



**Government of India
Ministry of Earth Sciences
India Meteorological Department**

**Press Release
Date: 01st October, 2022
Time of Issue: 1900 hrs IST**

Subject: Salient Features of Monsoon 2022

- The Southwest monsoon seasonal rainfall during June to September for the country as a whole had been above normal (105 -110% of Long Period Average (LPA)).
- Quantitatively, all India monsoon seasonal rainfall during 1 June to 30 September 2022 had been 92.5 cm against the Long Period Average of 87.0 cm based on data of 1971-2020 (106% of its LPA) as in **Fig.1**.
- The Southwest monsoon seasonal (June to September) rainfall had been Above Normal over South peninsula (122% of LPA) and Central India (119 % of LPA). Seasonal rainfall had been Normal over Northwest India (101%) and Below Normal over East and Northeast India (82%). Monthly and seasonal total rainfall over four homogeneous regions and for all India are given in **Fig.2**.
- The southwest monsoon seasonal (June to September) rainfall over the monsoon core zone, which consists of most of the rainfed agriculture regions in the country had been above normal (120% of LPA).
- Out of the total 36 meteorological subdivisions, 12 subdivisions constituting 40% of the total area of the country received excess, 18 subdivisions (43% of the total area) received normal rainfall and 6 subdivisions (17% of the total area) received deficient season rainfall (**Fig. 3**). These 6 Met subdivisions which got deficient rainfall are West Uttar Pradesh, East Uttar Pradesh, Bihar, Jharkhand, Gangetic West Bengal, and Nagaland, Manipur, Mizoram & Tripura (NMMT) (**Fig. 3**). Out of these six Subdivisions, majority of them lie in the Gangetic Plains.
- Considering month to month rainfall variation over the country as a whole, the season was very unique with contrasting month to month variation. The rainfall over the country as a whole was 92%, 117%, 104% and 108% of LPA during June, July, August and September respectively.
- The week to week progress of monsoon rainfall over country as a whole and cumulative rainfall in % departure are shown in **Fig. 4** while spatial distribution of monthly rainfall over different meteorological subdivisions is shown in **Fig. 5**.

- There were six Monsoon Depressions formed during the season; out of that, one system intensified into Deep Depression during 19-23 August. Out of six Depressions, four systems formed in August, one in July and one in September. The tracks of these systems are shown in **Fig 6**. The information on the number of low-pressure systems formed during the season are given in **Table 1**. The number of low pressure system days was 67 during the season against the normal of 57 days.
- The Southwest monsoon set in over Kerala on 29th May against normal date of 1st June and covered the entire country by 2nd July against normal date of 8th July.
- In July, the country received above normal rainfall (117% of LPA). Quantitatively, the rainfall over the country as a whole for the month of July 2022 had been 327.7 mm, which is 17% more than its LPA of 280.5 mm. This year's July rainfall (327.7 mm) is second highest since 2001 after the year 2005 (333.4 mm). During July, 4 low pressure systems formed over North Indian Ocean including one Depression over Arabian Sea (16 -17 July), one Well Marked Low pressure area over Bay of Bengal (9 -19 July) and one Well Marked Low pressure area (4 – 8 July) and one low pressure area (24 – 27 July) formed over land.
- During August, the country received normal rainfall (104% of LPA). Quantitatively, rainfall over the country as a whole for the month of August 2022 was 263.7 mm, which is 3% more than its LPA of 254.9 mm. Rainfall over the country was 8th highest since 2001. One Deep depression during 19 – 23 August over Bay of Bengal and three Depressions (2 over Bay of Bengal during 9 -10 August and 14 - 16 August and 1 over Arabian Sea during 12 – 13 August) formed during the month.
- In September, the country as whole received excess rainfall mainly over North & Central India especially over Indo-gangetic plains due to favourable conditions like increase in the strength of La Nina conditions and frequent passage of Western Disturbances and their interaction with the low pressure systems. There were three low pressure systems in September. Out of these, one system intensified into a Depression during 11-12 September. Strength of Madden Julian Oscillation (MJO) was weak on most of the days during the month. Typhoon activity over Pacific and westward movement of their remnants helped in the formation of low pressure systems over Bay of Bengal.

