# Earth System Science Organization (ESSO)
# Ministry of Earth Sciences (MoES)
# India Meteorological Department

## 2014 Southwest Monsoon End of Season Report

**HIGHLIGHTS**

- For the country as a whole, the rainfall for the season (June-September) was 88% of its long period average (LPA).

- Seasonal rainfall was 79% of its LPA over Northwest India, 90% of its LPA over Central India, 93% of its LPA over south Peninsula and 88% of its LPA over Northeast (NE) India.

- Out of the total 36 meteorological subdivisions, 23 subdivisions constituting 67% of the total area of the country received normal season rainfall and 12 subdivisions (30% of the total area of the country) received deficient season rainfall. One subdivision (South Interior Karnataka) constituting 3% of the total area of the country received excess rainfall.

- Monthly rainfall over the country as a whole was 57% of LPA in June, 90% of LPA each in July and August, and 108% of LPA in September.

- Monsoon current advanced over the Andaman Sea 2 days earlier than its normal date of 20$^{th}$ May. However, it set in over Kerala on 6$^{th}$ June, 5 days later than its normal date of 1$^{st}$ June and covered the entire country by 17$^{th}$ July, 2 days later than its normal date of 15$^{th}$ July. Withdrawal of monsoon from west Rajasthan commenced on 17$^{th}$ September against its normal date of 1$^{st}$ September.

- During the season, 1 Cyclonic Storm (**Nanauk**), 2 monsoon depressions and 10 monsoon low pressure areas were formed as against the normal of 6 monsoon depressions and 6 monsoon low pressure areas per season.

- The forecast for monsoon onset over Kerala for this year was correct, which is the tenth consecutive correct forecast for this event since issuing of forecast for the event was started in 2005.

- All the operational long range forecasts for the 2014 southwest monsoon season rainfall over the country as a whole and that over 4 broad geographical regions were within the limits of second forecast update issued in August. The forecasts for the monthly rainfall (for the months July and August) and that for the second half of the monsoon season over the country as a whole were also within the forecast limits.

## 1. Onset and Advance of southwest Monsoon

During 17th- 18th May, an easterly wave trough embedded in the northern hemispheric equatorial convergence zone developed into a cyclonic circulation over south Andaman Sea and neighbourhood. Associated with this, low level cross equatorial monsoon flow strengthened over the region resulting in the advance of southwest monsoon over most parts of Andaman Sea and some parts of southeast Bay of Bengal on 18th May and remaining parts of Andaman Sea, some more parts of southeast Bay of Bengal and some parts of southwest and east central Bay of Bengal on 19th. Thus the southwest monsoon current reached over south Andaman Sea 2 days before normal date of 20th May.

However, the southwest monsoon set in over Kerala on 6th June, 5 days later than its normal date of 1st June. Same day, monsoon also advanced into most parts of south Arabian Sea, some parts of Tamil Nadu, most parts of southwest Bay of Bengal and some parts of west central Bay of Bengal. Thereafter, though not rapid, it consistently advanced and by 18th June, it covered central Arabian Sea, some parts of north Arabian Sea, south Gujarat, entire Konkan & Goa, some parts of south peninsula, Odisha, Jharkhand and Bihar, entire northeastern states and most parts of Gangetic West Bengal. The Arabian Sea branch of the monsoon current was aided by the formation of a Cyclonic Storm (**Nanauk**) over the Arabian Sea. The eastward propagation of Madden Julian Oscillation (MJO) over maritime continent led to the development of convection over north Bay of Bengal and the subsequent formation of season's first low pressure area over coastal areas of Bangladesh and neighborhood on 19th June. This aided the advance of Bay of Bengal branch of the southwest monsoon over northeastern states. Subsequently it further advanced into most parts of south peninsula, east and adjoining parts of central India by 20th June.

During the last week of June, the weakening of monsoon activity caused the re-appearance of the heat wave conditions over eastern parts of peninsular India. After a hiatus of 10 days, monsoon started reviving. Subsequently, a favourable interaction of the southwest monsoon current with the mid-latitude westerlies aided the advance of southwest monsoon into the western Himalayan region and adjoining plains of northwest India. It advanced into entire Uttarakhand, Himachal Pradesh and Jammu & Kashmir, some more parts of Uttar Pradesh and some parts of Haryana (including Chandigarh) and Punjab on 1st July.

During the first week of July, the presence of anticyclone over the peninsular region resulted in subdued rainfall activity over parts of north, central and peninsular region. But the formation of a low pressure area over north Bay of Bengal and adjoining coastal areas of Bangladesh and Gangetic West Bengal (during 1st – 7th July) and a cyclonic circulation over west Uttar Pradesh and neighbourhood (during 3rd - 6th July) caused further advance of the monsoon into some more parts of Uttar Pradesh, remaining parts of Haryana (including Delhi) and Punjab and some parts of north Rajasthan on 3rd July and subsequently into most parts of Vidarbha, remaining parts of east Madhya Pradesh and Uttar Pradesh, some parts of west Madhya Pradesh and some more parts of northeast Rajasthan on 7th. Subsequent to the formation and west northwestwards movement of a low pressure area (during 11th-16th July), an off shore trough at mean sea level extending from Gujarat coast to Kerala coast (10th-16th July) and the cyclonic circulation extending between 3.1 & 5.8 kms a.s.l. over northeast Arabian Sea during (14th-16th July) during the second week, the monsoon activity revived gradually over central India and west coast thereby causing further advance of southwest monsoon over remaining parts of central India and most parts of northwest India on 16th and remaining parts of north Arabian Sea, Saurashtra & Kutch, Gujarat Region and west Rajasthan and thus the entire country on 17th July 2014

***Fig.1 shows the isochrones of advance of monsoon 2014.***

## 2. Chief Synoptic Features

Strong cross equatorial flow prevailed during July and August. The presence of ridge and formation of Cyclonic Storm over Arabian Sea prevented the cross equatorial flow to actually reach the west coast of peninsular India during first half of June. It was weak during later part of the September as well.

