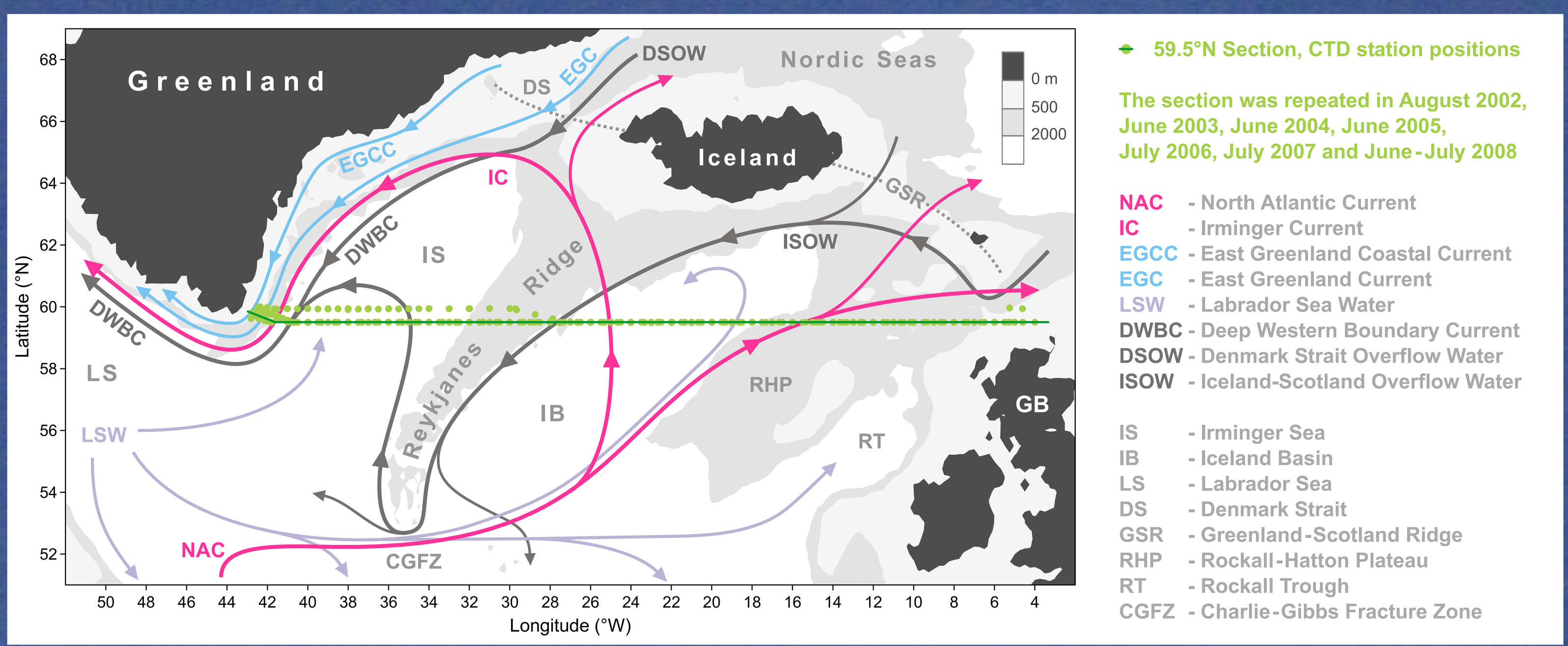
Mean full-depth circulation and transports in the North Atlantic across 60°N in 2000s

Sarafanov A. • Falina A. • Sokov A. – Shirshov Institute of Oceanology • Moscow
Mercier H. • Lherminier P. • Gourcuff C. – LPO • Ifremer • Plouzané • France

Data

1. CTD data from 7 annual repeats of the 59.5°N transatlantic section (2002–2008, June–August)
2. Mean Dynamic Topography (MDT) by Rio and Hernandez [2004]
3. Satellite Altimetry: Aviso 1/3° gridded SLAs (May–Sept, 2002–2008)
4. Quikscat monthly mean winds for the mean Ekman transport

