



INDIA METEOROLOGICAL DEPARTMENT
(MINISTRY OF EARTH SCIENCES)
SOUTHWEST MONSOON-2024
END OF SEASON REPORT
FOR
UTTARAKHAND STATE
HIGHLIGHTS

- For the state as a whole, the rainfall for the season (June-September) was **109%** of its long period average (LPA) and thus categorized as a '**Normal**' monsoon.
- Monthly rainfall over Uttarakhand as a whole was 50% of LPA in June, 115% of LPA in July, 109% of LPA in August and 155% of LPA in September respectively.
- Out of the total 13 districts of Uttarakhand, 02 districts received 'Large Excess', 01 district received 'Excess', 09 districts received 'Normal' and 01 district received 'Deficient' seasonal rainfall.
- Monsoon current advanced into most parts of Uttarakhand on **27th June, 2024** and covered the entire state on the **28th June, 2024**.
- The monsoon activity over Uttarakhand was '**Normal**' during the season (June-September).
- South-West Monsoon withdrew from the entire state on **02nd October, 2024** (Withdrawal).

1. ONSET OF SOUTHWEST MONSOON – 2024

The southwest (SW) monsoon 2024 set in over Kerala on 30th May against the normal date of 1st June i.e. 2-days before its normal date. It advanced in different states and thereafter advanced into most parts of Uttarakhand on 27th June, 2024 and covered the entire Uttarakhand state on **28th June 2024**. Fig.1 shows the isochrones of advance of SW Monsoon 2024.

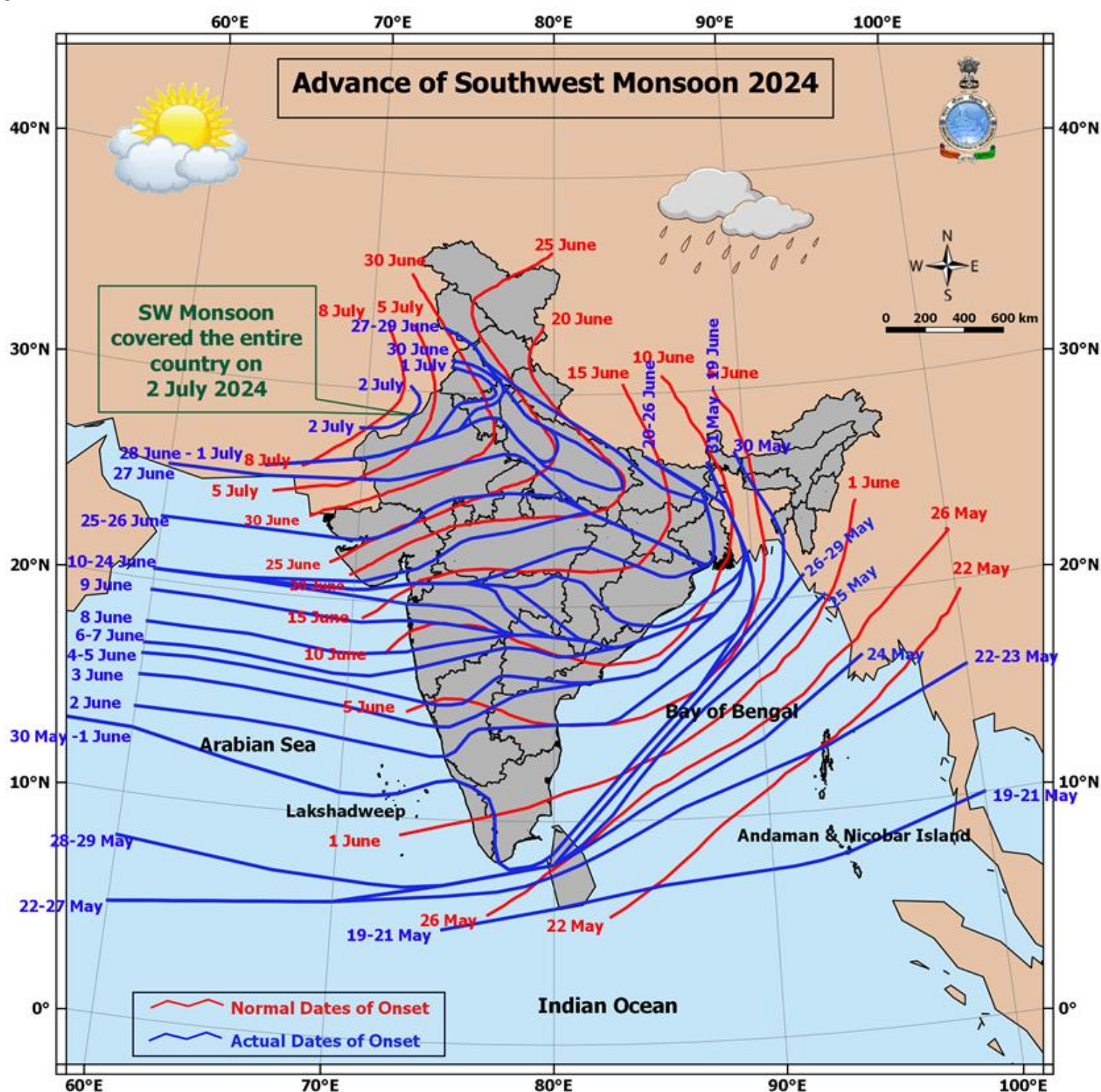


Fig.1 Isochrones of advance of SW-Monsoon 2024

2. CHIEF SYNOPTIC FEATURES OF SW MONSOON - 2024:

S. No.	Date	Synoptic Situation	Monsoon activity and significant rain (7 cm and above) (at 08:30 Hours IST. of Next Day)
1	26-Jun-24	<ul style="list-style-type: none">• The Northern Limit of Monsoon passed through 23°N/60°E, 23°N/65°E, Mundra, Mehsana, Udaipur, Shivpuri, Lalitpur, Siddhi, Chaibasa, Haldia, Pakur, Sahibganj and Raxaul.• A fresh Western Disturbance was seen as a trough in middle tropospheric westerlies with its axis at 5.8 km above mean sea level ran roughly along Long. 64°E to the north of Lat. 28°N.• The cyclonic circulation lied over northwest Rajasthan & neighbourhood and extended up to 1.5 km above mean sea level.• The east-west trough from southwest Madhya Pradesh to northeast Assam ran from northwest Rajasthan to Manipur across south Uttar Pradesh & Jharkhand at 0.9 km above mean sea level.	<p>Light to moderate rain occurred at many places with heavy to very heavy rain / thunderstorm / gusty wind at isolated places in Uttarakhand. Monsoon activity remained Active over Uttarakhand.</p> <p>MANUAL RAIN (cm) : Nainital-17, Sama-14, Champawat-10, Chamoli-8, Kapkot-7, Loharkhet-7</p> <p>AWS/ARG RAIN (cm) : Nainital-19, Sama-12, Bajpur-11, Kashipur-9, Sultanpur Patti-9, Nainital (Jeolikot)-8</p>
2	30-Jun-24	<ul style="list-style-type: none">• Northern Limit of Monsoon passed through 26°N/65°E, Jaisalmer, Churu, Hissar, Karnal, Jalandhar, Tarantaran and 31.5°N/74.5°E.• The cyclonic circulation over Northwest Bay of Bengal adjoining north Odisha-Gangetic West Bengal coasts lied over east Jharkhand & neighbourhood and extended up to 1.5 km above mean sea level.• The cyclonic circulation over East Uttar Pradesh adjoining Bihar extending up to 1.5 km above mean sea level had merged with the above cyclonic circulation.• The cyclonic circulation over north Punjab lied over north Haryana & neighbourhood and extended upto 1.5 km above mean sea level.• The cyclonic circulation over northwest Uttar Pradesh & neighbourhood between 1.5 km & 3.1 km above mean sea level had merged with the above cyclonic circulation.• A cyclonic circulation lied over central Pakistan & neighbourhood at 1.5 km above mean sea level.• The east-west trough ran from northwest Uttar Pradesh to the cyclonic circulation over Northwest Bay of Bengal adjoining north Odisha-Gangetic West Bengal coasts.	<p>Light to moderate rain occurred at most places with heavy to extremely heavy rain / thunderstorm at isolated places in Uttarakhand. Monsoon activity remained Active over Uttarakhand.</p> <p>MANUAL RAIN (cm) : Sama-22, Loharkhet-18, Roshnabad-8, Nandkeshari-7, Dharchula-7</p> <p>AWS/ARG RAIN (cm) : Sama-19, Nainital-15, Rikhnikhal-15, Nainital (Jeolikot)-13, Sult-8, Nainidanda-8 , Haldwani-7</p>
3	02-Jul-24	<ul style="list-style-type: none">• The Monsoon trough at mean sea level passed through Ferozpur, Rohtak, Hardoi, Ballia, Balurghat, Kailashahar and thence eastwards to Manipur.• A cyclonic circulation lied over southeast Pakistan & neighbourhood at 1.5 km above mean sea level.• A trough ran from northeast Madhya Pradesh to the above cyclonic circulation over Assam at 3.1 km above mean sea level.• The trough from north Punjab to Mizoram ran from northwest Bihar to south Assam across Sub-Himalayan West Bengal at 0.9 km above mean sea level.	<p>Light to moderate rain occurred at most places with heavy to very heavy rain / thunderstorm at isolated places in Uttarakhand. Monsoon activity remained Active over Uttarakhand.</p> <p>MANUAL RAIN (cm) : Jollygrant-14, Dehradun-13, Berinag-13, Haldwani-12, Kapkot-10, Rishikesh-10, Dharchula-9, Pithoragarh-8, Chamoli-7, Nainital-7</p> <p>AWS/ARG RAIN (cm) : Jollygrant-12, Gadarpur-12, Chorgalia-11, Gularbhoj-11, Sult-11, Bajpur-11, Bhainsiya Channa-9, Nainital-9, Bhikiyasain-8, Bhimtal-8, Didihat-8, Nainital (Jeolikot)-7, Agastyamuni-7</p>
4	03-Jul-24	<ul style="list-style-type: none">• The Monsoon trough at mean sea level passed through Ferozpur, Rohtak, Lucknow, Ballia, Purnea and thence eastwards to Manipur.• A trough ran from southeast Pakistan to Bangladesh across south Rajasthan, Madhya Pradesh, Jharkhand at 3.1 km above mean sea level.• A cyclonic circulation lied over Himachal Pradesh at 1.5 km above mean sea level.	<p>Light to moderate rain occurred at most places with heavy rain / thunderstorm at isolated places in Uttarakhand. Monsoon activity remained Active over Uttarakhand.</p> <p>MANUAL RAIN (cm) : Chakrata-11, Haripur-9, Khatima-8</p> <p>AWS/ARG RAIN (cm) :</p>

