Dynamique et stratification des gyres subtropicaux

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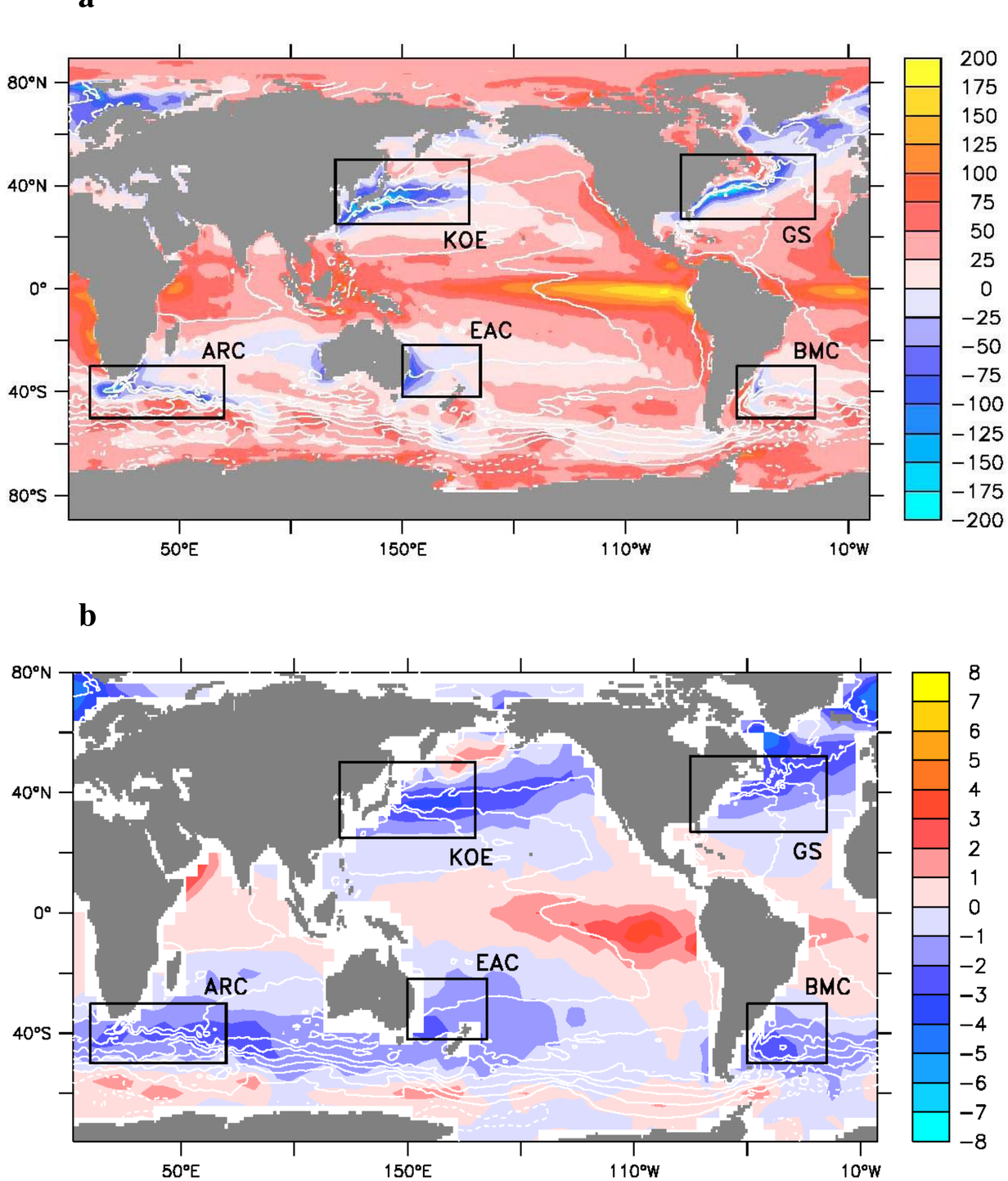


Figure 13.3

Global distribution of the climatological mean (a) latent plus sensible heat flux (in W m^{-2}; positive, atmosphere to ocean; Yu and Weller, 2007) and (b) CO_2 flux (in mol m^{-2} $year^{-1}$; positive, ocean to atmosphere; Takahashi et al., 2009) at the sea surface; the latter is for the reference year 2000 (non-El Niño conditions). White contours indicate mean sea surface dynamic height (Rio and Hernandez, 2004). ARC, Agulhas Return Current; KOE,

Imawaki et al, 2013

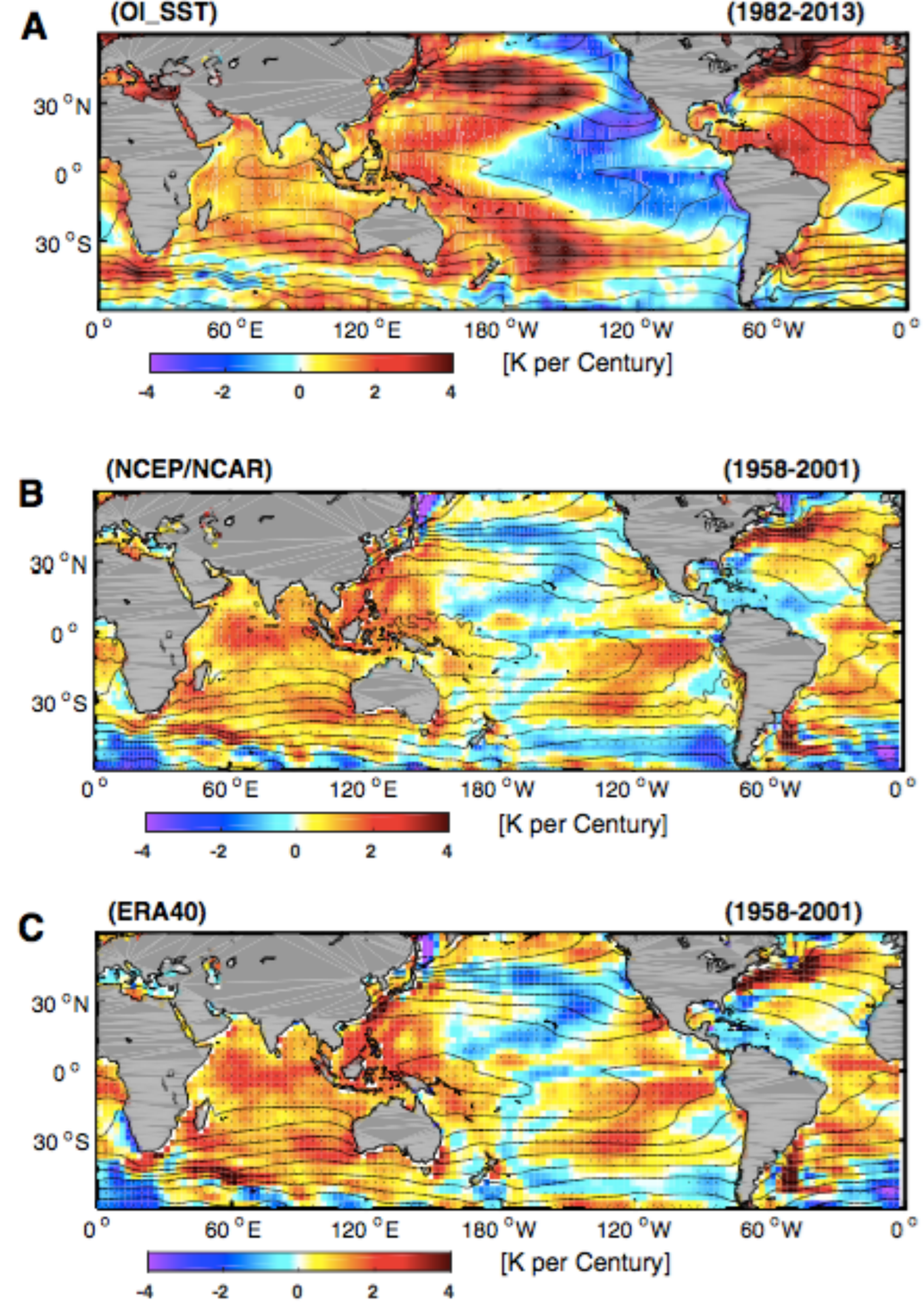


Figure 3. Observational trends in SST (shading). Black contours present climatological SST. Stippling indicates regions where th pass the 95% confidence level (Student's *t*-test).

Yang et al, JGR, 2016

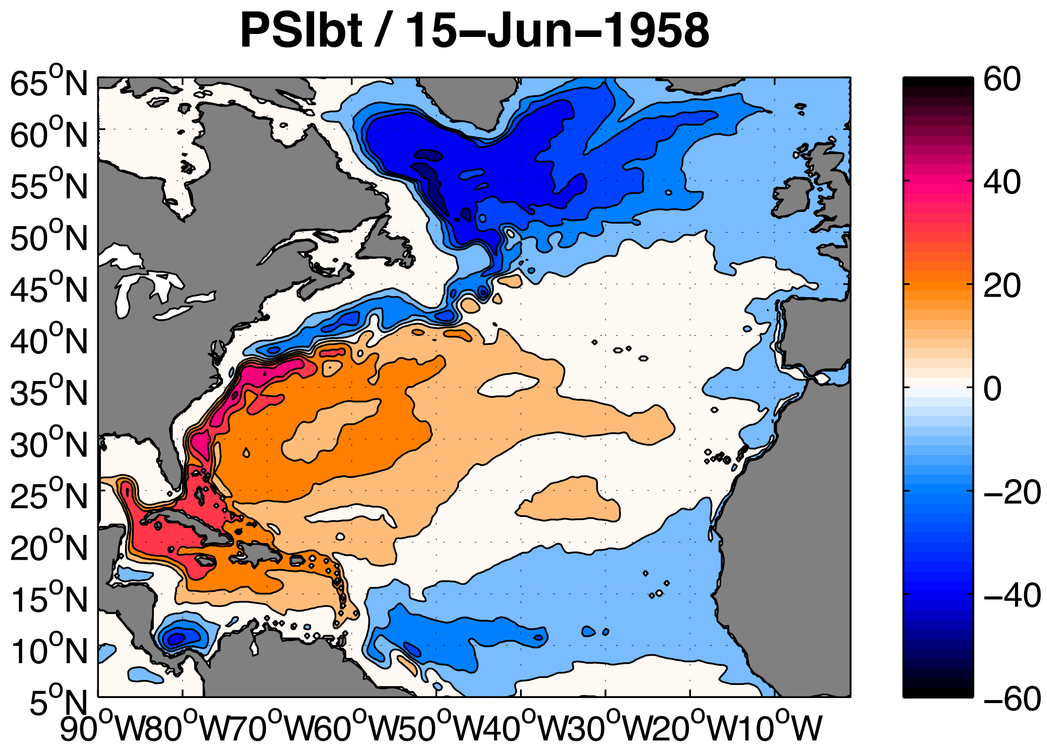
ORCA025 representation of large-scale stratification features in the North-Atlantic