The axis of monsoon trough mostly remained normal/south of its normal position during July and first half of September. It extended up to mid tropospheric levels without its characteristic tilt. It mostly remained north of its normal position /close to foot hills of Himalayas during August. The seasonal ‘heat low’ was less demarcated since second half of August except for first half of September, when it became noticeable. Thereafter, it became less apparent and subsequently, the axis of monsoon trough also weakened thereby becoming less delineated since 22nd September.

With the shifting of monsoon trough to the foot hills of Himalayas during the month of August, the circulation features and rainfall pattern resembled typical break like situation during 15th – 21st August.

During the season, 13 low pressure systems formed. These included 10 low pressure areas, one cyclonic storm (CS), a land depression and a deep depression. Tracks of the depressions and the CS are given in Fig.2. Out of the 10 low pressure areas formed during the season (against the season normal of 6), 8 (3 of them well marked) formed over the Bay of Bengal and two (as well marked) over the Arabian Sea. The monthly break up is 1 in June, 3 in July, 3 in August and 3 in September.

During the month of June, one CS and one low pressure area formed. The CS **'Nanauk'** (9th–14th June) which formed over east Arabian Sea at the leading edge of the monsoon current aided the further advance of Arabian branch up to south Gujarat coast. Its remnant vortex drifting northeastwards towards Gujarat resulted in extremely heavy rainfall over Saurashtra & Kutch on 16thJune. The first low pressure area (19th – 22nd June) formed over coastal areas of Bangladesh and neighborhood under the influence of a cyclonic circulation over northwest Bay of Bengal and neighborhood. It increased the rainfall activity over the region and thus led to the further advance of southwest monsoon over sub-divisions in the east.

The formation of second low pressure area (1st -7th July) over north Bay of Bengal and adjoining areas and its more north-northwesterly movement kept the monsoon activity over the eastern parts only. Therefore the rainfall activity all over India during the period remained subdued. With the formation of the land depression (21st – 23rd July) over northeastern parts of Odisha and adjoining areas of Gangetic West Bengal and thereafter its movement as a low pressure area in westward direction along with the other two low pressure areas (11th-18th July & 27th -31st July) over northwest Bay of Bengal, revived the monsoon activity over central and peninsular India during the period.

First week of August witnessed the formation of a deep depression (3rd -6th Aug.) over coastal areas of west Bengal and neighbourhood which spurred the vigorous monsoon conditions over the Indo- Gangetic plains whereas its remnant cyclonic circulation enhanced the rainfall activity over parts of northwest India. The low pressure area (9th -11th Aug.) formed over north Bay of Bengal and its northwestwards movement and dissipation, led the monsoon trough to shift towards the foot hills of the Himalayas on 13th Aug.

With the formation of 2 well marked low pressure areas (23rd -24th Aug.) & (27thAug – 6thSept), one each over the Arabian Sea and Bay of Bengal, the rainfall activity over major parts of peninsular India enhanced during the last week of August. Monsoon activity in general remained weak outside this areas and northeastern parts of the country, which received rainfall associated with the north-south trough in the lower and mid tropospheric westerlies. The formation of the well marked low pressure area over the Bay of Bengal and its west-northwestwards movement across the central parts of India along with the formation of the low pressure area (2nd -4th Sept.) over Saurashtra & Kutch and adjoining northeast Arabian Sea revived the rainfall activity over central and northwest India.

The above well marked low pressure area took a more northward course from 4th Sept and thereafter interacting with the trough in the mid-latitude westerlies in the lower tropospheric levels, caused heavy to very heavy rainfall resulting severe floods in Jammu & Kashmir during first week of September. The formation and movement of the third well marked low pressure area (5th– 9th Sept) over north Bay of Bengal off west Bengal–Bangladesh coasts helped the monsoon trough to shift southwards of its normal position and thus led to vigorous monsoon activity over north, east central and adjoining peninsular India.

In the latter half of September, a low pressure area (16th -24th Sept.) formed over northwest Bay of Bengal and adjoining coastal areas of Odisha and west central Bay of Bengal. Its northward movement increased the rainfall activity over eastern parts only.

## 3. Withdrawal of southwest Monsoon

The weather over the western parts of Rajasthan remained mainly dry from 17th Sept. A change in the lower tropospheric circulation pattern over the region from cyclonic to anti cyclonic during 16th - 17th Sept also made conditions favorable for the withdrawal of southwest monsoon from the region. Subsequently, withdrawal of monsoon from northwestern most parts of the country commenced on 23rd Sept. It withdrew from some parts of west Rajasthan and Kutch on 23rd Sept. and from some parts of Punjab, Haryana and Gujarat Region, some more parts of Kutch area and remaining parts of west Rajasthan on 26th. On 28th Sept., it further withdrew from remaining parts of Punjab, Haryana, Chandigarh & Delhi and east Rajasthan; some parts of Jammu & Kashmir, Himachal Pradesh, east Uttar Pradesh, Madhya Pradesh and Saurashtra; most parts of west Uttar Pradesh and some more parts of Gujarat Region, Kutch and north Arabian Sea. As on 30th September, the withdrawal line

passed through Jammu, Una, Bareilly, Kanpur, Nowgong, Ujjain, Vadodara, Porbandar, Lat. $22^0$ N/ Long. $65^0$ E and Lat. $22^0$ N / Long. $60^0$ E.

***Fig.3 shows the isochrones of withdrawal of monsoon 2014.***

## 4. High Impact Weather Events

Fig. 4 depicts the met. subdivisions or parts thereof, which experienced high impact weather events like, Heavy rainfall, floods, landslides and Heat waves during the southwest monsoon season (June- September) along with the dates. The figure also indicates areas that experienced isolated extremely heavy rainfall (Rainfall amount ≥25cm reported during the 24 hours ending at 0830 hrs IST) events during the season without any reference to the dates of these occurrences.