			Chaukhutiya-8, Bhainsiya Chhana -7, Kanatal-7
5	04-Jul-24	<ul style="list-style-type: none"> • The Monsoon trough at mean sea level passed through Bikaner, Orai, Churu, Purulia and thence east-south-eastwards to northeast Bay of Bengal. • A cyclonic circulation lied over southeast Pakistan at 1.5 km above mean sea level. • A cyclonic circulation lied over northeast Rajasthan at 1.5 km above mean sea level. • The trough from northeast Madhya Pradesh to Manipur ran from northeast Rajasthan to Bangladesh across Uttar Pradesh, Bihar & West Bengal and extended up to 1.5 km above mean sea level with embedded cyclonic circulation over northeast Rajasthan. 	<p>Light to moderate rain occurred at most places with heavy rain / thunderstorm at isolated places in Uttarakhand. Monsoon activity remained Active over Uttarakhand.</p> <p>MANUAL RAIN (cm) : Loharkhet- 11, , Dharchula- 10, Rudraprayag- 9, Sama- 8, Kapkot-7</p> <p>AWS/ARG RAIN (cm) : Pandukeshwar- 7</p>
6	05-Jul-24	<ul style="list-style-type: none"> • The Monsoon trough at mean sea level passed through Bikaner, Sikar, Orai, Churk, Daltonganj, Purulia, Contai and thence east-south-eastwards to northeast Bay of Bengal. • The cyclonic circulation over southeast Pakistan lied over West Rajasthan & adjoining Pakistan at 0.9 km above mean sea level. • A cyclonic circulation lied over East Uttar Pradesh & neighbourhood at 0.9 km above mean sea level. • The trough from northeast Rajasthan to Bangladesh ran from cyclonic circulation over West Rajasthan & adjoining Pakistan to Manipur across cyclonic circulation over East Uttar Pradesh, Jharkhand, West Bengal & Bangladesh at 0.9 km above mean sea level. • The cyclonic circulation over northeast Rajasthan lied over southwest Uttar Pradesh & neighbourhood and extended up to 7.6 km above mean sea level tilting southwards with height. • A trough ran from above cyclonic circulation over southwest Uttar Pradesh & neighbourhood to West Assam across Bihar, Sub-Himalayan West Bengal & Sikkim, North Bangladesh between 1.5 km & 3.1 km above mean sea level. 	<p>Light to moderate rain occurred at most places with heavy to very heavy rain / thunderstorm at a few places in Uttarakhand. Monsoon activity remained Active over Uttarakhand.</p> <p>MANUAL RAIN (cm) : Rishikesh (CWC)-17, Champawat-13, Lohaghat-12, Mori-12, Pithoragarh-9, Pati-9, Haridwar (CWC)-9, Devprayag (CWC)-9, Kotdwar-9, Haldwani-8, Nainital-8, Mohkampur-8, Haripur-8, Jollygrant-7, Ukhimath-7, Ganganagar(CWC)-7, Loharkhet-7, Dwarhat-7</p> <p>AWS/ARG RAIN (cm) : Pati-14, Raiwala-13, Mori-12, Bhimtal-11, Nainital-11, Laldhang-10, Jollygrant-8, Ukhimath-8, Bhainsiya Chhana -8, Jakholi-7, Pithoragarh-7, Jakhnidhar-7, Rikhnikhal-7, Chaukhutiya-7</p>
7	06-Jul-24	<ul style="list-style-type: none"> • The Monsoon trough at mean sea level passed through Bikaner, Jaipur, Gwalior, Satna, Daltonganj, Asansol, Bagati and thence south-eastwards to northeast Bay of Bengal. • The cyclonic circulation over southwest Uttar Pradesh & neighbourhood persisted and was seen between 0.9 & 7.6 km above mean sea level tilting south-westwards with height. • The trough ran from the cyclonic circulation over southwest Uttar Pradesh & neighbourhood to cyclonic circulation over northeast Assam across Bihar & West Bengal at 0.9 km above mean sea level. • A trough ran from cyclonic circulation over southwest Uttar Pradesh to northeast Arabian sea off Gujarat coast across Madhya Pradesh between 3.1 & 5.8 km above mean sea level. 	<p>Light to moderate rain occurred at most places with heavy to very heavy rain / thunderstorm at isolated places in Uttarakhand. Monsoon activity remained Active over Uttarakhand.</p> <p>MANUAL RAIN (cm) : Champawat-18, Nainital-16, Devprayag-14, Kotdwar-13, Haripur-11, Haldwani-10, Khatima-10, Banbasa-10, Lohaghat-9, Betalghat-9, Pithoragarh-7, Dharchula-7, Almora-7</p> <p>AWS/ARG RAIN (cm) : Nainital-16, Haldwani-12, Bhimtal-11, Nainital (Jeolikot)-11, Kaladhungi-11, Ramnagar-10, Bhainsiya Chhana-10, Sultanpur Patti-10, Gular Bhoj-9, Sitlaket-9, Matela-8, Chorgalia-8, Kanda-8, Champawat-8, Rishikesh-7, Takula-7, Bhikiyasain-7, Almora-7, Jhulaghat-7, Jasur-7, Kashipur-7, Gadarpur-7, Bajpur-7</p>
8	07-Jul-24	<ul style="list-style-type: none"> • The Monsoon trough at mean sea level passed through Bikaner, Sikar, Gwalior, Sidhi, Daltonganj, Contai and thence south-eastwards to northeast Bay of Bengal and extended up to 0.9 km above mean sea level. • The Western Disturbance as a cyclonic circulation over north Pakistan lied over Central Pakistan & neighbourhood at 3.1 km above mean sea level with a trough aloft in middle tropospheric westerlies with its axis at 5.8 km above mean sea level roughly along Long. 72°E to the north of Lat. 32°N. • The cyclonic circulation over southwest Uttar Pradesh & neighbourhood lied over northeast Rajasthan & 	<p>Light to moderate rain occurred at many places with heavy to extremely heavy rain / thunderstorm at isolated places in Uttarakhand. Monsoon activity remained Active over Uttarakhand.</p> <p>MANUAL RAIN (cm) : Banbasa-43, Khatima-28, Champawat-22, Pantnagar-20, Kathgodam-19, Lohaghat-19, Pithoragarh-12, Nainital-12, Kashipur-11, Gangolihat-8, Almora-7, Mukteshwar-7</p>

