Supporting Information of "Dissolved organic nitrogen production and export by meridional overturning in the subpolar North Atlantic"

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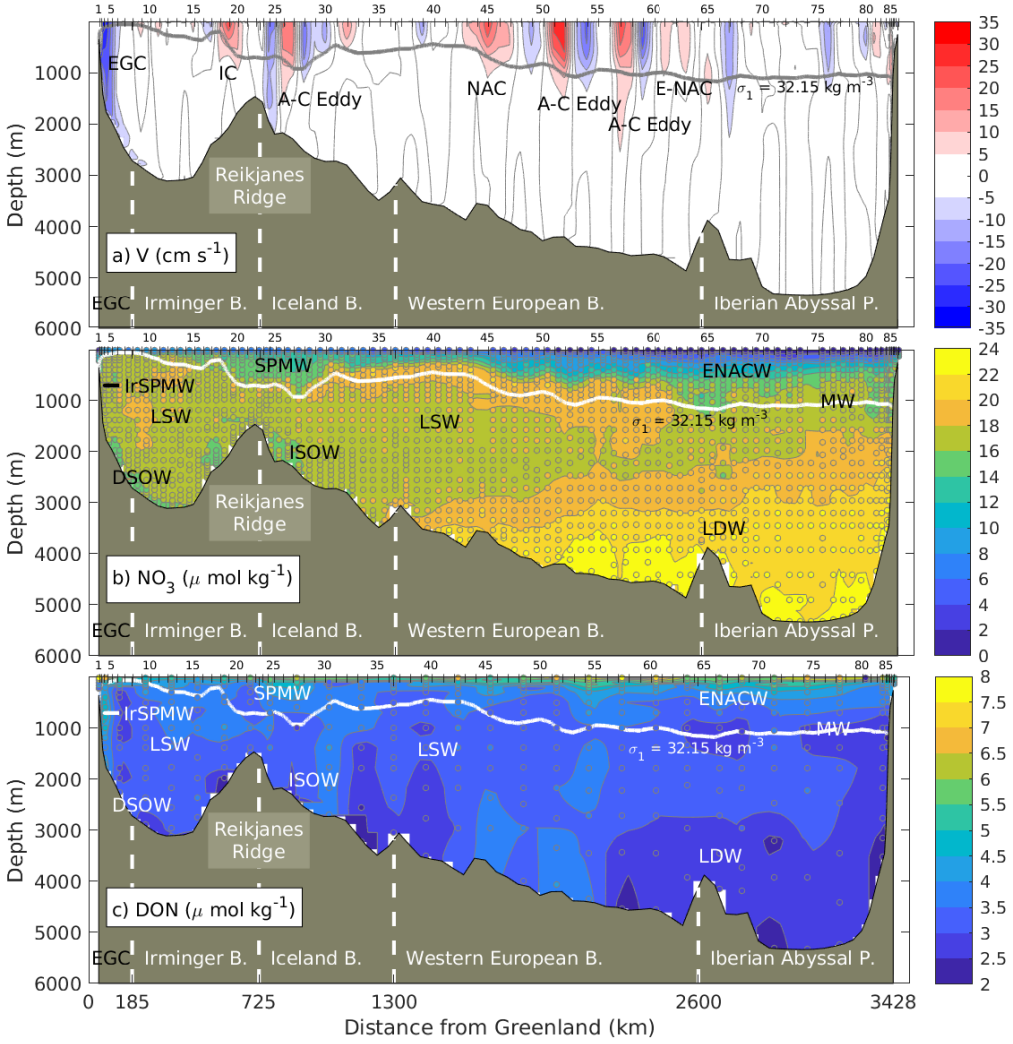

Figure S1. Distribution of the (a) cross-section velocities (V, cm s^{-1}), (b) nitrate (NO_3, µmol kg^{-1}) and (c) dissolved inorganic nitrogen (DON, µmol kg^{-1}) concentrations along the OVIDE 2002 section. Measured and interpolated concentrations are shown as coloured dots and contours, respectively. Numbers in the top of the panels indicate the station pair numbers. The main circulation features intersected by the OVIDE 2002 section are labeled in panel (a): East Greenland Current (EGC), Irminger Current (IC), North Atlantic Current (NAC), and three anticyclonic eddies (A-C Eddy). Two branches of the NAC have been intersected, a western more intense branch (NAC, station pairs 42.47) and a eastern weaker branch (ENAC, station pairs 60-64). The realms of the principal water masses present in the section are indicated: Eastern North Atlantic Central Water (ENACW), Subpolar Mode Water (SPMW), its variety at the Irminger Basin (IrSPMW), Mediterranean Water (MW), Labrador Sea Water (LSW), Iceland Strait Overflow Water (ISOW), Denkmark Strait Overflow Water (DSOW) and Lower Deep Water (LDW). The different regions in which the section has been divided for description purposes are also indicated: East Greenland Current (EGC), eastern Irminger Basin, Iceland Basin, Western European Basin and Iberian Abyssal Plain. The σ_1 = 32.15 kg m^{-3} isopycnal, separating the upper and lower limbs of the Meriodinal Overturning Circulation is depicted in all panels.