Incessant rainfall associated with the monsoon low pressure systems and active monsoon conditions in the presence of strong cross equatorial flow, often caused flood situations over various areas during different parts of the season. During the first half of the season, incessant heavy rains and floods over Odisha, Chhattisgarh, Madhya Pradesh, Uttar Pradesh and Assam & Meghalaya were observed in associated with the formation and the movement of monsoon low pressure systems over north Bay of Bengal. During the second half, the floods and associated huge casualty and damage occurred over Jammu & Kashmir during $1^{st}$ week of Sept., which resulted from the interaction between a monsoon low and a trough in the westerlies. Uttar Pradesh and Bihar experienced flood like situation due to heavy rainfall in the catchment areas of Nepal and release of water in Barrages. The formation of low pressure systems caused flooding in Odisha and Rajasthan whereas, the eastern end of monsoon trough passing through northeastern states and trough in mid-latitude westerlies led to extremely heavy rains and thus floods in Assam & Meghalaya and Arunachal Pradesh during the second half of season. Apart from these, some other sub-divisions/states which experienced flood situations are Jharkhand, Gujarat, Konkan & Goa, Andhra Pradesh, Karnataka and Kerala.

## 5. Rainfall Distribution

The realized 2014 southwest monsoon season (June to September) rainfall over the country as a whole and four broad geographical regions are given in the table below along with respective long period average (LPA) values. The rainfall during the 4 monsoon months and the second half of the monsoon season (August + September) over the country as whole are also given.

| ***Season (June to September) rainfall*** | | | |
|---|---|---|---|
| Region | **LPA (mm)** | **Actual Rainfall for 2014 SW Monsoon Season** | |
| | | **Rainfall (mm)** | **Rainfall (% of LPA)** |
| All India | 886.9 | 777.5 | 88 |
| Northwest India | 615.0 | 483.1 | 79 |
| Central India | 974.2 | 879.7 | 90 |
| Northeast India | 1437.8 | 1267.7 | 88 |
| South Peninsula | 715.7 | 665.4 | 93 |
| ***Monthly & second half of the monsoon season rainfall over the country as a whole (All India)*** | | | |
| **Month** | **LPA (mm)** | **Actual Rainfall for 2014 SW Monsoon Season** | |
| | | **Rainfall (mm)** | **Rainfall (% of LPA)** |
| June | 163.5 | 92.4 | 57 |
| July | 288.9 | 259.0 | 90 |
| August | 261.0 | 234.6 | 90 |
| September | 173.5 | 187.5 | 108 |
| August + September | 434.5 | 422.1 | 97 |

As seen in the table above, the season rainfall over the country as a whole as well as that over all the four geographical regions of the country were less than the respective LPAs. Month wise, the rainfall over the country as a whole during the first three months (June to August) were less than the LPA and that during September was more than the LPA. It may be mentioned that the June rainfall recorded this year (along with 1923) was fourth lowest June rainfall recorded during the last 114 years (1901-2014) and second lowest during the last 10 years. The lowest ever June rainfall (52% of LPA) was recorded in 1926 followed by 2009 (53% of LPA).

***Fig.5 shows the subdivision wise season (June to September) rainfall.***

Out of the total 36 meteorological subdivisions, the season (June-September) rainfall was normal in 23 subdivisions (67% of the total area of the country) and deficient in 12 subdivisions (30% of the total area of the country). Only one subdivision (South interior Karnataka) constituting 3% of the total area of the country received excess rainfall. Out of the 12 deficient subdivisions, 6 subdivisions were from north India India, 2 from central India, one from northeast India and 3 from south Peninsula.

***Fig.6 shows the subdivision wise monthly rainfall.***

In June, except for 5 subdivisions (South Himalayan West Bengal, Assam & Meghalaya, Rayalaseema, Tamil Nadu and Andaman & Nicobar Islands), which

received normal rainfall, all the other subdivisions (31 out of 36) received deficient (20 subdivisions) or scanty (11 subdivisions) rainfall. In July, majority of the subdivisions from central India and west peninsula received excess (3 subdivisions) or normal rainfall (17 subdivisions). The excess rainfall subdivisions are Konkan & Goa, South Interior Karnataka and Odisha. Out of the 16 remaining subdivisions, 15 subdivisions received deficient rainfall, majority of which are from northwest and northeast India, region close to Himalayas and interior & southeast Peninsula. However, one subdivision (Lakshadweep) received scanty rainfall.

In August, majority of the subdivisions from Peninsula, east and northeast India received normal/ excess rainfall. On the other hand, majority of the subdivisions from northwest India and neighboring central India received deficient/ scanty rainfall. During August, 8 subdivisions received excess rainfall, 13 subdivisions received normal rainfall, 12 subdivisions received deficient and 3 subdivisions received scanty rainfall. The excess subdivisions were Lakshadweep, Kerala, Tamilnadu and Pondicherry, South Interior and north Interior Karnataka, coastal Karnataka, Madhya Maharashtra, and Arunachal Pradesh. The 3 scantly rainfall subdivisions were neighboring subdivisions from north India (Punjab, Haryana, Chandigargh & Delhi and west Uttar Pradesh).

In September, the rainfall activity over many parts of the country showed significant increase and 9 subdivisions from northwest, west coast, northeast and east central India received excess rainfall. On the other hand, 13 subdivisions mainly from north India along the plains of Himalayan region and north peninsula received deficient rainfall. The remaining 14 subdivisions received normal rainfall.

From the monthly distribution, it can be seen that all the subdivisions have received deficient/ scantly monthly rainfall during at least one of the four months. Similarly in every month, at least 13 out of the 36 subdivisions have received deficient/ scantly rainfalls with highest number of subdivisions (31) received deficient/scanty rainfall during June. Four (4) subdivisions (i.e. Himachal Pradesh, west Uttar Pradesh, east Uttar Pradesh and Telangana) were deficient/scantly during all the four months of the season.