		neighbourhood & extended up to 4.5 km above mean sea level.	AWS/ARG RAIN (cm) : Chorgalia-31, Haldwani-20, Champawat-20, Gadarpur-18, Gularbhoj-16, Lohaghat-16, Kashipur-15, Sultanpur_Patti-14, Bhimtal-14, Nainital-14, Kaladhungi-14, Jainti-13, Nainital (Jeolikot)-12, Rudrapur-12, Ramnagar-9, Kanda-8, Didihat-8, Bhainsiya Chhana-8, Takula-7, Kanalichhina-7, Kashipur-7
9	19-Jul-24	<ul style="list-style-type: none"> The Monsoon trough at mean sea level passed through Jaisalmer, Kota, Guna, Sagar, Raipur, Puri and thence south-eastwards to the center of depression over Northwest and adjoining West central Bay of Bengal off Odisha and adjoining north Andhra Pradesh coasts and extended up to 1.5 km above mean sea level. The shear zone ran roughly along 20°N between 3.1 & 5.8 km above mean sea level tilting southwards with height. 	Light to moderate rain occurred at many places with heavy to very heavy rain / thunderstorm at isolated places in Uttarakhand. Monsoon activity remained Normal over Uttarakhand. MANUAL RAIN (cm) : Haripur-17, Narendranagar-9, Garisain-8 AWS/ARG RAIN (cm) : Dangoli- 9, Jakholi-7
10	20-Jul-24	<ul style="list-style-type: none"> The Monsoon trough at mean sea level passed through Jaisalmer, Ajmer, Damoh, Mandla, Raipur, center of depression over Odisha coast and thence east-south-eastwards to east central Bay of Bengal. A Western Disturbance as a trough in middle tropospheric westerlies with its axis at 5.8 km above mean sea level ran roughly along Long. 66°E to the north of Lat. 28°N. A cyclonic circulation lied over Himachal Pradesh at 1.5 km above mean sea level. A cyclonic circulation lied over central Rajasthan and extended up to 1.5 km above mean sea level. The shear zone roughly along 20°N between 3.1 & 5.8 km above mean sea level tilting southwards with height persisted. 	Light to moderate rain occurred at many places with heavy to very heavy rain / thunderstorm at isolated places in Uttarakhand. Monsoon activity remained Normal over Uttarakhand. MANUAL RAIN (cm) : Shama-12, Loharkhet-9 AWS/ARG RAIN (cm) : Tanakpur-16, Shama-13, Haldwani-9, Takula-7
11	21-Jul-24	<ul style="list-style-type: none"> The Monsoon trough at mean sea level passed through Jaisalmer, Kota, Guna, Mandla and center of well marked low pressure areas over interior Odisha & adjoining Chhattisgarh, Chandbali and thence east-south-eastwards to east central Bay of Bengal. The shear zone roughly along 20°N between 3.1 & 5.8 km above mean sea level tilting southwards with height persisted. The Western Disturbance as a trough in middle tropospheric westerlies with its axis at 5.8 km above mean sea level ran roughly along Long. 67°E to the north of Lat. 28°N. A cyclonic circulation lied over northeast Rajasthan & neighbourhood at 0.9 km above mean sea level. 	Light to moderate rain occurred at most places with heavy to very heavy rain / thunderstorm at isolated places in Uttarakhand. Monsoon activity remained Normal over Uttarakhand. MANUAL RAIN (cm) : Sama-13, Bangapani-11, Banbasa-10, Bhatwari-7, Mohkampur-7, Munsiyari-7, Dharchula-7 AWS/ARG RAIN (cm) : Shama-15, Bhagwanpur-9, Bhainsiya-Chhana-7
12	22-Jul-24	<ul style="list-style-type: none"> The Monsoon trough at mean sea level passed through Jaisalmer, Ajmer, Guna, center of low-pressure area over East Madhya Pradesh and adjoining Chhattisgarh, Chandbali and thence southeast wards to east central Bay of Bengal and extended up to 1.5 km above mean sea level. The cyclonic circulation over northeast Rajasthan & neighbourhood at 0.9 km above mean sea level had merged with the Monsoon trough. The shear zone ran roughly along 21°N between 3.1 & 7.6 km above mean sea level tilting southwards with height. A fresh Western Disturbance as a trough in middle tropospheric westerlies with its axis at 5.8 km above mean sea level ran roughly along Long. 65°E to the north of Lat. 30°N. 	Light to moderate rain occurred at many places with heavy rain / thunderstorm at isolated places in Uttarakhand. Monsoon activity remained Normal over Uttarakhand. MANUAL RAIN (cm) : Roorkee-10, Laksar-9, Bhagwanpur-7 AWS/ARG RAIN (cm) : Laksar-10
13	25-Jul-24	<ul style="list-style-type: none"> The Monsoon trough at mean sea level passed through Shri Ganganagar, Jaipur, Gwalior, Sidhi, Ranchi, Canning and thence east-south-eastwards to Northeast Bay of Bengal. 	Light to moderate rain occurred at many places with heavy to extremely heavy rain / thunderstorm at isolated places in Uttarakhand. Monsoon activity

		<ul style="list-style-type: none"> • The shear zone ran roughly along 22°N between 3.1 & 7.6 km above mean sea level tilting southwards with height. • A cyclonic circulation lied over northwest Uttar Pradesh & neighbourhood at 1.5 km above mean sea level. 	<p>remained Normal over Uttarakhand.</p> <p>MANUAL RAIN (cm) : Shama-27, Chamoli-11, Mussoorie-9, Ukhimat-8, Kotdwar-7</p> <p>AWS/ARG RAIN (cm) : Shama-24, Mussoorie-11, Sult-9, Nainidanda-9, Didihat-8, Ukhimath-7</p>
14	26-Jul-24	<ul style="list-style-type: none"> • The Monsoon trough at mean sea level passed through Shri Ganganagar, Rohtak, Delhi, Agra, Siddhi, Daltonganj, Asansol and thence south-eastwards to centre of above Low pressure area and extended up to 1.5 km above mean sea level. • The shear zone ran roughly along 18°N over Indian region between 5.8 & 7.6 km above mean sea level tilting southwards with height. 	<p>Light to moderate rain occurred at most places with heavy to very heavy rain / thunderstorm at isolated places in Uttarakhand. Monsoon activity remained Active over Uttarakhand.</p> <p>MANUAL RAIN (cm) : Haripur-20, Ganganagar-12, Karnprayag-12, Mussoorie-9, Jakholi-9, Didihat-8, Champawat-8, Loharkhet-8, Kapkot-7, Gangolihat-7, Sama-7, Lohaghat-7, Ukhimath-7, Dhanaulti-7</p> <p>AWS/ARG RAIN (cm) : Mussoorie-14, Pancheshwar-9, Utt. Tech. Uni.-9, Didihat-9, Champawat-8, Dangoli-7, Sama-7, Lohaghat-7, Chorgalia-7</p>
15	31-Jul-24	<ul style="list-style-type: none"> • The Monsoon trough at mean sea level passed through Ganganagar, Hissar, Delhi, Hardoi, Dehri, Purulia, Sagar Island and thence east-south-eastwards to northeast Bay of Bengal. • A shear zone ran roughly along 20°N between 4.5 & 5.8 km above mean sea level tilting southwards with height. 	<p>Light to moderate rain occurred at most places with heavy to extremely heavy rain / thunderstorm at isolated places in Uttarakhand. Monsoon activity remained Active over Uttarakhand.</p> <p>MANUAL RAIN (cm) : Haripur-24, Roshnabad-21, Mohkampur-17, Haridwar-15, Jollygrant-12, Narendranagar-11, Dhanolti-10, Bhagwanpur-9, Chakrata-9, Loharkhet-9, Kathgodam-8, Khatima-7</p> <p>AWS/ARG RAIN (cm) : Raiwala-16, Asharori-11, Nainital (Jeolikot)-11, Jollygrant-11, Chakrata-10, Ucost-10, Utt. Tech. Uni.-9, Takula-9, Hatibharkala-9, Roorkee_Amfu-9, Nainital-9, Dhanolti-8, Lansdown-7, Chorgalia-7</p>
16	06-Aug-24	<ul style="list-style-type: none"> • The well marked low pressure area over central parts of Pakistan lied as a low pressure area over the same region. The associated cyclonic circulation extended up to 5.8 km above mean sea level. • The Monsoon trough at mean sea level passed through center of the Low pressure area over central parts of Pakistan, Sikar, Gwalior, Churk, Purulia, Contai and thence south-eastwards to east-central Bay of Bengal. • The east-west trough from the above mentioned Low Pressure Area ran to East Bihar across central parts of Rajasthan & Uttar Pradesh between 0.9 & 3.1 km above mean sea level. 	<p>Light to moderate rain occurred at most places with heavy to very heavy rain / thunderstorm at isolated places in Uttarakhand. Monsoon activity remained Active over Uttarakhand.</p> <p>MANUAL RAIN (cm) : Banbasa-12, Pantnagar-11, Khatima-11, Nandkesari-9, Uttarkashi-7, Loharkhet-7, Shama-7, Bageshwar-7</p> <p>AWS/ARG RAIN (cm) : Gular Bhoj-18, Rudrapur-16, Dangoli-14, Tanakpur-13, Bhainsiya Chhana -11, Kanda-11, Kichha-10, Bageshwar-10, Gadarpur-10, Bajpur-10, Utt. Tech. Uni.-8, Sultanpur Patti-7, Berinag-7, Nainital (Jeolikot)-7, Vikas Nagar-7, Ucost-7</p>
17	18-Aug-24	<ul style="list-style-type: none"> • The Monsoon trough at mean sea level passed through Bikaner, Sikar, Orai, Sidhi, Ranchi and thence to the centre of low-pressure area over south Bangladesh & neighbourhood. • A cyclonic circulation over Southwest Pakistan & neighbourhood extended up to 3.1 km above mean sea level tilting south-westwards with height. 	<p>Light to moderate rain occurred at many places with heavy to very heavy rain / thunderstorm at isolated places in Uttarakhand. Monsoon activity remained Normal over Uttarakhand.</p> <p>MANUAL RAIN (cm) : Haripur-18, Loharkhet-17, Mussoorie-7</p>