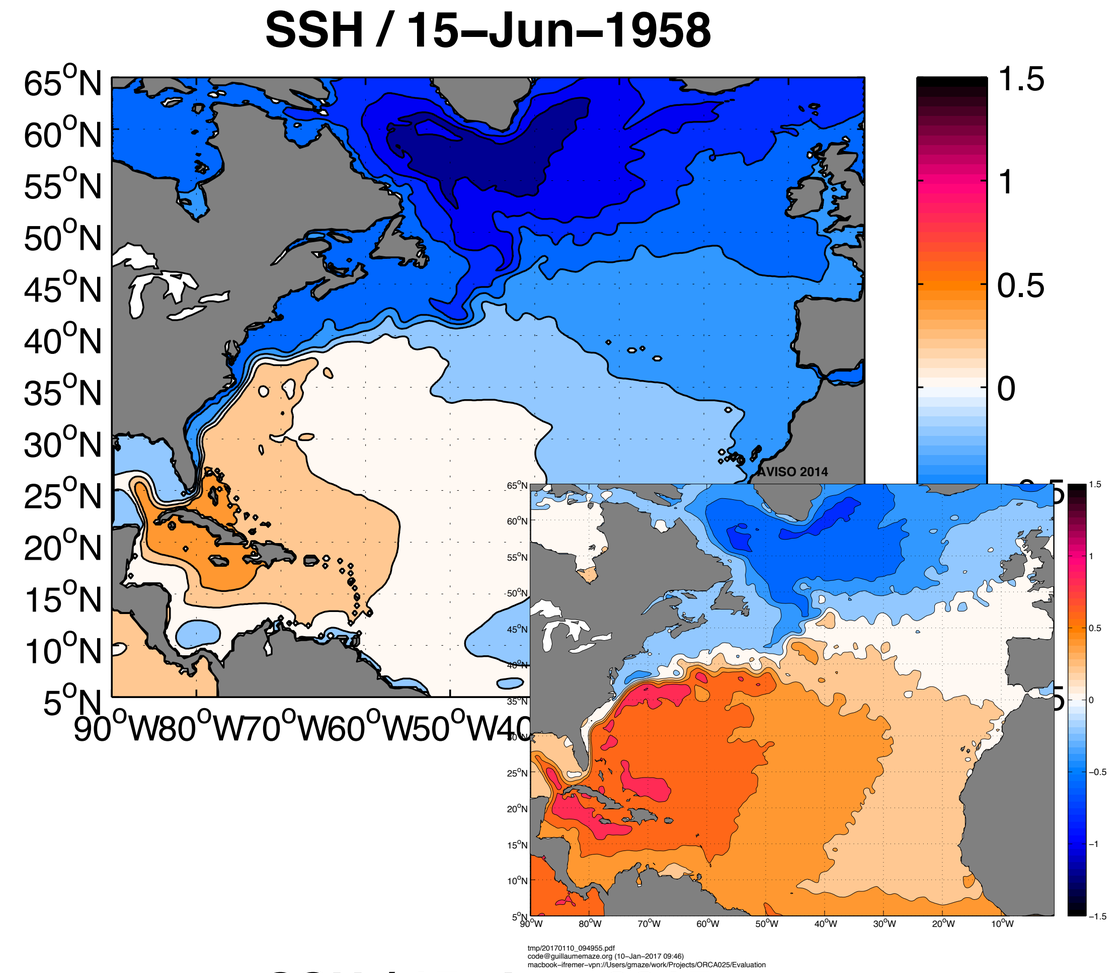
Guillaume Maze, Herlé Mercier, Charlène Feucher

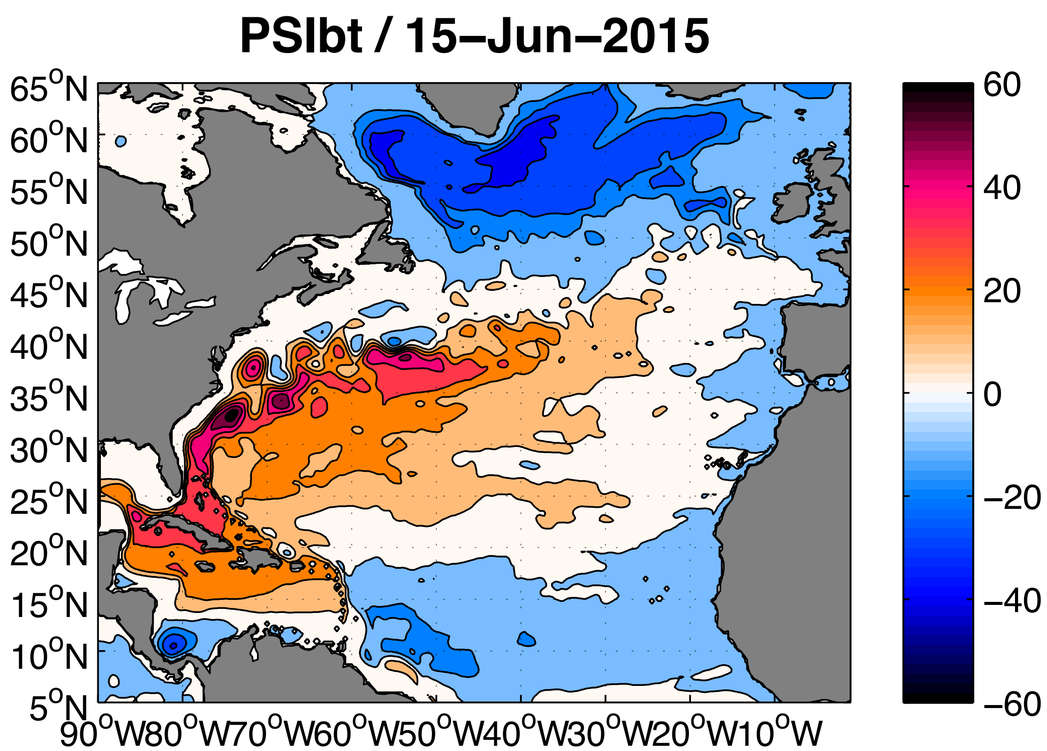
merci à Claude et Camille pour leur aide/commentaires

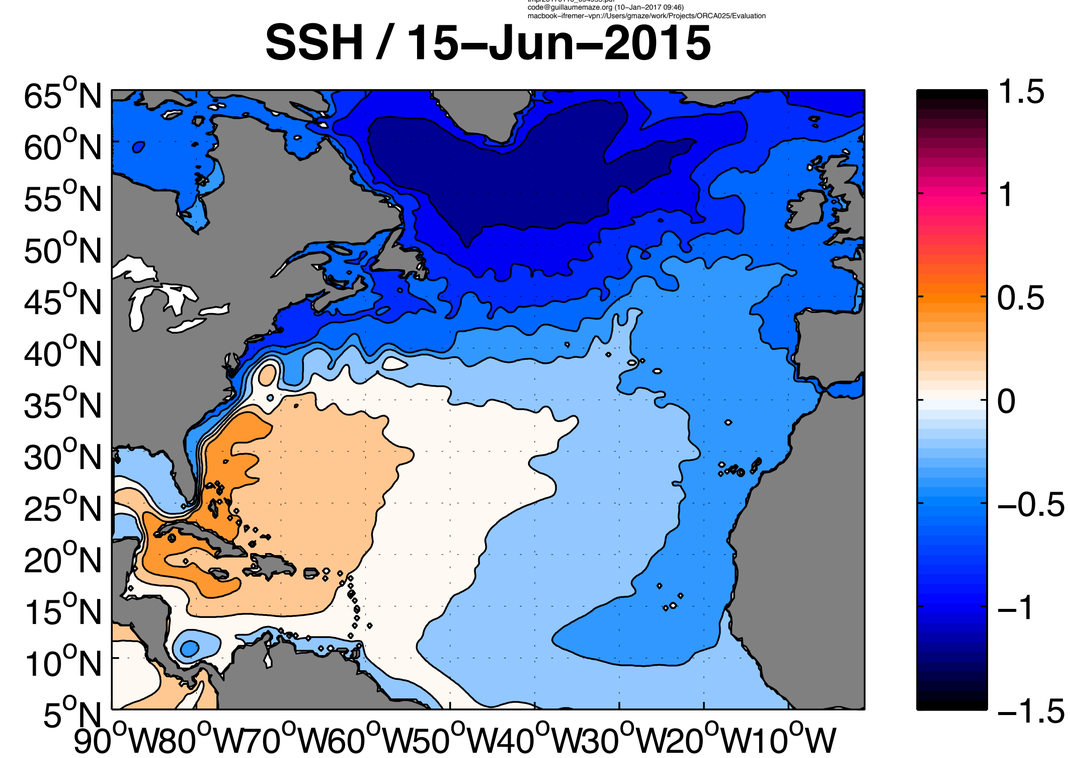
1958 - 2015, 58 years of simulations
75 vertical levels, 0.25 x 0.25 horizontal grid
Forced with DRAKKAR Forcing Set, COARE bulks

Circulation



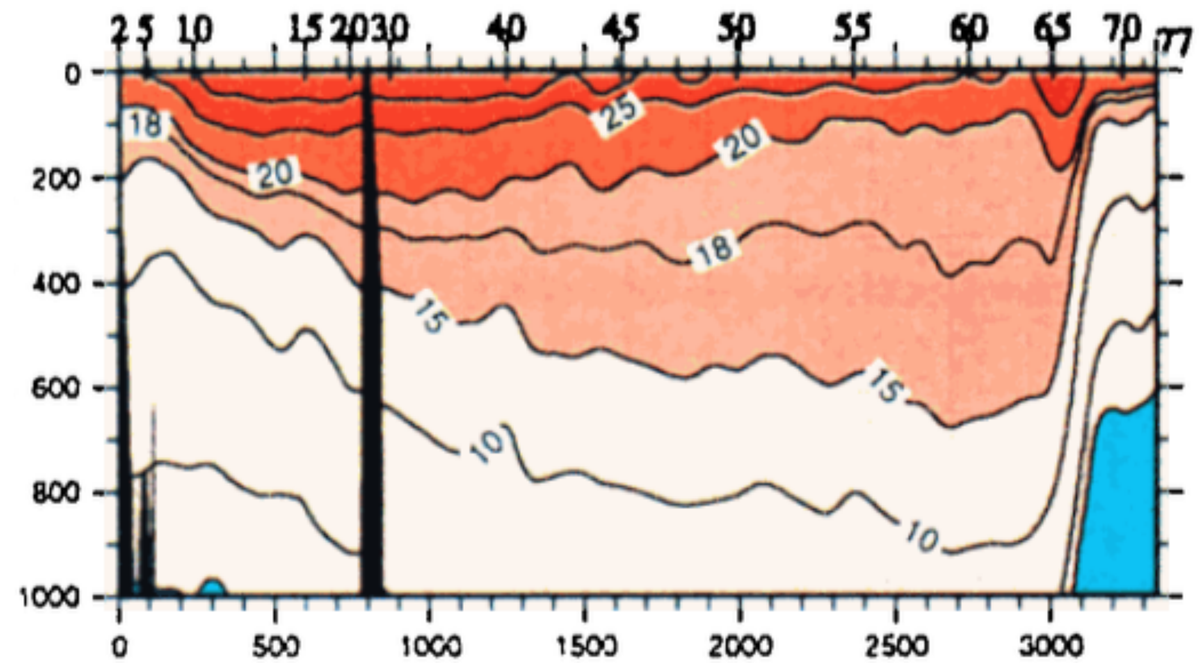




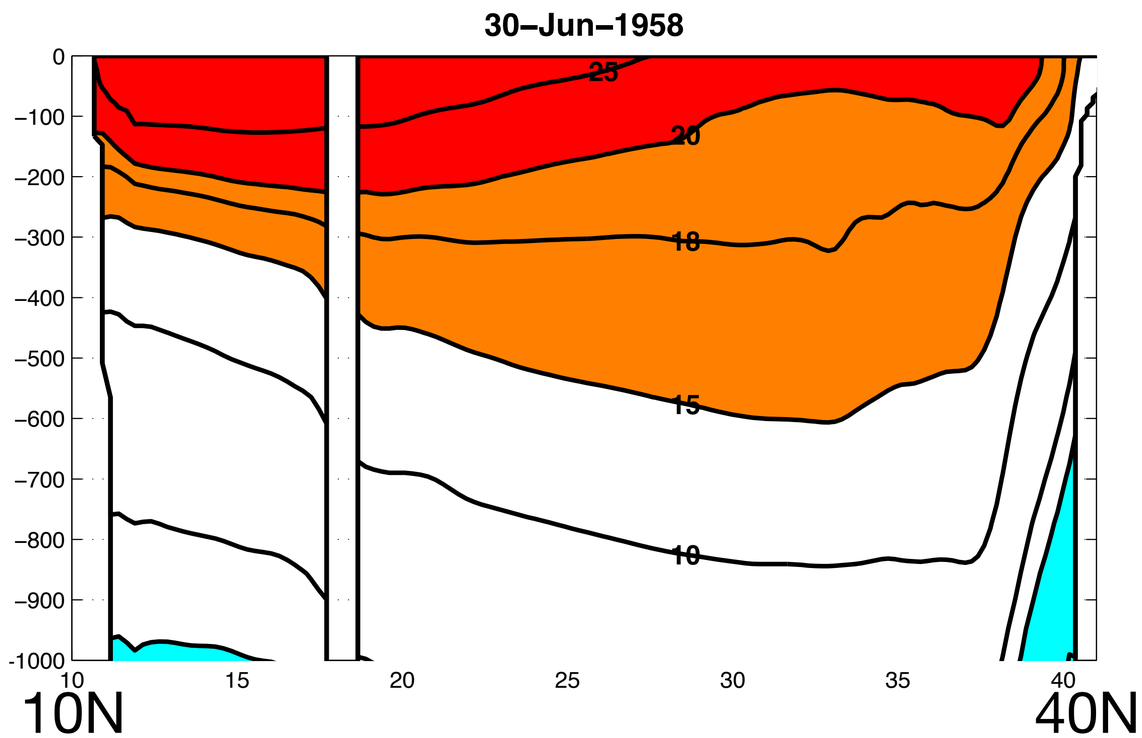


18° Mode Water (West)

