Global HYCOM Forced by CORE Atmospheric Boundary Conditions

Shan Sun[1] and Rainer Bleck[1,2]

[1]NOAA Earth System Research Laboratory

[2]NASA Goddard Institute for Space Studies

Layered Ocean Model Workshop, Ann Arbor, Michigan

May 23, 2013

GLOBAL HYCOM Ocean Model

- HYbrid Coordinate Ocean Model (HYCOM, Bleck 2002)
- Tri-polar grid: Mercator projection south of 57^{o}N, combined with bipolar patch
- Horizontal resolution: 1^{o}x1^{o} cos(latitude), 30km at North Pole
- Arakawa C grid
- 26 hybrid layers in the vertical
- KPP mixed layer scheme
- Enloan primitive ice model
- Initialized from Levitus Climatology

version 2 forcing for common ocean-ice reference experiments (core)

Datasets on this page are sponsored by the CLIVAR Working Group for Ocean Model Development (WGOMD) for use in their Common Ocean-ice Reference Experiments (CORE). There are datasets just for the interannually varying forcing (IAF), as developed by Large and Yeager (2008) at NCAR. The datasets are Version 2 of the CORE-IAF. This web page is maintained by GFDL scientists in collaboration with NCAR for use by the international modeling community.

Documentation

Support Code

Support data

Corrected Inter-Annual Forcing Version 2.0 (CIAF)

un-Corrected Inter-Annual Forcing Version 2.0 (unCIAF)

Corrected Normal Year Forcing Version 2.0 (CNYF)

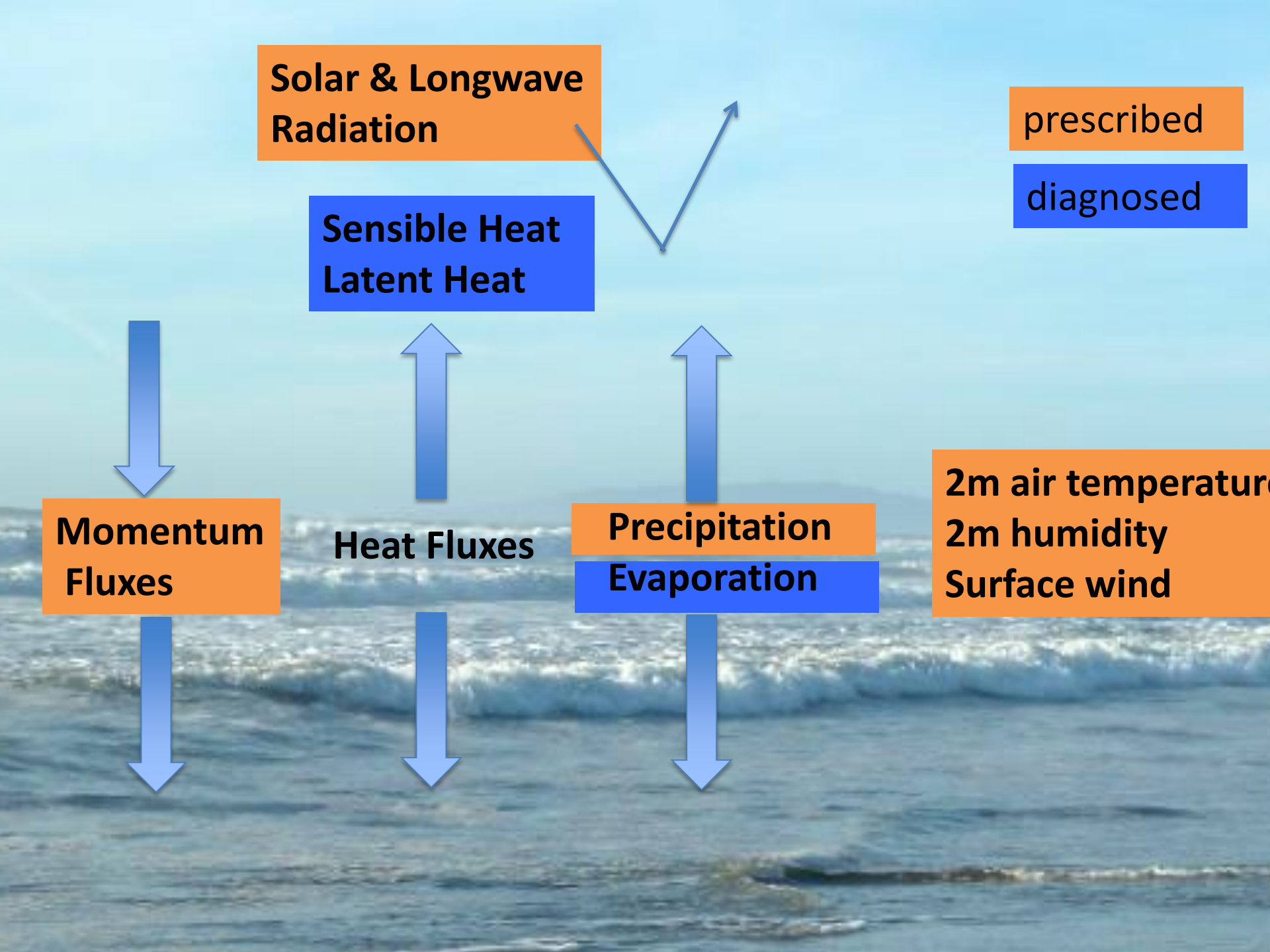
un-Corrected Normal Year Forcing Version 2.0 (unCNYF)