			AWS/ARG RAIN (cm) : Sahashtadthara-15, Didihat-10, Ukhimath-8
18	19-Aug-24	<ul style="list-style-type: none"> • The Monsoon trough at mean sea level passed through Sri Ganganagar, Delhi, Kanpur, Dehri, Bankura, centre of low-pressure area over south Bangladesh & neighbourhood and thence to northeast Bay of Bengal. • The cyclonic circulation over Southwest Pakistan & neighbourhood extending up to 3.1 km above mean sea level persisted. 	Light to moderate rain occurred at most places with heavy to very heavy rain / thunderstorm at isolated places in Uttarakhand. Monsoon activity remained Active over Uttarakhand. MANUAL RAIN (cm) : Shama-19, Kapkot-16, Nainital-8, Haldwani-8, Chamoli-8 AWS/ARG RAIN (cm) : Shama-16
19	20-Aug-24	<ul style="list-style-type: none"> • The Monsoon trough at mean sea level passed through Sri Ganganagar, Rohtak, Orai, Churk, Malda to the centre of low-pressure area over Central parts of Bangladesh & neighbourhood. • A cyclonic circulation lied over northwest Uttar Pradesh & neighbourhood at 0.9 km above mean sea level. • The cyclonic circulation over Southwest Pakistan & neighbourhood extending upto 3.1 km above mean sea level persisted. • A Western Disturbance as a trough in middle tropospheric westerlies with its axis at 5.8 km above mean sea level ran roughly along Long. 70°E to the north of Lat. 32°N. 	Light to moderate rain occurred at most places with heavy to very heavy rain / thunderstorm at isolated places in Uttarakhand. Monsoon activity remained Active over Uttarakhand. MANUAL RAIN (cm) : Mohkampur-13, Sama-9, Dharchula-9, Pantnagar-9, Loharkhet-7, Gadarpur-7, Kotdwar-7, Kapkot-7 AWS/ARG RAIN (cm) : Bajpur-17, Ramnagar-16, Gadarpur-14, Kaladhungi-13, Gular Bhoj-12, Mohakampur-11, Sahastradhara-10, Tanakpur-9, Shama-8, Haldwani-7, Hatibharkala-7, Agastyamuni-7, Berinag-7, Rudrapur-7
20	21-Aug-24	<ul style="list-style-type: none"> • The Monsoon trough at mean sea level passed through Sri Ganganagar, Rohtak, Orai, Dehri, Purulia, centre of low-pressure area over north Bangladesh & neighbourhood and thence to east-south-eastwards to northeast Bay of Bengal. • The Western Disturbance was seen as a cyclonic circulation over Jammu & Kashmir at 3.1 km above mean sea level. 	Light to moderate rain occurred at most places with heavy to very heavy rain / thunderstorm at isolated places in Uttarakhand. Monsoon activity remained Normal over Uttarakhand. MANUAL RAIN (cm) : Kapkot-15, Roshnabad-13, Loharkhet-12, Kotdwar-10, Tejam-10, Bangapani-7, Jollgrant-7, Haridwar-7 AWS/ARG RAIN (cm) : Haridwar-11, Jollygrant-7, Shama-7
21	22-Aug-24	<ul style="list-style-type: none"> • The Monsoon trough at mean sea level passed through Sri Ganganagar, Rohtak, Orai, Siddhi, Gaya, centre of low-pressure area over north Bangladesh & neighbourhood and thence to east-south-eastwards to northeast Bay of Bengal and extended up to 0.9 km above mean sea level. • The cyclonic circulation over northwest Uttar Pradesh & neighbourhood at 0.9 km above mean sea level had merged with the above trough. • A fresh Western Disturbance as a trough in middle tropospheric westerlies with its axis at 5.8 km above mean sea level ran roughly along Long. 65°E to the north of Lat. 30°N. 	Light to moderate rain occurred at many places with heavy to very heavy rain / thunderstorm at isolated places in Uttarakhand. Monsoon activity remained Active over Uttarakhand. MANUAL RAIN (cm) : Kotdwar-15 ,Khatima-8, Tejam-7 AWS/ARG RAIN (cm) : Sahastradhara-17, Yamkeshwar-8
22	01-Sep-24	<ul style="list-style-type: none"> •The Monsoon trough at mean sea level passed through Sri Ganganagar, Guna, Mandala, centre of depression over South Odisha and adjoining South Chhattisgarh & north Andhra Pradesh and thence southeastwards to westcentral Bay of Bengal. •The cyclonic circulation lied over north Haryana and neighbourhood at 1.5 km above mean sea level. •The Western Disturbance as a trough in middle tropospheric westerlies with its axis at 5.8 km above mean sea level ran roughly along Long. 60°E to the north of Lat. 30°N. •The shear zone ran roughly along 18°N over north Peninsular India between 4.5 & 7.6 km above mean sea level. 	Light to moderate rain occurred at most places with heavy to extremely heavy rain / thunderstorm at isolated places in Uttarakhand. Monsoon activity remained Active over Uttarakhand. MANUAL RAIN (cm) : Sama-21, Loharkhet-17, Mohkampur-14, Rishikesh-12, Haripur-12, Kotdwar-10, Kapkot-9, Narendranagar-9, Lansdowne-8, Munsiyari-8, Mori-8, Ukhimath-7, Didihat-7, Chakrata-7 AWS/ARG RAIN (cm) : Ucost-19, Shama-19, Song-17, Sahastradhara-17, Utt.

			Tech. Uni.-17, Maldevta-13, Pokhari-13, Mohakampur-13, Dangoli-11, Tharali-10, Asharori-10, Soneprayag-9, Didihat-7, Naitwar-7
23	11-Sep-24	<ul style="list-style-type: none"> • The well-marked low pressure area over Northeast Madhya Pradesh and neighbourhood moved nearly north-north-westwards and re-intensified into a depression and lay centred at 0830 hours IST of today, the 11th September over Northeast Madhya Pradesh near latitude 24.0°N and longitude 80.0°E, about 60 km east-northeast of Damoh (Madhya Pradesh), 110 km south of Khajuraho (Madhya Pradesh), 110 km southwest of Satna (Madhya Pradesh) and 210 km southeast of Jhansi (Madhya Pradesh). • The Monsoon trough at mean sea level passed through Bikaner, Sikar, Shivpuri, the centre of depression over Northeast Madhya Pradesh and neighbourhood, Pendra Road, Rourkela, Digha and thence south-eastwards to central Bay of Bengal and extended up to 1.5 km above mean sea level. • The Western Disturbance as a trough in middle tropospheric westerlies with its axis at 5.8 km above mean sea level ran roughly along Long. 72°E to the north of Lat. 28°N. 	<p>Light to moderate rain occurred at most places with heavy to very heavy rain / thunderstorm at isolated places in Uttarakhand. Monsoon activity remained Active over Uttarakhand.</p> <p>MANUAL RAIN (cm) : Banbasa-12, Champawat-9, Pantnagar-8, Lohaghat-7, Haldwani-7</p> <p>AWS/ARG RAIN (cm) : Rudrapur-16, Chorgalia-11, Pati-9, Chalthi-9, Gular Bhoj-8, Jageshwar-7, Bhainsiya Channa-7, Bhimtal-7, Mukteshwar-7, Nainital (Jeolikot)-7</p>
24	12-Sep-24	<ul style="list-style-type: none"> • The depression over northwest Madhya Pradesh and neighbourhood moved north-north-eastwards with a speed of 10 kmph during past 06 hours and lay centred at 0830 hours IST of today, the 12th September over Southwest Uttar Pradesh & neighbourhood near latitude 27.0°N and longitude 78.5°E, about 50 km east-southeast of Agra (Uttar Pradesh), 90 km north-northeast of Gwalior (Madhya Pradesh), 110 km south-southeast of Aligarh (Uttar Pradesh) and 180 km south-southwest of Bareilly (Uttar Pradesh). • The Monsoon trough at mean sea level passed through Amritsar, Delhi, the centre of depression over Southwest Uttar Pradesh & neighbourhood, Nowgong, Churk, Dehri, Purulia, Canning and thence south-eastwards to northeast Bay of Bengal. • A cyclonic circulation lied over Punjab & adjoining Haryana at 3.1 km above mean sea level. • The Western Disturbance as a trough in middle tropospheric westerlies with its axis at 5.8 km above mean sea level roughly along Long. 72°E to the north of Lat. 28°N persisted. 	<p>Light to moderate rain occurred at most places with heavy to very heavy rain / thunderstorm at a few places and extremely heavy rain at isolated places in Uttarakhand. Monsoon activity remained Vigorous over Uttarakhand.</p> <p>MANUAL RAIN (cm) : Lohaghat-26, Champawat-20, Banbasa-13, Khatima-13, Kashipur-11, Pithoragarh-11, Mukteshwar-9, Jaspur-9, Pantnagar-9, Haldwani-9, Pati-9, Almora-8, Ranikhet-7, Gairsain-7, Haridwar-7, Betalghat-7, Nainital-7</p> <p>AWS/ARG RAIN (cm) : Champawat-18, Pancheshwar-16, Mukteshwar-13, Rudrapur-13, Tanakpur-11, Chorgalia-11, Nainital-11, Pithoragarh-11, Sitlakhet-8, Jainti-7, Kanalichinna-7</p>
25	13-Sep-24	<ul style="list-style-type: none"> •The depression over central Uttar Pradesh moved north-northwestwards during past 6 hours and weakened into a well marked low pressure area over the same region at 0830 hours IST of 13th September. However, the associated cyclonic circulation over central Uttar Pradesh extended upto 7.6 km above mean sea level. •The Monsoon trough at mean sea level passed through Firozpur, Karnal, the centre of well marked low pressure area over central Uttar Pradesh, Barabanki, Chapra, Purnia, centre of low pressure area over northeast Bay of Bengal and adjoining southeast Bangladesh coast. •A fresh Western Disturbance was seen as a trough in middle tropospheric westerlies with its axis at 5.8 km above mean sea level roughly along Long. 62°E to the north of Lat. 32°N. 	<p>Light to moderate rain occurred at most places with heavy to very heavy rain / thunderstorm at isolated places in Uttarakhand. Monsoon activity remained Vigorous over Uttarakhand.</p> <p>MANUAL RAIN (cm) : Champawat-18, Haldwani-16 Nainital-15, Lohaghat-11, Pantnagar-9, Pithoragarh-9, Ghansali-7, Banbasa-7, Bhagwanpur-7</p> <p>AWS/ARG RAIN (cm) : Nainital-19, Nainital (Jeolikot)-17, Bhimtal-16, Chorgalia-15, Kashipur-15, Dhari-13, Pati-12, Champawat-12, Kaladhungi-12, Lohaghat-11, Mukteshwar-9, Pithoragarh-9, Haldwani-9, Jageshwar-9, Gular Bhoj-7, Sult-7</p>
26	25-Sep-24	<ul style="list-style-type: none"> • The shear zone roughly along 16°N over north peninsular India between 3.1 km to 7.6 km above mean sea level tilting southwards with height had merged with the above trough. 	<p>Light to moderate rain occurred at most places with heavy to extremely heavy rain / thunderstorm at isolated places in Uttarakhand. Monsoon activity remained Vigorous over Uttarakhand.</p>