Section WOCE A22 @ 67W



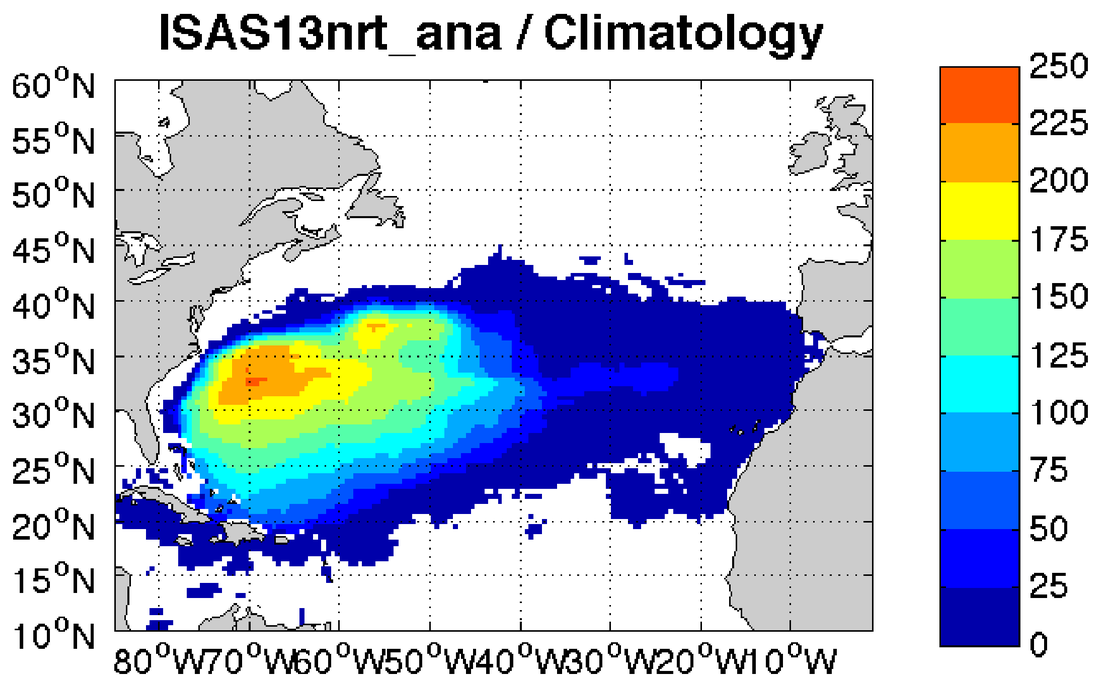
Joyce et al, 2001



ORCA025 - 67W

Structure is correct at the beginning of the simulation

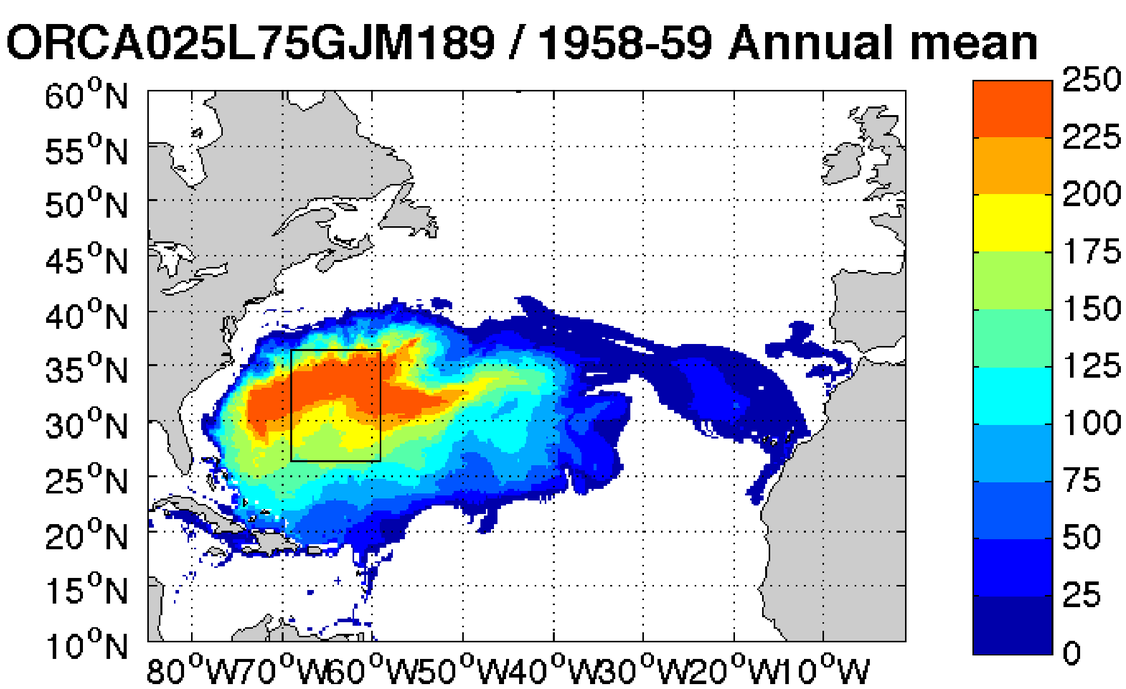
18° Mode Water (West)

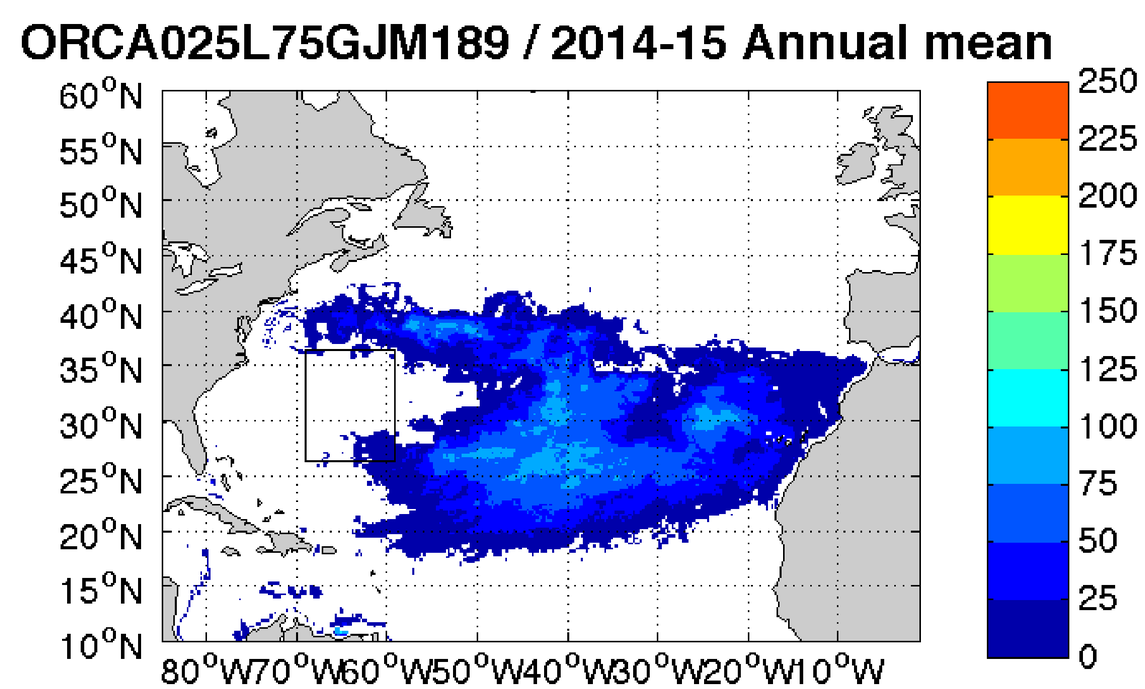


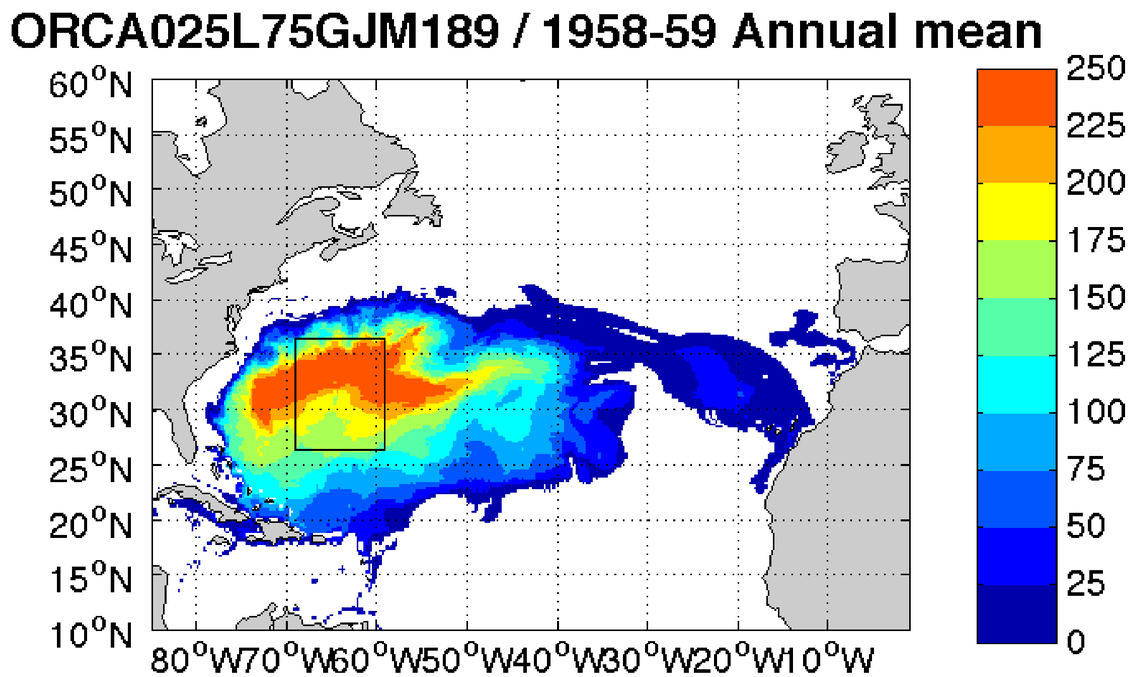
STc = 26.4; dST = 0.1;
Tc = 18; dT = 1;
PVmax = 1.5e-10;
Hmin = 50; % Minimum thickness

Start with a pool around Bermuda
Already underestimated (true MW biased)
Western pool is destroyed