**Figures 7 and 8 depict the all India weekly and cumulative weekly rainfall anomaly expressed as percentage departure from the LPA.**

The all India weekly rainfall anomalies during 14 of the 18 weeks of the monsoon season were negative. Out of the 4 positive rainfall weeks, one week (week ending 23$^{rd}$ July) was from first half and 3 weeks (weeks ending 6$^{th}$ August, 3$^{rd}$ September and 10$^{th}$

September) were from second half of the season. The highest negative weekly rainfall anomaly of -53.0% was recorded during the week ending 2nd July and highest positive rainfall anomaly of 63.7% was recorded during the week ending 10th September. Due to large all India rainfall deficiency during the first 7 weeks of the season, the all India cumulative weekly rainfall anomalies were negative throughout the season.

## 6. Verification of the Long Range Forecasts

Based on an indigenously developed statistical model, it was predicted on 15th May 2014 that monsoon will set in over Kerala on 5th June with a model error of ±4 days. The forecast came correct as the actual monsoon onset over Kerala took place on 6th June, 1 day later than the forecasted date. Thus this is the tenth consecutive correct operational forecast for the date of monsoon onset over Kerala since issuing of operational forecast for the event was started in 2005.

This year, the long range forecast for the 2014 southwest monsoon rainfall was issued in 3 stages. The first stage long range forecast issued on 24th April consisted of only forecast for season (June-September) rainfall over the country as a whole. In the second stage (9th June), along with the first update for the April forecast, forecast for season rainfall over the four broad geographical regions (northwest India, central India, south Peninsula and northeast India) and that for monthly rainfall over the country as a whole for the months of July and August were issued. In the 3rd stage (12th August), along with the forecast for the rainfall during the second half of the monsoon season over the country as a whole, second update for the season rainfall over the country as a whole and first update for the season rainfall over the four broad geographical regions were issued.

The first stage forecast for the season (June-September) rainfall over the country as a whole issued in April was 95% of LPA (below normal) with a model error of ± 5% of LPA). This forecast was downgraded to 93% ± 4% of LPA (below normal) in the first update in June, and further downgraded to 87% ± 4% of LPA (deficient) in August. The actual season rainfall for the country as a whole is 88% of LPA, which is less than the first stage forecast issued in April by 7% of LPA. On the other hand, it is less than the first update by 5% of LPA and more than the second update by just 1% of LPA. Thus the actual season rainfall over the country as whole is within the limits of second forecast update.

Considering the four broad geographical regions of India, the forecast issued in June (August) for the season rainfall over northwest India was 85% (76%) of LPA, that over Central India was 94% (89%) of LPA, that over northeast India was 99% (93%) of

LPA, and that over South Peninsula was 93% (87%) of LPA all with a model error of ± 8%. The actual rainfalls over northwest India, central India, northeast India and south Peninsula were 79%, 90%, 88% and 93% of the LPA respectively. The actual season rainfall over northwest India is 6% less than the forecast issued in June and 3% more than that its August update. Similarly, the actual season rainfall over Central India is 4% less than the forecast issued in June and 1% more than that its August update. In case of south Peninsula, the actual season rainfall is exactly equal to the forecast issued in June and 6% more than that its August update. On the other hand, the season rainfall over northeast India is less than forecasts issued in both June and August by 11% and 5% of LPA respectively. Thus the actual season rainfalls over northwest India, central India and south Peninusla are within the limits of the forecasts issued in both June and August. In case of northeast India, though the actual season rainfall (88% of LPA) is within the limits of forecast (93% ± 8%) issued in August, it is less than its lower limit of forecast (91 (99-8) % of LPA) issued in June.

The forecast for the second half of the monsoon season (August –September) for the country as a whole was 95% with a model error of 8% of LPA against the actual rainfall of 97% of LPA. Thus the forecast for the rainfall during the second half of the monsoon season over the country as a whole is also within the forecast limits.

The forecasts for the monthly rainfall over the country as a whole for the months of July & August issued in June were 93% & 96% respectively with a model error of ± 9%. The actual monthly rainfall during July and August is 90% of LPA each. Thus the forecasts for the July and August rainfalls are underestimate to the realized rainfall by 3% of LPA and 6% of LPA respectively and are within the forecast limits.

The Table below gives the summary of the verification of the long range forecasts issued for the 2014 Southwest monsoon.

**Table: Details of long range forecasts and actual rainfall.**

| Region | Period | Forecast (% of LPA) | | | Actual Rainfall (% of LPA) |
|---|---|---|---|---|---|
| | | 24$^{th}$April | 9$^{th}$ June (1$^{st}$ Update) | 12$^{th}$ August (2$^{nd}$ Update) | |
| All India | June to September | 95 ± 5 | 93 ± 4 | 87 ± 4 | 88 |
| Northwest India | June to September | | 85 ± 8 | 76 ± 8 | 79 |
| Central India | June to September | | 94 ± 8 | 89 ± 8 | 90 |
| Northeast India | June to September | | 99 ± 8 | 93 ± 8 | 88 |
| South Peninsula | June to September | | 93 ± 8 | 87 ± 8 | 93 |

| | | | | | |
|---|---|---|---|---|---|
| All India | July | | 93 ± 9 | | 90 |
| All India | August | | 96 ± 9 | 96 ± 9 | 90 |
| All India | August to September | | | 95 ± 8 | 97 |

As seen in the table, the season rainfall over the country as a whole and that over four broad geographical regions (northwest India, central India, northeast India and south Peninsula) are within the limits of the forecasts updated in August and accurate. Similarly, the forecasts for the monthly rainfall (for July and August) as well as that for the rainfall during the second half of the monsoon season over the country as a whole are also accurate.