MANUAL RAIN (cm) :

Haripur-24, Sama-20, Loharkhet-16, Mussoorie-16, Rudraprayag-13, Kapkot-12, Tehri (CWC)-8, Chakrata-8, Narendra Nagar-7, Jakholi-7, Karnprayag-7, Dharchula-7, Dhanaulti-7

AWS/ARG RAIN (cm) :

Shama-18, Kalsi-16, Koti-15, Song-13, Ucost-12, Vikas Nagar-12, Utt. Tech. Uni.-12, Nainital-12, Nainbagh-10, Agastyamuni-9, Dangoli-9, Sahastradhara-8, Chakrata-8, Nainital-8, Jauljibi-7, Berinag-7, Dewal-7

3. WITHDRAWAL OF SOUTHWEST MONSOON:

The withdrawal of southwest monsoon from Northwest India commenced on **23rd September, 2024** against the normal date of 17th September. SW monsoon withdrew from entire **Uttarakhand** on **2nd October, 2024**. Subsequently, SW monsoon withdrew from the entire country on **15th October 2024**. Fig.2 shows the isochrones of withdrawal of SW Monsoon 2024.

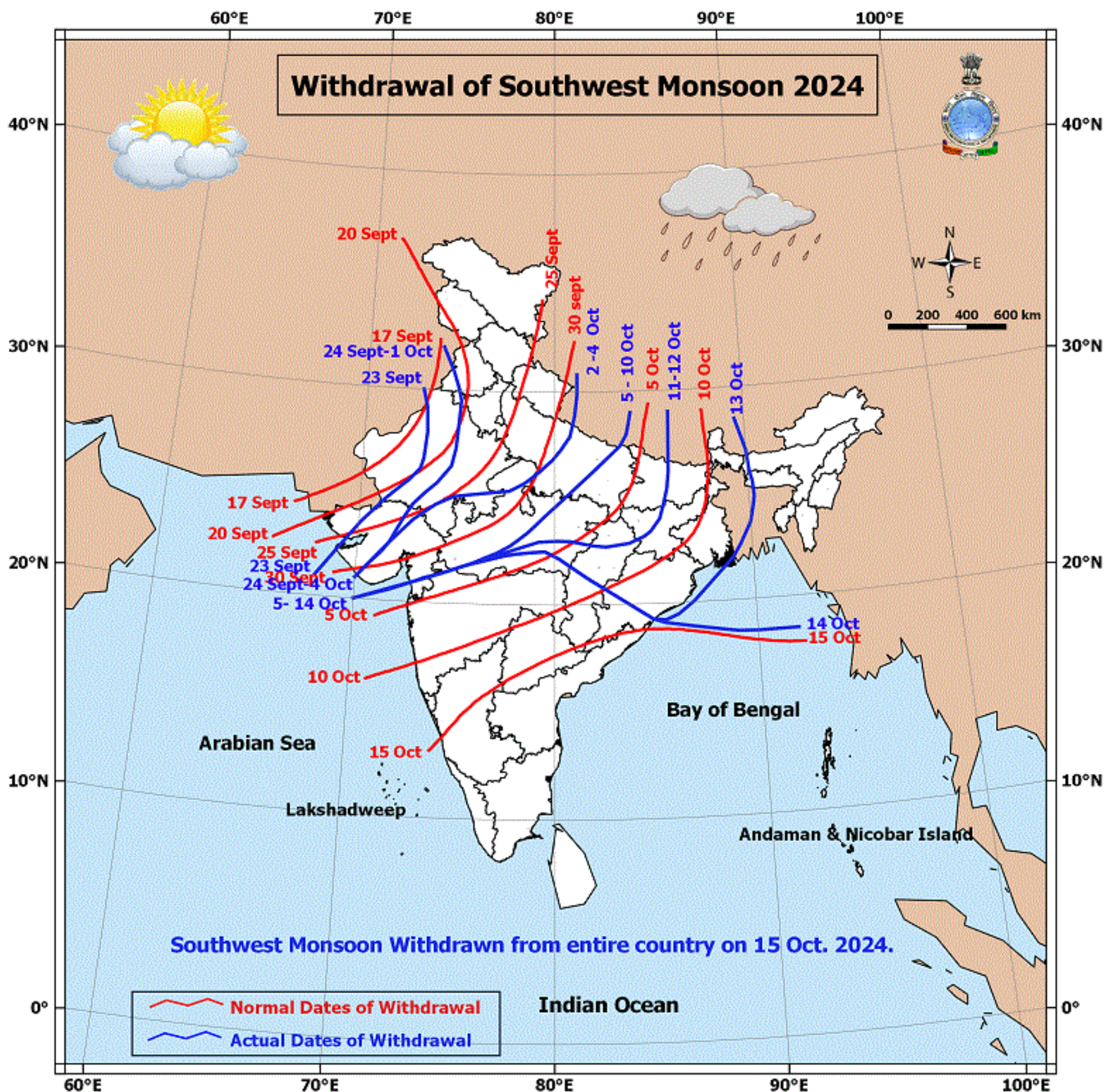


Fig.2: Isochrones of withdrawal of SW-Monsoon 2024

4. RAINFALL DISTRIBUTION OVER UTTARAKHAND DURING MONSOON – 2024:

The rainfall during SW monsoon season (June to September) for the State as a whole is as follows:

Met. Sub-division/ State	Actual Rainfall June-September(in mm)	Normal/Long Period Average (LPA) Rainfall June-September(in mm)	Departure from normal (in %)
Uttarakhand	1273.0	1162.7	+9

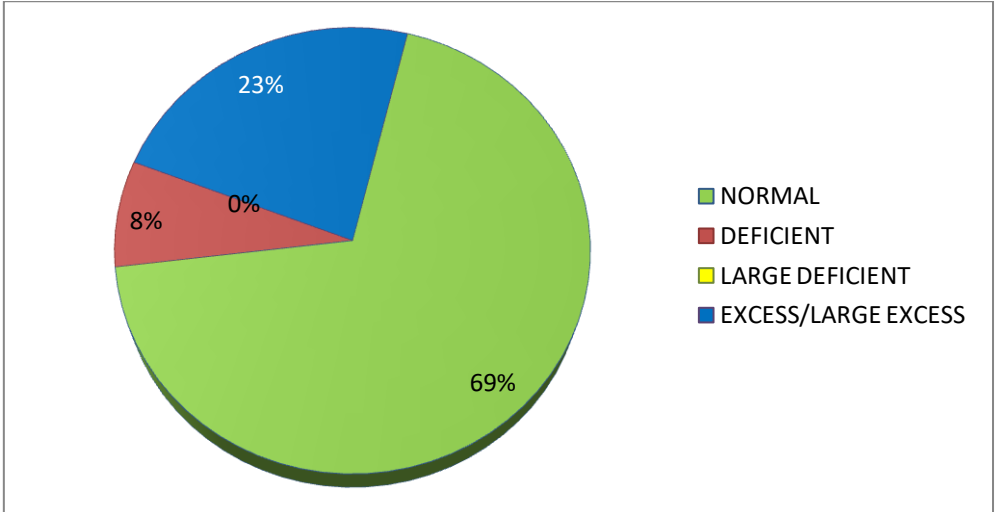


Fig. 3 Rainfall Distribution over the area of Uttarakhand

The LPA rainfall of Uttarakhand state / sub-division is 1162.7 mm based on 1971 to 2020 observed rainfall data series. As seen in the table above, the seasonal rainfall over Uttarakhand State / sub-division as a whole was 109% of its LPA. The seasonal rainfall intensity distribution over the State was in the categories of large excess, excess, normal and deficient. Out of 13 districts of Uttarakhand, 02 districts received large excess, 01 district received excess, 09 districts received normal and 01 district received deficient seasonal rainfall. In terms of area, 23% area received excess to large excess rainfall, 69% area received normal rainfall and 8% area received deficient rainfall. In totality, the monsoon rainfall was normal (+9%) over the state.