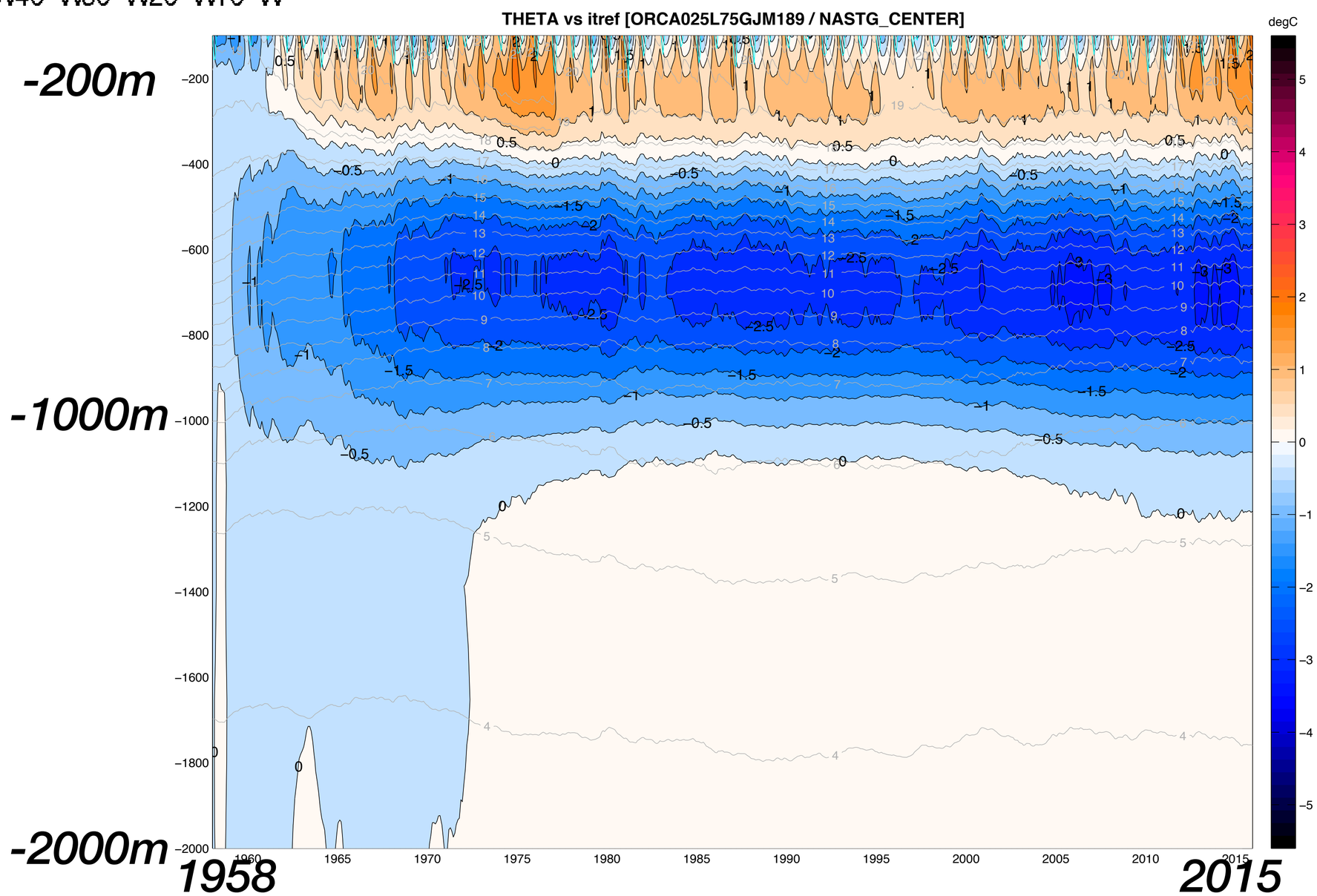
EDW thickness







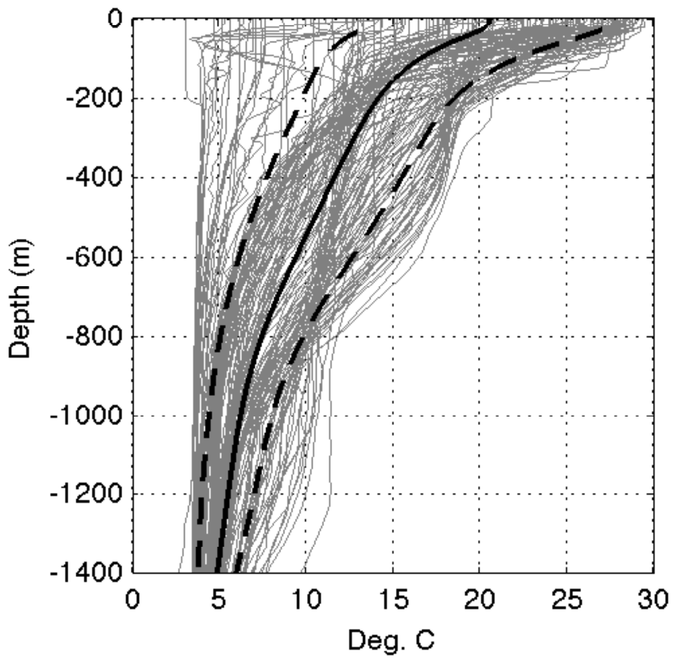
Temperature vs 1958



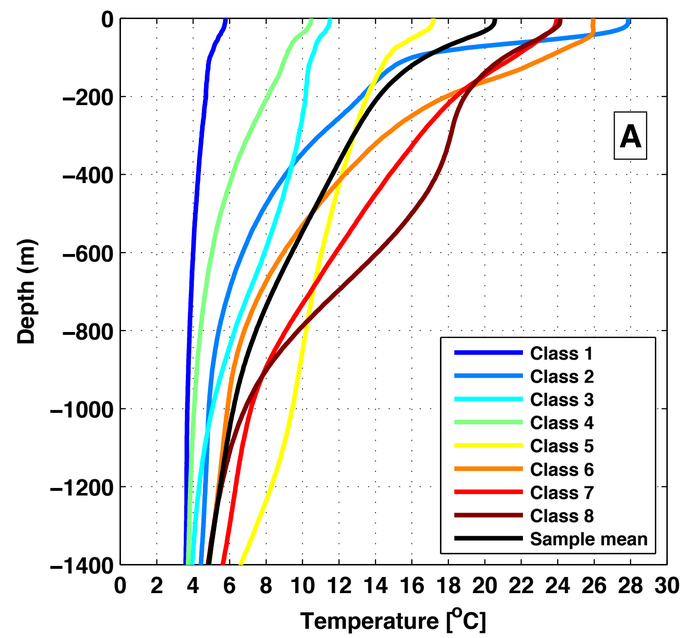
Collapse of the Western Stratification Structure

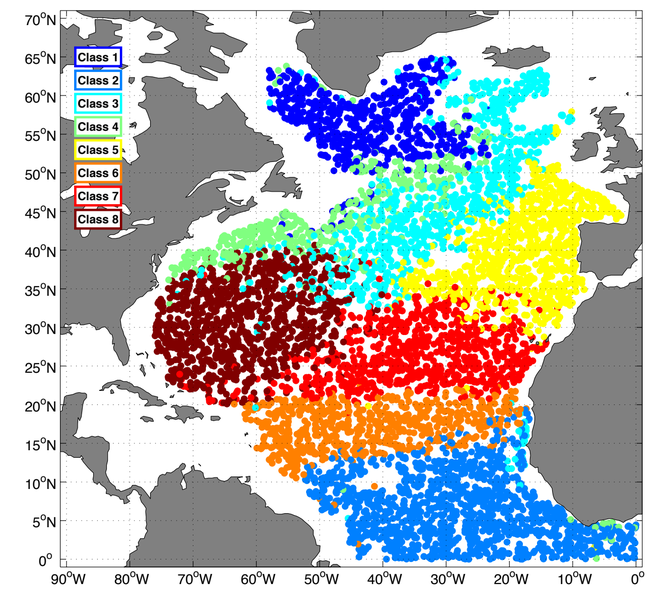
PCM: Profile Classification Model from Argo data, Maze et al, 2017

Complex distribution of heat in space



Data-driven model of internal heat content structure



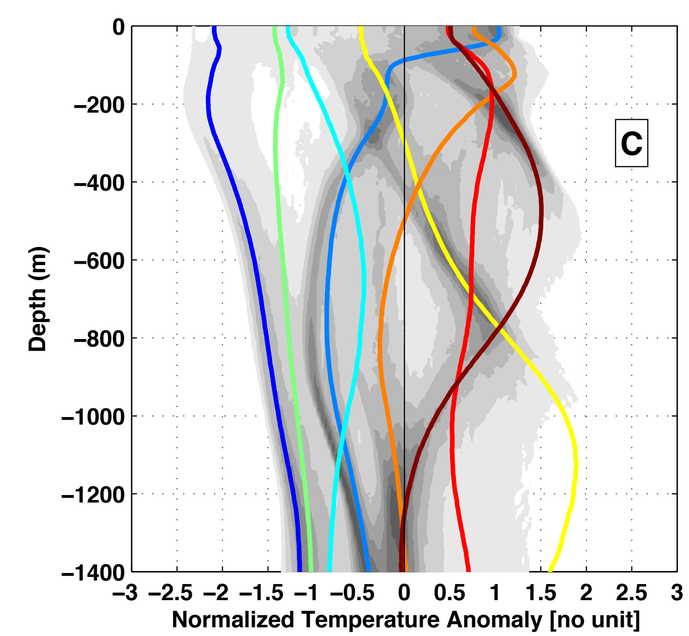


Random sample of Argo temperature profiles in the North Atlantic

unsupervised classification

Different groups of temperature profiles are identified automatically

which correspond to coherent regions of the ocean

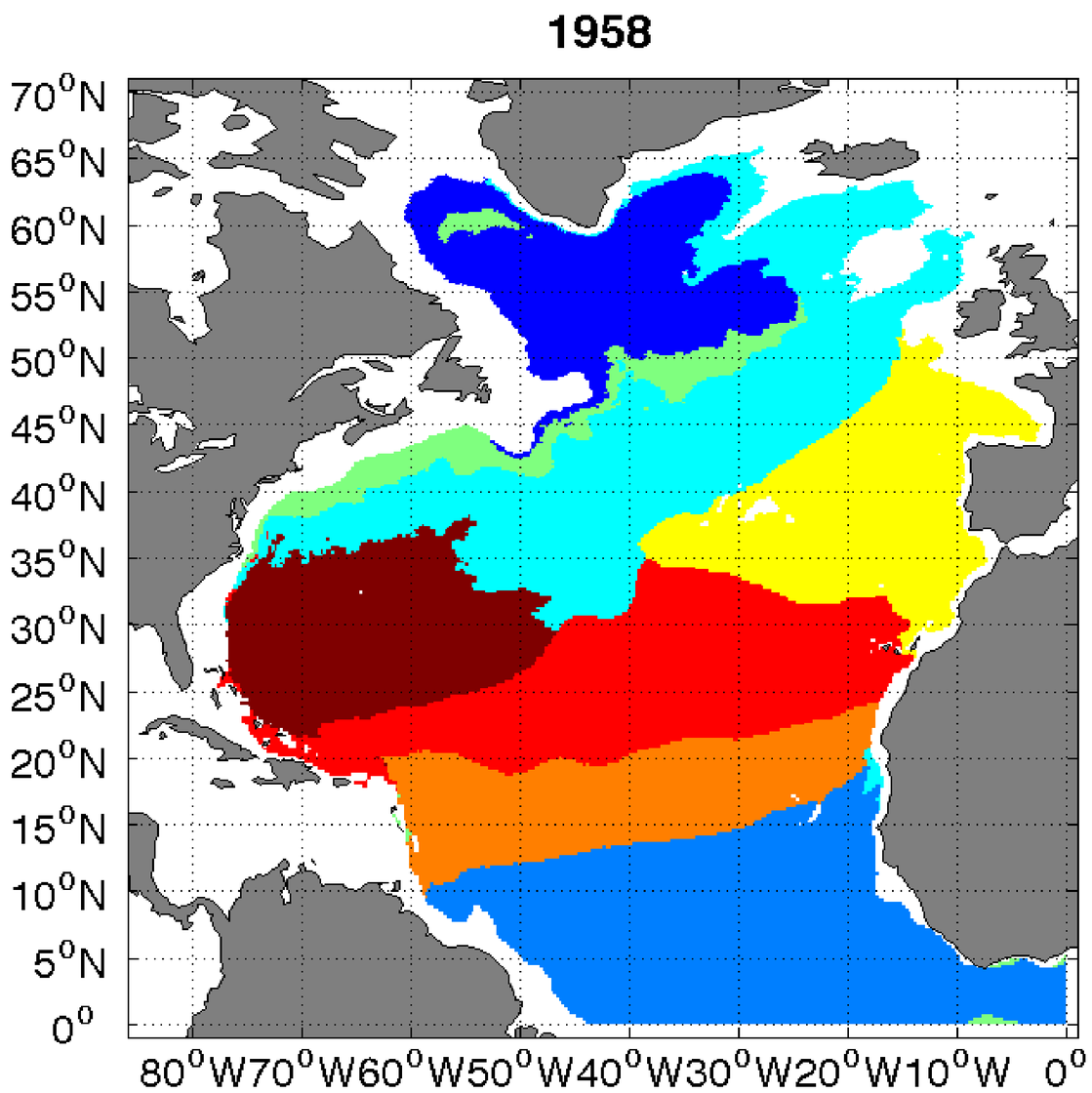


Article: http://dx.doi.org/10.1016/j.pocean.2016.12.008
PCM data: http://dx.doi.org/10.17882/47106
Toolbox: https://forge.ifremer.fr/projects/pcm