Atmospheric Forcings

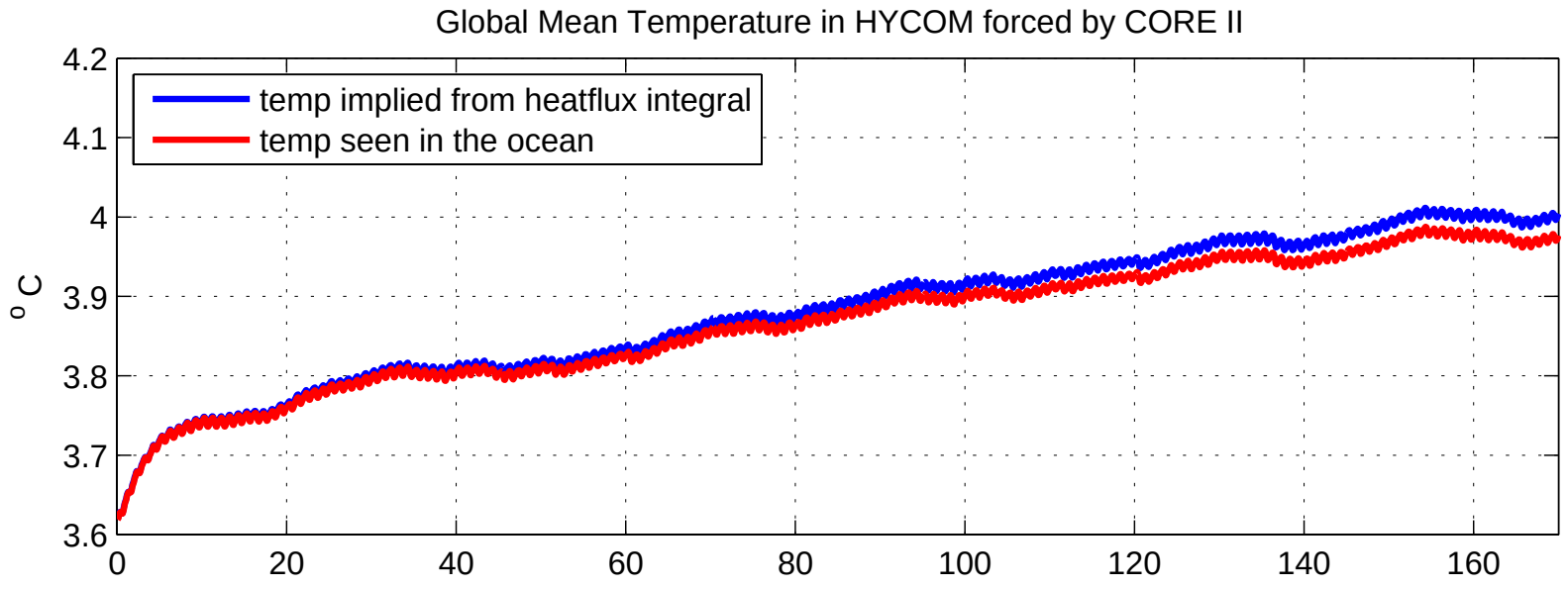
Common Ocean-ice Reference Experiments (CORE) II

