

Gravity Current CPT

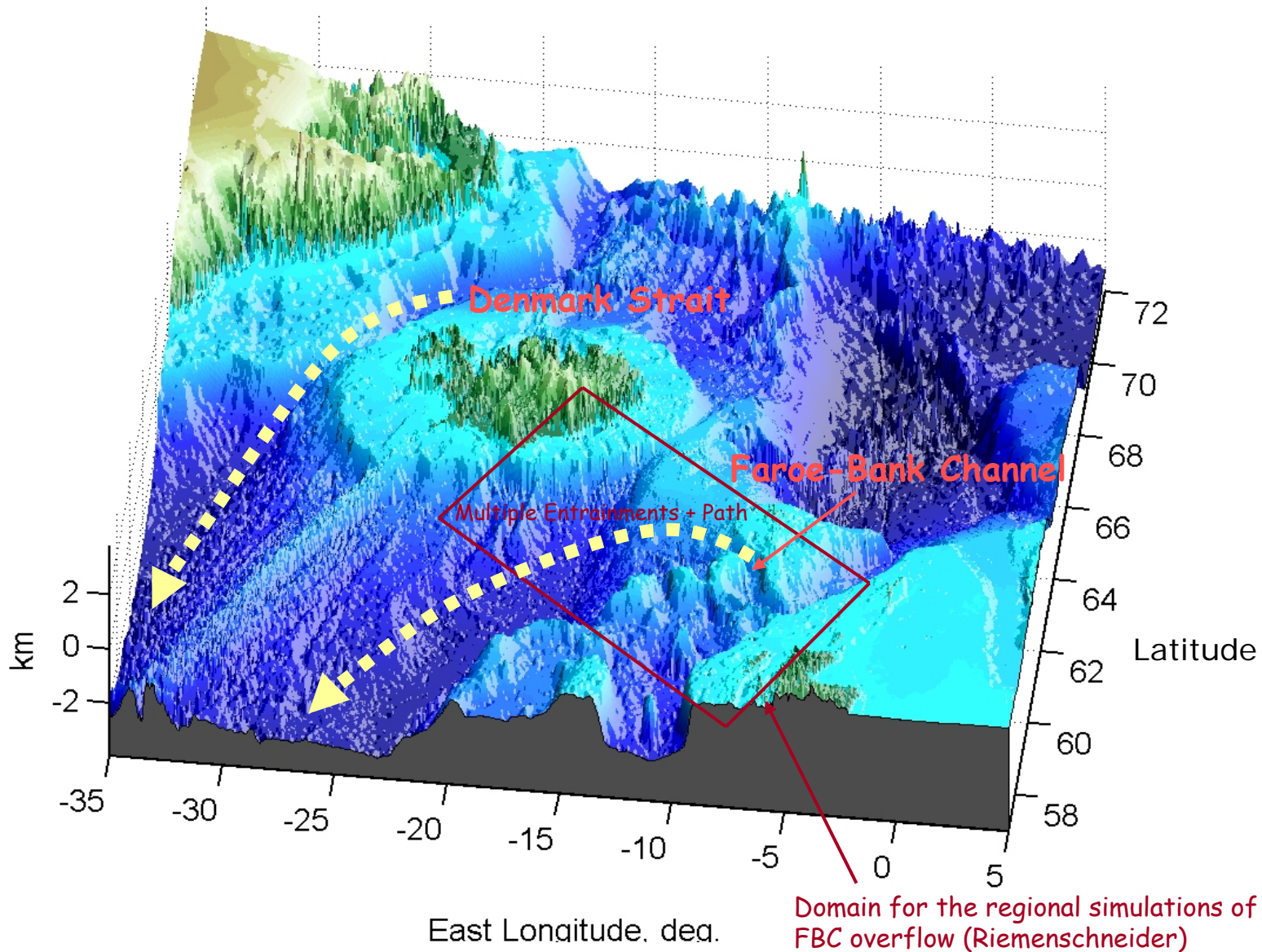
Parameterizing the Faroe Bank Channel (FBC) and Denmark Strait (DS) Overflows

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(NCAR)

WHAT HAVE WE DONE ???

DOES IT WORK ???

DOES IT MATTER ???