The observed rainfall deficiency of about 7-12% of LPA in all the four broad geographical regions was mainly caused by the large rainfall deficiencies over most parts of the country during June resulted from the delayed progress of the monsoon over these areas. The delayed monsoon progress in turn was caused by the below normal heating of the Indian subcontinent during the pre-monsoon season resulting in weaker than normal monsoon flow into the region. However, the monsoon gained its normal strength around the middle of July. It may be noted that this year, the observed conditions over the equatorial Pacific during prior and early part of the monsoon season were close to be classified as the border line El Nino. Forecasts from several global models were also indicating formation of weak El Nino during the middle of the monsoon season. However, subsequent weak air-sea coupling over the region led to the weakening of El Nino conditions from early July resulting in ENSO neutral conditions during remaining part of the monsoon season. This helped monsoon to remain more or less normal thereafter. However, the season also witnessed strong intra seasonal variation in the rainfall activity with long break monsoon spell in the middle of August caused by unfavourable phase of Madden Julian Oscillation (MJO) and short active monsoon spells during middle of July and early part of August caused by passage of low pressure systems along the monsoon trough region. In the early part of September, the interaction between the western disturbances moving across north India and monsoon low pressure systems caused increased rainfall activity over north, northwest India and central India. The country received near normal rainfall (94% of LPA) during the period July to September period. But due to the large rainfall deficiency in June, the 2014 season rainfall over the country as a whole (88% of LPA) ended as deficient (<90% of LPA).

