

Factors Responsible for North India's Monsoon Mayhem

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What's in today's article?

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Why in news?

- North Indian states witnessed an intense spell of monsoon rain, resulting in significant damage, loss of life, and property.
- The deluge in north India over the past two days resulted from a deadly confluence of two systems – the monsoon winds and a western disturbance.

What are Western Disturbances?

- **About**

- A Western Disturbance refers to an extratropical storm or a low-pressure system that originates in the Mediterranean region.
- As they travel eastward across the Middle East and Iran, they bring changes in weather conditions to the Indian subcontinent.
- Western Disturbance has a substantial influence on the weather in northern India.

- **Formation**

- They are usually formed by the interaction between cold polar air masses and warm tropical air masses.
- As they move eastward, they bring moisture from the Mediterranean region and the Caspian Sea.

- **Influence on weather conditions of India**

- During the winter months, Western Disturbances are primarily responsible for bringing rainfall and snowfall to the northwestern Himalayan region, including Jammu and Kashmir, Himachal Pradesh, and Uttarakhand.
- Western Disturbances also influence the weather conditions in the Indo-Gangetic plains.
- As they approach the plains, they often lead to cloud cover, lower temperatures, and occasional rainfall.

News Summary: North India's monsoon mayhem is a confluence of factors

Why this year's monsoon is different?

- This year's monsoon has managed to produce a rather unique onset and evolution thus far.

- **Onset delayed**

- The onset this season was delayed by unforeseen interactions between typhoons and cyclones.
- Cyclone Biparjoy was born after the onset and lingered for longer than normal to delay the arrival of the monsoon over Mumbai by nearly two weeks.

- **Simultaneous arrival in Mumbai and Delhi**

- Mumbai finally saw the monsoon arrive together with Delhi for the first time in over half a century.

- **Incessant heavy rain across large swathes of north India**

- A rare phenomenon that is the result of the interaction of two climatic factors has led to incessant heavy rain across large swathes of north India.
- This phenomenon has led to Delhi recording 153 mm of rain in 24 hours on July 9, the highest in a single day in July since 1982.

What is this rare interaction?

- The IMD confirmed that the heavy rain in parts of Himachal Pradesh and Uttarakhand is due to the interaction of the monsoonal winds with the western disturbance.
 - There was a trough extending from Rajasthan to north Arabian Sea associated with a western disturbance.
 - At the same time, due to strong monsoon conditions, the winds from Bay of Bengal were also reaching the north.
 - There was a confluence of these two systems, centred around Jammu & Kashmir on Saturday and around Himachal Pradesh on Sunday.
- These areas got moisture from both Arabian Sea and Bay of Bengal, resulting in very heavy showers.

Image caption: Rare interaction between monsoon and western disturbances

- This is similar to the interaction of two systems that led to the deadly Uttarakhand flooding in 2013.
 - In mid-June of 2013, a western disturbance sucked moisture towards the north from a low-pressure system coming in from the Bay of Bengal.
 - This not only resulted in the monsoon covering the entire country in record time (by June 16) but also caused cataclysmic downpours in Uttarakhand, including the cloudburst at Kedarnath.
 - The flooding and landslides caused by that deluge killed over 5,000 people and displaced over 5,00,000, according to reports.

What else could be driving the current weird summer monsoon?

- **Global warming**
 - It should be noted that today everything happens in a warmer world that is also more humid. Every weather event now has some contribution from global warming.
- **Impact of El Niño**
 - The El Niño has been grabbing most of the headlines this year.
 - However, it is not clear that the monsoon mayhem thus far has had much to do with the El Niño.
- **Role of Arabian Sea**
 - Excess rainfall over northwest India is consistent with the Arabian Sea having warmed by about 1.5 degrees Celsius since January.
- **Role of Atlantic Ocean**
 - The entire Atlantic Ocean has been warmer than normal since March.
 - The so-called Atlantic Niño, with a warm tropical Atlantic, generally tends to suppress monsoon rainfall.
 - However, it is not clear what the impacts are when the entire Atlantic is as warm as it has been this year.

- **Role of upper atmospheric circulation**

- The strongest winds that occur in the upper atmosphere can spontaneously break into clockwise and anticlockwise patterns, especially when they run into mountainous terrain, such as the Himalaya.
- Strong clockwise winds, with air flowing out from the centre, 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.

Q1) What is upper atmospheric circulation?

Upper atmospheric circulation refers to the movement of air in the Earth's atmosphere at higher altitudes, typically above the troposphere, which is the lowest layer of the atmosphere where weather phenomena occur. This circulation pattern plays a crucial role in redistributing heat, moisture, and energy across the globe.

Q2) What is El Niño?

El Niño is a climate phenomenon characterized by the warming of the central and eastern tropical Pacific Ocean, particularly in the equatorial region. It occurs irregularly every few years and can have significant impacts on weather patterns and climate around the globe.

Source: [Rare phenomenon pummeling heavy rains over north India. It's not climate change](#) | [The Hindu](#) | [Times of India](#)

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