 Dec	Nil
16 Dec	Nil
17 Dec	Nil
18 Dec	Nil
19 Dec	Nil
20 Dec	Nil
21 Dec	Nil
22 Dec	Nil
23 Dec	Nil
24 Dec	Nil
25 Dec	Nil
26 Dec	Nil
27Dec	Nil
28 Dec	Nil
29 Dec	Nil
30 Dec	Nil
31 Dec	Nil

normal outside some parts of western Himalayan region, northeastern states and Peninsular India on many days where it was normal/above normal during the first fortnight of the month. With the commencement of the northeast monsoon and formation of a low pressure area over south Bay of Bengal, kept the maximum temperatures *below normal/appreciably below normal* over parts of eastern, northeastern and Peninsular India during later part of second fortnight. They were near normal over the rest of the country.

The minimum temperatures were generally *normal/above normal* on most of the days.

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

The month's highest maximum temperature was 39.4° C recorded at Jaisalmer & Ganganagar (Rajasthan) on 6th & 16th October, 2013 and the lowest minimum temperature was 10.2° C recorded at Najibabad (Uttar Pradesh) on 29th October, 2013 in the plains of the country.

3.1.6. *Disastrous weather events and associated damage*

As per press reports, VSCS 'Phailin and rain related incidents claimed 63 lives in Odisha, 53 in Andhra Pradesh, 26 in West Bengal, 24 in Bihar, 12 in Jharkhand, 4 in Tamil Nadu and 2 each in West Bengal and Uttar Pradesh. 'Phailin' storm affected 1.2 crores of people in Odisha & West Bengal. Crops in almost 16 lakhs hectares and 3.3 lakh houses were damaged. Thunderstorm/Lightning took a toll of 21 people in Bihar, 7 each in Karnataka and Tamil Nadu, 5 in Andhra Pradesh, 1 each in Jharkhand and Chhattisgarh. Land slide related incidents claimed 7 lives in Himachal Pradesh.

3.2. *November*

3.2.1. *Storms and depressions*

Four intense low pressure system VSCS 'Lehar', SCS 'Helen', and one Depression formed over the Bay of Bengal and one Depression formed over the Arabian Sea.

3.2.2. *Other synoptic features and associated weather*

A summary of the synoptic systems for the month of November 2013 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 during the month despite the formation of two storms, *viz.*, : VSCS (Lehar) & SCS (Helen) during the month. The passage of active western disturbances caused *excess* rainfall over parts of northwest India during the first two weeks and the formation of Depression over the Bay of Bengal during the second week caused *excess to normal* rainfall over parts of south Peninsular India.

Cold wave conditions prevailed over central India towards the end of second & third week of the month.

The northeast monsoon was *active / vigorous* over the sub-divisions of the northeast monsoon regime, *viz.*, : Coastal Andhra Pradesh and Kerala during mid November.

Scattered to isolated rainfall occurred on most days over peninsular India whereas *isolated* rainfall was realized on a few days over north and northwest India during the first half of November.

3.2.3. *Temperature*

Cold wave conditions prevailed on 1 to 2 days in some parts of Haryana, west Rajasthan and Madhya Pradesh.

The minimum temperatures were generally *below/appreciably below normal* over major parts of India except during the later part of November when they were *above normal/markedly above normal* in northwest and peninsular India. They were normal over the rest of the country.

The month's lowest minimum temperature over the plains of the country was 7.4° C, recorded at Churu (Rajasthan) on 18th November, 2013.

3.2.4. *Disastrous weather events and associated damage*

SCS (Helen) affected mostly the coastal districts of East & West Godavari, Krishna and Guntur. In all, 10

persons died in the floods caused by 'Helen' and 3.51 lakh hectares of crops were damaged. In all around 70,000 people in 96 villages were affected and near about 400 houses were partially or fully damaged. Rail and road traffic was also disrupted. Rain related incidents/lightning claimed 25 lives in Tamil Nadu & Puducherry.

3.3. December

3.3.1. Storms and depressions

Only one VSCS 'Madi' 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 2013. 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.

Remnant of the VSCS 'Madi' which crossed south Tamil Nadu coast as a Depression caused *vigorous* northeast monsoon activity over Tamil Nadu for the 24 hrs period ending at 0830 hrs IST on 13th December.

The formation and movement of VSCS 'Madi' over the Bay of Bengal enhanced the rainfall activity during the month. *Isolated* rainfall occurred over parts of northeast and peninsular India during the first half of the month. *Fairly widespread to Scattered* rainfall occurred on a few days over islands during the first fortnight. Snowfall occurred in the upper reaches of Jammu & Kashmir, Uttarakhand and Himachal Pradesh during the later part of the month.

The factors which led to the occurrence of *Cold wave* over central and adjoining peninsular India during the second fortnight of December could be accounted for by the presence of an anticyclone in the lower tropospheric levels, which led to moisture divergence and clear nights. Also, thick fog prevailed over the northern plains of the country on few days, during the second fortnight of the month. This was the resultant of slackening of winds in the lower troposphere along with a stable atmosphere and increase in moisture content ahead of Western disturbances which precipitated over Afghanistan and Pakistan.

3.3.3. Temperature

Minimum temperatures remained above normal over most parts of the country except over northeastern states and peninsular India where it was below normal for most of

the days. *Severe cold wave / cold wave conditions* prevailed over many parts of the country during the month. *Severe cold wave conditions* prevailed on 1 day each in some parts of Haryana, west Rajasthan and Saurashtra & Kutch. *Cold wave conditions* prevailed on 12 days in some parts of Odisha; on 4 to 7 days in some parts of Madhya Maharashtra and north interior Karnataka and on 1 to 3 days in some parts of Haryana, Punjab, Rajasthan, Saurashtra & Kutch and Vidarbha.

Cold day conditions prevailed on 4 days in west Rajasthan and on 1 to 3 days in some parts of Haryana, Punjab, west Madhya Pradesh and Saurashtra & Kutch.

Leh town recorded minimum temperature of *minus* 17.3° C on 29th December.

The month's and seasons lowest minimum temperature in the plains of the country was *minus* 0.8° C recorded at Hissar (Haryana) on 29th December, 2013.

3.3.4. *Disastrous weather events and associated damage*

According to media reports, severe cold, icy winds and dense fog affected the normal life in north India as such that it claimed 7 lives in Uttar Pradesh, 4 in Himachal Pradesh, 2 in Punjab and 1 in Gujarat. An avalanche/snowfall claimed 13 lives in Jammu & Kashmir. Also 6 people lost their lives and a few missing in a snowstorm during their attempt to cross the Rohtang Pass in Himachal Pradesh. Rain related incidents/strong winds claimed 1 life each in Sikkim and Tamil Nadu.

Appendix

Definitions of the terms given in '*Italics*'

Rainfall

<i>Excess</i>	- percentage departure from normal is + 20% or more.
<i>Normal</i>	- percentage departure from normal is -19 % to + 19 %.
<i>Deficient</i>	- percentage departure from normal is -20 % to -59 %.
<i>Scanty</i>	- 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 ≥ 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.	<i>Appreciably below normal</i>	- departure from normal is between -3 °C to -4 °C (where the normal minimum temperature is 10 °C or more).
<i>Cold day conditions</i>	For inland plain stations, when the day temperature is less than or equal to 16 °C.	<i>Below normal</i>	- departure from normal is -2° C.
<i>Markedly below normal</i>	- departure from normal is -5 °C to -6 °C (where the normal minimum temperature is 10 °C or more).	<i>Normal</i>	- departure from normal is +1 °C to -1 °C.