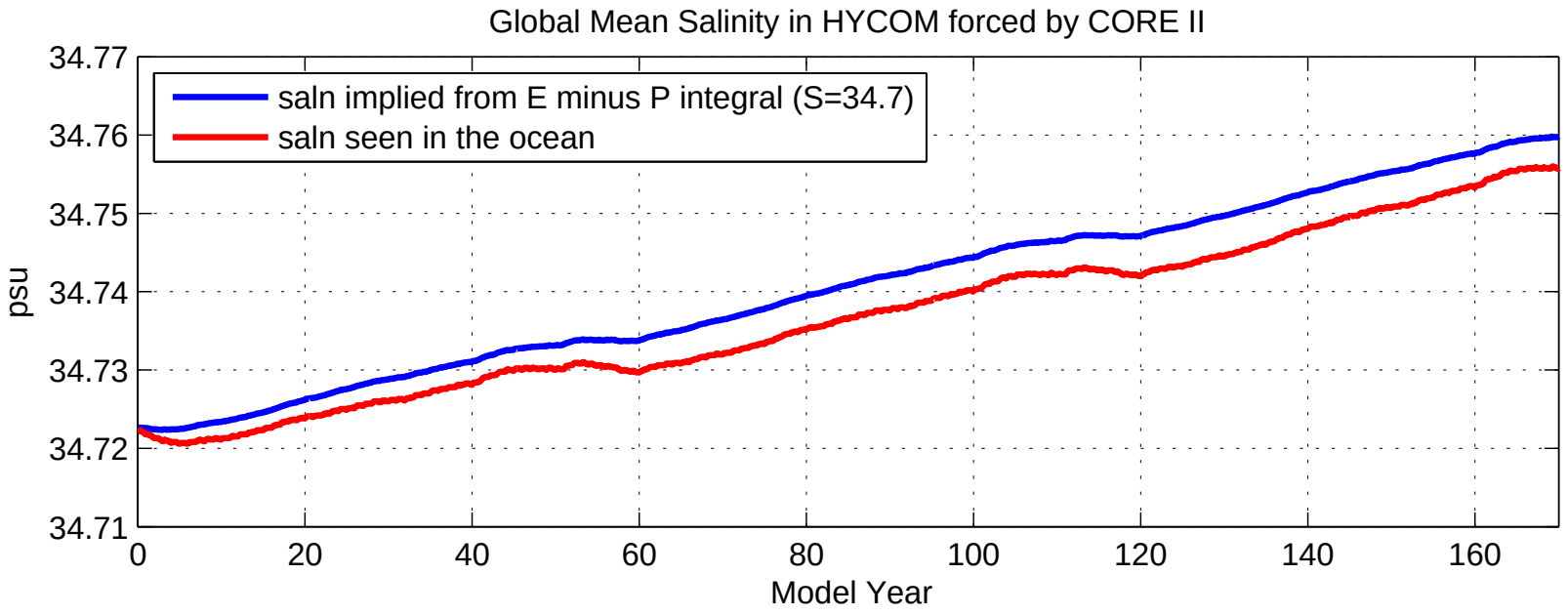
years 1949 – 2008; cycled

- 6-hourly fields: 2m air temperature and humidity, surface U/V wind;
- Daily fields: downward shortwave & longwave;
- Monthly fields: precipitation (& sea surface salinity);
- Annual field: runoff


Solar & Longwave Radiation
prescribed
diagnosed
Sensible Heat
Latent Heat
Momentum Fluxes
Heat Fluxes
Precipitation
Evaporation
2m air temperatur
2m humidity
Surface wind

HYCOM is T/S conserving!