The number of heavy rainfall events during the last five years is given in **Table 2**. Locations of Very Heavy Rainfall (115.6 to 204.4 mm) and Extremely Heavy Rainfall

(more than 204.4 mm) reported stations for June to September 2022 are given in **Fig 7**. The extremely heavy rainfall events had been more over Konkan & Goa, Coastal Karnataka, Telangana, Odisha, Assam & Meghalaya, Sub Himalayan West Bengal and Sikkim, Uttar Pradesh and Gujarat during the season.

Verification of Long-Range Forecast issued for SW Monsoon 2022:

- The forecast for monsoon onset over Kerala for this year was correct. The Forecast date of onset of monsoon over Kerala was 27th May with a model error of ± 4 days and realized date of onset of monsoon over Kerala was 29th May.
- The first stage forecast for the seasonal (June-September) rainfall over the country as a whole issued in April was 99% of LPA with a model error of $\pm 5\%$ of LPA. The forecast was upgraded to 103% of LPA with a model error of $\pm 4\%$ of LPA in the updated forecast issued on 31st May. The actual seasonal rainfall for the country as a whole was 106% of LPA.
- Considering the four broad geographical regions of India, the forecasts issued on 31st May for the seasonal rainfall over Central India and South Peninsula were Above Normal ($>106\%$ of LPA), Normal over Northeast India (94-106% of LPA) & Northwest India (92-108% of LPA) respectively. The forecast of seasonal rainfall over the newly introduced Monsoon Core Zone (MCZ) was Above Normal ($>106\%$ of LPA). The actual rainfall over Northwest India, Central India, Northeast India, South Peninsula and Monsoon Core Zone were 104%, 119%, 82%, 122% and 120 % of the LPA respectively. The monthly forecast issued for July was underestimated and that for August was within the range of the forecast whereas for September it was close to the forecast. The forecast for the second half of the monsoon season (August –September) for the country as a whole was within the forecast limit. Details of the verification of forecast are shown in Table 3.
- This year, IMD had indicated possibility of development of negative IOD over Indian Ocean and La Nina conditions to continue over the equatorial Pacific Ocean during the monsoon season in its forecasts issued in April and May. The La Nina conditions and negative IOD were observed over the equatorial Pacific and Indian Ocean as predicted by IMD.