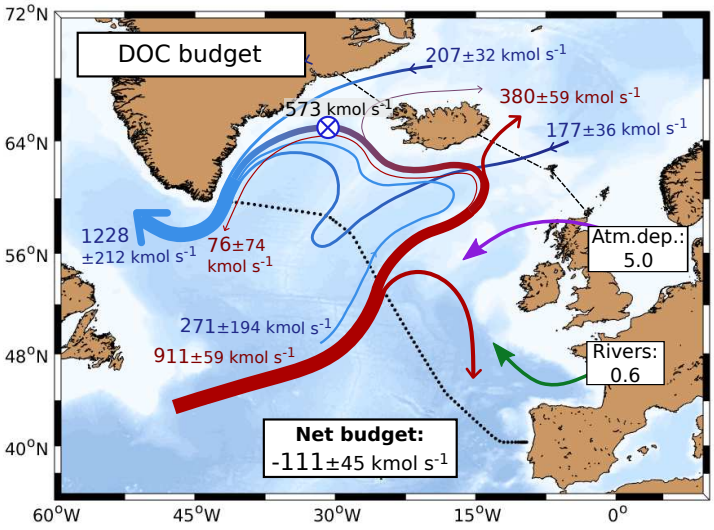

Figure S2. Dissolved organic carbon (DOC) transports and net budget ($\mathrm{kmol\,s^{-1}}$) in the eastern Subpolar North Atlantic. A schematic representation of the main circulation patterns in the area is outlined. Red (upper) and blue (lower) arrows and numbers represent the circulation in the density levels corresponding to the upper and lower limbs of the Atlantic Meridional Overturning Circulation (MOC), limited by the $\sigma_1 = 32.15\ \mathrm{kg\,m^{-3}}$ isopycnal. Fluxes across the OVIDE 2002 section are given for the Irminger Sea plus Iceland basin (West) and Western European Basin (East). Fluxes across the GIS sills are reported for the DSOW, the ISOW (blue) and the Atlantic Water (plus Polar Water) (red). The $\otimes$ symbol represents the downward transport by the overturning circulation. DOC supply by atmospheric deposition and rivers are represented by the purple and green arrows, respectively. Those fluxes were obtained from *Fontela et al.* [2016] and references herein.