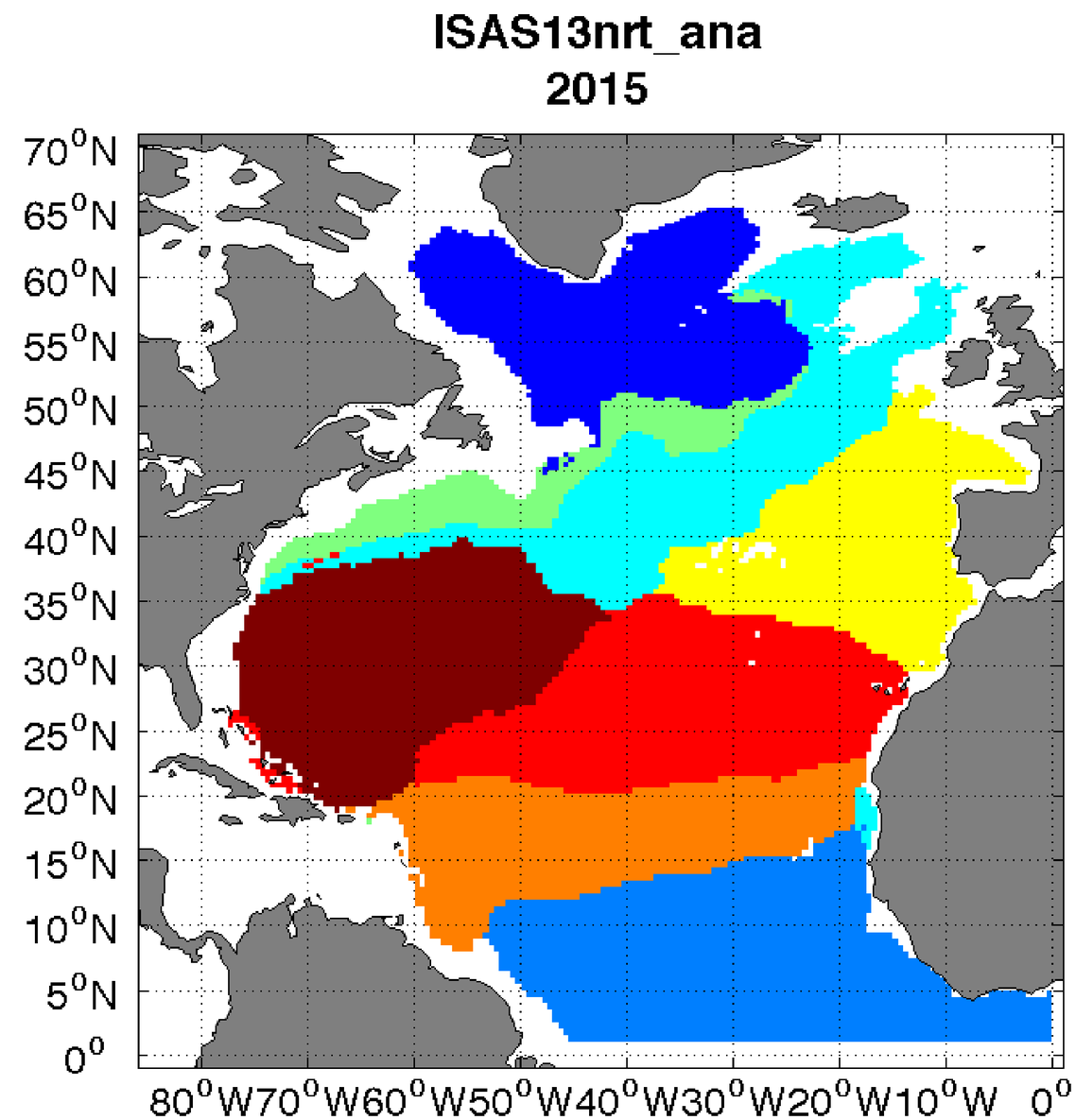
Collapse of the Western Stratification Structure

Correct Initial State in 1958

ORCA025 / 1st year



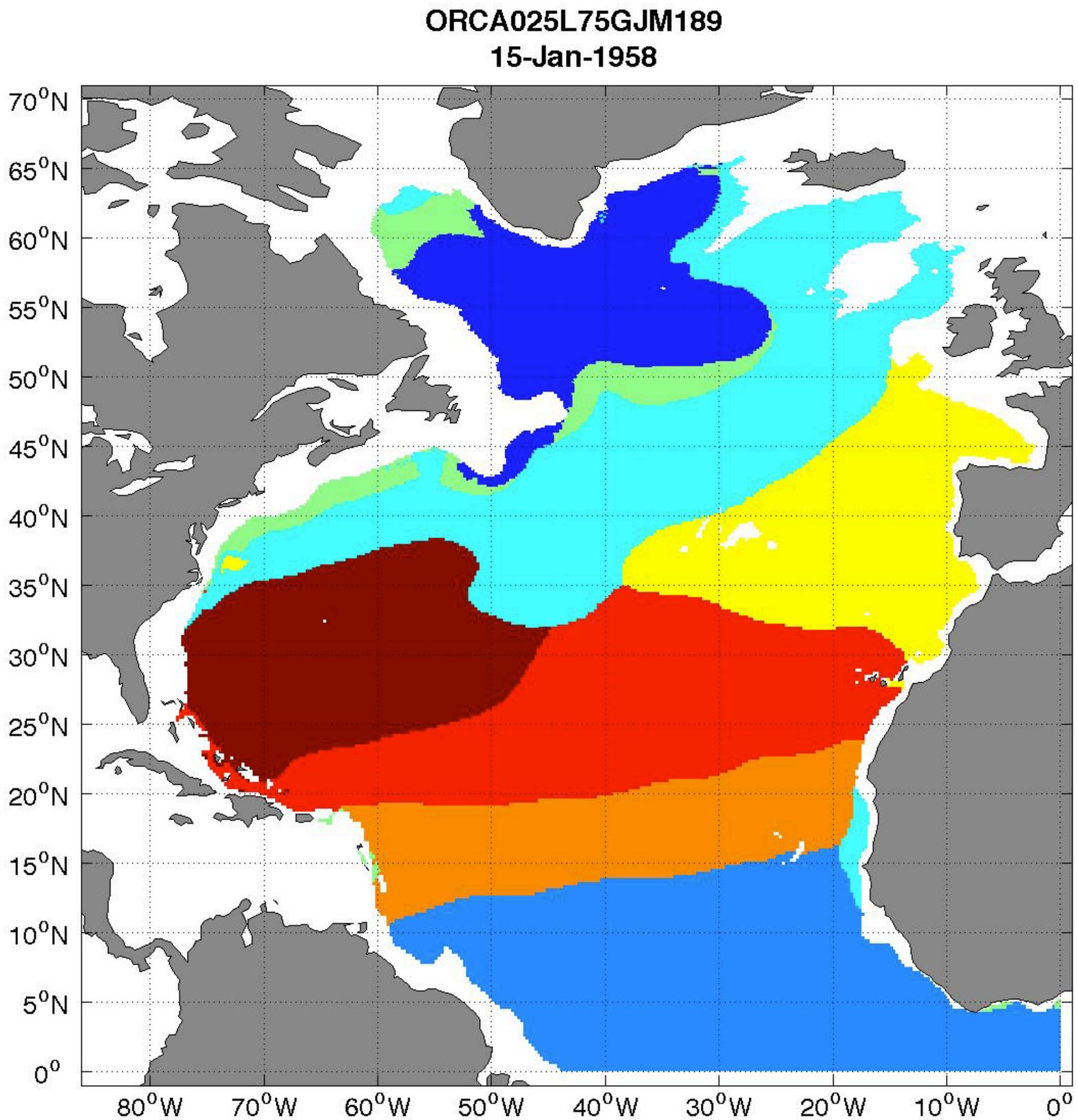
OBSERVATION / 1 year



Locally Most Frequent Labels

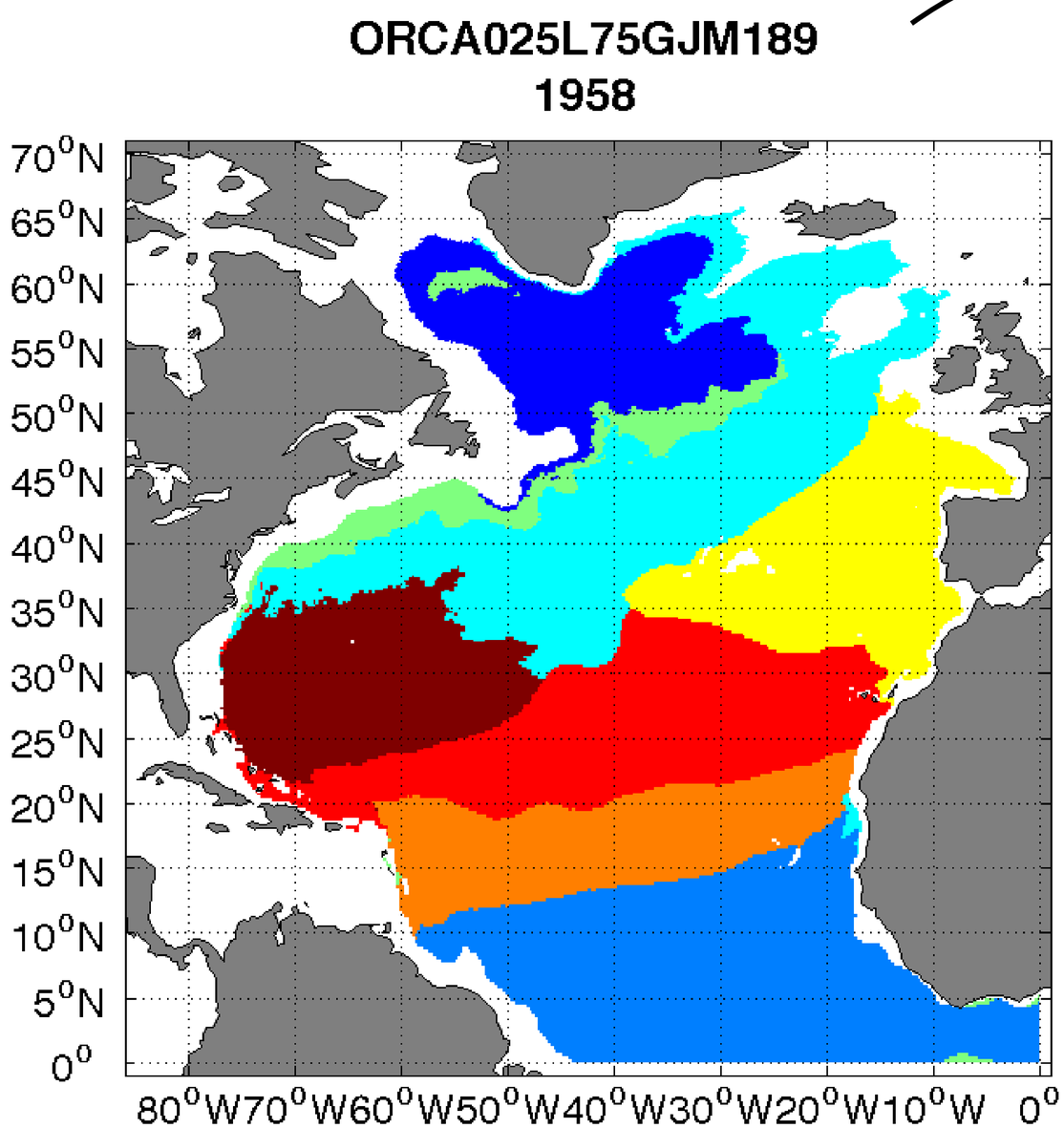
PCM:Argo (Maze et al, 2017)