from J.Price

ATLANTIC

NORDIC SEAS

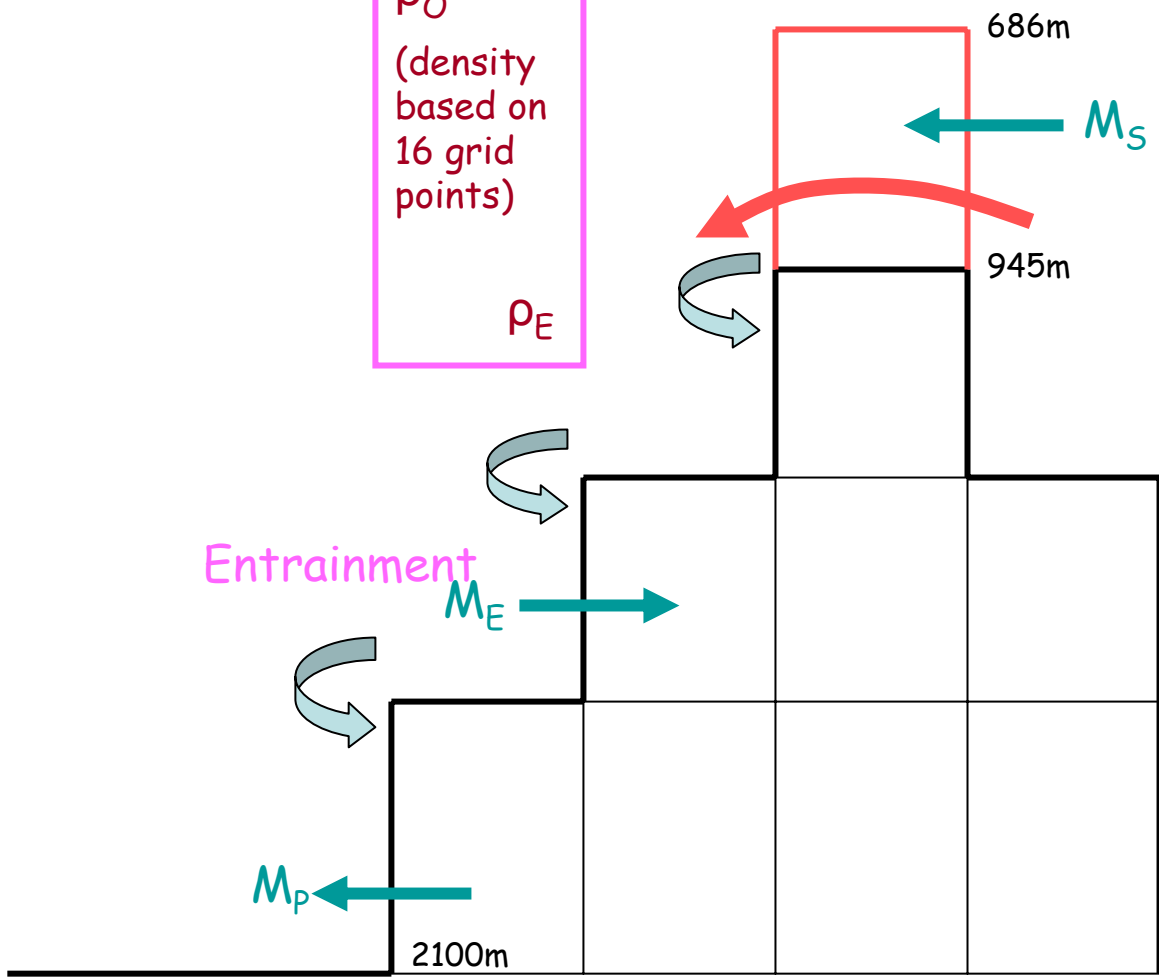
Surface

-z

ρ_0
(density based on 16 grid points)
 ρ_E

ρ_S
(Source density based on 16 grid points)

$$g' = g (\rho_S - \rho_0) / \rho_{ref}$$
$$g'_E = g (\rho_S - \rho_E) / \rho_{ref}$$



$$M_S = g' (h_S)^2 / 2f$$
$$M_P = M_S + M_E$$

+
Heat and salt conservation

Global x3ocn (25 levels) Experiments

- CON : 200 year, “resolved” overflows
- FBC : 200 year, parameterized FBC
- DS : 200 year, parameterized DS

RESULTS : (Years 181 - 200)
FBC - CON
DS - CON
CON - OBS (biases)

