Buoyancy Flux in Tropical Water

Prelims: *Current events of national and international importance| Indian & World Geography*

Why in News?

Recently, a new study by researchers at the University of Washington revealed the complicated process of tropical ocean waters.

- Scientists have long assumed so because rainwater is fresh and freshwater is lighter than seawater.
- **Recent Findings -** A recent study revealed that rain sometimes makes the surface heavier and more stable.
- **Reason -** Rain in the tropics often comes with large clouds and cold, dry air called ***cold pools.***
- These cold pools can actually cool the ocean's surface by blocking sunlight and increasing the transfer of heat from the water to the air.
- **Data taken from -** The researchers used data from 22 buoys across the equatorial oceans that measure *rainfall, sea surface temperature, wind speed, and heat transfer.*
- They analysed more than 31,000 hours of rainfall events from this data, focusing on the buoyancy flux, which combines the effects of heat and freshwater.

> ***Buoyancy flux*** *is the rate at which buoyancy is transported through a given area, typically per unit mass. It represents the vertical transport of potential energy due to density differences in a fluid.*

Buoyancy flux	Rain	Ocean stability
Positive	Light rain (0.2-4 mm/hr).	Less stable and promotes mixing happens mostly during night than day.
Negative	Heavy rain accompanied by stronger cold pools that pull heat out of the ocean more effectively.	More stable.

- **Key findings –** The study also found that at night, rainfall was more likely to cause instability than during the day.
- The researchers found two rain zones
  - **Cold rain zone –** In the western Pacific and Indian Oceans, where rain was associated with more heat loss.

    - **Hot rain zone –** In the central Pacific where heat loss was less intense.
- **Significance –** Ocean mixing plays a key role in regulating the climate by transporting heat, carbon, and nutrients.

Quick facts

Buoyancy
• It is the upward force exerted by a fluid on an object placed in it, making the object appear lighter. • This force is a result of pressure differences in the fluid surrounding the object, as described by *Archimedes' principle.* • **Affected by –** Density of the fluid, the volume of the fluid displaced by the object, the local acceleration due to gravity. • **Not affected by –** Mass of the immersed object and the density of the immersed object.

Reference

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