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## Pathways and time scales of ocean heat uptake and redistribution in a global ocean-ice model

**Alice Marzocchi**<sup>1</sup>, George Nurser<sup>1</sup>, Louis Clement<sup>1</sup>, and Elaine McDonagh<sup>1,2</sup>

<sup>1</sup>National Oceanography Centre, Southampton, UK

<sup>2</sup>NORCE, Norwegian Research Centre, Bjerknes Centre for Climate Research, Bergen, Norway

Changes in regional ocean heat content are not only sensitive to anthropogenic and natural influences, but also substantially impacted by the redistribution of heat, which is in turn driven by changes in ocean circulation and air-sea fluxes. Using a set of numerical simulations with an ocean-sea-ice model of the NEMO framework, we assess where the ocean takes up heat from the atmosphere and how ocean currents transport and redistribute that heat. Here, the strength and patterns of the net uptake of heat by the ocean are treated like a passive tracer, by including simulated sea water vintage dyes, which are released annually between 1958 and 2017. An additional tracer released in year 1800 is also used to investigate longer-term variability. All dye tracers are released from 29 surface patches, representing different water mass production sites, allowing us to identify when and where water masses were last ventilated. The tracers' distribution and fluxes are shown to capture years of strong and weak convection at deep and mode water formation sites in both hemispheres, when compared to the available observations. Using this approach, which can be applied to any passive tracer in the ocean, we can: (1) assess the relative role of each of the water mass production sites, (2) evaluate the regional and depth distribution of the tracers, and (3) determine their variability on interannual, multidecadal and centennial time scales.