

## The Monsoon Mayhem

### Why in news?

The monsoon deficit due to the delayed onset has been nearly wiped out, but the distribution of rainfall remains patchy.

### What is monsoon?

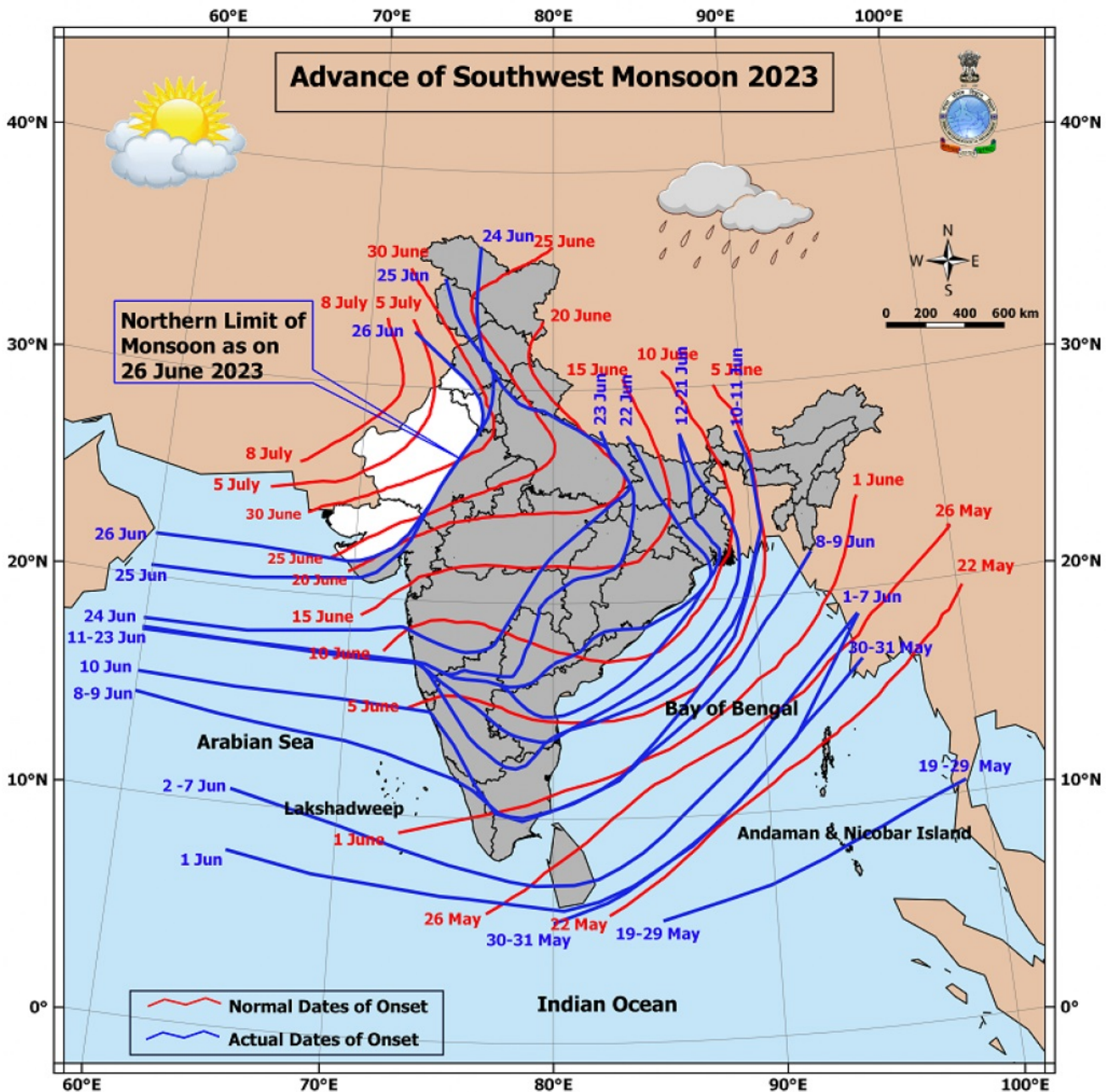
- The seasonal reversal of wind direction during a year accompanied by corresponding changes in precipitation.
- The monsoon or southwest monsoon is a sea-breeze from the Arabian Sea and the Bay of Bengal that officially onsets over Kerala on June 1 and retreats from Rajasthan by the end of September.
- It is then replaced by the retreating, or northeast monsoon in November which is the key source of rainfall for several parts of Tamil Nadu, Andhra Pradesh and north interior Karnataka.