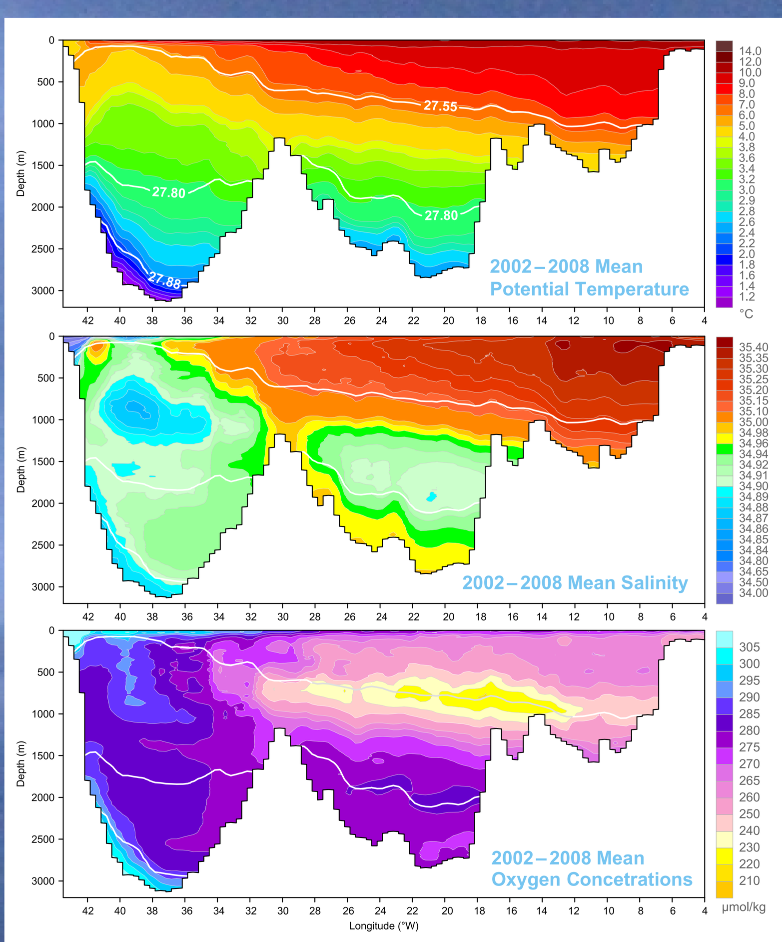


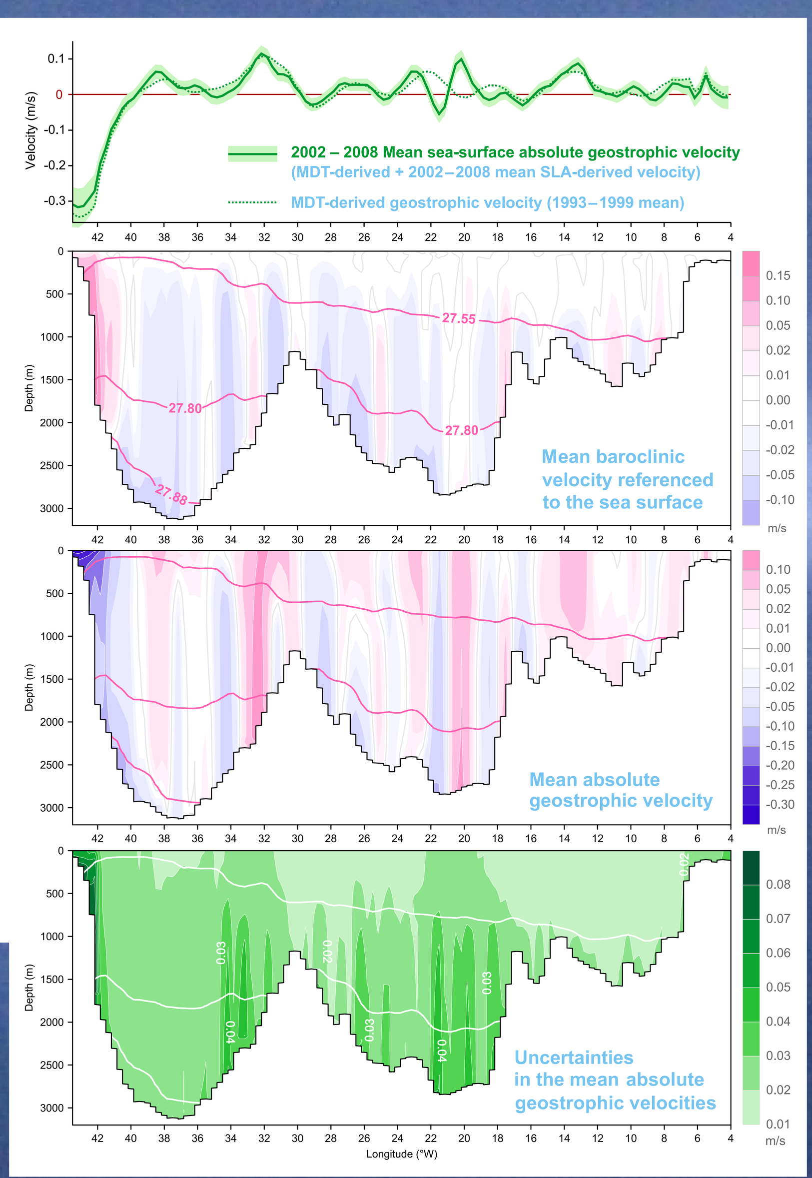
Schematic representation of the main currents at the upper, mid-depth and deep levels in the subpolar North Atlantic (adapted from Schott et al. [JPO, 2004], Sutherland and Pickart [DSR, 2008]) and the location of the 59.5°N transatlantic section

