

Monitoring the North Atlantic Subpolar Overturning Circulation from surface observations

Damien Desbruyères, Herlé Mercier, Patricia Zunino, Anne Piron, Nathalie Daniault, Pascale Lherminier, Virginie Thierry

A region crucial for the meridional overturning circulation (MOC) is the northern North Atlantic, where waters transported northward in the MOC upper limb get transformed into denser waters before being eventually exported into the southward flowing lower limb. Here, a novel mechanistic analysis of the subpolar MOC variability will be presented using ensembles of global datasets and the theoretical concept of *surface-forced* water mass transformation (*Walín's* formalism). We will see that the interannual to decadal variability (1994 – 2015) of the *density-space* subpolar MOC can be skillfully predicted from the sole knowledge of sea surface properties and air-sea buoyancy fluxes over the SPG. The critical role of such variability in driving heat content trends in the subpolar gyre – specifically the recent warming (1994-2005) to cooling (2005-2014) reversal – will be finally shown.