Collapse of the Western Stratification Structure

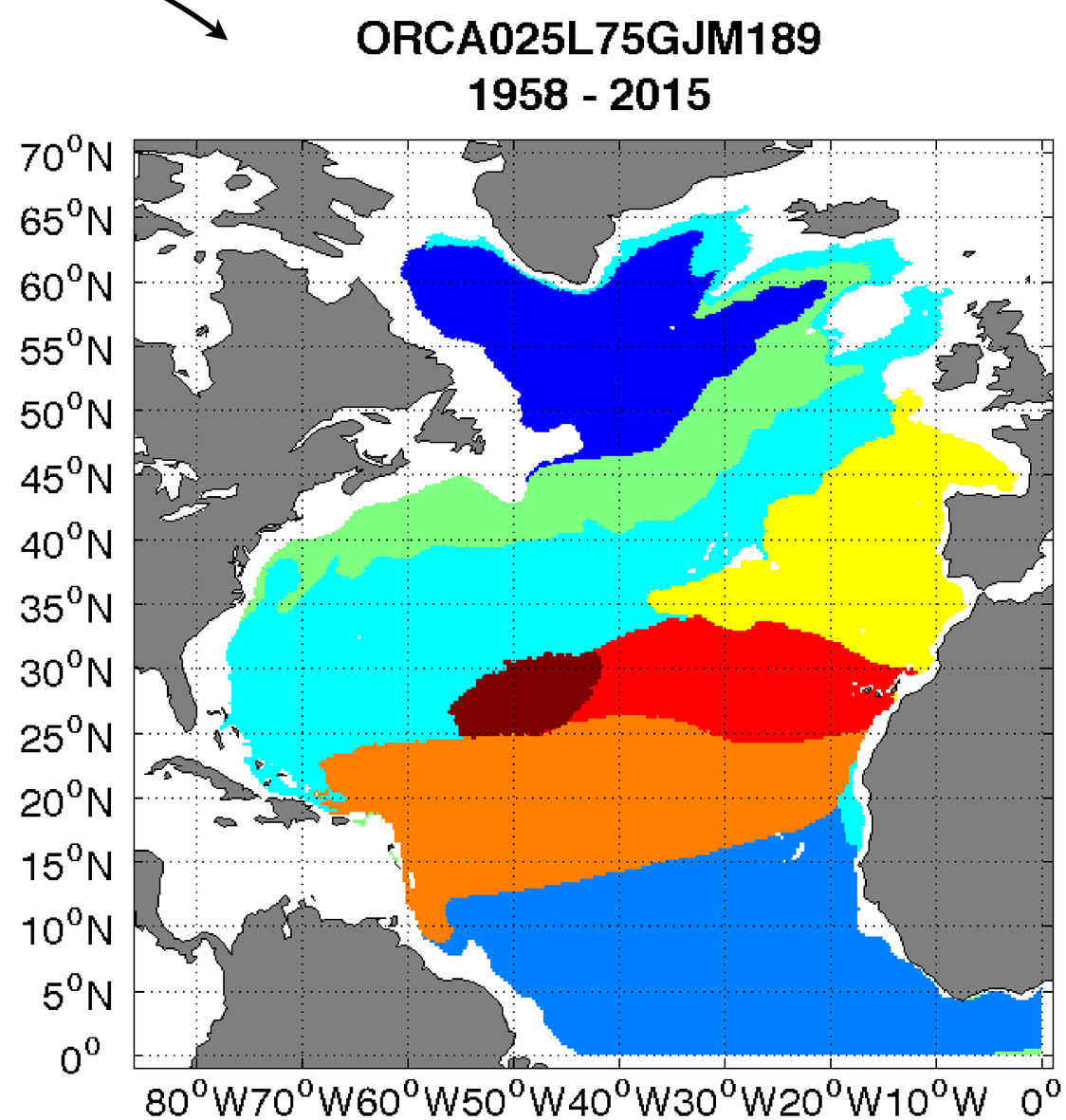


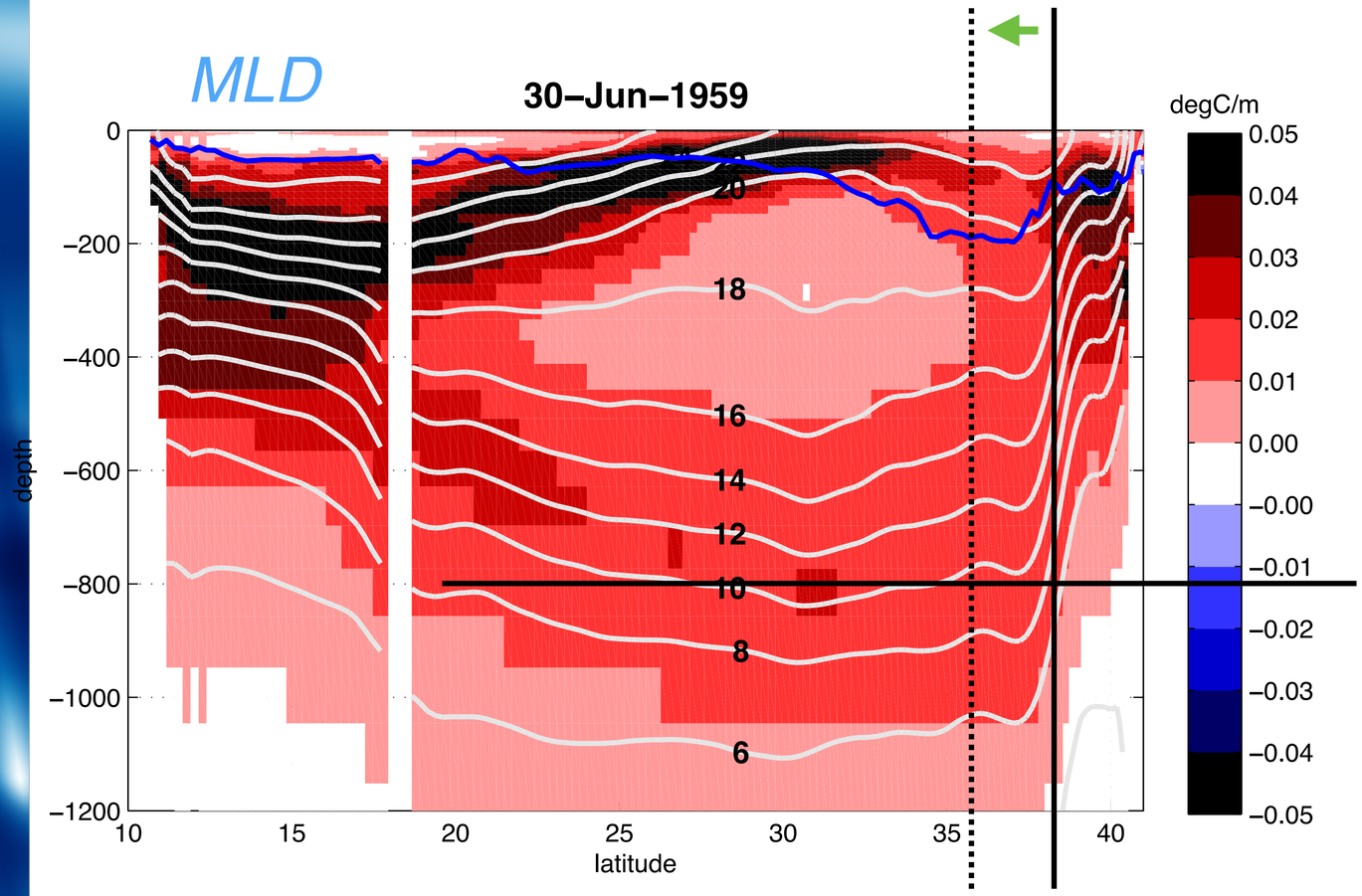
Collapse of the Western Stratification Structure