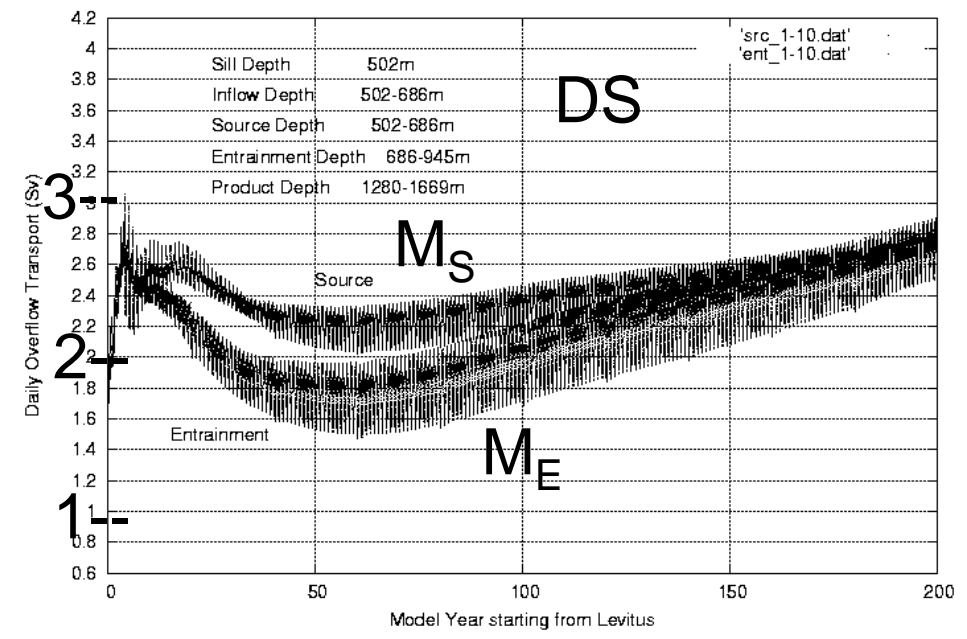
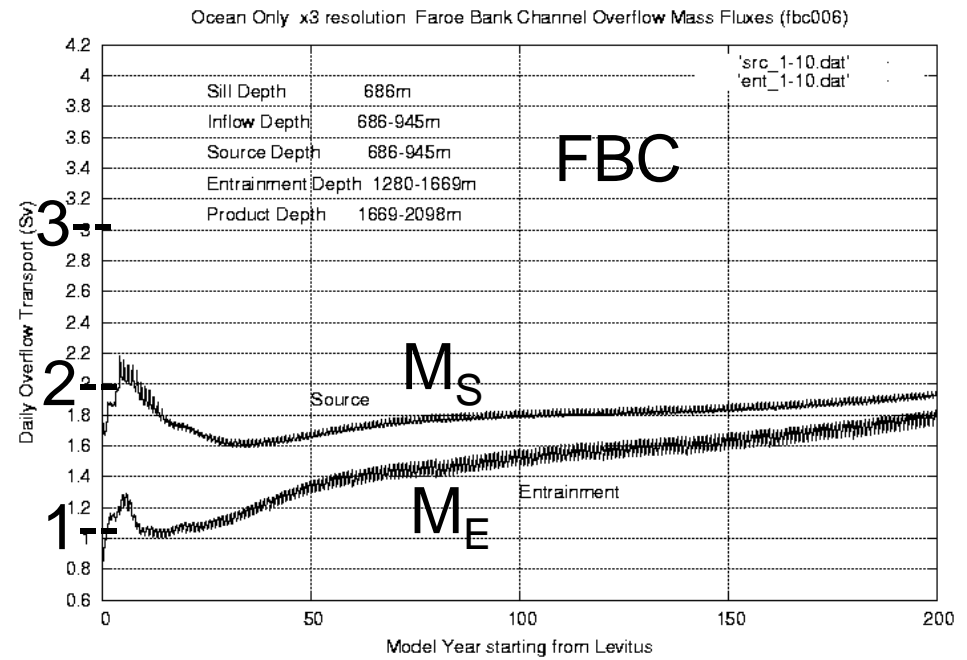
FBC and DS results are very similar; little cancellation.
Hypothesis : Combined Nordic Sea (NS - CON) much less than sum of (DS - CON) + (FBC - CON)

M_S , M_E (Sv)

200 year Spin Up

Acceptable drifts

Final assessment
when run together

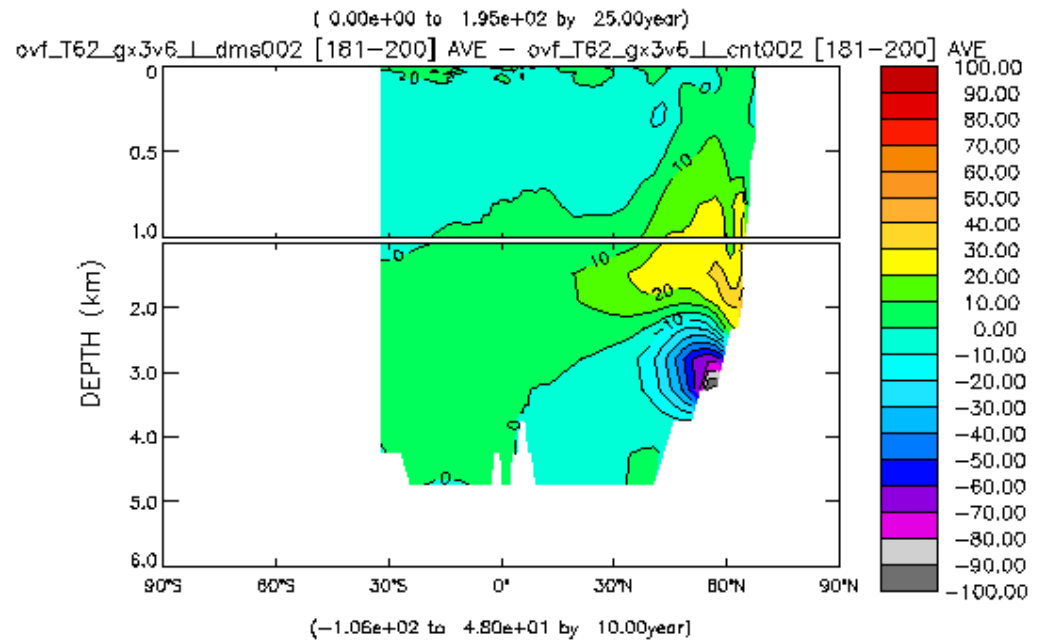
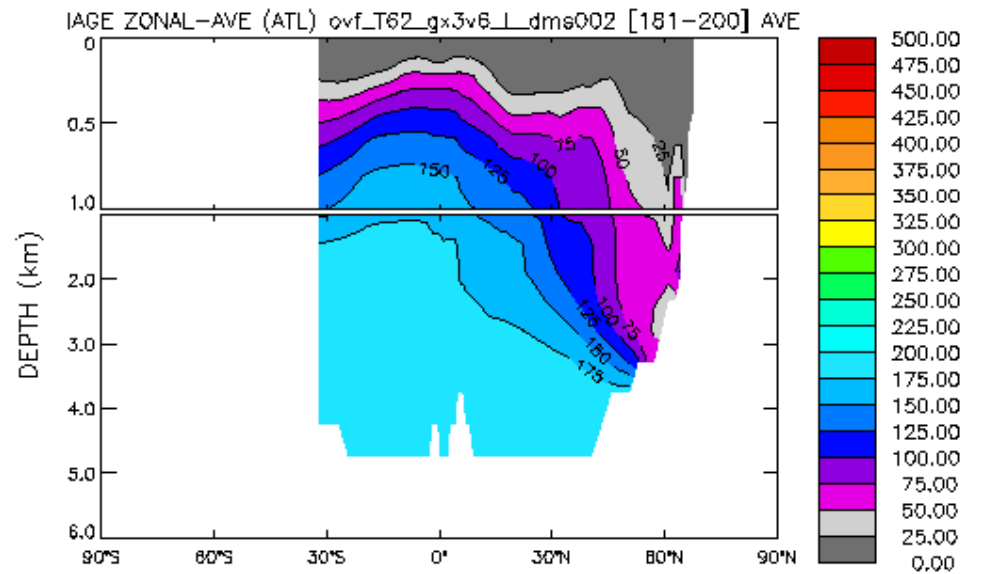