### What is the status of the monsoon in 2023?

- **Onset** - The onset of monsoon was delayed by unforeseen interactions between typhoons and cyclones.
- Cyclone Biparjoy disrupted the monsoon winds and delayed the arrival of monsoon over Mumbai by 2 weeks.
- The monsoon arrived together in Mumbai and Delhi for the first time in over half a century.
- The monsoon trough had an exaggerated curvature over northwest India.
- **Rainfall** - The distribution of rainfall remains as patchy as ever.
- The northern Western Ghats into Northwest India saw excess rainfall.
- Deficits extended in a horseshoe pattern from Uttar Pradesh into Odisha and back to the east into Chhattisgarh, Madhya Pradesh, and Maharashtra.
- **Himachal** - Some areas received heavy rainfall and few areas had extreme heat.

### How was the monsoon system affected by Cyclone Biparjoy?

- The monsoon normally arrives in Mumbai on June 11 and Delhi on June 27, according to long-term assessments by IMD.
- The monsoon has arrived in both Mumbai and Delhi simultaneously on June 25, 2023.
- Such an incident previously happened on June 21, 1961.
- Typhoons Mawar and Guchol pulled winds and moisture from the Indian Ocean.
- The typhoons created weak winds over the Arabian Sea, which allowed cyclone Biparjoy to form very late and last very long.
- Cyclone Biparjoy, in turn, disrupted the monsoon winds, created a delayed arrival of the monsoon over Mumbai.



### What else could be driving the summer monsoon mayhem?

- **Global warming** - With this, a warm and humid atmosphere acts like a steroid for the weather.
- **Wildfires** - So far this year, wildfires have burned over 3-times the normal area and have contributed to the warming.

*Excess rainfall over northwest India is consistent with the Arabian Sea having warmed by about 1.5 degrees Celsius since January.*

- **Arabian Sea** - Rainfall this pre-monsoon was above normal due to a combination of the warm Arabian Sea and an unusually high number of [western disturbances](#).
- **Land factor** - Disuniform terrain and heterogeneous land-use patterns accounts for uneven distribution of rainfall.

- **Pre-monsoon rainfall** - June contributes only about 15% of the rainfall to the seasonal total.
- **Atlantic Ocean** - A warm tropical Atlantic generally tends to suppress monsoon rainfall (*Atlantic Niño*).
- The entire Atlantic Ocean has been warmer than normal since March and its impact on monsoon is not clear.
- **Upper atmospheric circulation** - The strongest winds in the upper atmosphere can break into clockwise and anticlockwise patterns when they run into mountainous terrain (The Himalayas).
- Strong clockwise winds in the upper atmosphere demand an anticlockwise circulation near the surface, in order to feed the upper level outflow.
- Such a convergence near the surface can drive excess rainfall.
- **Himalayas** - Warming over the Himalaya has not been uniform
- Some parts of the mountain chain are amplifying global warming, leading to rapid local warming.
- Irregular weather patterns during the monsoon superpose on these local features resulting in cloudbursts, heavy rains or even heatwaves.

## References

1. [The Hindu - North India's monsoon mayhem is a confluence of factors](#)
2. [DTE - Global warming, Cyclone Biparjoy worked in tandem to bring monsoon to Mumbai and Delhi on same date](#)

