Cyclone Sitrang

For Prelims: Cyclone and it Types

For Mains: Cyclone and its formation, Important Geophysical phenomena

Why in News?

Bangladesh has been devastated by Cyclone Sitrang, which slammed into densely-populated, low-lying areas.

- Named by Thailand, Sitrang is the **first tropical cyclone** of the post-monsoon season of 2022.
- In 2018, Titli was the last October cyclone in the Bay of Bengal.

What are the Tropical Cyclones?

- A **tropical cyclone** is an **intense circular storm that originates over warm tropical oceans** and is characterized by low atmospheric pressure, high winds, and heavy rain.
- A **characteristic feature of tropical cyclones is the eye,** a central region of clear skies, warm temperatures, and low atmospheric pressure.
- Storms of this type are called hurricanes in the North Atlantic and eastern Pacific and typhoons in SouthEast Asia and China. They are called tropical cyclones in the southwest Pacific and Indian Ocean region and Willy-willies in north-western Australia.
- **Storms rotate counterclockwise in the northern hemisphere** and clockwise in the southern hemisphere.
- The conditions favourable for the formation and intensification of tropical storms are:
    - Large sea surface with temperature higher than 27°C.
    - Presence of the **Coriolis force**.
    - Small variations in the vertical wind speed.
    - A pre-existing weak low- pressure area or low-level-cyclonic circulation.
    - Upper divergence above the sea level system.

How do Tropical Cyclones Form?

- The development cycle of tropical cyclones may be divided into three stages:
    - **Formation and Initial Development Stage:**
        - The formation and initial development of a cyclonic storm depends upon the transfer of water vapour and heat from the warm ocean to the overlying air, primarily by evaporation from the sea surface.
        - It encourages formation of massive vertical cumulus clouds due to convection with condensation of rising air above the ocean surface.
    - **Mature Stage:**
        - When a tropical storm intensifies, the air rises in vigorous thunderstorms and tends to spread out horizontally at the tropopause level. Once air spreads out, a positive pressure at high levels is produced, which accelerates the downward motion of air

due to convection.

- With the inducement of subsidence, air warms up by compression and a warm ‘Eye’ (Low pressure centre) is generated. The main physical feature of a mature tropical cyclone in the Indian Ocean is a concentric pattern of highly turbulent giant cumulus thundercloud bands.

◦ **Modification and Decay:**

- A tropical cyclone begins to weaken in terms of its central low pressure, internal warmth and extremely high speeds, as soon as its source of warm moist air begins to ebb or is abruptly cut off.

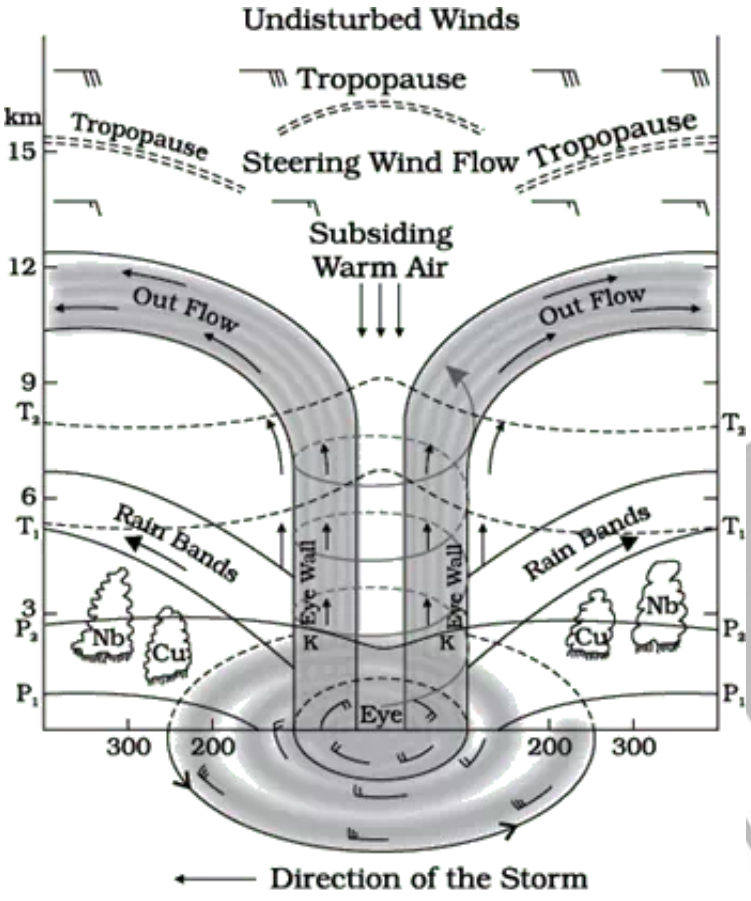

Fig: Vertical section of the tropical cyclone

Infographics

UPSC Civil Services Examination, Previous Year Questions

Prelims

Q. In the South Atlantic and South-Eastern Pacific regions in tropical latitudes, cyclone does not originate. What is the reason? (2015)

(a) Sea surface temperatures are low

(b) Inter-Tropical Convergence Zone seldom occurs

(c) Coriolis force is too weak

(d) Absence of land in those regions

Ans: (b)

- The most proximate reasons for the lack of cyclones in the South Atlantic and South Eastern Pacific ocean is the rare occurrence of the Inter-Tropical Convergence Zone (ITCZ) over the region.
- It becomes very difficult or nearly impossible to have genesis of tropical cyclones, unless synoptic vorticity (it is a clockwise or counterclockwise spin in the troposphere) and convergence (i.e., large scale spin and thunderstorm activity) are provided by ITCZ.
- Therefore, option (b) is the correct answer.

Q. In the context of which of the following do some scientists suggest the use of cirrus cloud thinning technique and the injection of sulphate aerosol into the stratosphere? (2019)

(a) Creating the artificial rains in some regions

(b) Reducing the frequency and intensity of tropical cyclones

(c) Reducing the adverse effects of solar wind on the Earth

(d) Reducing the global warming

Ans: (d)

- Cirrus cloud thinning is a kind of technology that involves thinning the wispy, elongated cirrus clouds of high altitudes. Cirrus clouds do not reflect a lot of solar radiation back into space, but as these are formed at high altitudes and cold temperatures, these clouds trap long-wave radiation and have a climate impact similar to greenhouse gases. Thinning cirrus clouds would be achieved by injecting ice nuclei (such as dust) into regions where there are cirrus clouds, making the ice crystals bigger and reducing the cirrus optical depth. Thinning the clouds would allow more heat to escape into space and thereby cool the planet.
- Stratospheric Aerosol Injection (SAI) is a technique that would involve spraying large quantities of inorganic particles (e.g. Sulphur dioxide) into the stratosphere to act as a reflective barrier against incoming sunlight, thus helping to reduce the global warming. **Therefore, option (d) is the correct answer.**

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 10ºC 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)

- 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.**
- **Therefore, option (c) is the correct answer.**

Mains

Q. The recent cyclone on the east coast of India was called “Phailin”. How are the tropical cyclones named across the world? Elaborate. (2013)

Q. Tropical cyclones are largely confined to the South China Sea, Bay of Bengal and Gulf of Mexico. Why? (2014)

Q. Discuss the meaning of colour-coded weather warnings for cyclone prone areas given by India Meteorological Department. (2022)

Source: TH