Method

The 2002–2008 mean absolute geostrophic velocities (V) in the water column were obtained from the 2002–2008 mean hydrography-derived V referenced to the 2002–2008 mean sea-surface V (MDT-derived + 2002–2008 mean SLA-derived)

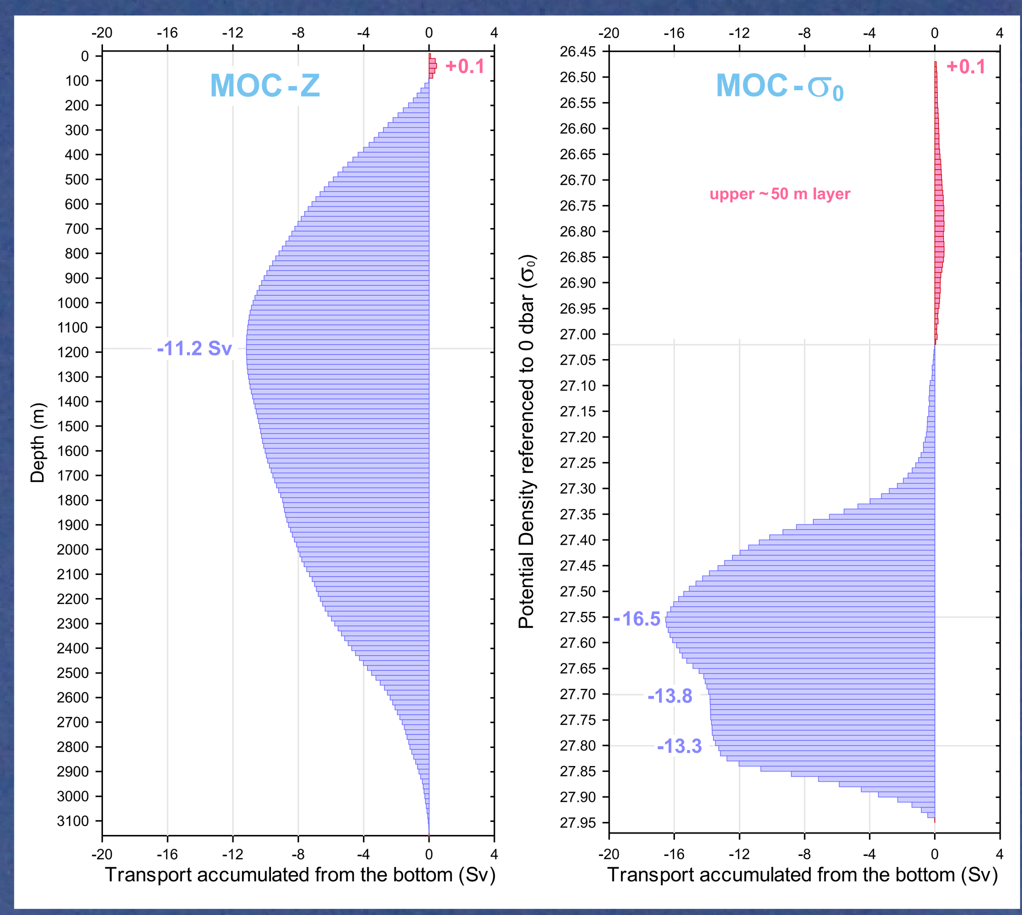
Mean properties and velocities



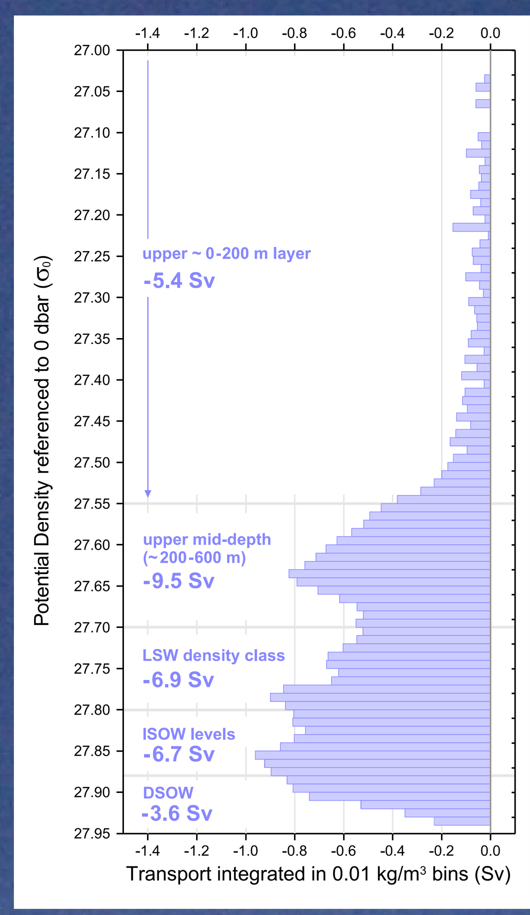


Left: the 2002–2008 mean potential temperature, salinity and oxygen;
Right: components and uncertainties of the 2002–2008 mean velocities at 59.5°N