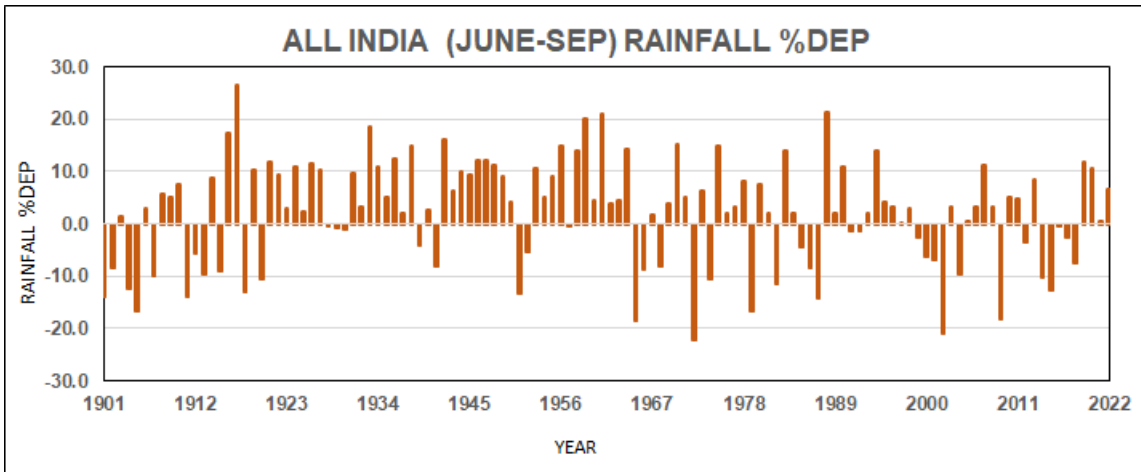


Fig 1. All India Seasonal Monsoon rainfall in % departure