**New Delhi**
**the 11th October, 2014** **(L S Rathore)**
**19th Asvina 1936 (SE)** **Director General of Meteorology**

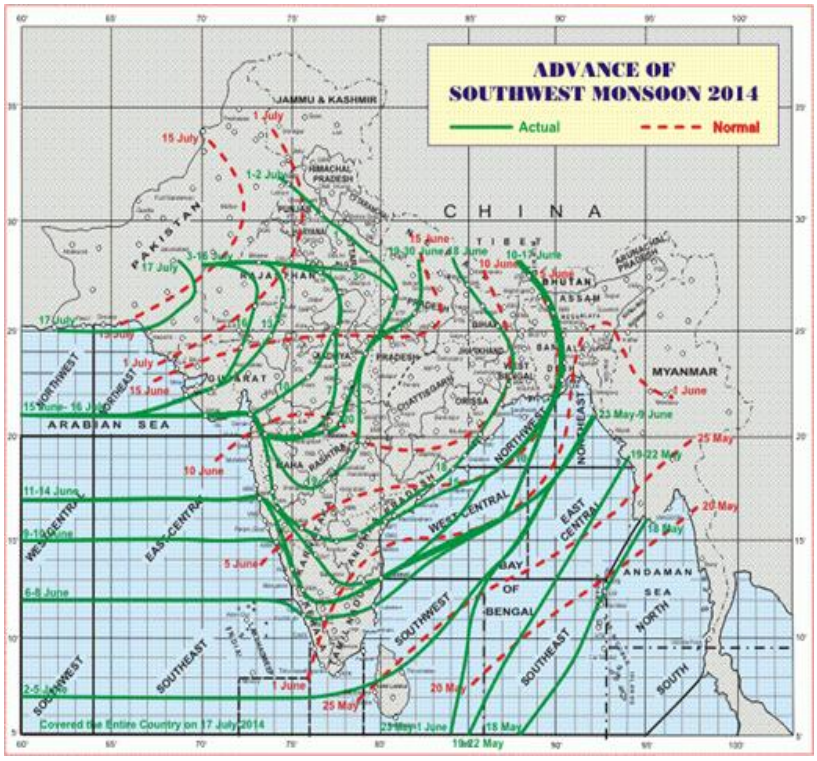


**Fig.1:** Progress of Southwest Monsoon – 2013

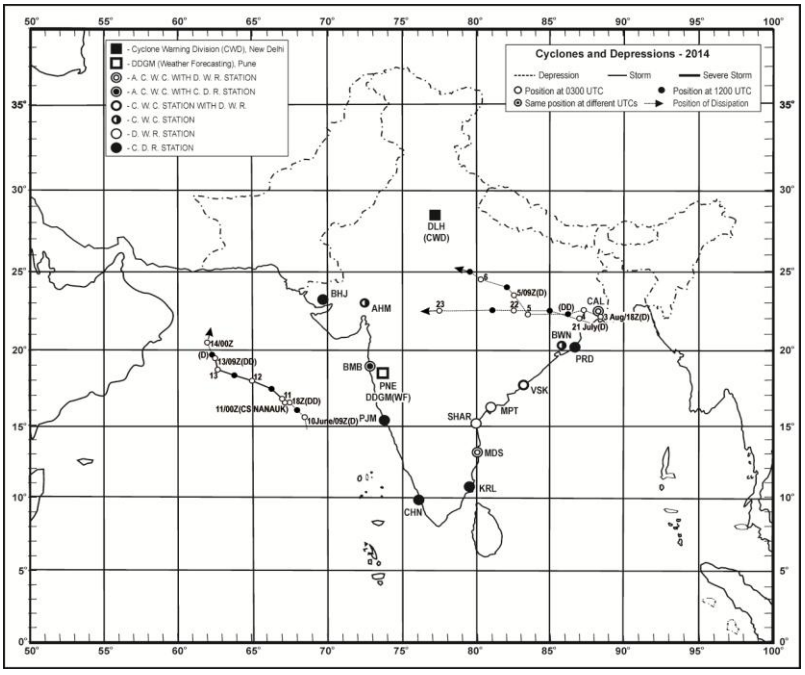


**Fig.2:** Track of the monsoon depressions

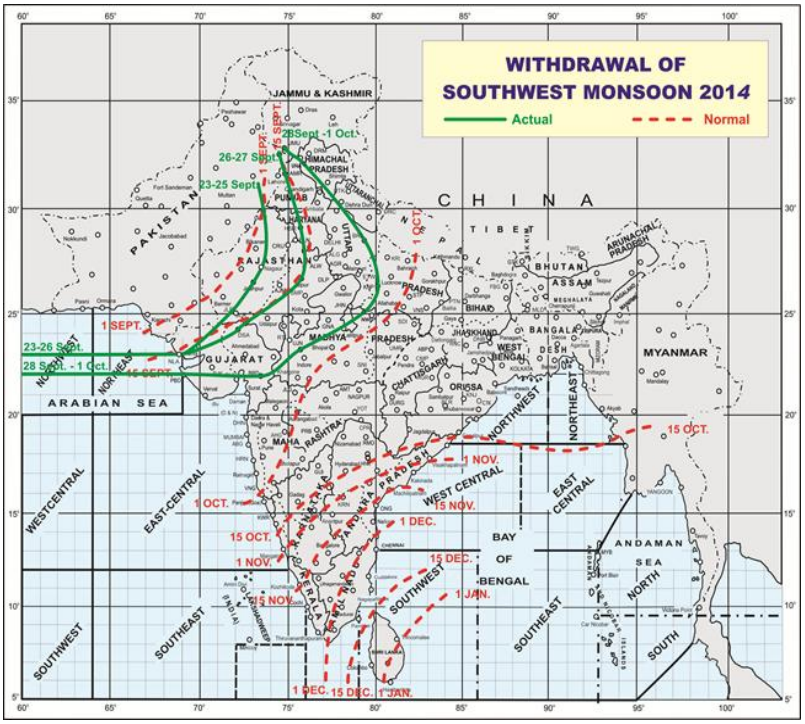


**Fig.3:** Isochrones of withdrawal of southwest monsoon - 2014.

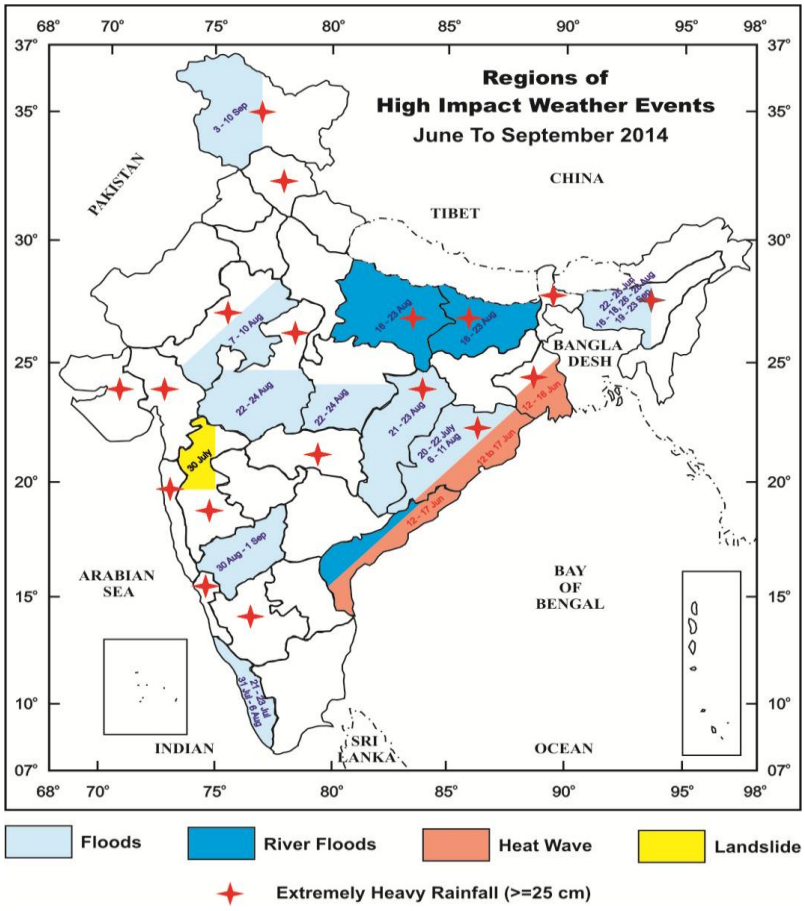


**Fig.4:** Areas and dates of high impact weather events during the 2014 southwest monsoon.

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INDIA METEOROLOGICAL DEPARTMENT