Working ? Ideal Age (181-200)

DS

Young DS water
goes deeper to 4000m

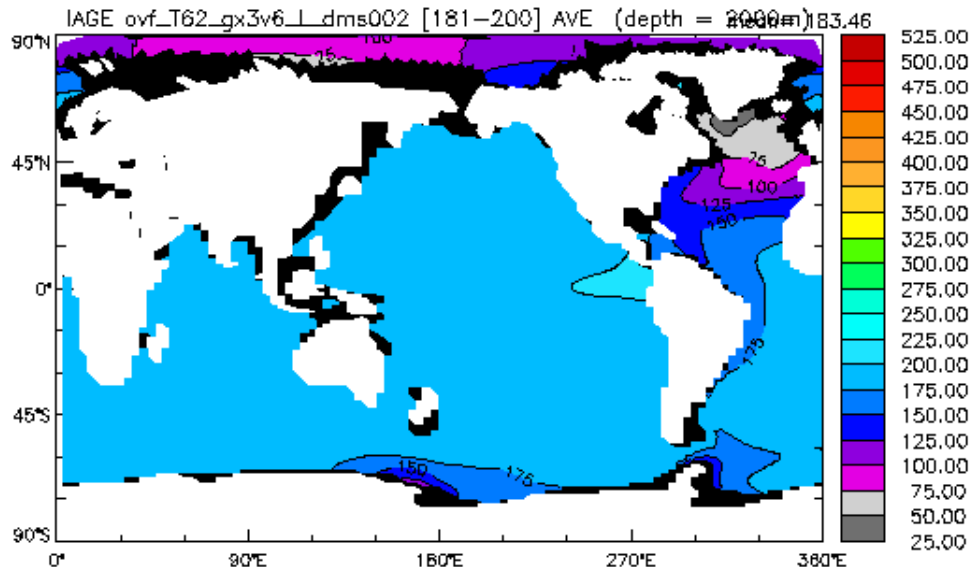
DS - CON



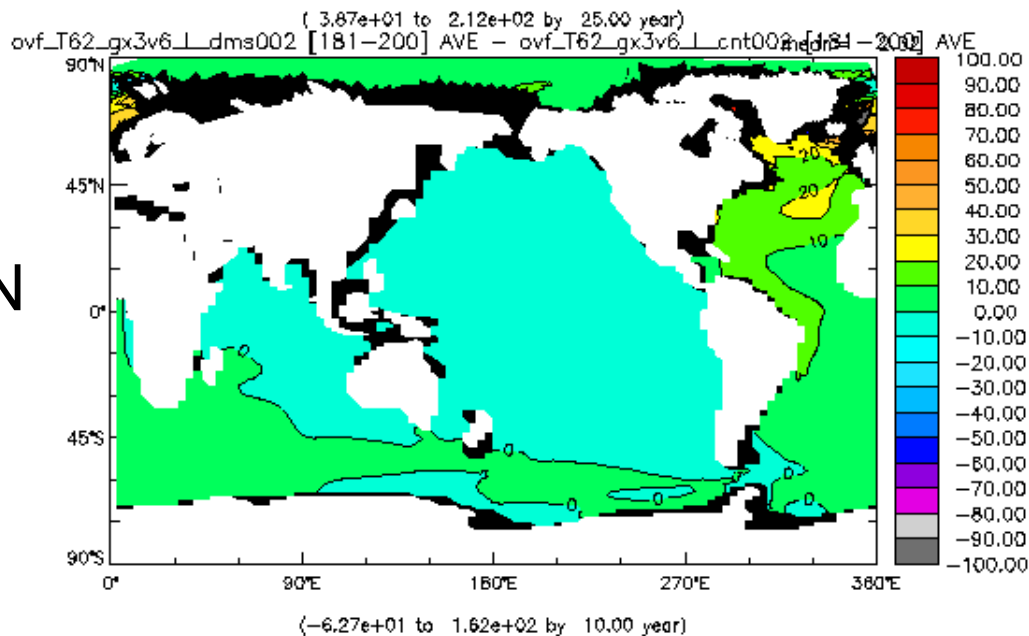
Ideal Age at 2000m

DS

North Atlantic is older at 2000m



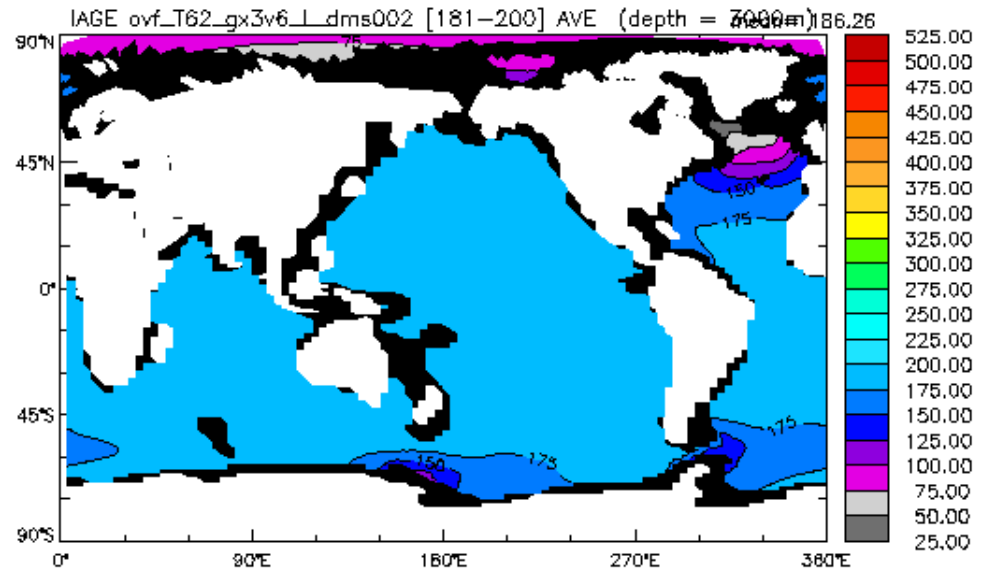
DS-CON