from normal

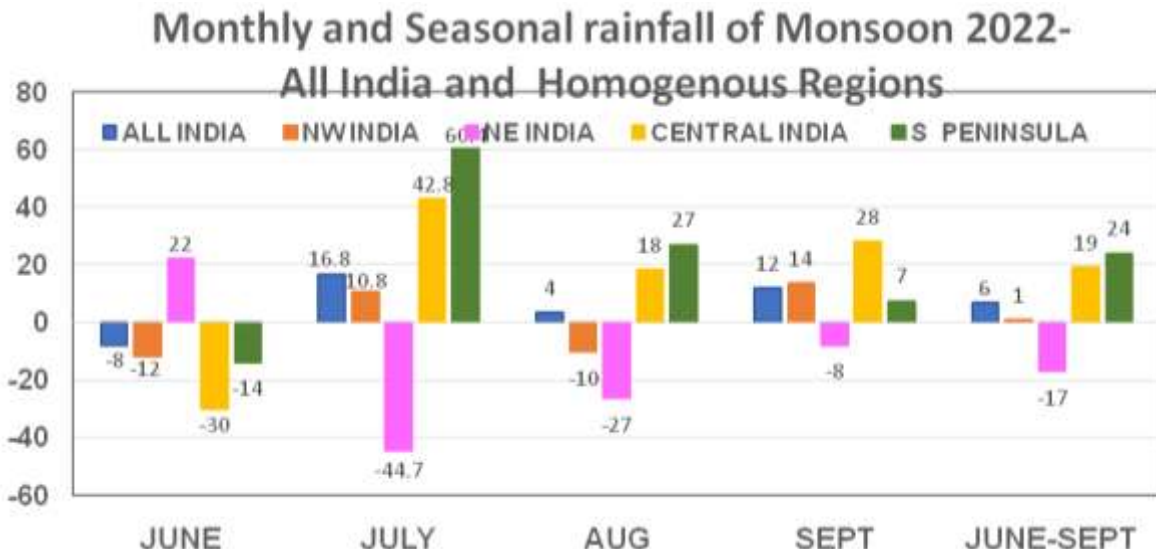
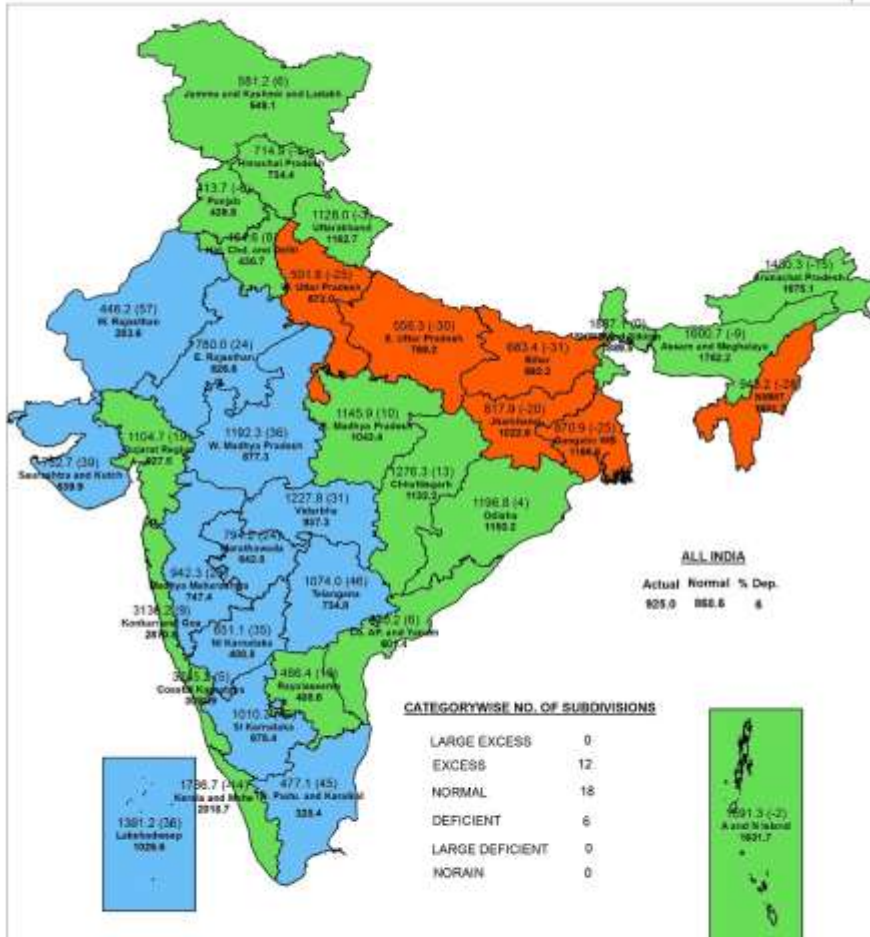