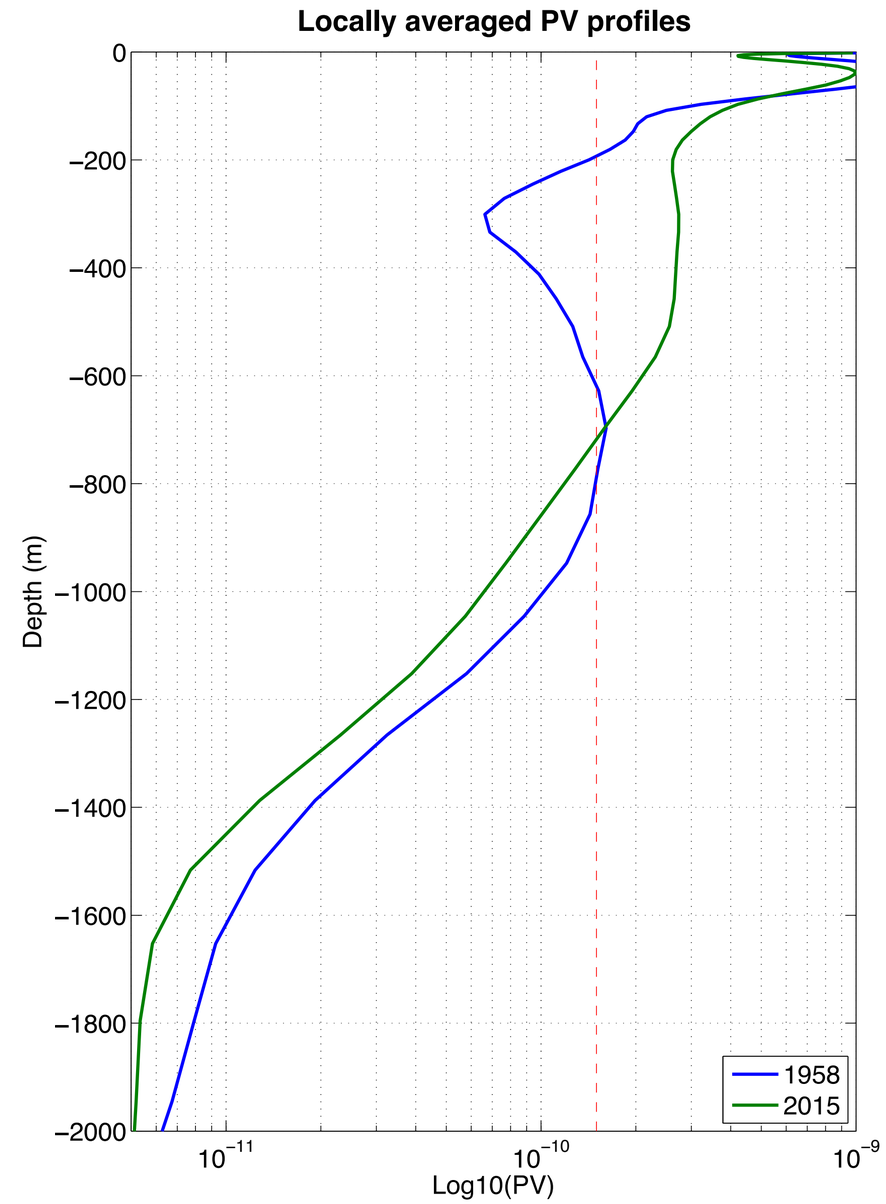
ORCA025 / 1st year

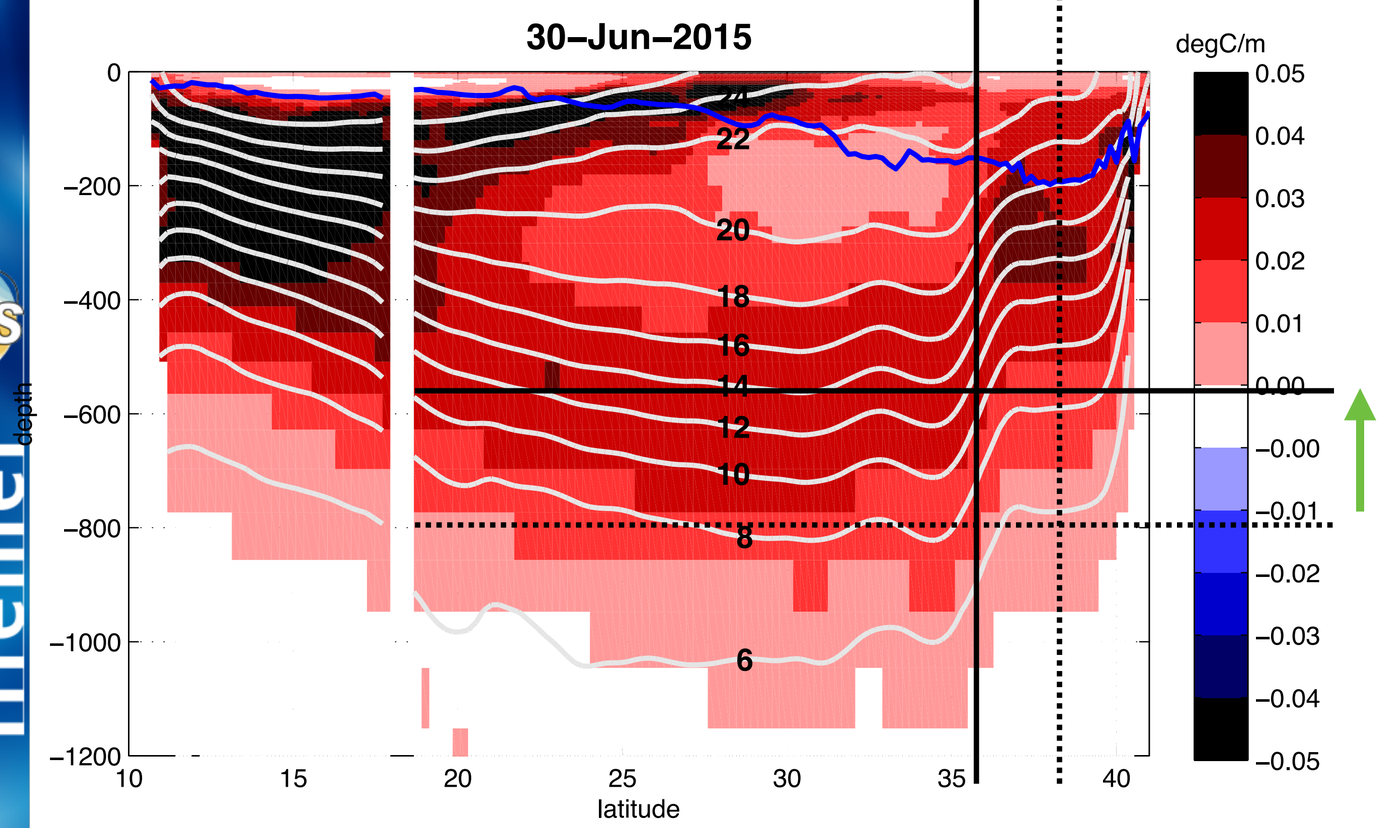


ORCA025 / All years



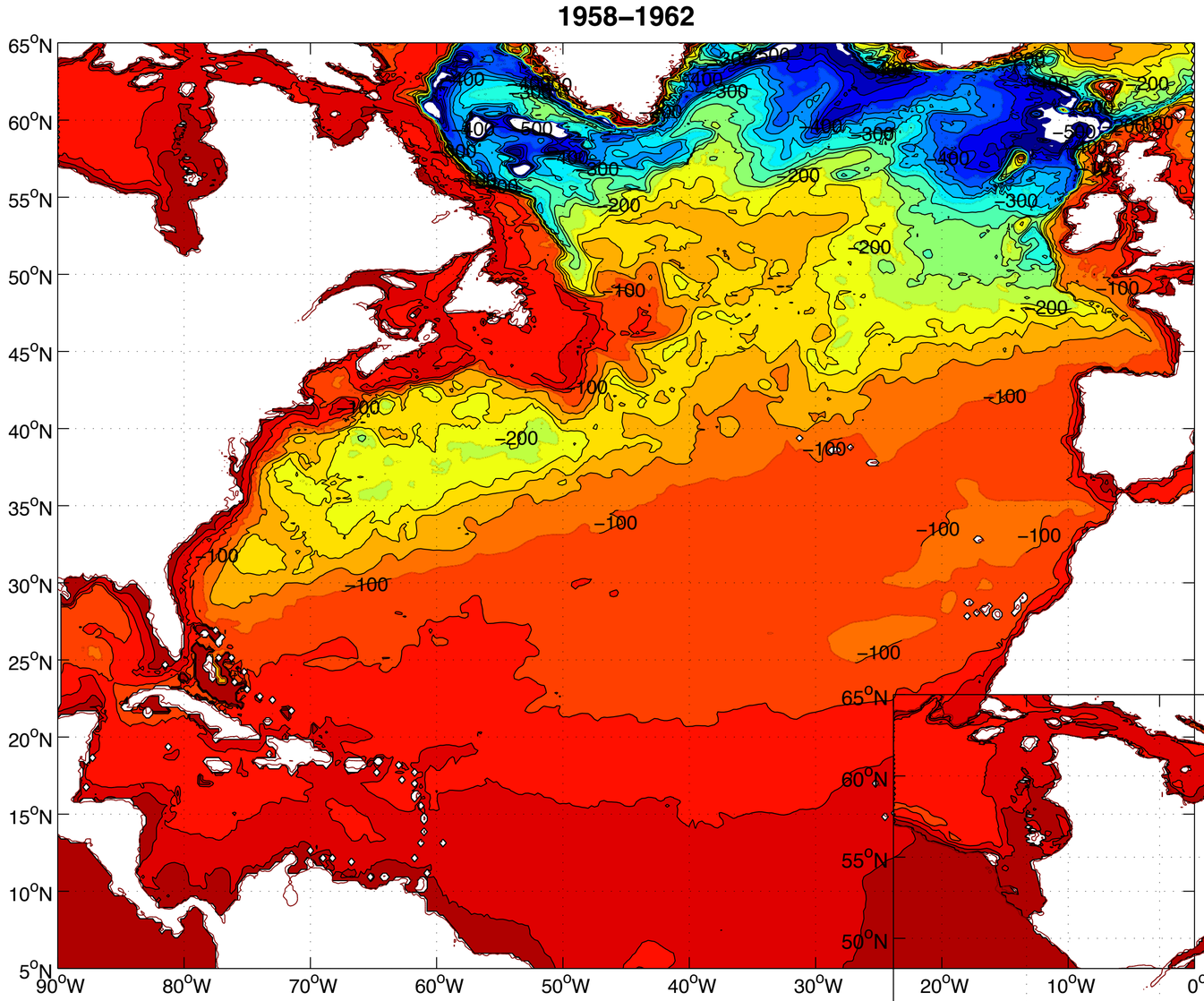






Working hypothesis:

- The GS shifts south
- Not the forcing
- MLD not following the GS
- PV is not lost anymore
- Stratification increases
- No STMW formation
- Loss of structure