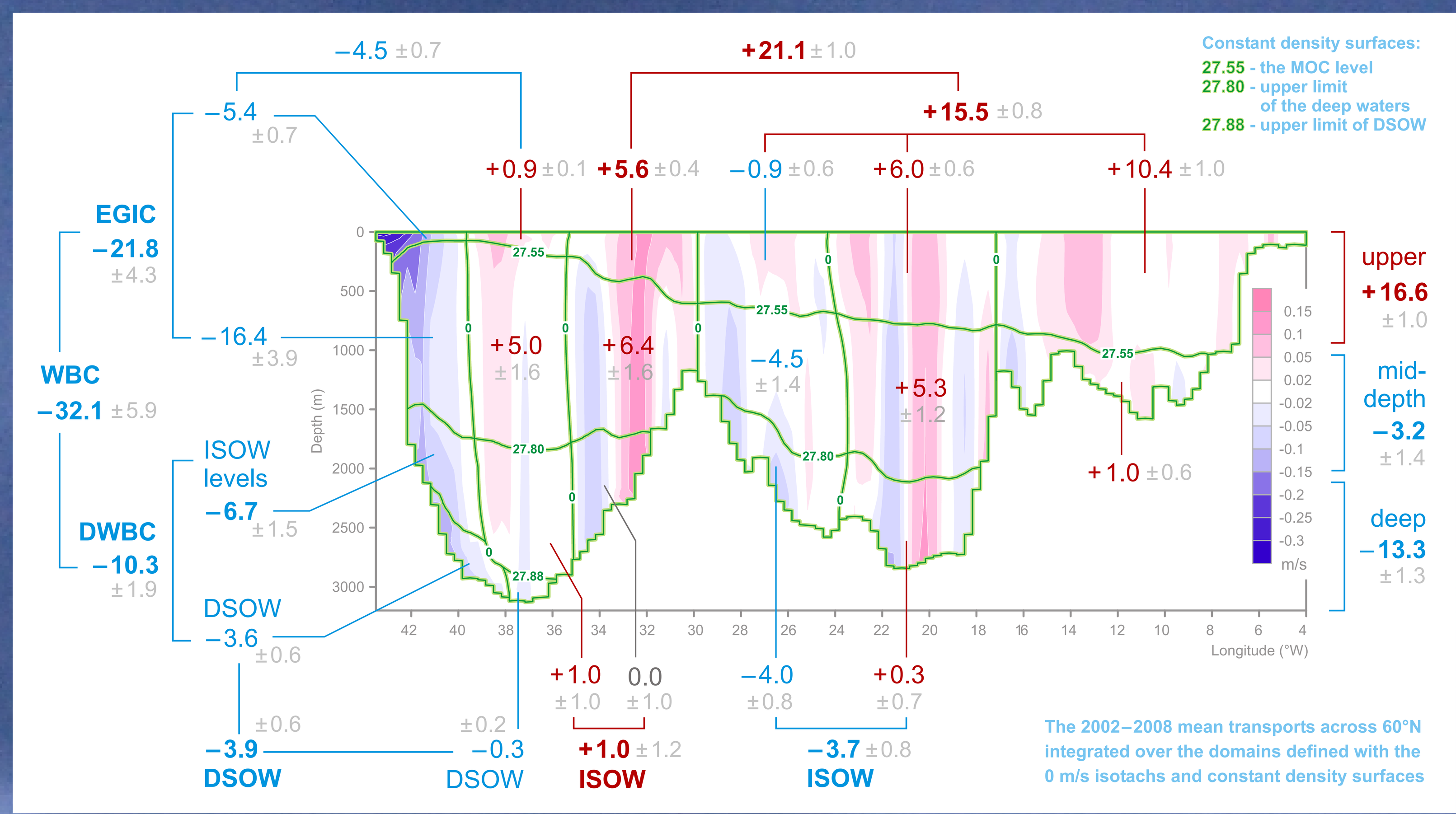
MOC



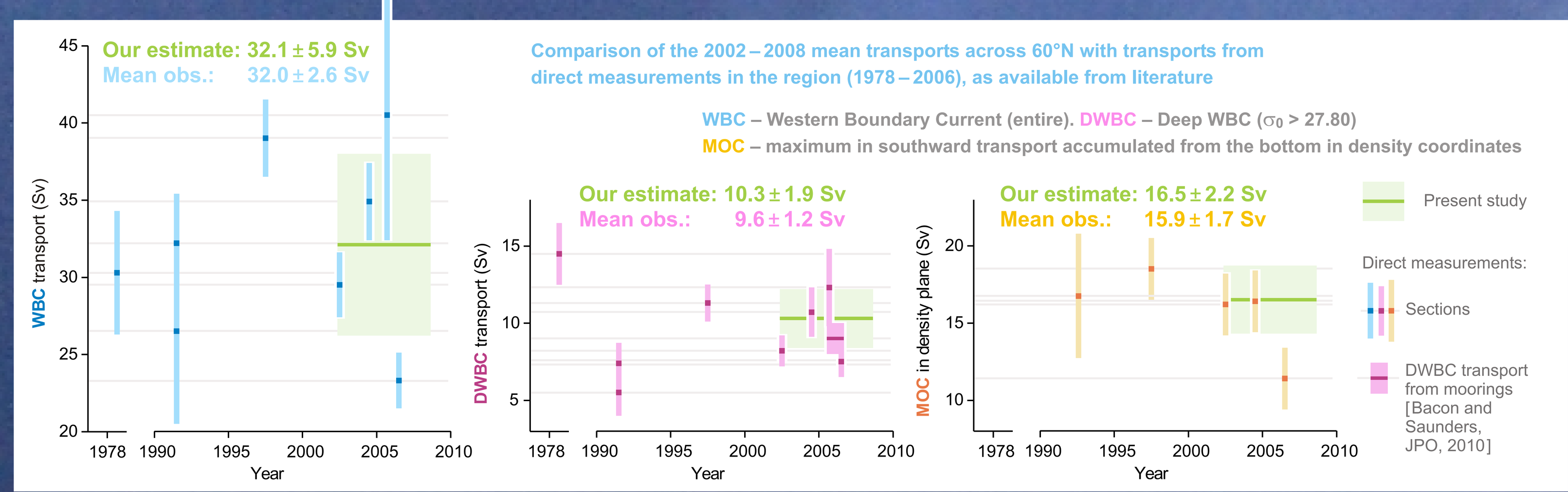
WBC



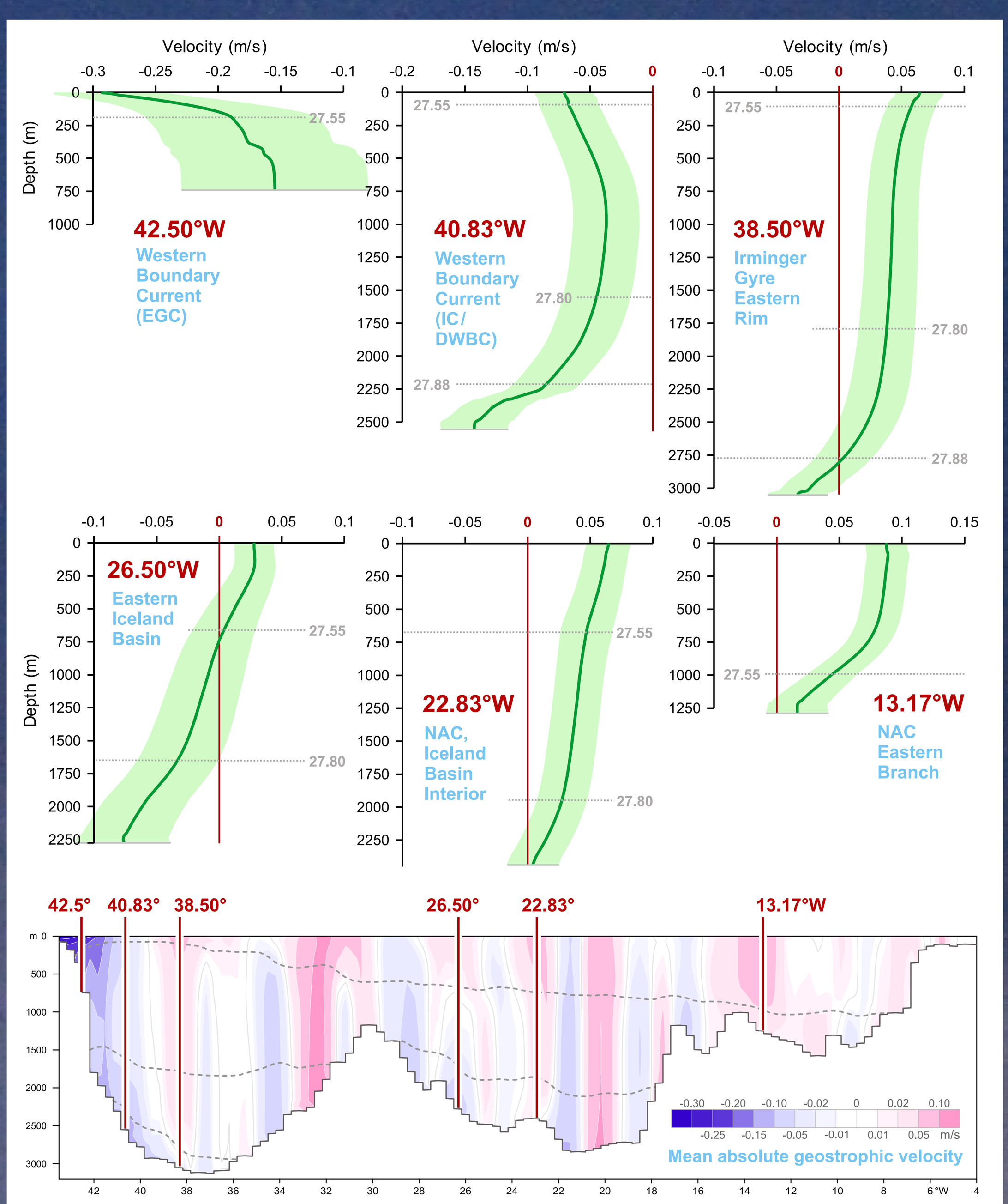
Transports



Mean vs. measured synoptic

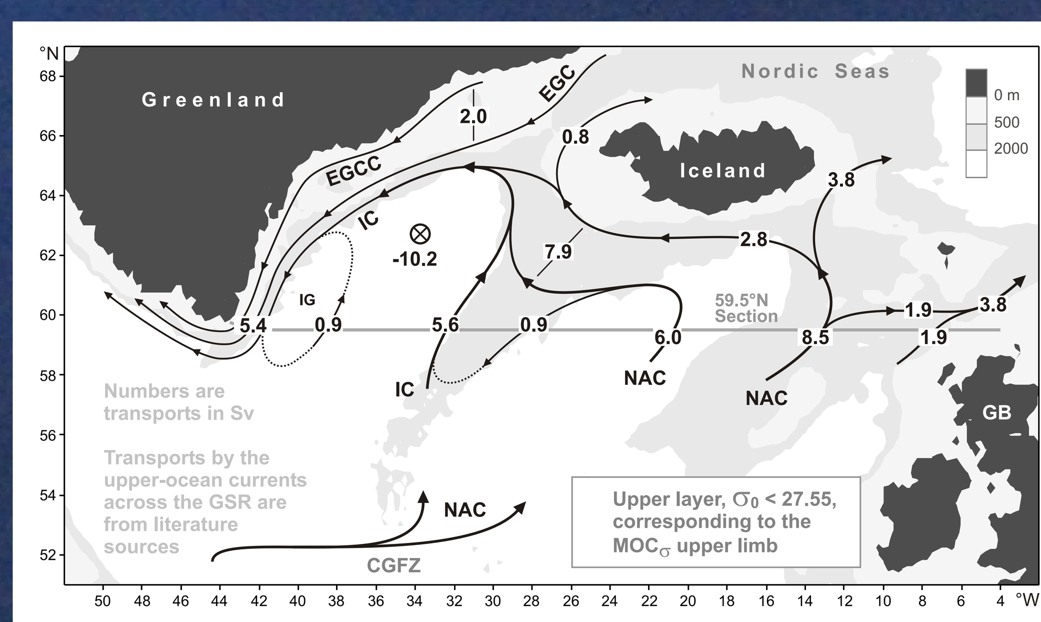


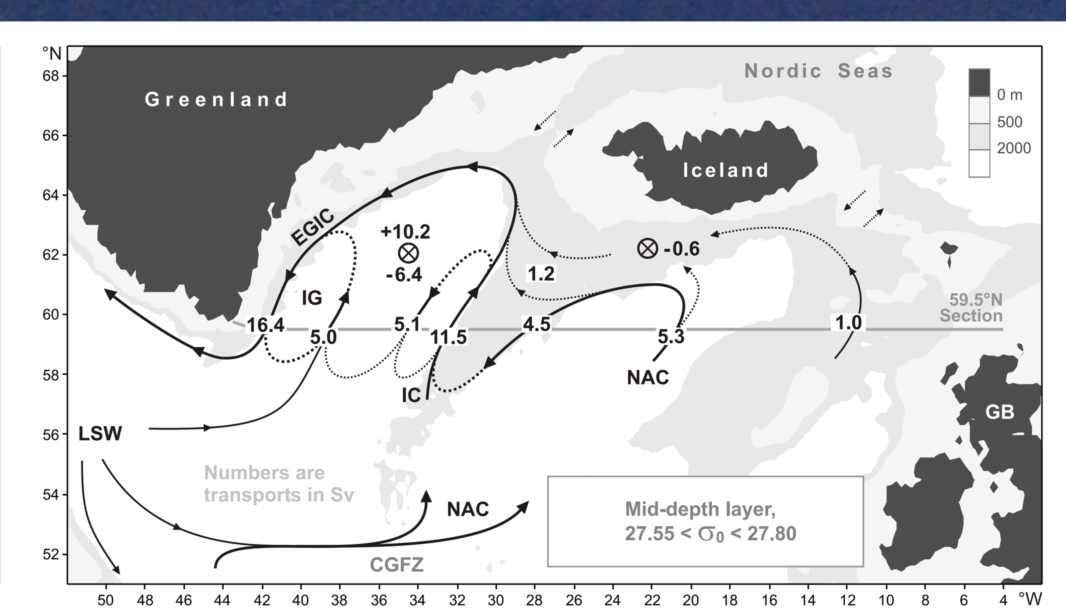
Sheared flows