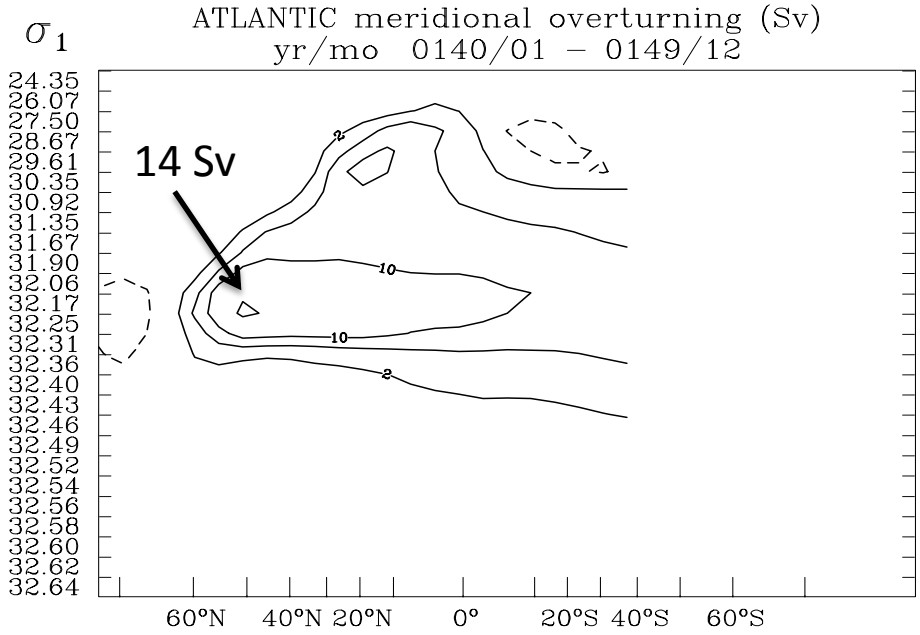


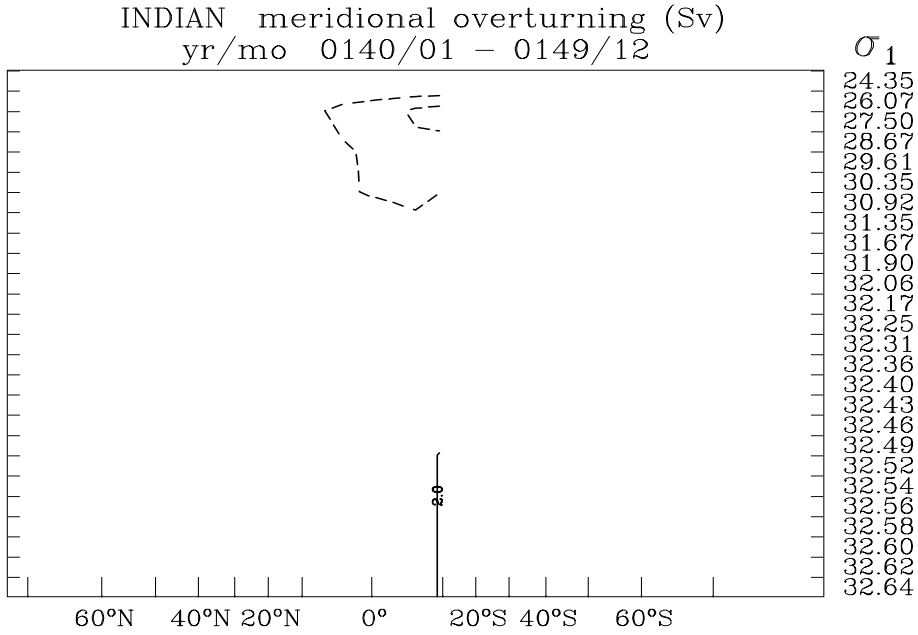


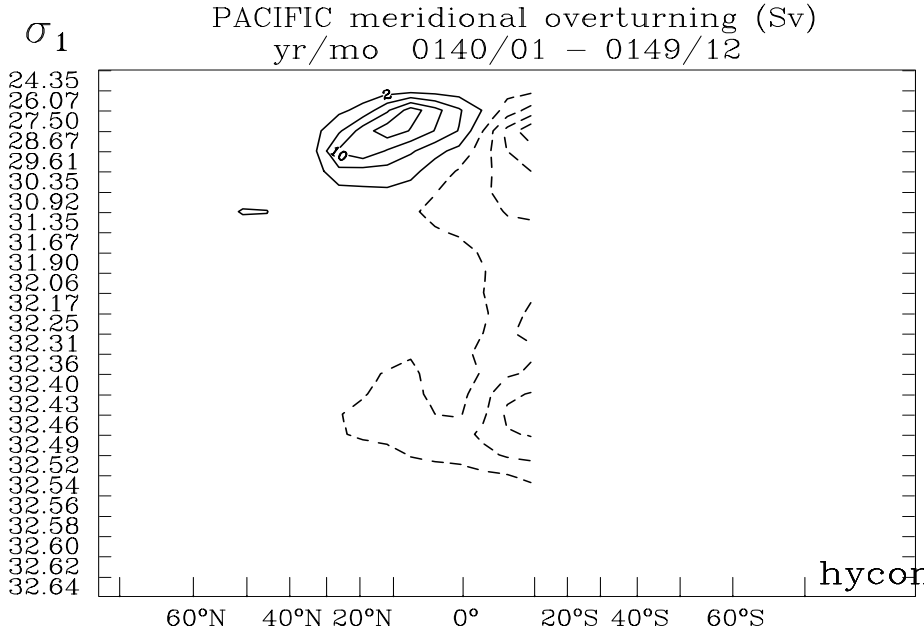
Latest Corrections to T/S budgets

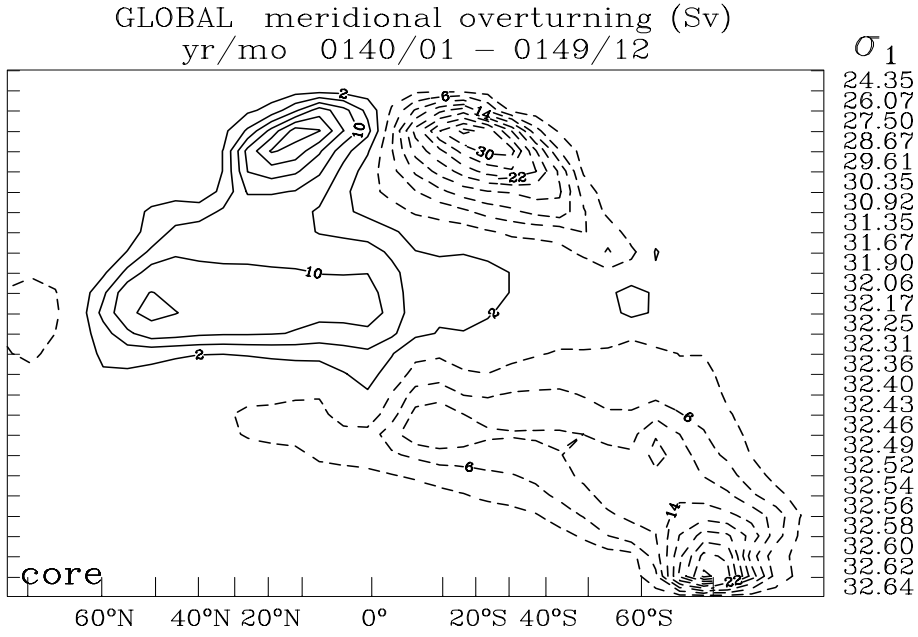
- T/S recovered from advected $T\Delta p/S\Delta p$ is constrained to lie within bounds of “old” T/S field. Implied gains/losses are logged and corrected for globally;