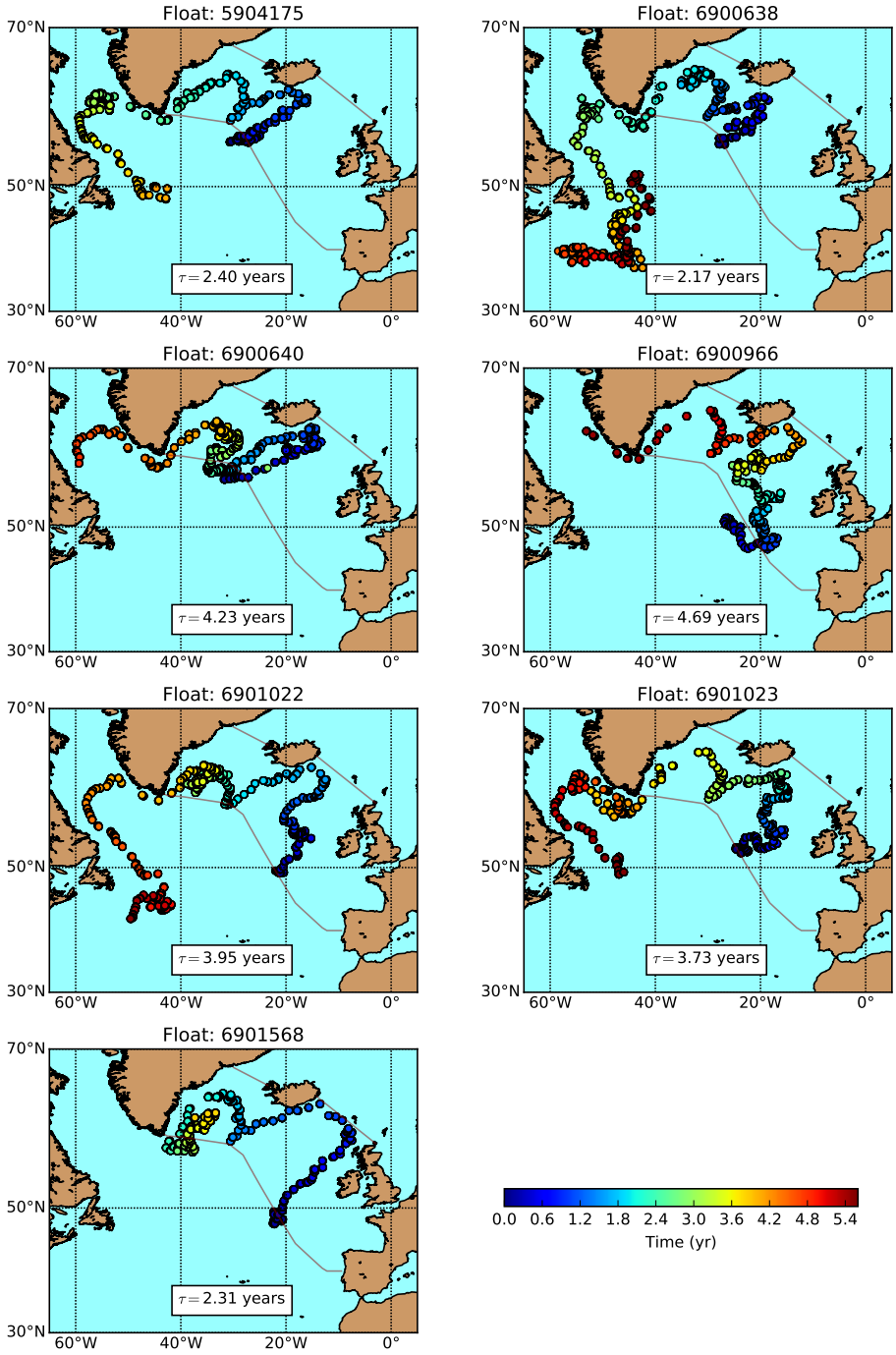

Figure S3. Trajectories of seven selected Argo floats (`http://www.argo-france.fr/fr/home/`) contouring the eastern North Atlantic subpolar gyre. The bubble color-scale represents the time since deployment. The float trajectories were used to estimate the transit time inside the eastern subpolar North Atlantic (τ) corresponding to a water parcel following the main path of the subpolar gyre. The floats are parked at 1000 m between profiles and, hence, the trajectories represent the mean flow at this depth. As a consequence, the transit time is possibly an upper bound estimate of the renewal time of surface waters, where the flow is more energetic. The positions of the Argo floats were downloaded from `ftp://ftp.ifremer.fr/ifremer/argo/dac/`.

Table S1. Volume fluxes, density and nutrient concentrations for water masses at the Greenland-Iceland-Scotland (GIS) sills. DOC and DON concentrations for the corresponding water masses in the OVIDE 2002 section are also reported. Those were used to estimate DON concentrations at the GIS sills according to Eq. **??** DS: Denmark strait, IFR: Iceland-Faroe Ridge, FSC: Faroe-Shetland channel, AW: Atlantic Water, PW: Polar Water, DSOW/ISOW: Denmark/Iceland strait Overflow water, SPMW: Subpolar Mode Water. Superscripts indicate the bibliography from where the data were obtained. Note that the flux values differ from those reported in Fig. **??**a, which correspond to volume-conserving transports (a net volume transport of 0.4 ± 1.2 Sv across the GIS sills has been substracted, see Methods).

		GIS sills					OVIDE 2002		
Reg.	WM	Volume	ρ[1]	NO_3 ([1])	DOC[2]	DON	WM	DOC[3]	DON[3]
		Trp. (Sv)	($kg\,m^{-3}$)	($\mu mol\,kg^{-1}$)				($\mu mol\,kg^{-1}$)	
DS	AW	0.8 ± 0.16 ([4])	1027.8	10.1 ± 1.5	59 ± 4	4.83 ± 0.62	SPMW	50.5 ± 0.6	3.58 ± 0.08
	PW	-1.5 ± 0.5 ([5])	1027.7	9.0 ± 1.6	70 ± 10	4.88 ± 0.81	-	-	-
	DSOW	-3.4 ± 0.4 ([6])	1030	12.6 ± 0.5	58 ± 6	4.05 ± 0.94	DSOW	50.8 ± 2.0	2.97 ± 0.14
IFR	AW	3.8 ± 0.5 ([4])	1028	11.0 ± 1.7	58 ± 4	4.69 ± 0.61	SPMW	50.5 ± 0.6	3.58 ± 0.08
	ISOW	-1.0 ± 0.5 ([7])	1029.9	13.8 ± 0.3	53 ± 5	3.90 ± 0.74	ISOW	46.9 ± 0.6	3.04 ± 0.10
FSC	AW	3.8 ± 0.5 ([4])	1027.8	9.6 ± 2.4	58 ± 4	4.69 ± 0.62	SPMW	50.5 ± 0.6	3.58 ± 0.08
	ISOW	-2.1 ± 0.3 ([7])	1031.6	13.8 ± 0.2	53.5 ± 5	3.96 ± 0.75	ISOW	46.9 ± 0.6	3.04 ± 0.10

References [1]: World Ocean Atlas 2013 (`https://www.nodc.noaa.gov/OC5/woa13/`), [2] : *Jeansson et al.* [2011], [3]: *Álvarez-Salgado et al.* [2013], [4]: *Østerhus et al.* [2005], [5]: *Nilsson et al.* [2008], [6]: *Macrander et al.* [2005], [7]: *Hansen et al.* [2008]