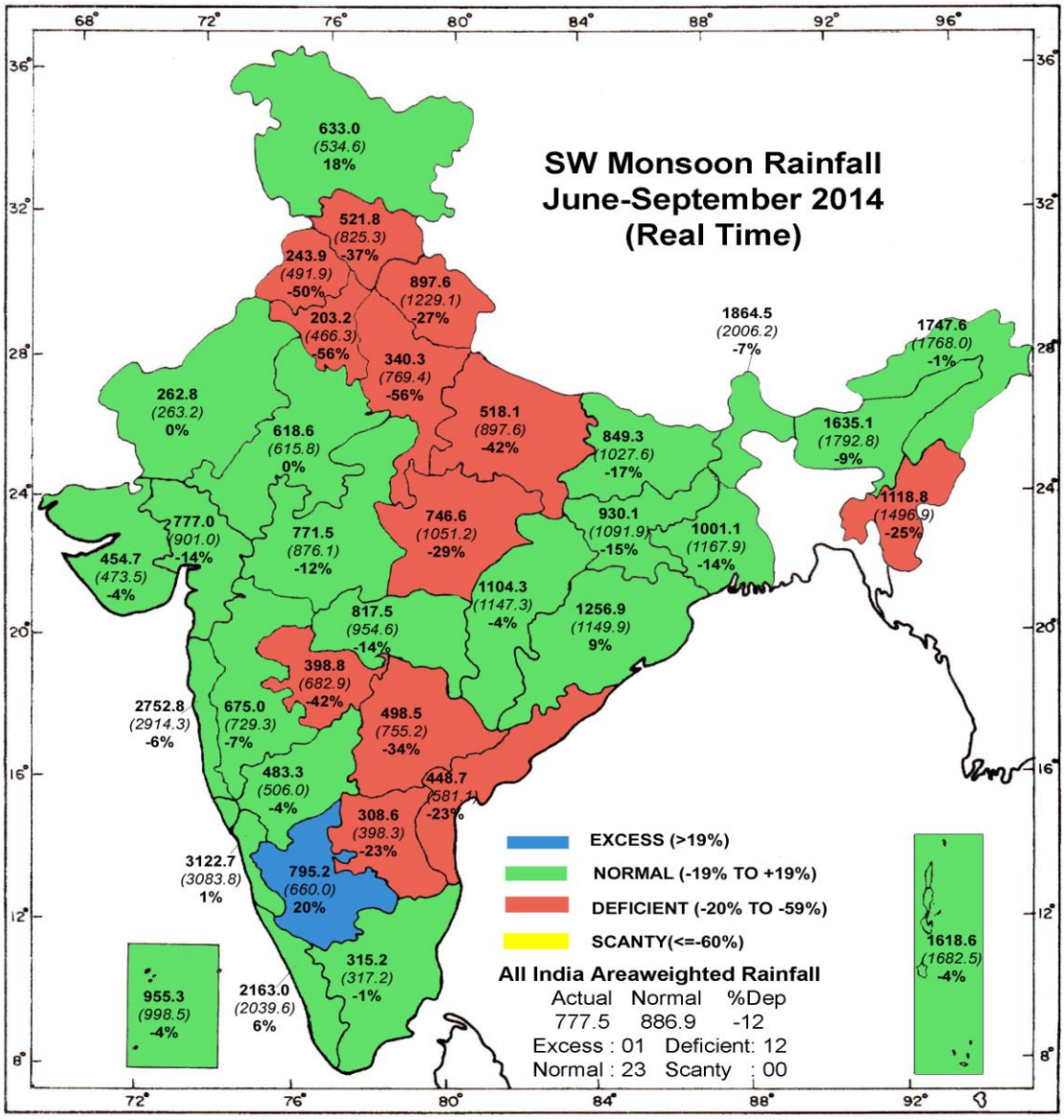


**Fig.5:** Sub-divisionwise rainfall distribution over India during southwest monsoon season (June to September) – 2014

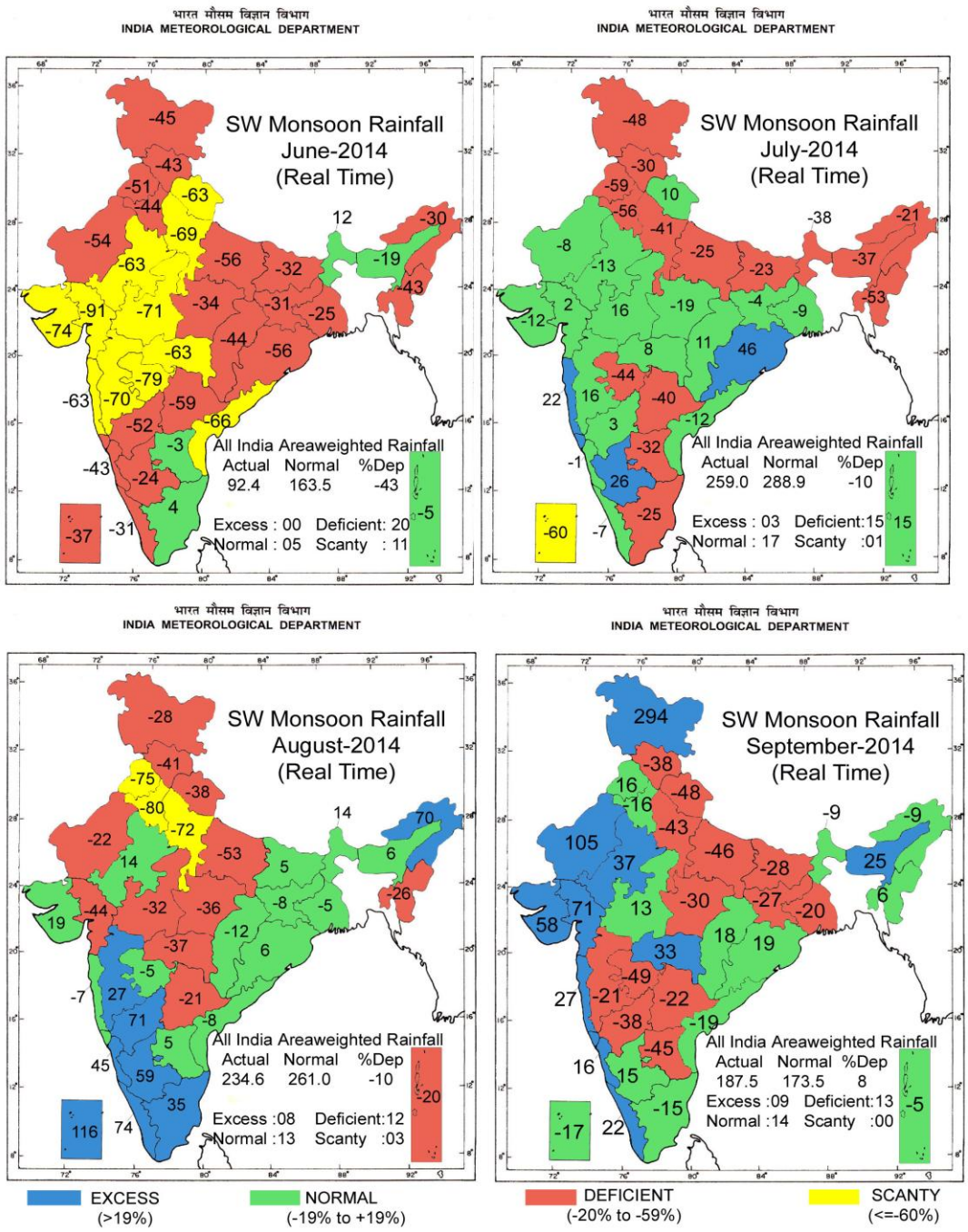


**Fig.6:** Sub-division wise monthly rainfall distribution over India