



Twin Cyclones

For Prelims: Madden-Julian Oscillation, Rossby Wave, Cyclones

For Mains: Tropical and temperate cyclones, Twin Cyclones and their formation

Why in News?

Recent satellite images have Captured Twin Cyclones **in the Indian Ocean region**, one in the northern hemisphere and one in the southern hemisphere, named cyclone Asani and cyclone Karim respectively.

What are Cyclone Karim and Asani?

- Karim is classified as a **category II hurricane**, with a wind speed of 112 kilometers per hour (kmph).
- Asani remains a **Severe Cyclonic Storm over the Bay of Bengal**, with wind speeds of 100-110 kmph gusting to 120 kmph.
- Both were formed in the **Indian Ocean region**.
- Both cyclones **originated in the same longitude and now drifting apart**.
- Cyclone Karim has **created a path in the open seas west of Australia**.
- The name **Karim was given by the South African country Seychelles**. The name Cyclone Asani was suggested by Sri Lanka.

What are Twin Cyclones?

- The interplay of the wind and the **monsoon system** combined with the Earth system produces these synchronous cyclones.
- The twin tropical cyclones are caused by what are called **equatorial Rossby waves**.
 - **Rossby waves are huge waves in the ocean with wavelengths of around 4,000-5,000 kilometres.**
 - Rossby waves are named for famous meteorologist Carl-Gustaf Rossby who was the first to explain that **these waves arose due to the rotation of the Earth**.
- This **system has a vortex in the northern hemisphere and another in the southern hemisphere**, and each of these is a mirror image of the other.
- The vortex in the **north spins counterclockwise and has a positive spin, while the one in the southern hemisphere spins in the clockwise direction and therefore has a negative spin**.
- Both have a **positive value of the vorticity which is a measure of the rotation**.
- Very often **twin cyclones are formed from these Rossby waves**.

How do Cyclones Form?

- When the vorticity is positive in both Northern and Southern hemispheres, as is the case with Rossby waves, the air in the boundary layer, which is moist, is lifted slightly.
- That is **enough to set off a feedback process**.
- When the air is lifted slightly, the water vapour condenses to make clouds. As it condenses, **it lets out the latent heat of evaporation**.
- The atmosphere warms, this parcel of air rises, and positive feedback is set off by this process. The warmer parcel of air can rise further because it is lighter than the surrounding air, and it can form deeper clouds. Meanwhile, moisture comes in from both sides. This leads to the formation of a cyclone if certain conditions are present.
- The ocean's surface temperature has to be 27 degrees or warmer; the wind shear in the atmosphere must not be too high.
 - For example, if you have westerly winds at the lower level and easterly winds at the upper level, if the difference between them is too high, **cyclones will not form**.
 - But **if the difference is modest, cyclones will still form**.
- There will be a big, tall vortex with all sorts of clouds inside. Once they are stronger, they will spin faster and faster and organise themselves into the big storms.

Will the Two Cyclones Necessarily Move to Different Hemispheres?

- Yes, once formed they will generally move west. In the Northern Hemisphere, they will have a slightly northerly component of motion, while in the southern hemisphere they usually have a slightly southern component to their movement.
- So, this means that in the northern hemisphere the cyclone is moving north and west, while the southern one is moving south and west.

Does Madden-Julian Oscillation (MJO) Give Rise to Twin Cyclones?

- The MJO is a **large cluster of clouds and convection**, about 5,000-10,000 kilometers in size.
- It is **composed of a Rossby wave and a Kelvin wave**, which is a type of wave structure that we see in the ocean. On the eastern side of the MJO is the Kelvin wave, while on the western, trailing edge of the MJO is the Rossby wave, again with two vortices on either side of the equator.
- However, **not all tropical cyclones are born from the MJO**. Sometimes it's just a Rossby wave with two eddies on either side.

UPSC Civil Services Examination, Previous Year Questions (PYQs)

Q. Consider the following statements: (2020)

1. Jet streams occur in the Northern Hemisphere only.
2. Only some cyclones develop an eye.
3. The temperature inside the eye of a cyclone is nearly 10°C lesser than that of the surroundings.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 and 3 only
- (c) 2 only
- (d) 1 and 3 only

Ans: (c)

Exp:

- Jet Stream is a geostrophic wind blowing horizontally through the upper layers of the troposphere, generally from west to east, at an altitude of 20,000 - 50,000 feet. Jet Streams develop where air masses of different temperatures meet. So, usually surface temperatures determine where the Jet Stream will form. Greater the difference in temperature, faster is the wind velocity inside the jet

stream. Jet Streams extend from 20° latitude to the poles in both hemispheres. **Hence, statement 1 is not correct.**

- Cyclones are of two types, tropical cyclone and temperate cyclone. The center of a tropical cyclone is known as the 'eye', where the wind is calm at the center with no rainfall. However, in a temperate cyclone, there is not a single place where winds and rains are inactive, so the eye is not found. **Hence, statement 2 is correct.**
- The warmest temperatures are found in the eye itself, not in the eyewall clouds where the latent heat occurs. The air is saturated only where convective vertical motions pass through flight level. Inside the eye, the temperature is greater than 28°C and the dewpoint is less than 0°C. These warm and dry conditions are typical of the eyes of extremely intense tropical cyclones. **Hence, statement 3 is not correct.**

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