Fig.2. Monthly and seasonal monsoon rainfall of 2022 over Broad homogenous region and for the Country as a whole in % departure



SUBDIVISION RAINFALL MAP

Period : 01-06-2022 To 30-09-2022



Legend
 Large Excess [80% or more] Excess [20% to 80%] Normal [-10% to 10%] Deficient [-40% to -20%] Large Deficient [-80% to -60%] No Rain [-100%] No Data

NOTES :
 a) Rainfall figures are based on operation data.
 b) Small figures indicate actual rainfall (mm), while bold figures indicate Normal rainfall (mm).
 c) Percentage Departures of rainfall are shown in brackets.

Fig.3. Met-sub-division wise seasonal rainfall during June-September 2022

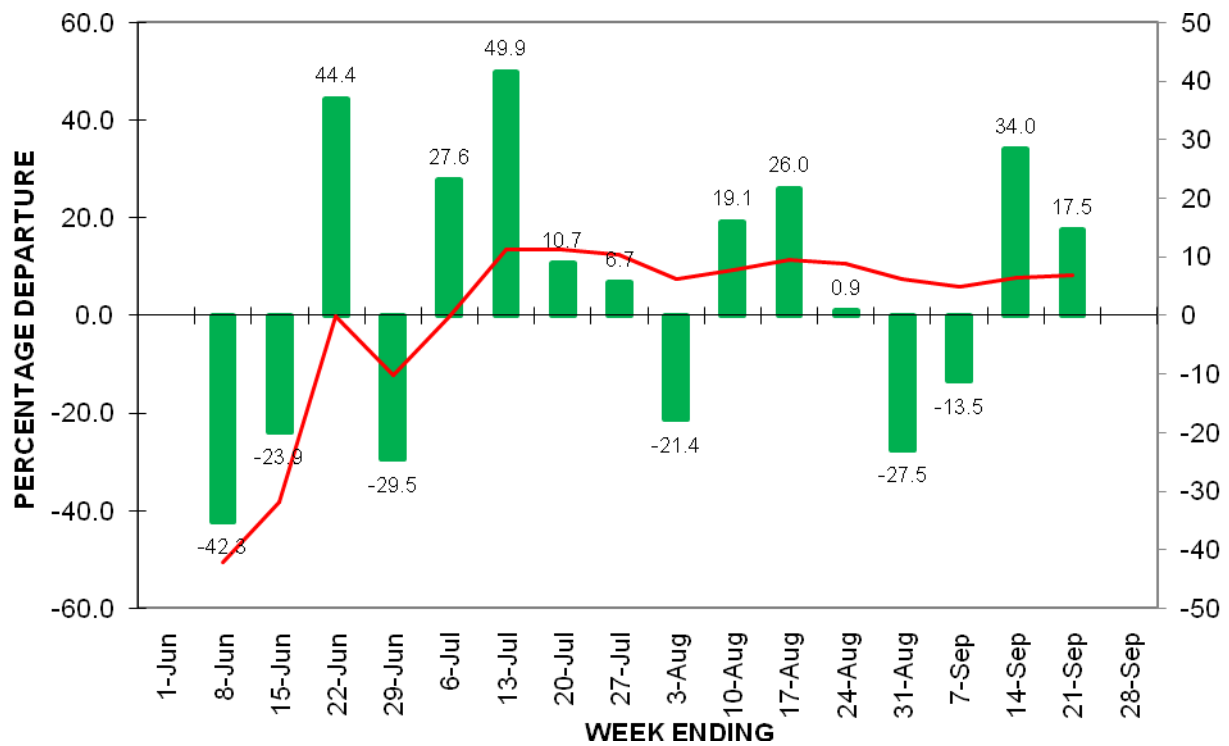
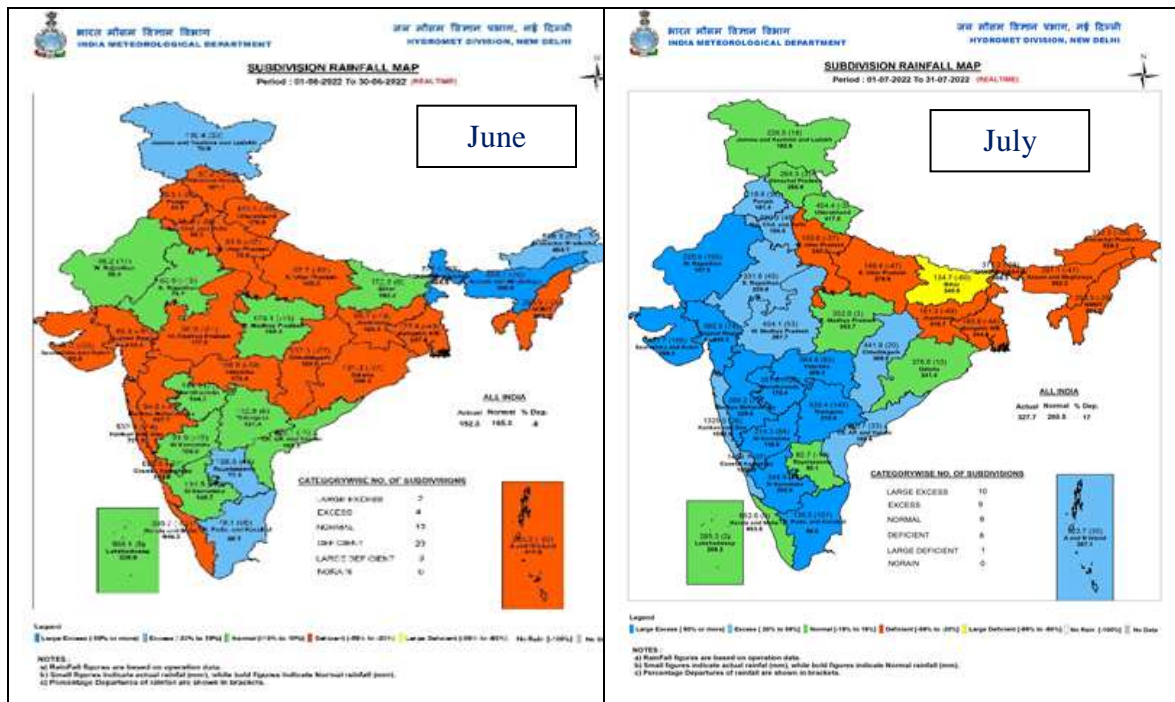


Fig 4. Week by week progress and cumulative rainfall (% departure from normal) over the Country as a whole