5. INTENSITY DISTRIBUTION OF RAINFALL DURING MONSOON-2024 OVER UTTARAKHAND:

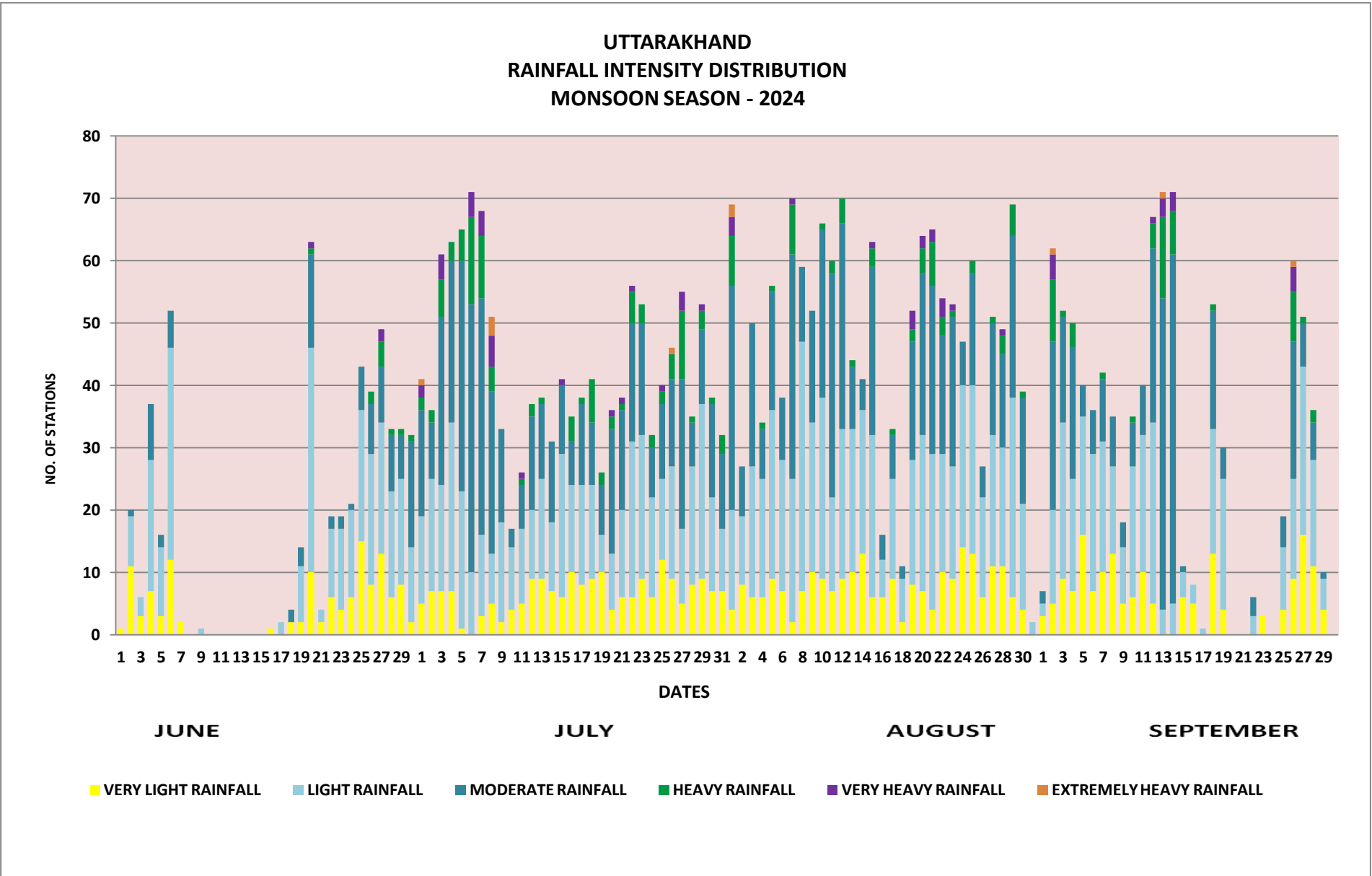


Fig. 4 Rainfall Intensity Distribution

6. MONTHLY DISTRIBUTION OF RAINFALL OVER THE STATE:

The monthly rainfall distribution of the state is given in a table below:

Met. Sub-division/ State	Month	Actual Rainfall (in mm)	Normal or Long period average(LPA) (in mm)	Departure from normal (in %)
Uttarakhand	June-2024	88.9	176.8	-50
	July- 2024	481.9	417.8	+15
	August- 2024	419.4	385.7	+9
	September-2024	282.8	182.4	+55

From the above table, the monthly rainfall was excess over the state in September month, normal during July & August months and deficient during June month. The June rainfall was 50%, July 115%, August 109% and September 155% of the respective monthly LPAs. The amount of rainfall (in terms of % of LPA) was maximum in September month and minimum in June month. This year 23% area received excess to large excess rainfall, 69% area received normal rainfall and 8% area received deficient rainfall. In this way, the performance of monsoon 2024 was normal (109% of LPA) over the State.

7. WEEKLY RAINFALL DISTRIBUTION:

Weekly rainfall distribution and departure over Uttarakhand Meteorological sub-divisions is shown in Fig. 5 and Fig. 6 below respectively:

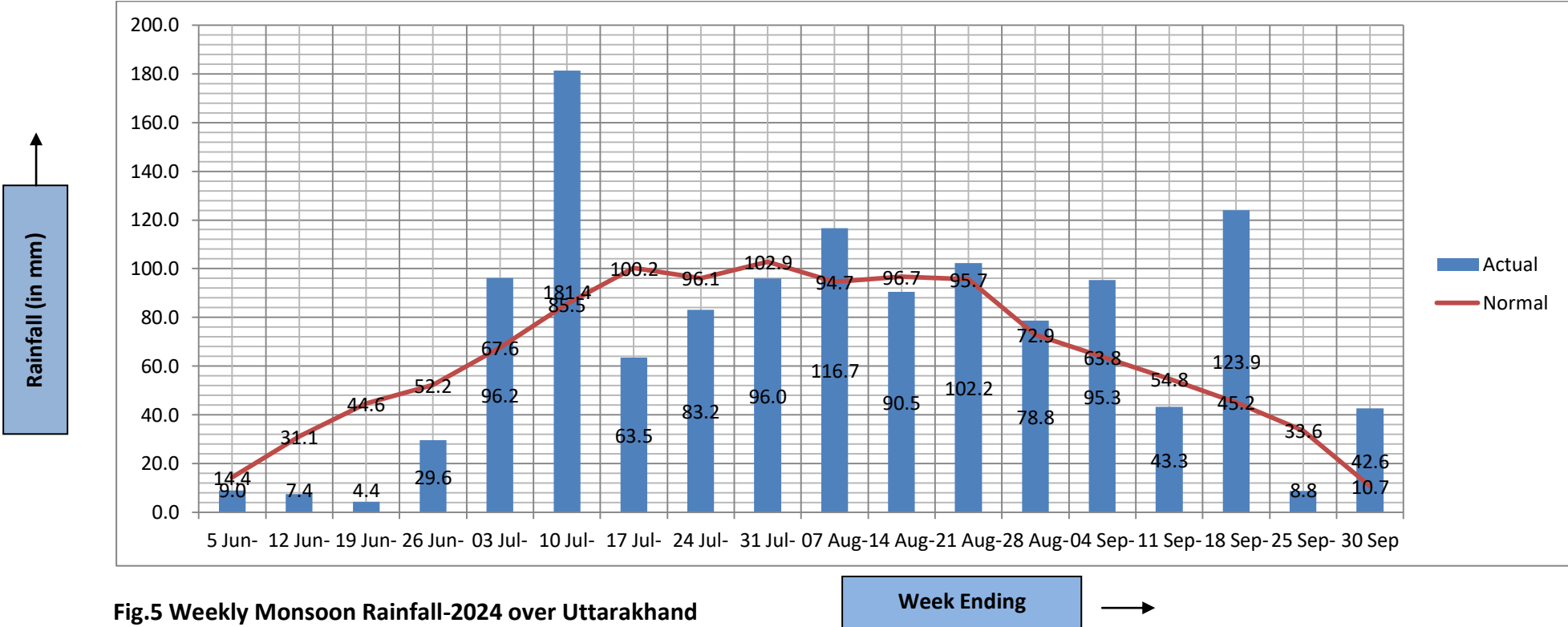


Fig.5 Weekly Monsoon Rainfall-2024 over Uttarakhand

The weekly monsoon rainfall was more than normal over the State during 6 occasions: 2 in July, 1 in August & 3 in September; normal on 5 occasions: 2 in July and 3 in August, and less than normal on other weeks. In terms of percentage departure from normal, the weekly rainfall was large excess ($\geq +60\%$) during 3 weeks, excess (+20 to +59 %) during 3 weeks, normal (-19% to +19%) during 5 weeks, deficient (-20% to -59%) during 4 weeks and large deficient (-60% to -99%) during 3 weeks. Thus, week by week monsoon rainfall performance was average.

