## Meeting AMOC Observation Needs in a Changing Climate



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## Enhancing observational mooring arrays for next generation biogeochemical measurements

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The AMOC is key to the North Atlantic (NA) being a sink for carbon dioxide (CO2) from the atmosphere, through both surface cooling of waters advected polewards (making them more soluble to CO2) prior to sinking at high latitudes, and through northwards nutrient delivery that sustains strong subpolar biological production (that drives down CO2 levels). As atmospheric CO2 levels have increased, the NA has played an outsized role in mitigating their rise, accounting for ~30% of all global CO2 uptake from the atmosphere and 25% of the global anthropogenic carbon inventory, despite making up only 15% of the ocean surface.

However, current climate models however significantly underestimate the current ocean uptake of CO2 (by up to 20%) and disagree widely in future projections (particularly in subpolar regions), limiting our ability to assess the effects of emissions reduction policies. The main source of uncertainty is attributed to how the models represent the magnitude of and balance between ocean carbon transports and regional carbon uptake in mid-to-high latitudes, which determine how much carbon accumulates in the ocean interior. Current observations are insufficient to constrain these processes, lacking both the temporal and spatial coverage necessary to quantify both NA carbon/nutrient transport convergence, and deconvolve the anthropogenic component of air-sea CO2 fluxes.

Here we present new initiatives to improve our knowledge of the movements of carbon and nutrients into and out of the Atlantic - and the surface carbon fluxes that result - through the instrumentation of transport mooring arrays with biogeochemical sensors and autonomous water samplers. They will help us better understand how the ventilation and overturning systems interact, the mechanisms that drive the current NA carbon sink (thermal / biological), and the fate of carbon exported to depth.

## Topic

Future AMOC observing -outlining a roadmap

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