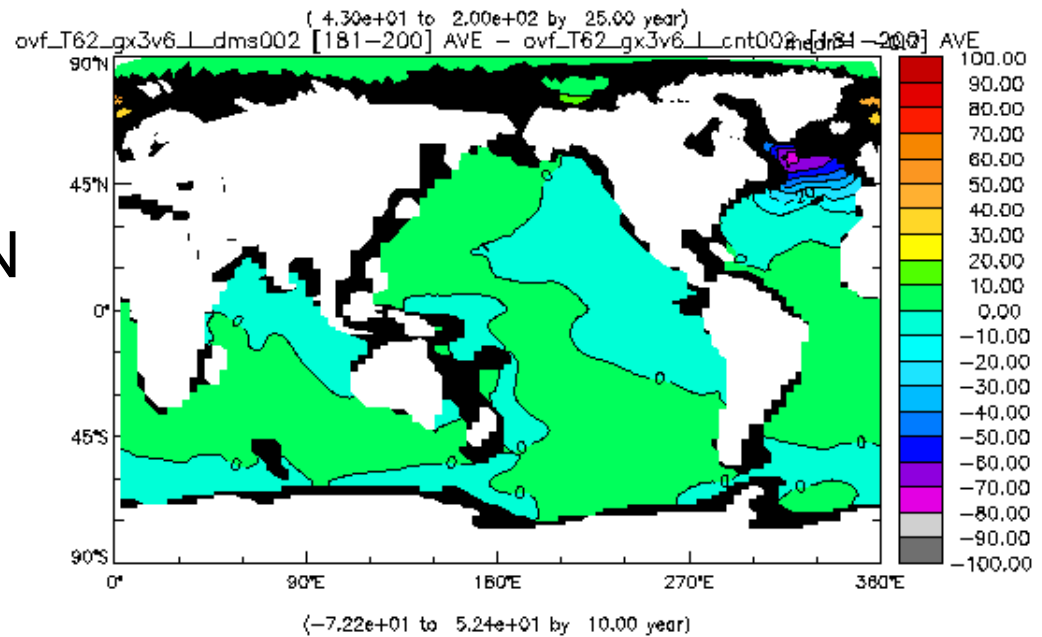
Ideal Age at 3000m

North Atlantic is younger at 3000m

DS

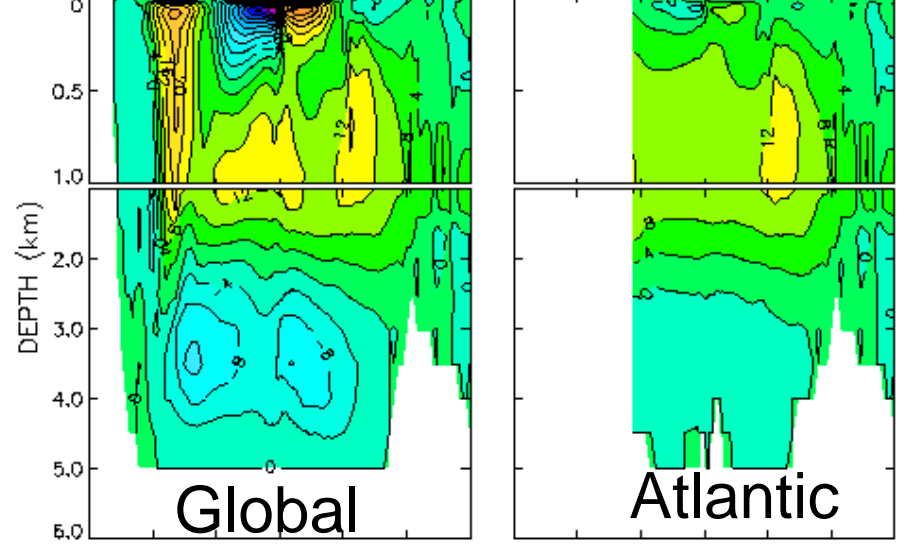


DS-CON



MOC

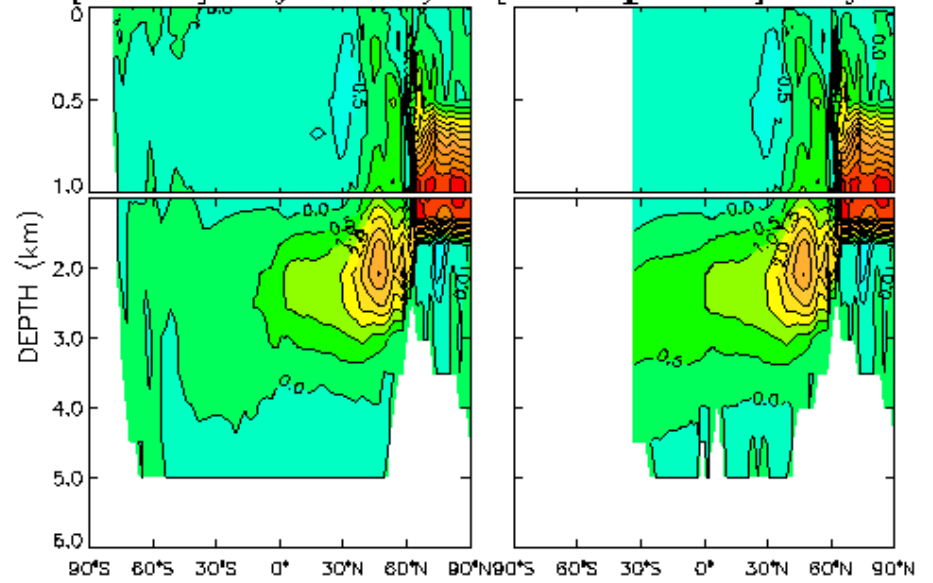
TOTAL MOC (GLO) ovf_T62_gx3v6_L101ms002 [181-200] T62_gx3v6_L101ms002 [181-200]