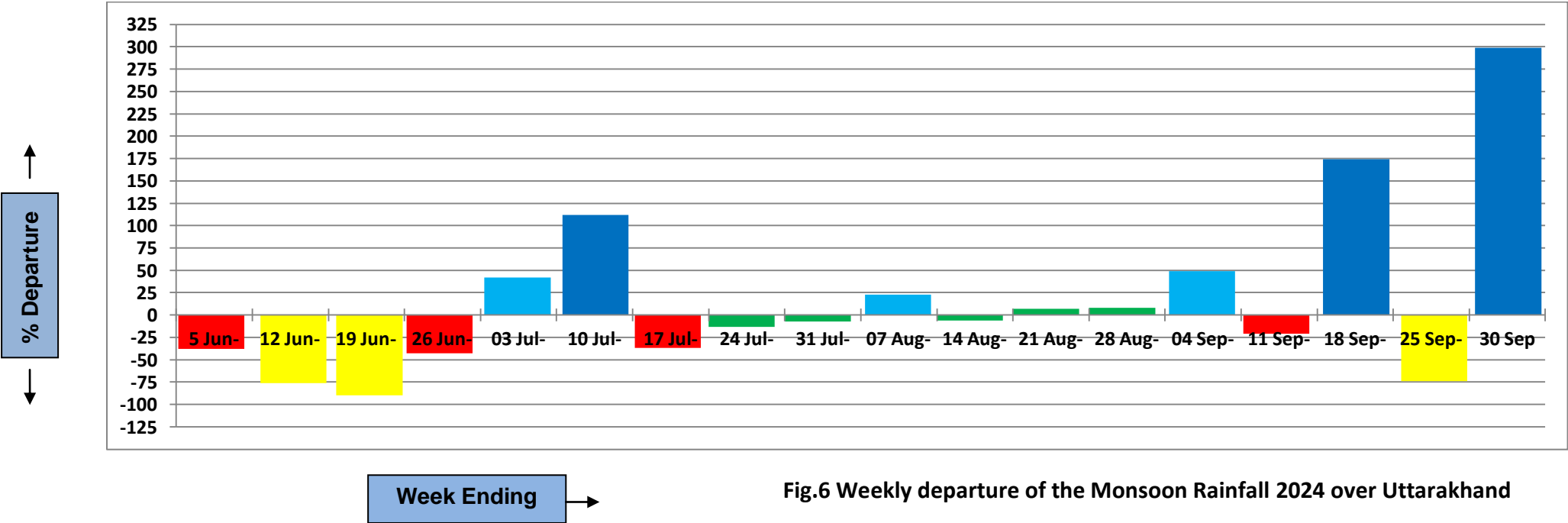


Fig.6 Weekly departure of the Monsoon Rainfall 2024 over Uttarakhand

Week Ending	5 Jun-	12 Jun-	19 Jun-	26 Jun-	03 Jul-	10 Jul-	17 Jul-	24 Jul-	31 Jul-	07 Aug-	14 Aug-	21 Aug-	28 Aug-	04 Sep-	11 Sep-	18 Sep-	25 Sep-	30 Sep
Actual	9.0	7.4	4.4	29.6	96.2	181.4	63.5	83.2	96.0	116.7	90.5	102.2	78.8	95.3	43.3	123.9	8.8	42.6
Normal	14.4	31.1	44.6	52.2	67.6	85.5	100.2	96.1	102.9	94.7	96.7	95.7	72.9	63.8	54.8	45.2	33.6	10.7
% Departure	-38	-76	-90	-43	42	112	-37	-13	-7	23	-6	7	8	49	-21	174	-74	299

8. DISTRICT-WISE SPATIAL DISTRIBUTION OF RAINFALL DURING MONSOON 2024:

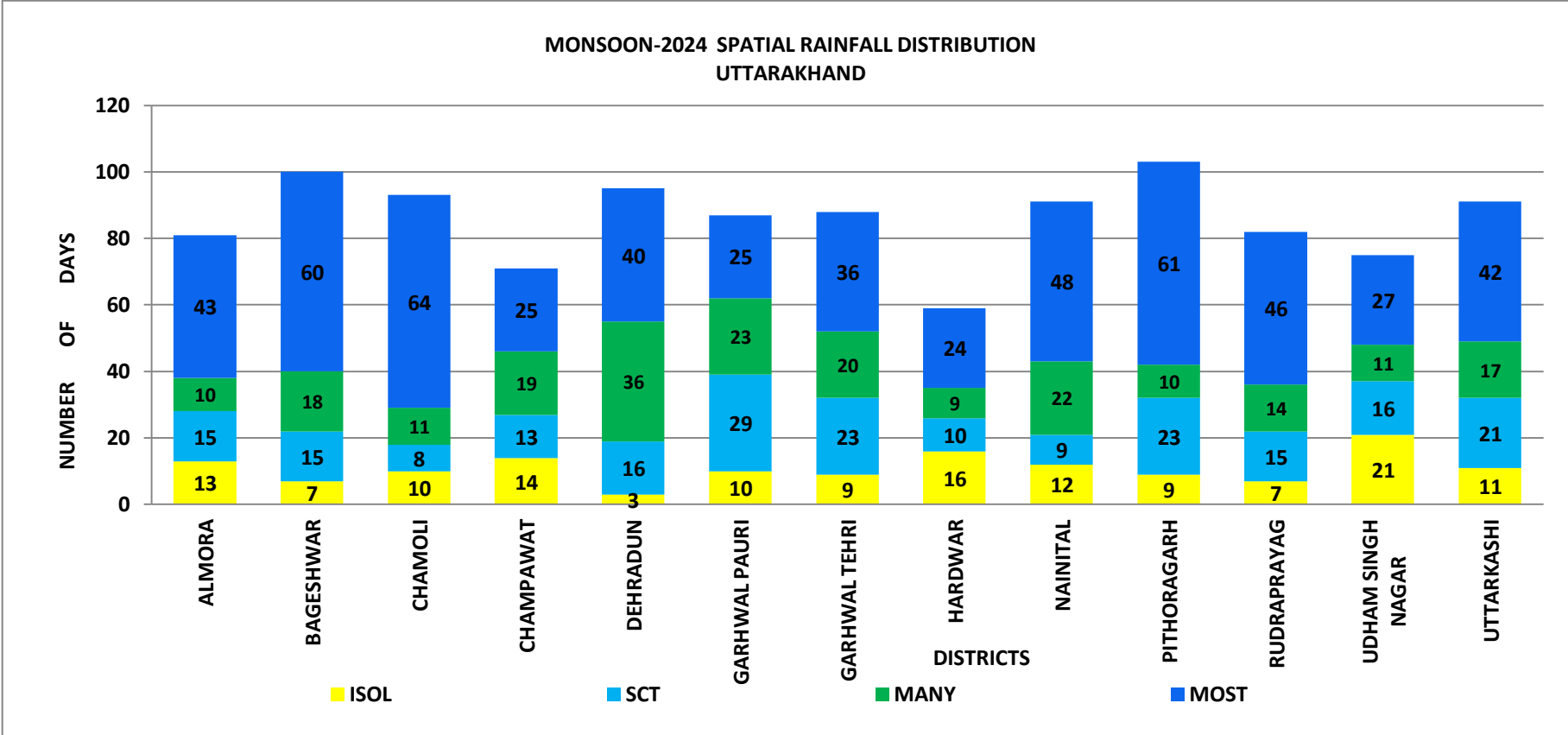


Fig.7 District wise Spatial Distribution of Rainfall during monsoon 2024 over Uttarakhand

The maximum number of rainfall days was over Pithoragarh district (103 days) and minimum number of rainfall days was over Haridwar district (59 days). Widespread to fairly widespread rainfall occurred on 78 days (maximum) over Bageshwar district and 33 days (minimum) over Haridwar district.