- Time smoothing (Asselin filter) artificially adjusted to be globally conservative;
- Enloan does not distinguish between ice and snow. Thus, precip intercepted by sea ice “automatically” assumes salinity of sea ice => artificial salt source.

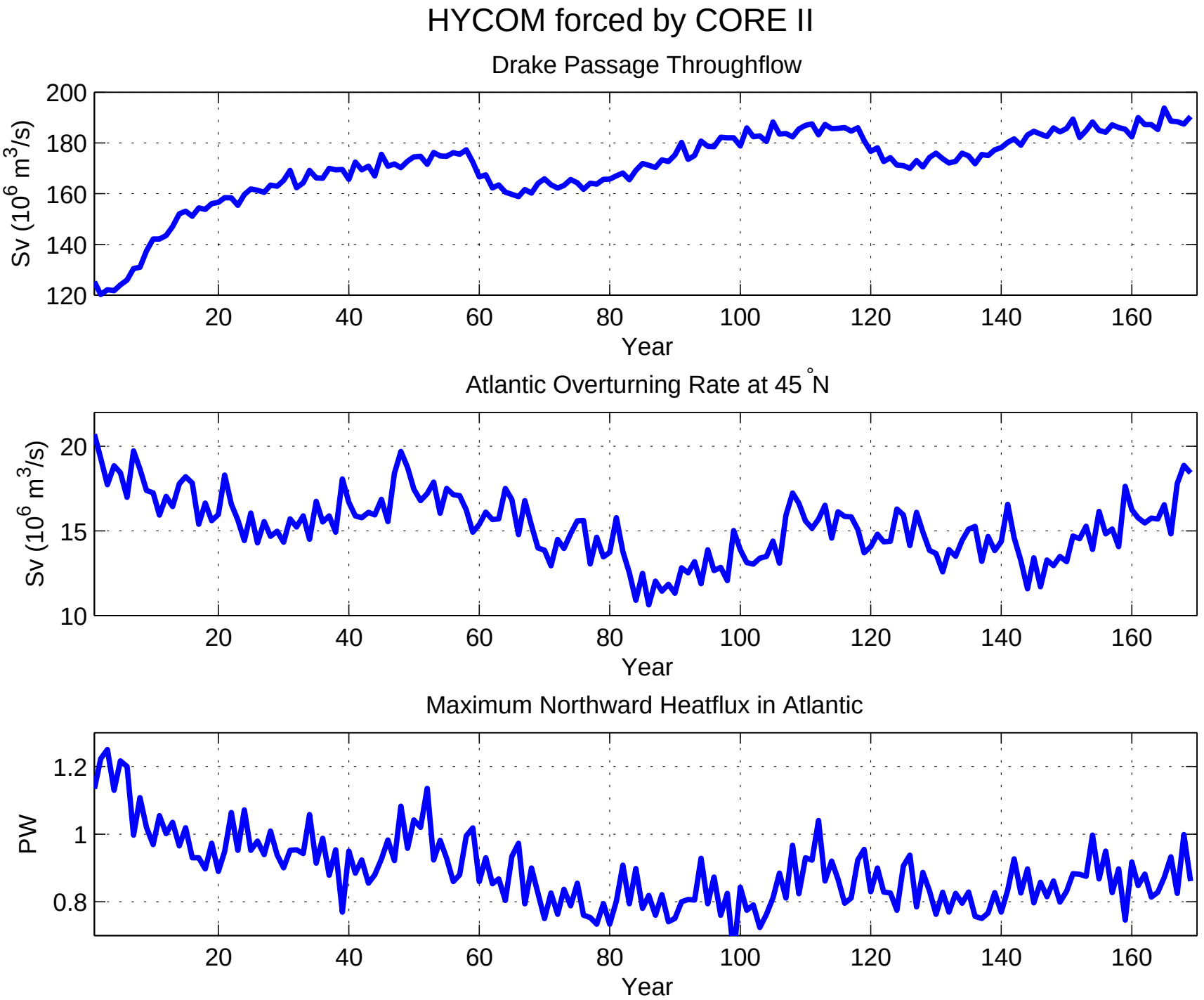
Overturning stream function year 140-149