Selected vertical profiles of the mean absolute velocity illustrating typical velocity shears in the main currents

Large-scale full-depth circulation pattern

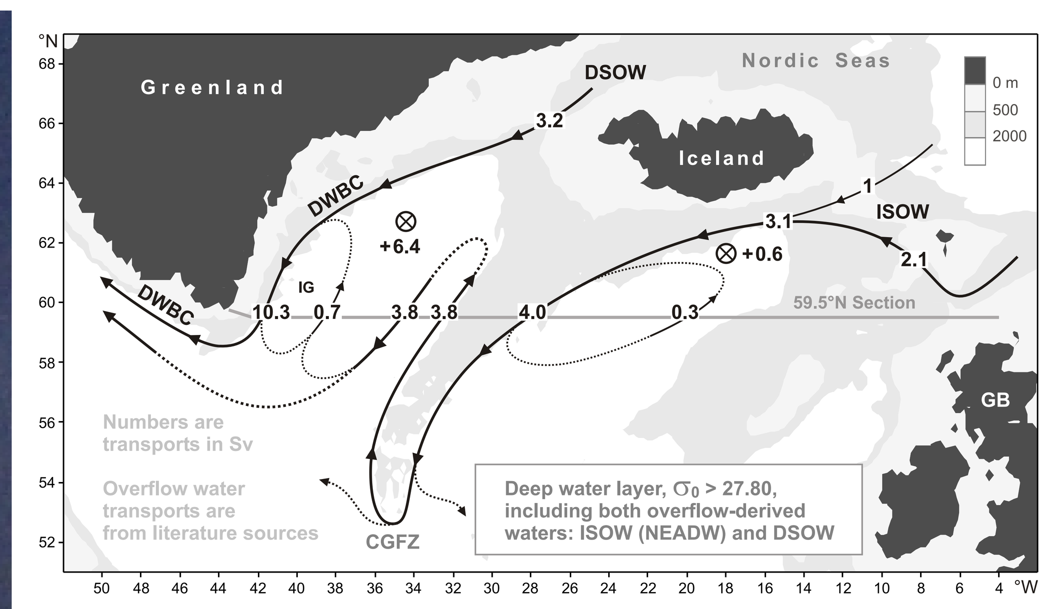




Outcome

By combining repeat hydrography (7 annual snapshots) with satellite altimetry (continuous long-term measurements), the 2002–2008 mean state of the basin-wide full-depth circulation at the Atlantic northern periphery is assessed

The AMOC rate and vertical structure at 60°N, transports by the main upper-ocean, mid-depth and deep currents are quantified



Our analysis shows that the combined use of the MDT, altimetry data and repeat hydrography allows the multi-year mean circulation and transports in the region to be 'successfully' quantified with no *a priori* constrains and inverse analysis needed. The obtained observation-based estimates can be used as a benchmark for models