

What caused an 'early' monsoon onset in India this year?

Monsoon Update in India: Multiple, large-scale atmosphere-oceanic and local factors developed and favoured the early monsoon onset this year. Here is what to know.

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Visitors at Vizhinjam fishing harbour during rain, in Thiruvananthapuram, Saturday, May 24, 2025, as the southwest monsoon hit Kerala. (PTI)

Monsoon Start Update in India 2025: The India Meteorological Department (IMD) declared the monsoon onset over Kerala on Saturday (May 24), eight days ahead of its normal date schedule of June 1. The onset marks the beginning of the four-month, June-

S<mark>eptember southwest monsoon season over India, which brings more than 70 per cent of the country's annual rainfall. This makes the date a significant event in India's economic calendar.</mark>

It last happened in 2009 that the monsoon arrived <u>so early in the year</u>, on May 23. Here is how the onset is declared, and what impacted it this year.

When is the onset of monsoon declared?

The IMD attempts to declare the schedule for southwest monsoon onset any time after May 10. To do so, certain essential criteria are considered, including:

1. Rainfall: If 60% of the available 14 southern meteorological stations – Minicoy, Amini, Thiruvananthapuram, Punalur, Kollam, Allapuzha, Kottayam, Kochi, Thrissur, Kozhikode, Thalassery, Kannur, Kudulu and Mangalore – report rainfall measuring 2.5 mm or more rainfall for two consecutive days.

2. Wind field: Westerly winds blow from West to East in the 30 to 60 degree latitudes, both in the northern and southern hemispheres. For the onset, the depth of westerly winds should be maintained at upto 600 hectoPascals or hPa, which is the unit for measuring atmospheric pressure, and wind speeds must range between 15-20 knots (27-37km/hr) at 925 hPa.

3. Outgoing Longwave Radiation (OLR): The Earth both absorbs and reflects energy from the Sun, and the difference between these processes impacts the Earth's temperature and atmosphere. For instance, larger aerosol particles in the atmosphere interact with and absorb some of the radiation, thus warming the atmosphere. According to NASA, the resultant heat is emitted as longwave infrared radiation.

OLR includes radiation from the warmed upper atmosphere, along with a small amount from the Earth's surface. Most of OLR warms the lower atmosphere, in turn warming the surface. For India's southwest monsoon, Satellite-derived OLR values should be below 200 Watts per square metre. If all these criteria are fulfilled, the IMD declares the monsoon onset over Kerala on the second day of observations. This year, there has been a simultaneous onset over the entire Lakshadweep, Mahe (Puducherry), many parts of the Arabian Sea and the Bay of Bengal, along with monsoon winds reaching parts of southern Karnataka and Mizoram in northeast India.

What factors contributed to the early onset?

Multiple, large-scale atmosphere-oceanic and local factors developed and favoured the early monsoon onset this year. The monsoon arrived over the south Andaman Sea and neighbourhood areas on May 13, against a normal of May 21.

The IMD termed the onset to have taken place under 'very' favourable conditions, including:

1. The Madden-Julian Oscillation (MJO): It is one of the most important and complex <u>ocean-atmospheric phenomena</u> influencing Indian monsoons, with origins in the Indian Ocean. A key feature is that a disturbance of clouds, wind and pressure moves eastward at a speed of 4-8 metres per second. Within 30 to 60 days, MJO wind bands can travel around the world and cause significant weather changes during their movement. In a favourable phase, it can enhance rainfall over India during the monsoon season.

2. Mascarene High: The IMD describes the Mascarene High as a high-pressure area found around the Mascarene Islands (in the south Indian Ocean) during the monsoon period. The variation in the intensity of high pressure is responsible for heavy rains along India's west coast.

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https://indianexpress.com/article/explained/explained-climate/early-monsoon-onset-india-reason-factors-meaning-10027688/

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Monsoon advance, as of the afternoon of May 25. (IMD)

3. Convection: An increase in the convective activity, that is, the vertical transport of heat and moisture in the atmosphere, also brings rainfall. For example, a <u>convective system over Haryana</u> moved southeastward last week and led to rains in the <u>Delhi</u> region.

4. The Somali jet: It is a low-level, inter-hemispheric cross-equatorial wind band originating near Mauritius and north Madagascar. During May, after crossing the east coast of Africa, it reaches the Arabian Sea and the west coast of India. A strong Somali jet is associated with the strengthening of monsoon winds.

5. Heat-low: Following the movement of the Sun to the northern hemisphere, marking the summer season, a low-pressure area develops in the Arabian Sea. The development of a heat-low pressure zone over Pakistan and adjoining areas acted as a suction device for moist air along the monsoon trough, and its strong presence influences good monsoon rainfall.

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6. Monsoon trough: It is an elongated low-pressure area extending from the heat low to the north Bay of Bengal. The north-south swinging of this trough causes rainfall during the June–September period across the core monsoon zone.

Pressure gradient and **monsoon onset vortex**, a cyclonic formation in the Arabian Sea, also play a role in heralding a good <mark>monsoon</mark>.

A comparison of the normal v/s realised onset dates over select locations

| Location | Normal date | Realised date 2025 |
|--------------------|-------------|--------------------|
| Port Blair | May 21 | May 15 – 16 |
| Thiruvananthapuram | June 1 | May 24 |
| Kochi | June 1 | May 24 |

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| <u>Bangalore</u> | June 3 | May 24 |
|------------------|--------|--------|
| Shimoga | June 4 | May 24 |
| Karwar | June 5 | May 24 |

Source: IMD

Which regions did the monsoon cover on its onset day?

The southwest monsoon has hit India with a bang, covering the southwest and east-central Bay of Bengal, Maldives and Comorin regions, south and central Arabian Sea, Kerala, Lakshadweep and Mahe.

It has made a simultaneous and early onset over northeast India (Mizoram), southern and coastal Karnataka and <u>Tamil Nadu</u> (except its northern regions).

Under normal conditions, the monsoon crosses central Kerala and reaches Karnataka around June 5, making this year's onset the earliest over these regions in recent years. In Karnataka, the onset advance is over 10 days this year.

On Sunday, the second day since the onset, the southwest monsoon further advanced into some parts of west-central and eastcentral Arabian Sea, more parts of Karnataka, the entirety of Goa, some parts of Maharashtra, parts of west-central and north Bay of Bengal, and of Mizoram, Manipur and Nagaland.

The Northern Limit of Monsoon, an imaginary line marking the progress of the southwest monsoon, now passes through Devgad, Belagavi, Haveri, Mandya, Dharmapuri, <u>Chennai</u>, Aizawl and Kohima.

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