DS

Both deep downstream and shallow upstream responses

v6_L_dms002 [181-200] T62_gx3v6_L101ms002 [181-200] T62_gx3v6_L101ms002 [181-200] T62_gx3v6_L101ms002 [181-200]



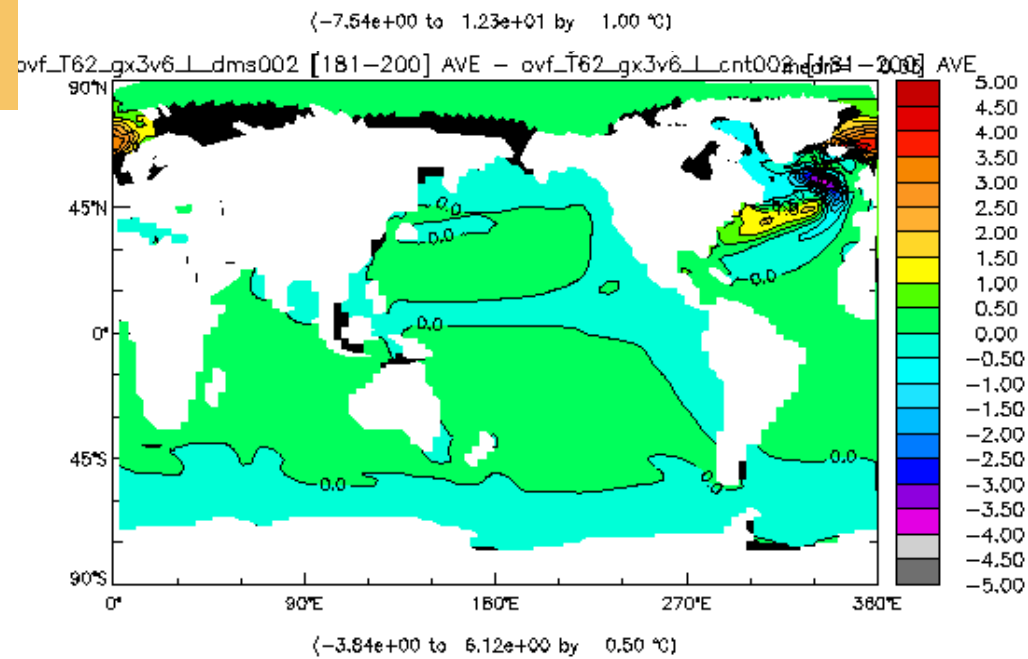
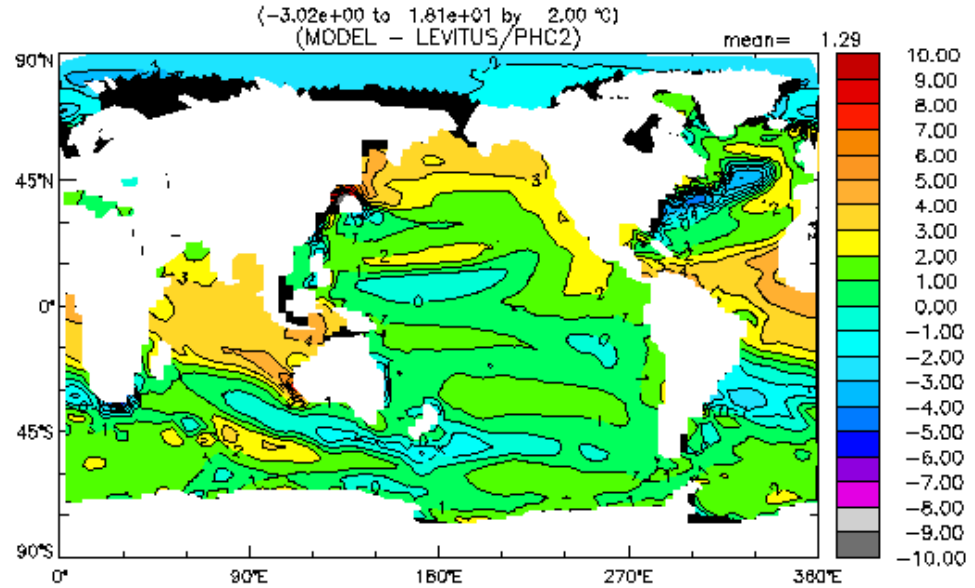
DS-CON

