The effect and importance of processes affecting the global overturning circulation is not fully understood. Recent laboratory experiments and numerical simulations have been used to show that buoyancy fluxes and wind stress forcings on the ocean surface, affecting available potential energy and kinetic energy reservoirs, are necessary to sustain the global overturning circulation. Full understanding of the effect that heat and wind stress forcings have on circulation, flow patterns and spatial distribution of kinetic and available potential energy is still lacking.

Using an energetic formulation based on the Boussinesq equations, the energy pathways and processes that affect the global overturning circulation are evaluated. Data from eddy resolving calculations using general circulation models are used to compute the rates of energy transfer between kinetic and available potential energy reservoirs in flows under the influence of external heat and wind forcings. Energy input from surface buoyancy forcing and from mechanical sources are also computed. The effect of the spatial distribution of different quantities, such as available potential energy density, kinetic energy, temperature and mass density, on the pathways and mechanisms affecting the flow is explored.