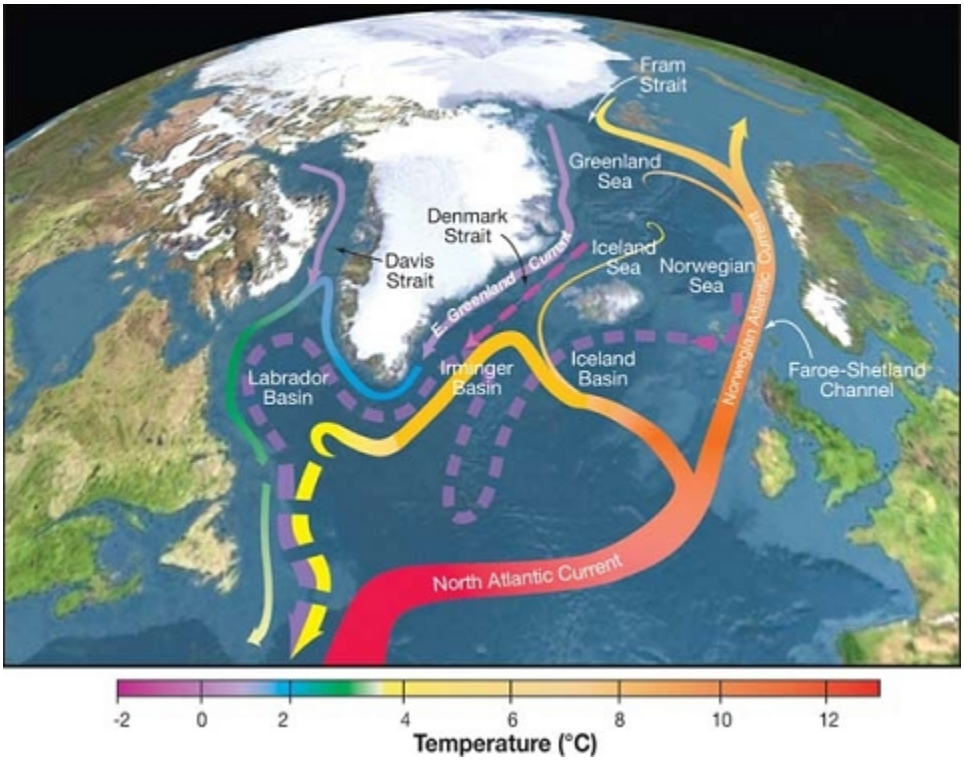
Atlantic Meridional Overturning Circulation (AMOC)

The Atlantic Meridional Overturning Circulation (AMOC) is a large system of ocean currents that carry warm water from the tropics northwards into the North Atlantic. The AMOC is an important component of the Earth's climate system and is a result of both atmospheric and thermohaline drivers.

For the past 15 years, Atlantic Meridional Overturning Circulation (AMOC) has been weakening, signs show that AMOC may be slowing, which could have drastic consequences on the global climate.

A new study suggests a link between Atlantic Meridional Overturning Circulation (AMOC) and the Indian Ocean and the rising temperatures in the Indian Ocean can help to boost the AMOC and delay slow down.

About AMOC



(**Source:** https://en.wikipedia.org/wiki/Atlantic_meridional_overturning_circulation)

- The AMOC is a large system of ocean currents, like a conveyor belt, driven by differences in temperature and salt content – the water's density
- It is one of the Earth's largest water circulation systems

- AMOC is characterized by a northward flow of warm, salty water in the upper layers of the Atlantic, and a southward flow of colder, deep waters that are part of the **thermohaline circulation**
- It aids in distributing heat and energy around the earth, as the warm water it carries releases heat into the atmosphere, and in absorbing and storing atmospheric carbon

What is Thermohaline Circulation?
Thermohaline Circulation (THC) is a part of the large-scale ocean circulation that is driven by global density gradients created by surface heat and freshwater fluxes.

It is also called the Global Ocean Conveyor or Great Ocean Conveyor Belt, the component of a general oceanic circulation controlled by horizontal differences in temperature and salinity. It continually replaces seawater at depth with water from the surface and slowly replaces surface water elsewhere with water rising from deeper depths.

Slowing Down of AMOC - Causes and Impact

Oceanographers have been measuring the AMOC continuously since 2004. Discussed below are the causes that have resulted in the slowing down of AMOC and the impact this slow down shall be leaving on the climate and the environment.

Why is AMOC Slowing Down?

- Global warming caused by Greenhouse gases is one of the major reasons for the slowing down of Atlantic Meridional Overturning Circulation
- The Atlantic overturning is driven by what the scientists call deep convection, triggered by the differences in the density of the ocean water
    - Warm and salty water moves from the south to the north where it cools down and thus gets denser. When it is heavy enough the water sinks to deeper ocean layers and flows back to the south. It carries heat equivalent to a million nuclear power plants.
- Global warming has caused the Arctic to warm, Greenland to melt, rainfall to increase, and the flow of freshwater into the northern seas to intensify

Impact of AMOC Slow Down

- The Intergovernmental Panel on Climate Change (IPCC) Report suggests that AMOC has already weakened. Any substantial weakening of the AMOC would cause a further decrease in marine productivity in the North Atlantic
- Its slowdown is also associated with an observed ‘cold blob’ in the northern Atlantic
- A further slowdown of the AMOC could imply more extreme weather events like a change of the winter storm track coming off the Atlantic, possibly intensifying them
- The Sahara region will become more drought prone

Indian Ocean and AMOC - Climate Change

For thousands of years, AMOC has remained stable, but since the past 15 years, it has been weakening. However, rising temperatures in the Indian Ocean can help boost the AMOC and delay the slow down.

- Warming in the Indian Ocean generates additional precipitation, which, in turn, draws more air from other parts of the world, including the Atlantic
- As the Indian Ocean warms faster and faster, it generates additional precipitation, resulting in less precipitation in the Atlantic Ocean
- This saltier water, 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.
- Alternating oceanic system patterns like El Niño-Southern Oscillation (ENSO) also affects rainfall distribution in the tropics and can have a strong influence on weather in other parts of the world