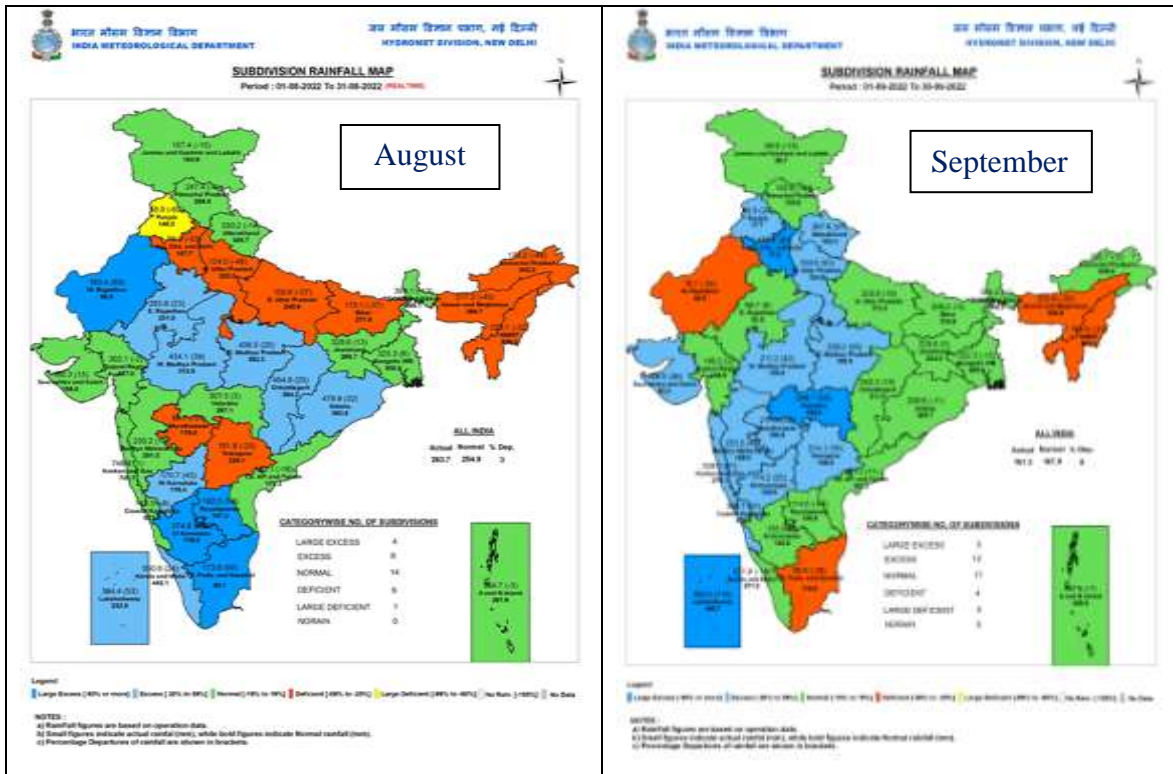


Fig 5: Monthly Met-subdivisionwise monsoon seasonal rainfall during 2022

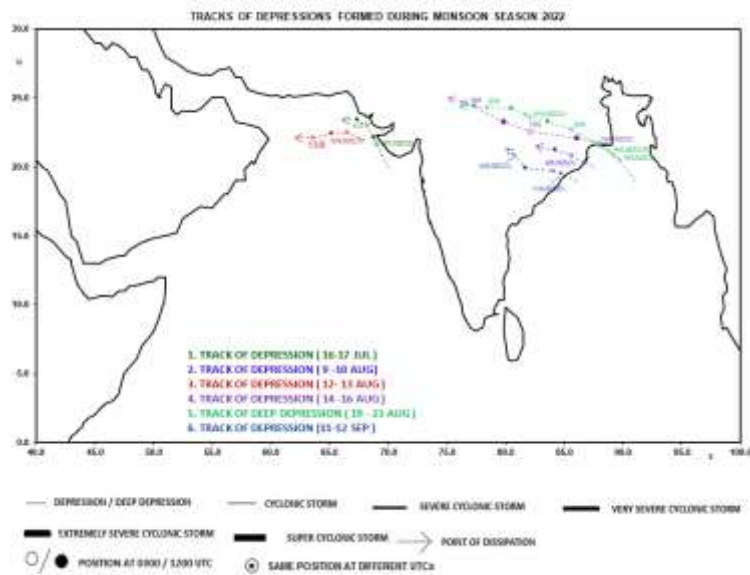


Fig. 6. Tracks of the Deep Depression/ Depressions during Monsoon Season 2022

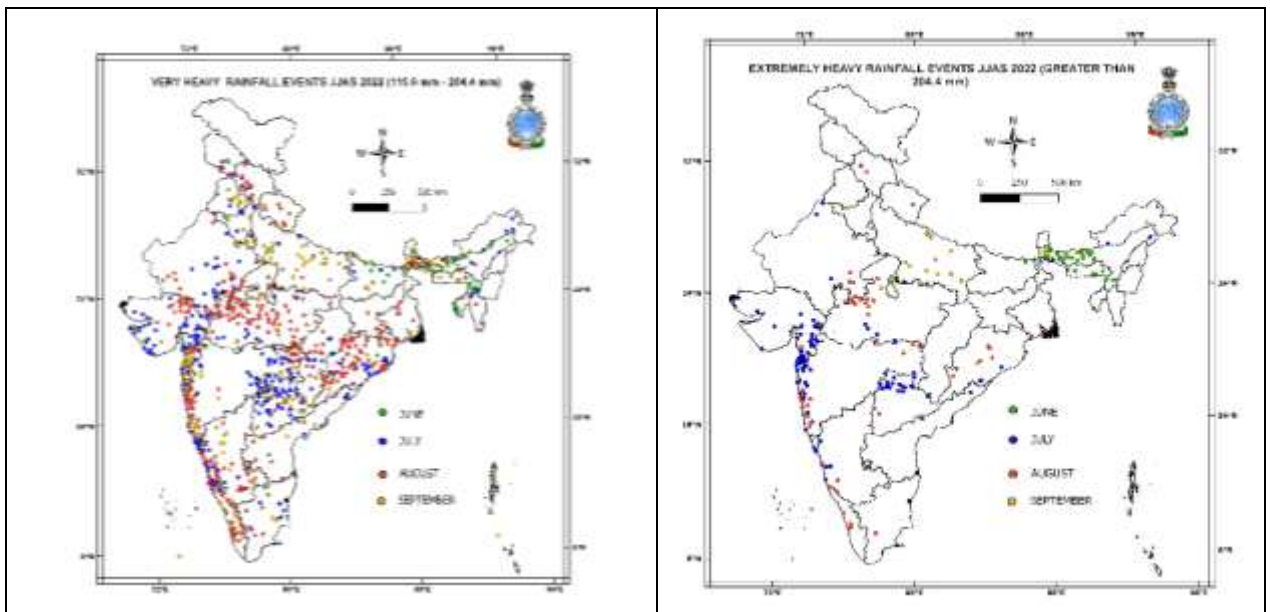


Fig7. Location of Very Heavy Rainfall (115.6 to 204.4 mm)(left one) and Extremely Heavy Rainfall (more than 204.4 mm) (right one) stations during monsoon season,2022.

Table 1: Number of Low pressure System (LPS) including Low (L), Well Marked Low (WML), Depression (D), Deep Depression (DD), Cyclonic Storm (CS) in monsoon season 2022

Systems / Month	CS	Deep Depression	Depression	Well-marked low-pressure area	Low-pressure area	Total systems
June	0	0	0	0	1	1
July	0	0	1	2	1	4
August	0	1	3	0	0	4
Sept.	0	0	1	0	2	3

Table 2: Number of heavy rainfall events over India during the last five years

Year	2018		2019		2020		2021		2022	
Month	>115.6 and <204.5	>204.5	>115.6 and <204.5	>204.5	>115.6 and <204.5	>204.5	>115.6 and <204.5	>204.5	>115.6 and <204.5	>204.5
Jun	380	64	211	52	262	36	277	35	237	80