1958–1962
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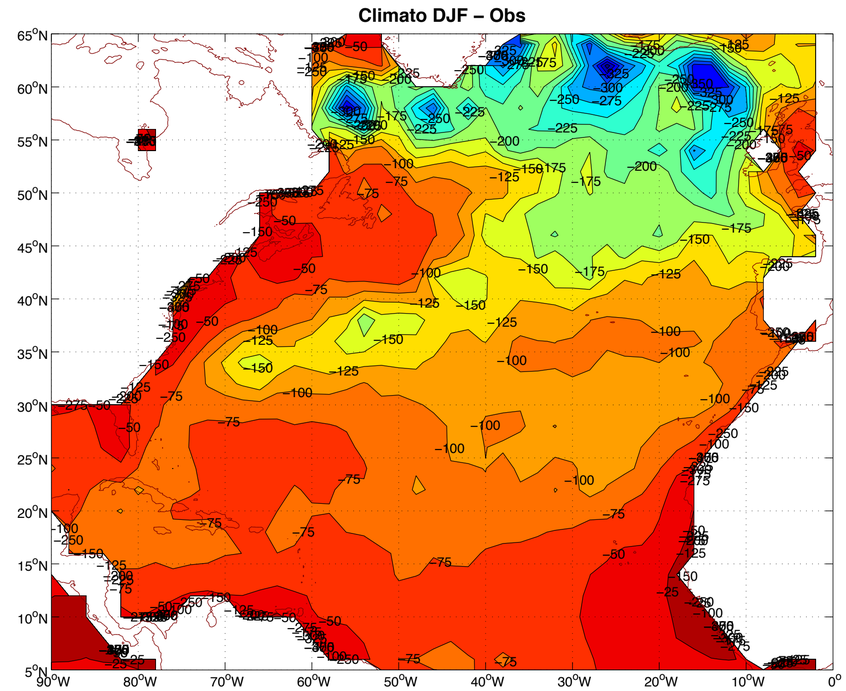
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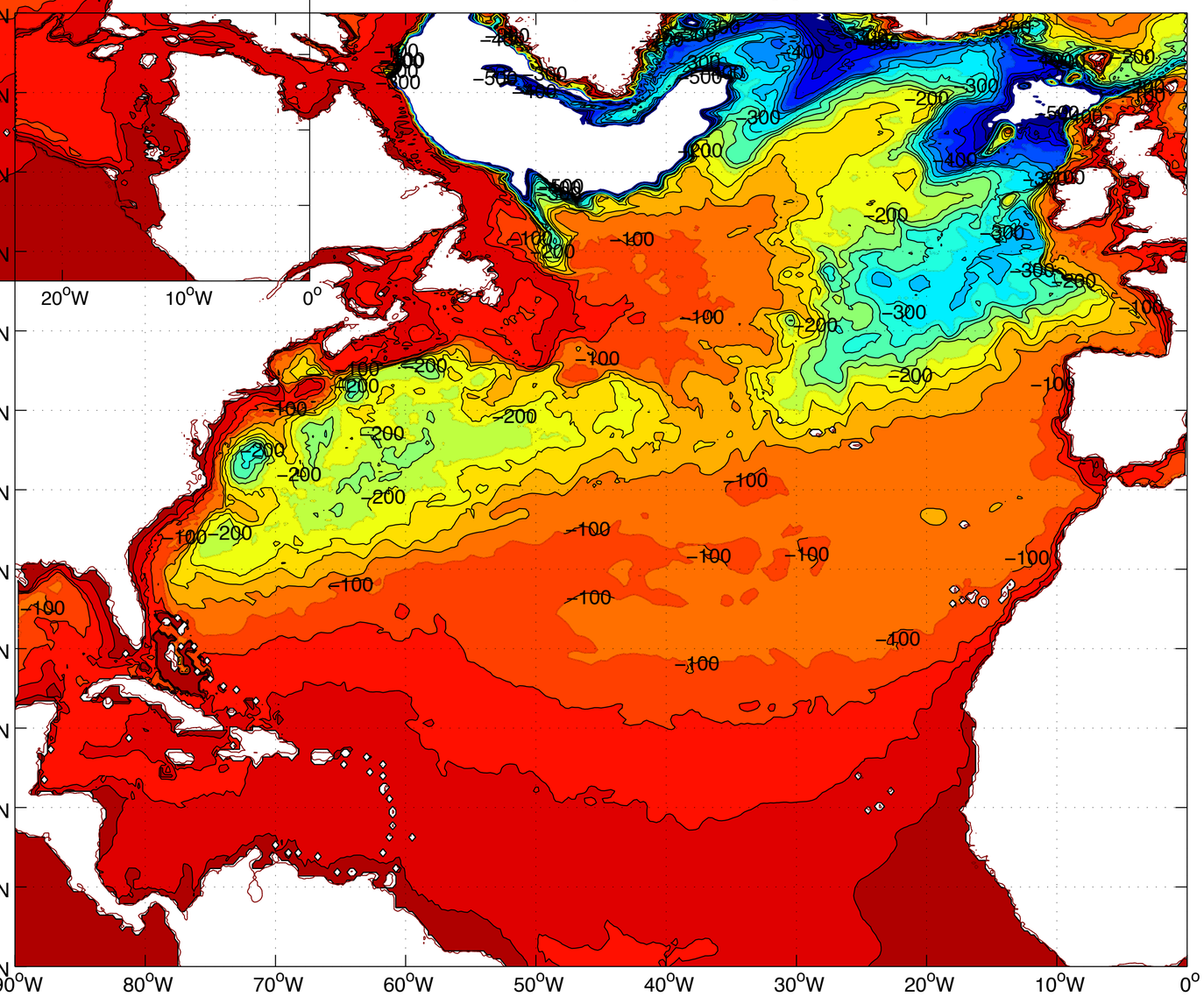
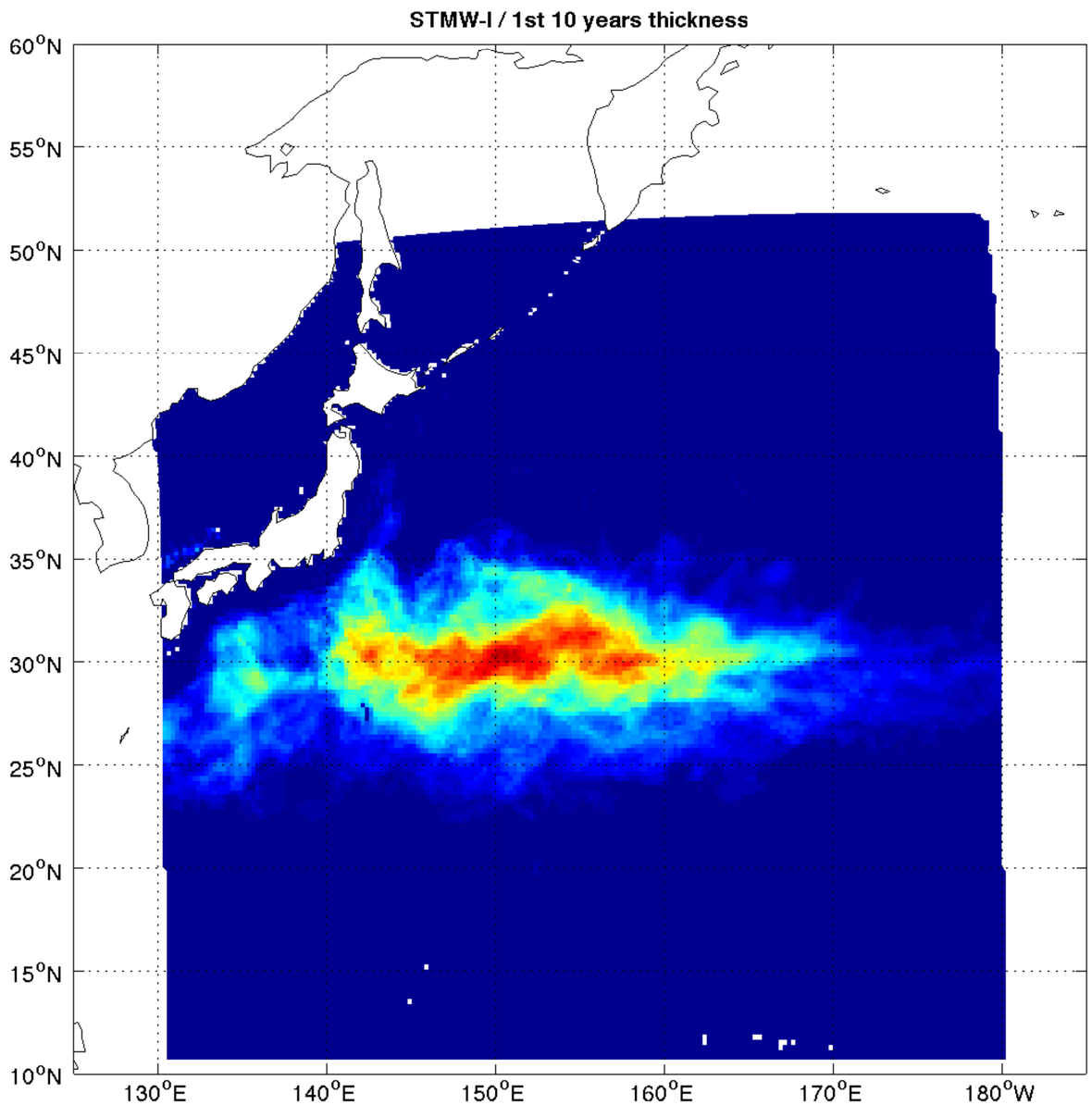
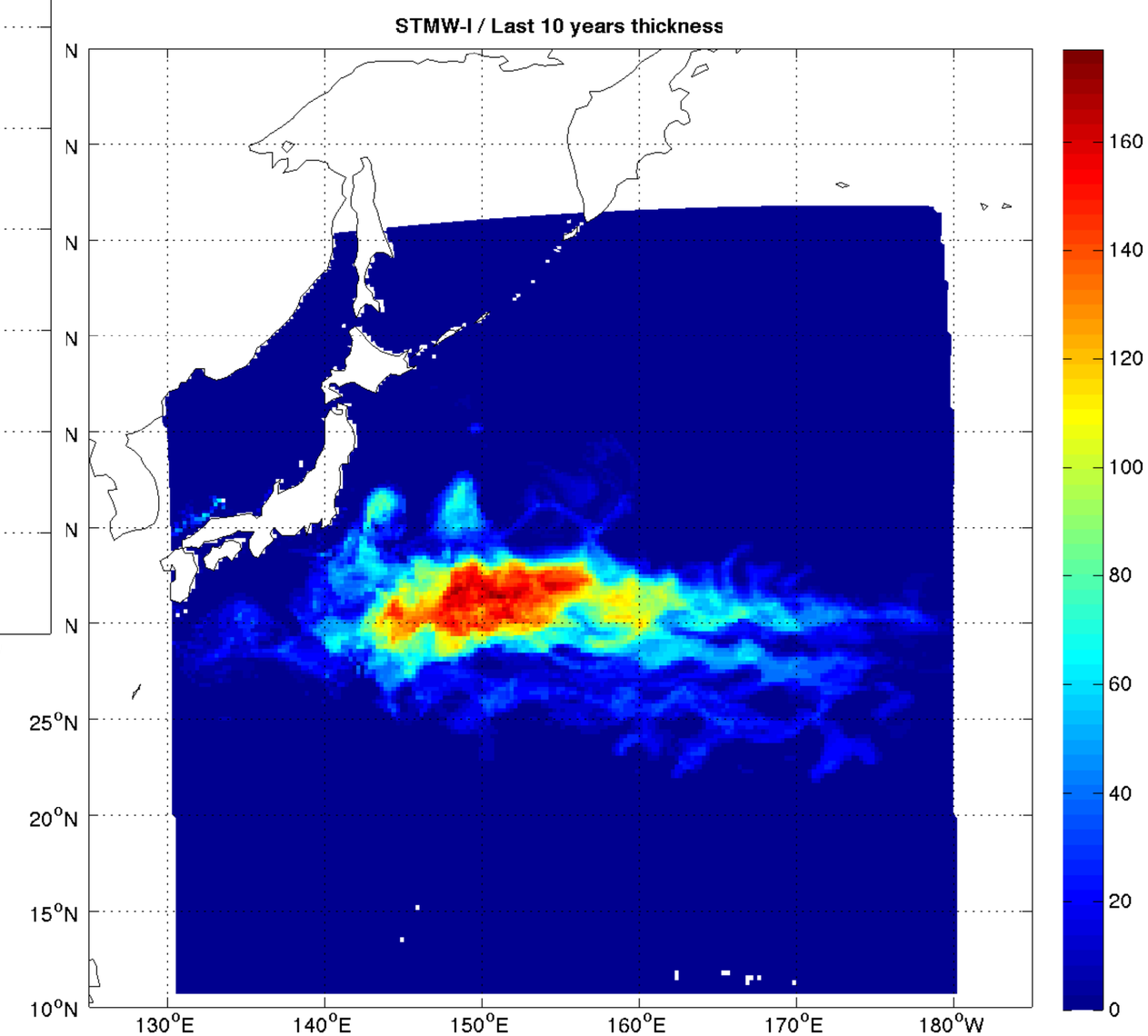

2011–2015

DJF MLD

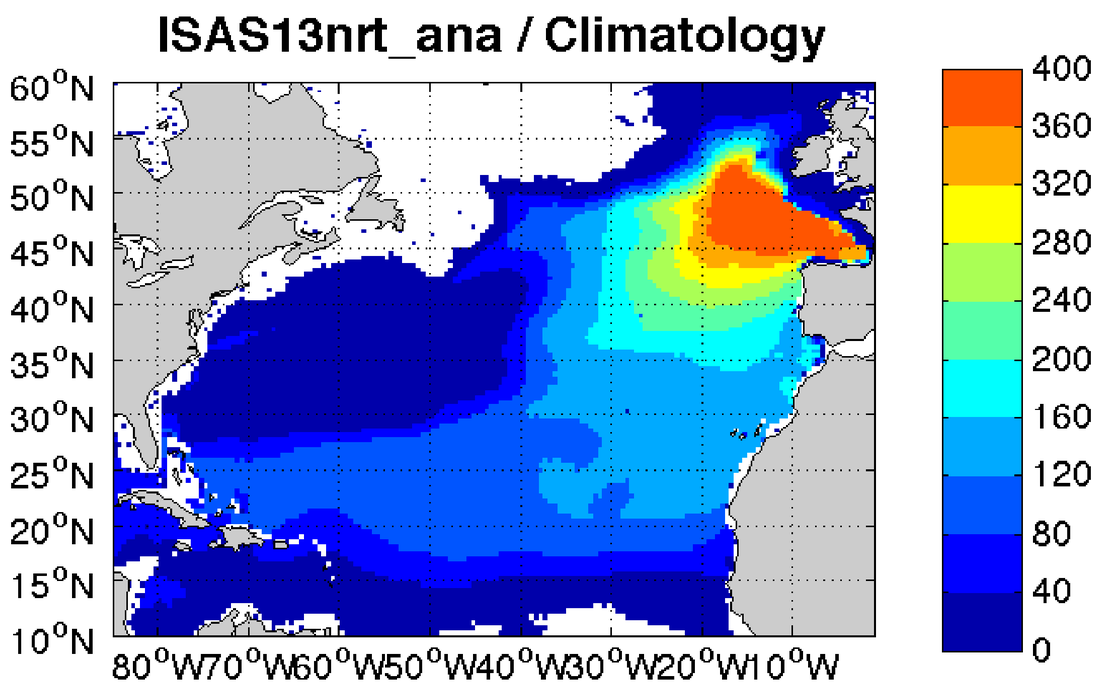
Trend in another WBC ?



STMW in North Pacific: no trend



11-12° Mode Water (East)



STc = 27.1; dST = 0.1;
Tc = 11.5; dT = 1; % Tc +/- dT
PVmax = 1.5e-10;

11-12 MW thickness