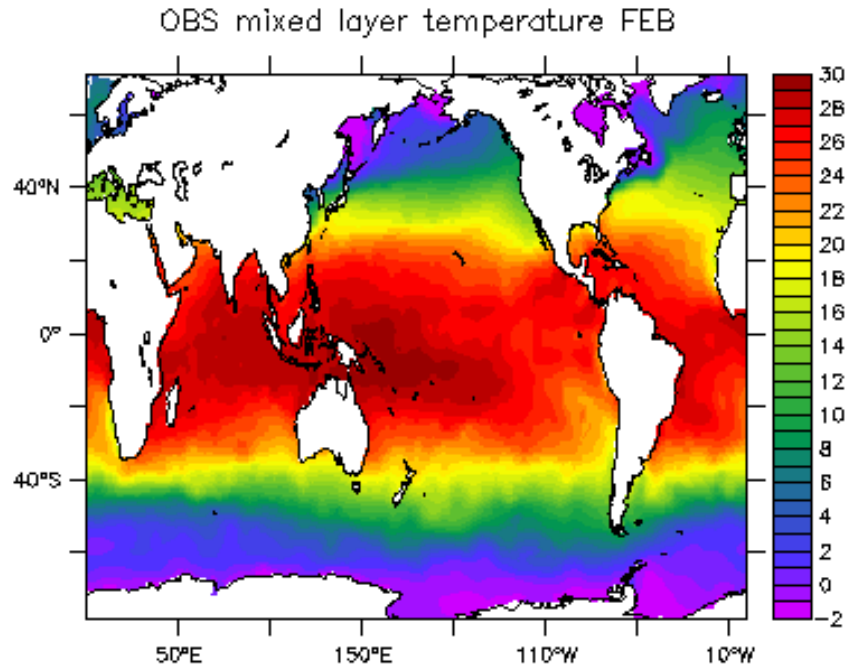


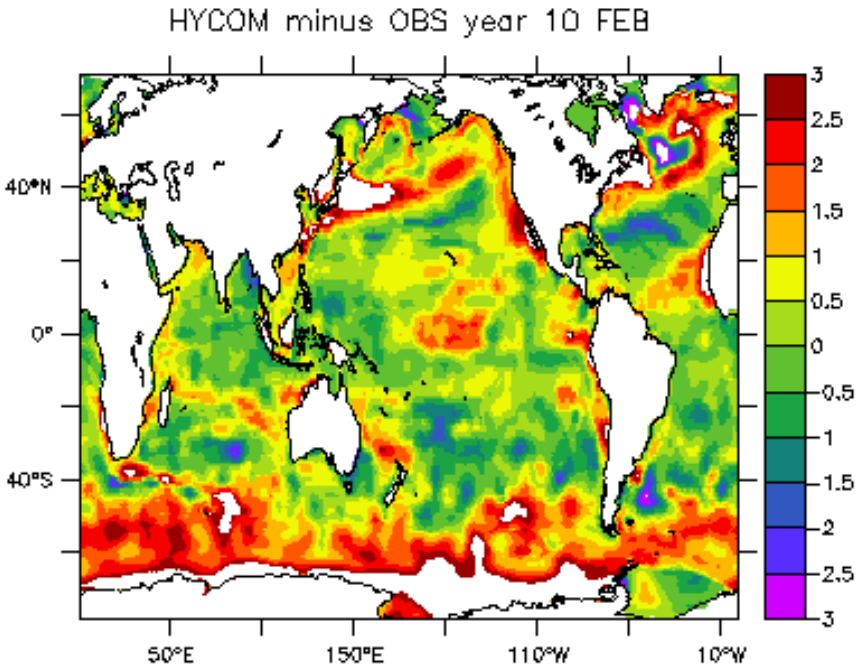



HYCOM forced by CORE II
Drake Passage Throughflow
Sv (10^6 m^3/s)
200
180
160
140
120
20
40
60
80
100
120
140
160
Year
Atlantic Overturning Rate at 45 °N
Sv (10^6 m^3/s)
20
15
10
20
40
60
80
100
120
140
160
Year
Maximum Northward Heatflux in Atlantic
PW
1.2
1
0.8
20
40
60
80
100
120
140
160
Year