Temperature at 500m

CON-OBS

DS alone removes most
North Atlantic bias between
30 and 75° N .

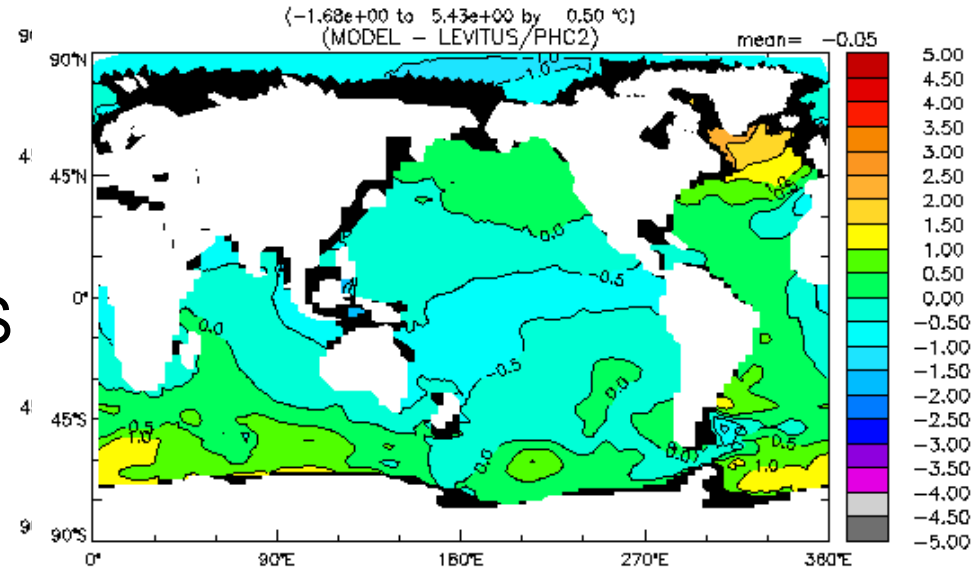
DS-CON



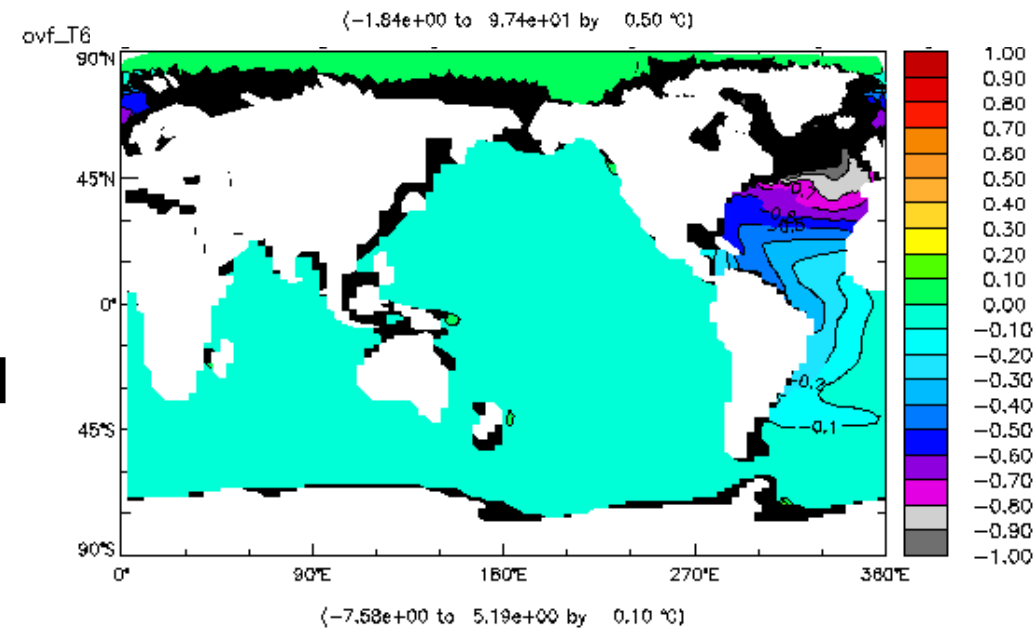
Temperature at 2000m

DS alone removes much of the North Atlantic bias from the Labrador Sea to the South Atlantic