Jul	741	117	753	161	447	90	638	121	829	131
Aug	510	96	987	282	1008	165	272	28	577	63
Sep	229	44	551	59	308	61	449	89	231	22
Monsoon	1860	321	2502	554	1912	341	1636	273	1874	296

Table 3: Details of the verification of forecast

Region	Period	Forecast (% of LPA)	Actual Rainfall
			(% of LPA)
		(issued on 14 th April)	
All India	June to September	Normal (96-104% of LPA) 99± 5 of LPA	106
		(issued on 31 st May)	
All India	June to September	Normal (96-104% of LPA) 103± 4 of LPA	106
Northwest India	June to September	Normal (92-108% of LPA)	101
Central India	June to September	Above Normal (>106% of LPA)	119
Northeast India	June to September	Normal (96-106% of LPA)	82
South Peninsula	June to September	Above Normal (>106% of LPA)	122
Monsoon Core Zone	June to September	Above Normal (>106% of LPA)	120
All India	June	Normal (92-108% of LPA)	92
All India	July (issued on 1st July)	July: Normal (94-106% of LPA)	117
All India	August & Aug-Sept (issued on 1st Aug)	August: Normal (94-106% of LPA)	103
		Aug+Sept: Normal (94-106% of LPA)	105
All India	September (issued on 1st Sept)	Above Normal (>91-109% of LPA)	108