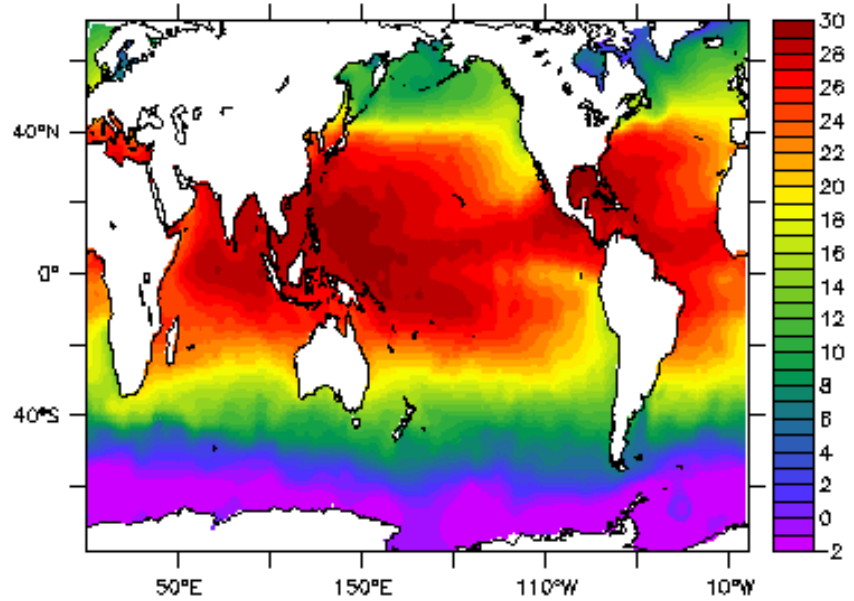
OBS

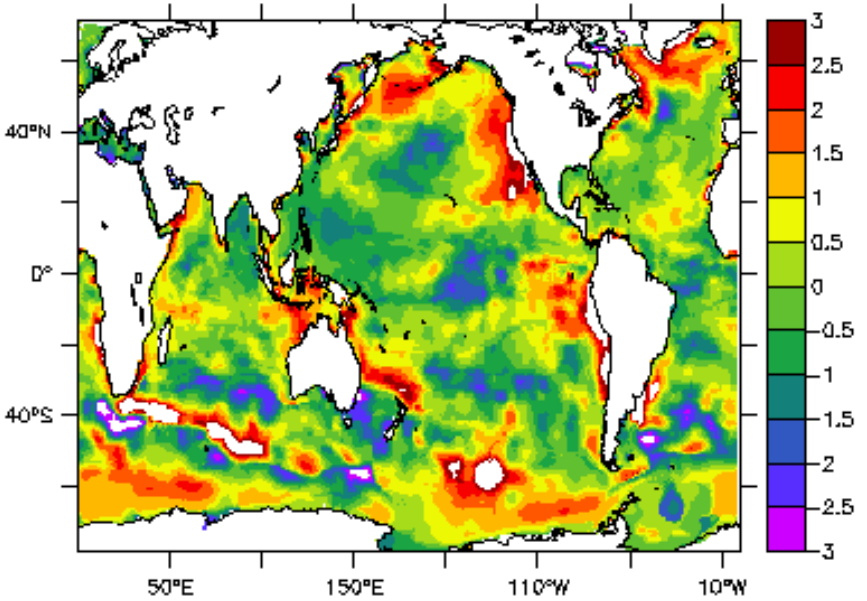
HYCOM minus OBS





FEB