CON-OBS



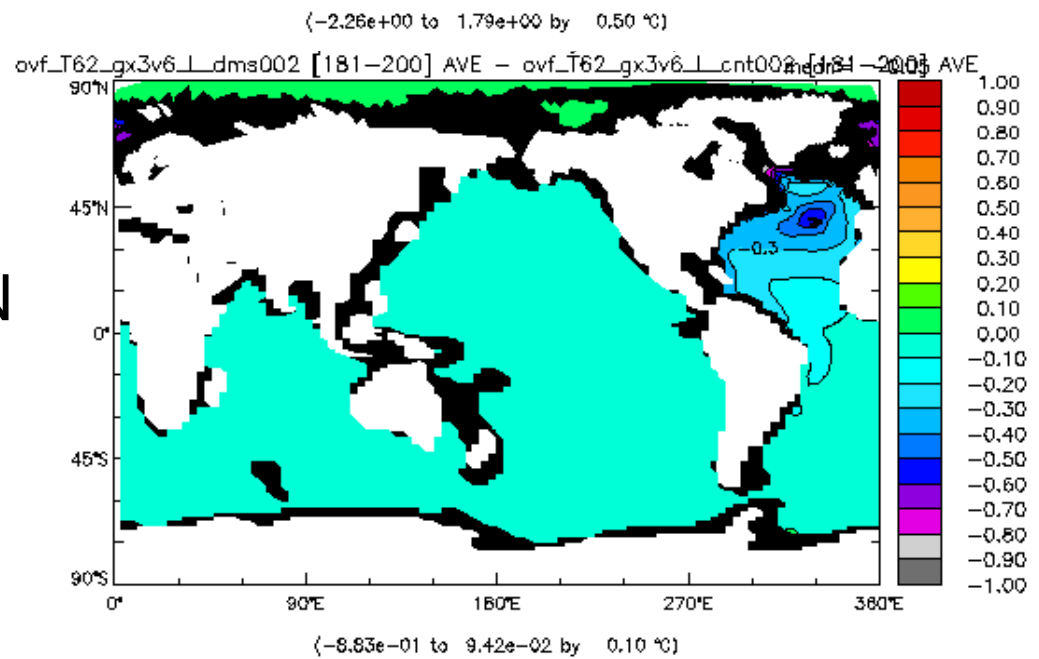
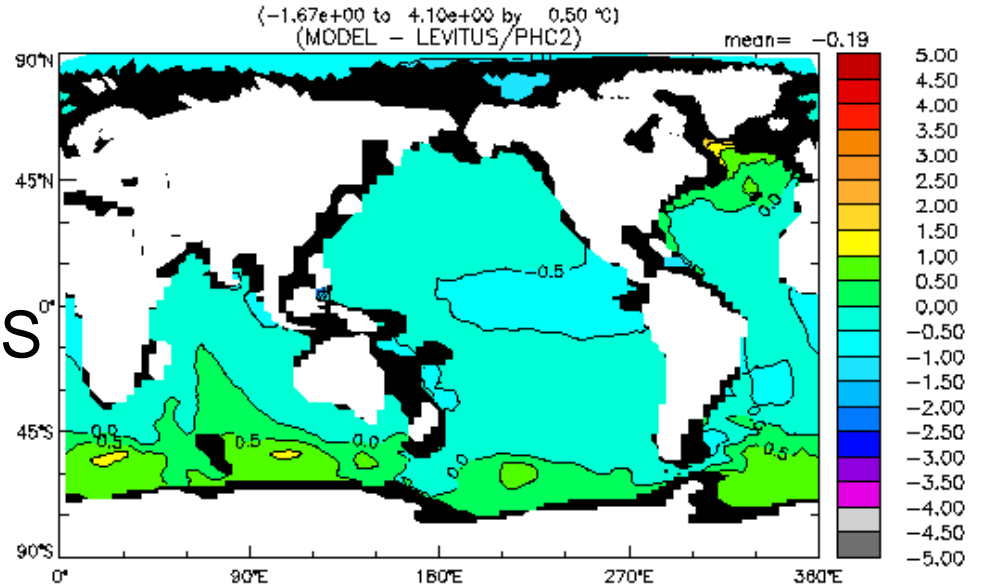
DS-CON



Temperature at 3000m

CON-OBS

DS alone reduces
North Atlantic biases



Future (CCSM4?)

- Transfer Overflow Parameterization from POP1.4 to POP2. Generalize for multiple overflows, higher resolution, SE standards
- Coupled climate impact of Nordic Sea Overflow (e.g. CFC uptake)
- Hosing response

THE END

ATLANTIC

ARCTIC

Surface

-z

OGCM

baroclinic & barotropic velocities are modified to account for M_E and topography

686m

M_S

M_E

945m

M_P

2100m

BOTTOM TOPOGRAPHY

Input parameter values are from

- Price & Baringer (1994)
- Price & Yang (1997)
- Price & Baringer (1997)
- CPT Observationalists' Table (2005)

