Atlantic Meridional Overturning Current (AMOC)

What is the issue?

- Atlantic Meridional Overturning Current (AMOC) is thought to be slowing down for the last 15 years, which could have drastic consequences on global climate.
- A new study suggests that AMOC is getting help from the Indian Ocean.

What is an AMOC?

- Atlantic Meridional Overturning Current is the large system of ocean currents operating in the Atlantic Ocean.
- It circulates the waters between the north and the south.
- It ensures the oceans are continually mixed, and heat and energy are distributed around Earth.
- Warming as a result of climate change, the Indian Ocean is causing a series of cascading effects that is providing AMOC a “jump start”.

How AMOC works?

- As warm water flows northwards in the Atlantic, it cools, while the evaporation increases its salt content.
- Low temperature and high salt content raise the density of the water, causing it to sink deep into the ocean.
- The cold, dense water deep below slowly spreads southward.
- Eventually, it gets pulled back to the surface and warms again and, the circulation is complete.
- This continual mixing of the oceans, and distribution of heat and energy around the planet, contribute to global climate.
- Another oceanic system, which is more frequent, is the El Niño-Southern Oscillation (ENSO).
- This involves temperature changes of 1°-3°C in the central and eastern tropical Pacific Ocean, over periods between 3 and 7 years.
- El Niño refers to warming of the ocean surface and La Niña to cooling, while “Neutral” is between these extremes.
- This alternating pattern affects rainfall distribution in the tropics and can have a strong influence on weather in other parts of the world.

What is happening now?
AMOC has been stable for thousands of years. Data since 2004 and projections are cause for concern. It is not clear whether the signs of slowing in AMOC are a result of global warming or only a short-term anomaly. Yale University research - AMOC had weakened substantially 17,000 to 15,000 years ago. The new study, by Fedorov and Shineng Hu of Scripps Institution of Oceanography, appears in Nature Climate Change.

What is Indian Ocean’s role?

- Fedorov and Hu’s work involves climate mechanisms that may be shifting due to global warming.
- Using observed data and computer modelling, they have plotted out what effect such shifts might have over time.
- In this study, they looked at warming in the Indian Ocean.
- **Their findings** - As the Indian Ocean warms faster and faster, it generates additional precipitation.
  - This draws more air from other parts of the world to the Indian Ocean, including the Atlantic.
  - With so much precipitation in the Indian Ocean, there will be less precipitation in the Atlantic Ocean.
  - Less precipitation will lead to higher salinity in the waters of the tropical portion of the Atlantic.
  - This saltier water in the Atlantic, as it comes north via AMOC, will get cold much quicker than usual and sink faster.
- This would act as a jump start for AMOC, intensifying the circulation.
- **Concern** - It is not know how long this enhanced Indian Ocean warming will continue.
  - If other tropical oceans’ warming, especially the Pacific, catches up with the Indian Ocean, the advantage for AMOC will stop.

Source: The Indian Express