during southwest monsoon season – 2014

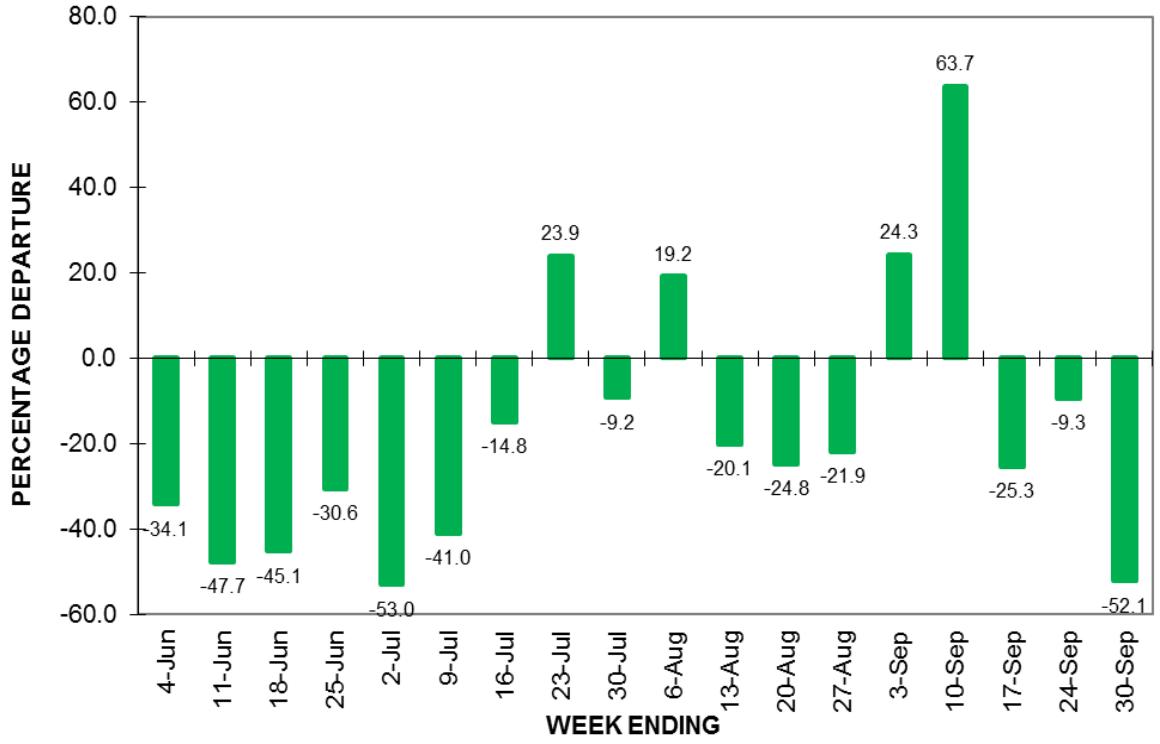


**Fig.7:** Week - by - Week Progress of the Monsoon Rainfall – 2014

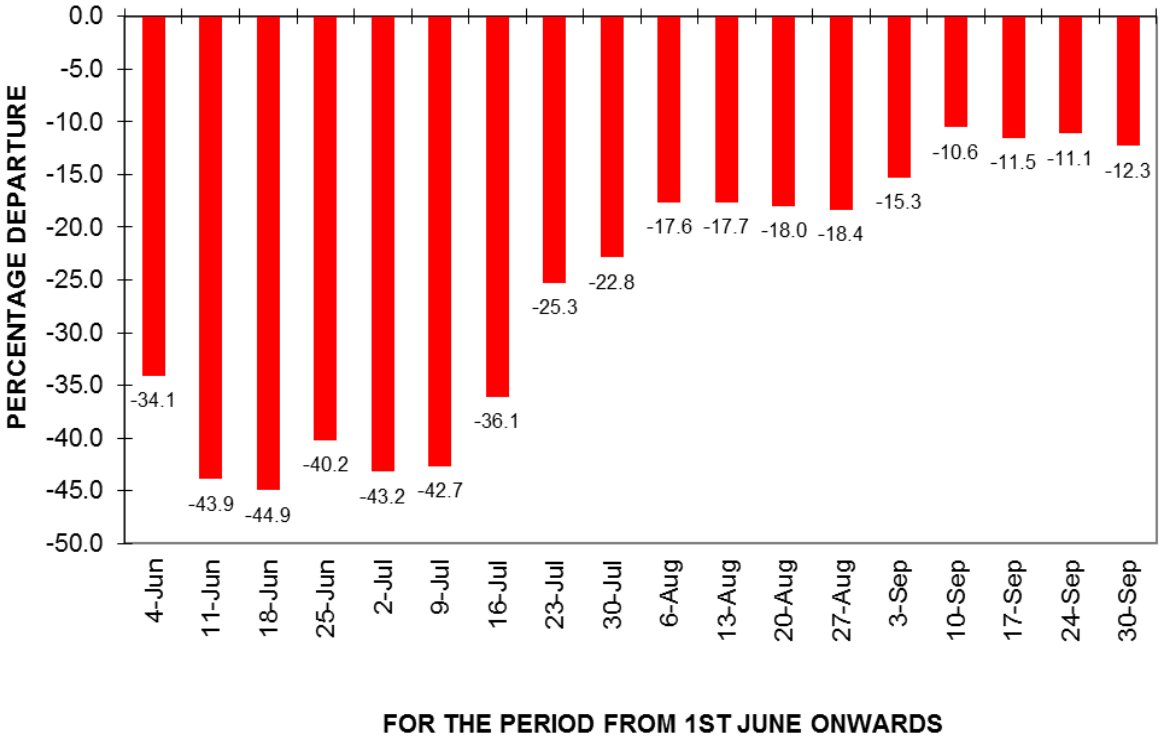


**Fig.8:** Week - by - Week Progress of the Monsoon Rainfall - 2014 (Cumulative)