AMOC

A Plain English Guide to the Ocean Conveyor Belt

And what it means that it might be slowing down

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The Conveyor Belt

The Atlantic Ocean runs a conveyor belt.

Warm, salty water flows northeast from the tropics. Near Iceland and Norway it cools, becomes denser, and sinks. Cold water then flows back south along the ocean floor, eventually rising again in the Southern Ocean, warming up, and returning north. This cycle has been running for millions of years. It moves enormous quantities of heat from the tropics toward Northern Europe. It is, in no small part, why London has tolerable winters when it really shouldn't, given its latitude.

This conveyor belt is called AMOC — the Atlantic Meridional Overturning Circulation. It is one of the most important systems in Earth's climate. It is not particularly stable.

The Switch

AMOC has two stable states: on and off. This is not speculation. It is established science going back to the 1960s, confirmed by sixty years of oceanographic research.

The palaeoclimate record shows that AMOC has switched between these two states at least 25 times in the last 115,000 years. Each switch happened in decades — geologically instantaneous. Greenland ice core records show temperature changes of 10 to 15 degrees Celsius within a human lifetime. These are called Dansgaard–Oeschger events, and they are the most dramatic abrupt climate changes the planet has experienced in the era of modern humans.

Oceanographic observations since 2004 suggest AMOC may currently be weakening.

The Needle's Eye

The entire Atlantic overturning circulation — all of it, 100% — passes through a surprisingly small number of places. The actual sinking happens in convective chimneys in the Labrador Sea, the Irminger Sea, and the Nordic Seas. These chimneys cover less than 5% of the total ocean surface area. That is the needle's eye: a tiny passage through which the entire thread of the circulation must pass.

The switch — when AMOC weakens or stops — is what happens when the needle's eye closes. When enough freshwater enters the North Atlantic (from melting ice, for instance) to reduce the salinity and density of the surface water, the sinking slows. The thread can no longer pass through the eye. The conveyor belt stalls.

What the Computer Simulations Show

The SFVFS™-DNS programme ran saltwater through twenty-four fluid simulations. The result: saltwater parks in Cell A of the Beehive — the same void cell as water, helium, and hydrogen, with a vorticity-strain angle of about 50 degrees.

This gives the AMOC prediction something it didn't have before: an empirical anchor. The prediction is: if you measured the strain geometry inside the North Atlantic convective chimneys, you should find a vorticity-strain angle near 50 degrees, not 90 degrees. That is testable with existing oceanographic instruments.

What This Is and Isn't

This framework does not predict whether AMOC will collapse. It does not provide a timeline. It does not say the switch is imminent or inevitable.

What it does is name the geometry of the bistability precisely, provide a dimensionless diagnostic (the Γ_{THC} ratio) that should rise measurably toward 1 as AMOC weakens, and connect the oceanographic observations to the same geometric framework that governs turbulent fluids in computer simulations, fusion reactors, and the polar vortex of Saturn.

> "*The thread has been through the needle's eye ten thousand times. This time it is asking whether the eye will still be there.*"
>
> *Art Until Proven Otherwise.*
