Project title: Horizon EU-project EPOC [**E**xplaining and **P**redicting the **O**cean **C**onveyor]
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Abstract

EPOC aims to generate a new conceptual framework for understanding how the Atlantic meridional overturning circulation (AMOC) functions in the Earth system and its impact on weather and climate. The AMOC has canonically been seen as a 'great ocean conveyor' with generally the same connectivity across latitudes. However, recent observational studies suggest substantial discontinuities in the conveyor belt at key latitudes in the Atlantic, while modelling studies have identified regions of AMOC transport variability discontinuities, though region and degree of discontinuity differ between coupled and forced ocean-only models, as well as in model resolution employed. We seek to understand the key processes responsible for maintaining or breaking meridional connectivity of ocean transport and assess their representation in models. In addition, we will identify processes and drivers of recent change in AMOC and infer the role of external forcing, as well as assess key processes and feedback for future changes in AMOC.

Using observational data and high resolution coupled and ocean-only models, we will diagnose the mechanisms that make or break the meridional coherence of AMOC transports across key regions such as the subpolar North Atlantic, subpolar-to-subtropical North Atlantic gyre, equatorial Atlantic and South Atlantic, with particular focus on the Transition Zone at 47°N in the Atlantic. Additionally, we want to clarify the relationship between the AMOC, deep western boundary current (DWBC) and ventilation, as well as quantify influence of the North Atlantic Current on the variability of the DWBC.

We will investigate the role of historical greenhouse gas (GHG) forcing in past AMOC changes by designing a set of model experiments that would isolate the influence of historical GHG forcing on the AMOC. The sensitivity of AMOC response in those cases to resolution will also be evaluated. Similarly, we will study the future evolution of AMOC, evaluating processes and feedbacks of the AMOC response and its impact under abrupt 4xCO2 forcing, with particular attention to resolution sensitivity.