9. DISTRICT-WISE HEAVY RAINFALL DISTRIBUTION DURING MONSOON 2024:

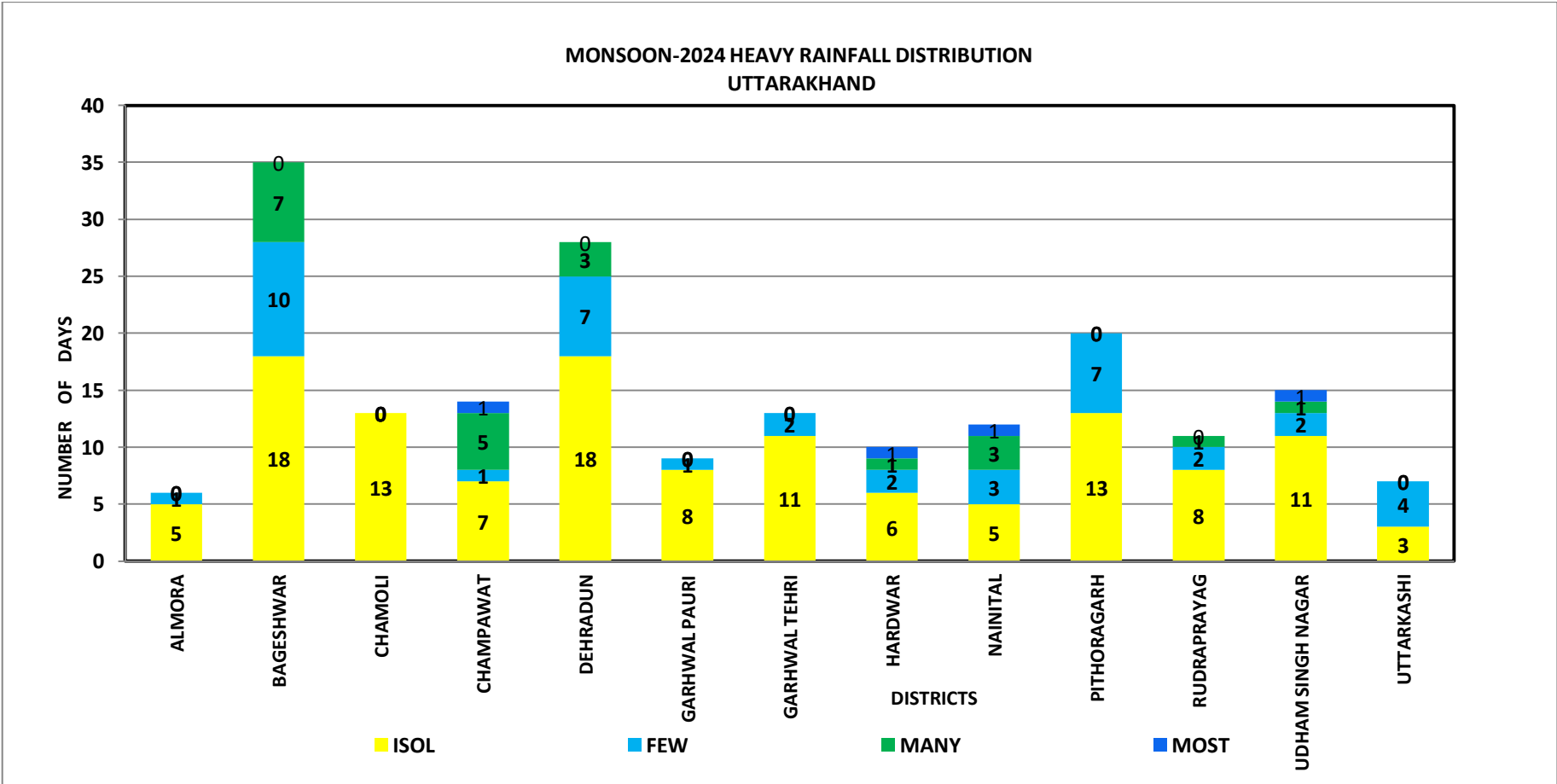


Fig.8 District wise Heavy Rainfall distribution during monsoon 2024 over Uttarakhand

The maximum number of heavy rainfall days was over Bageshwar district (35 days) and minimum over Almora district (6 days).

10. DISTRICTS WISE RAINFALL DISTRIBUTION (JUNE-SEPTEMBER) 2024:

The following table shows the district wise rainfall distribution for Uttarakhand:

Serial No	State/ Districts	Actual Rainfall June-September(in mm)	Normal/ Long period average(LPA) Rainfall June-September (in mm)	Departure from normal (in %)
1.	Almora	897.5	792.3	13
2.	Bageshwar	2556.5	792.3	223
3.	Chamoli	1255.1	721.4	74
4.	Champawat	1397.7	1313.8	6
5.	Dehradun	1751.4	1442.9	21
6.	Pauri Garhwal	782.7	1273.3	-39
7.	Tehri Garhwal	992.4	948.0	5
8.	Haridwar	838.0	989.8	-15
9.	Nainital	1306.6	1537.9	-15
10.	Pithoragarh	1606.5	1502.5	7
11.	Rudraprayag	1489.3	1549.1	-4
12.	Udham Singh Nagar	1221.9	1125.5	9
13.	Uttarkashi	1092.7	1151.2	-5

Out of 13 districts, 9 districts viz. Almora, Champawat, Tehri Garhwal, Haridwar, Nainital, Pithoragarh, Rudraprayag, Udham Singh Nagar and Uttarkashi received normal rainfall; 1 district viz. Pauri Garhwal received deficient rainfall; 1 district viz. Dehradun received excess rainfall and 2 districts viz. Bageshwar and Chamoli received large excess rainfall in varying intensity. The actual rainfall of the season was highest over Bageshwar (2556.5 mm) and lowest over Pauri Garhwal (782.7 mm) district. In terms of % of the normal rainfall/ LPA, Bageshwar district received the maximum (223%) and Pauri Garhwal received minimum (-39%) rainfall. Thus, monsoon 2024 has been a normal (+9%) monsoon year for Uttarakhand.

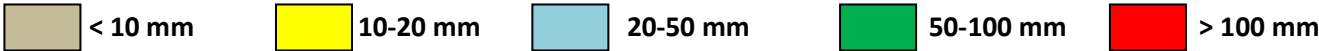
11. MONTHLY DISTRICT-WISE RAINFALL (IN MM) OVER UTTARAKHAND DURING MONSOON SEASON-2024

S. No.	State/ Districts	June (in mm)	Departure (%) June	July (in mm)	Departure (%) July	Aug (in mm)	Departure (%) Aug	Sept (in mm)	Departure (%) Sept
1	Almora	41.6	-72	375.4	37	248.2	3	232.3	79
2	Bageshwar	155.2	6	996.0	263	882.8	265	522.5	302
3	Chamoli	110.2	5	432.8	64	463.3	87	248.8	137
4	Champawat	95.6	-55	686.3	45	201.5	-49	414.3	80
5	Dehradun	124.0	-36	675.3	27	625.8	26	326.3	50
6	Pauri Garhwal	39.1	-74	261.4	-41	291.3	-38	190.9	-7
7	Tehri Garhwal	51.4	-60	350.9	6	353.1	6	237.0	55
8	Hardwar	27.0	-80	267.3	-20	367.1	3	176.6	6
9	Nainital	146.9	-45	549.2	-3	297.1	-33	313.4	20
10	Pithoragarh	109.9	-56	709.8	31	425.7	-11	361.1	53
11	Rudraprayag	118.4	-46	517.7	-6	529.9	-7	323.3	56
12	Udham Singh Nagar	47.9	-73	568.9	46	337.3	-10	267.8	44
13	Uttarkashi	76.9	-56	293.4	-31	480.8	26	241.6	44

60% or more 20 % to 59 % -19 % to 19% -20 % to -59 % -60 % or less

12. WEEKLY DISTRICT-WISE RAINFALL (IN MM) OVER UTTARAKHAND DURING MONSOON SEASON-2024:

Week Ending	5 Jun-	12 Jun-	19 Jun-	26 Jun-	03 Jul-	10 Jul-	17 Jul-	24 Jul-	31 Jul-	07 Aug-	14 Aug-	21 Aug-	28 Aug-	04 Sep-	11 Sep-	18 Sep-	25 Sep-	30 Sep
Almora	11.8	3.2	0.0	17.0	35.2	213.7	24.7	58.1	53.2	53.2	81.0	52.5	40.3	51.4	19.6	159.8	0.7	22.0
Bageshwar	21.7	5.3	3.8	32.6	245.8	216.5	111.0	245.7	268.7	183.9	131.4	342.1	181.6	221.6	54.2	126.5	41.6	122.4
Chamoli	12.6	6.8	6.1	28.2	103.8	103.2	45.1	92.7	144.4	122.0	96.8	125.3	89.3	104.5	46.9	82.6	2.3	42.4
Champawat	2.2	3.8	0.0	13.7	96.9	492.6	28.5	54.1	90.1	80.4	45.8	52.6	18.2	10.8	3.4	354.7	4.0	46.0
Dehradun	3.5	13.5	0.2	73.6	110.9	184.5	44.6	143.6	224.9	184.4	127.2	143.6	131.4	143.6	48.2	56.0	9.9	107.8
Pauri Garhwal	2.8	3.6	0.0	18.9	34.9	118.3	43.9	47.3	30.6	58.8	60.3	51.0	88.0	90.5	15.3	88.2	0.3	29.9
Tehri Garhwal	11.0	9.7	0.0	22.6	23.8	162.7	55.2	70.3	46.9	103.4	81.1	48.3	85.6	87.4	25.2	99.7	4.2	55.3
Hardwar	0.0	0.2	0.0	10.3	66.0	51.6	57.0	102.6	6.4	128.7	92.0	50.5	57.8	56.6	47.8	89.6	6.6	14.3
Nainital	2.0	0.8	0.0	49.7	198.6	288.6	67.6	44.8	44.1	105.8	60.4	93.1	32.6	16.0	57.7	224.4	1.3	19.2
Pithoragarh	16.0	13.2	17.8	38.1	141.0	226.7	128.9	133.1	105.2	113.6	87.1	128.8	54.3	126.0	64.4	137.0	26.4	49.0
Rudraprayag	29.6	14.5	13.4	33.0	72.1	139.5	75.7	97.7	160.7	118.9	139.6	136.8	98.1	141.6	29.9	93.7	1.3	93.6
Udham Singh Nagar	0.2	0.2	0.0	16.3	106.3	313.1	66.9	48.0	66.1	116.4	34.1	95.3	61.9	31.0	26.6	215.1	6.8	17.9
Uttarkashi	5.5	11.5	3.4	22.0	52.5	112.8	50.9	32.2	79.4	150.0	124.2	77.2	94.3	115.6	62.1	73.9	9.7	15.4



13. RAINFALL MAP OF MONSOON-2024 OF DIFFERENT DISTRICTS OF UTTARAKHAND MET SUB-DIVISION:

PERIOD: 01.06.2024 – 30.09.2024