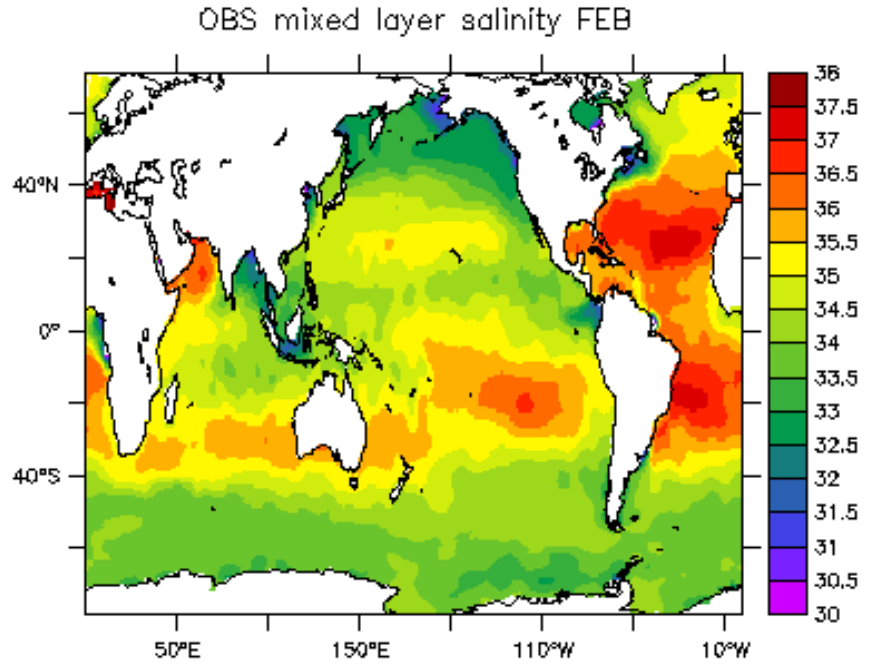


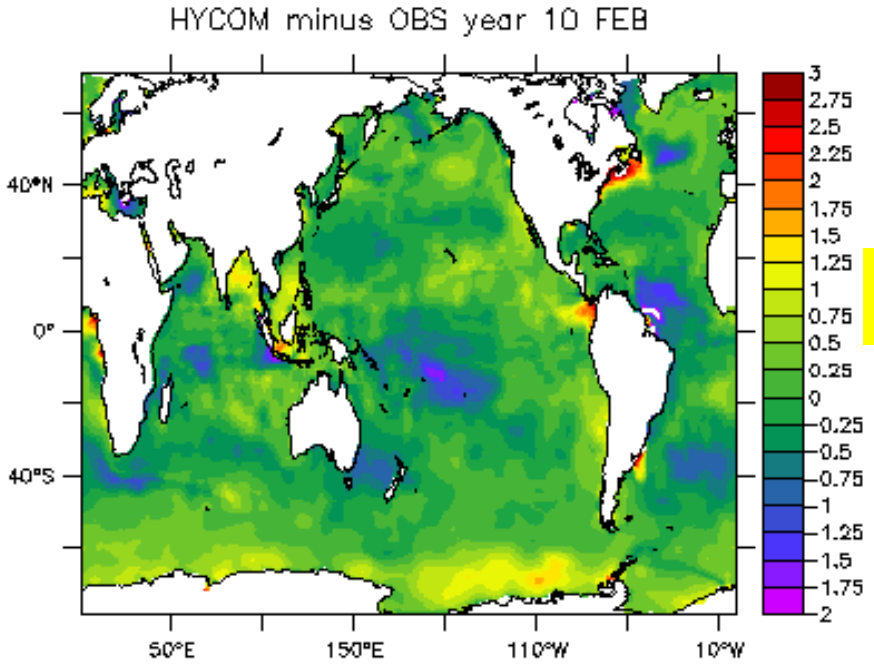


AUG

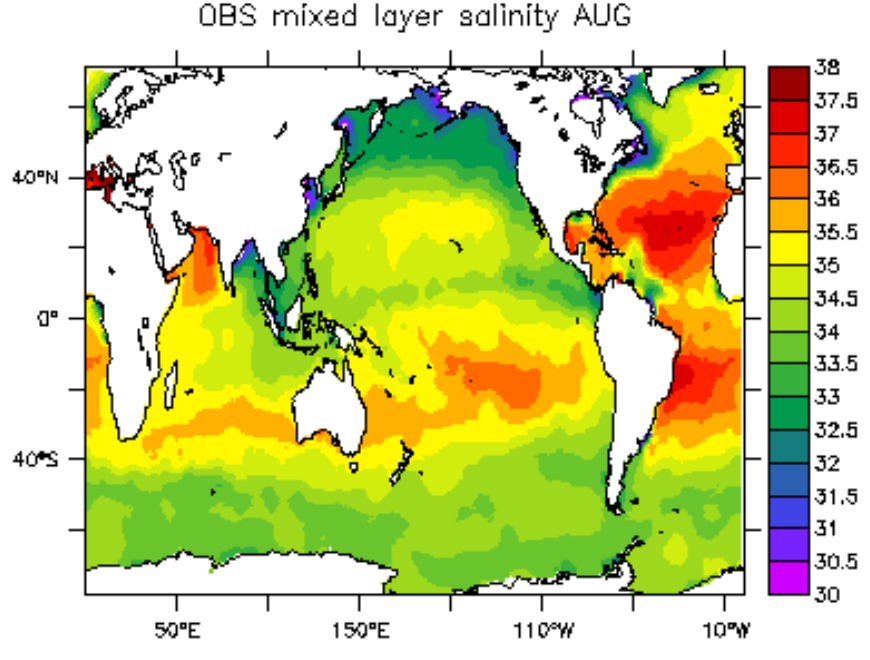
OBS

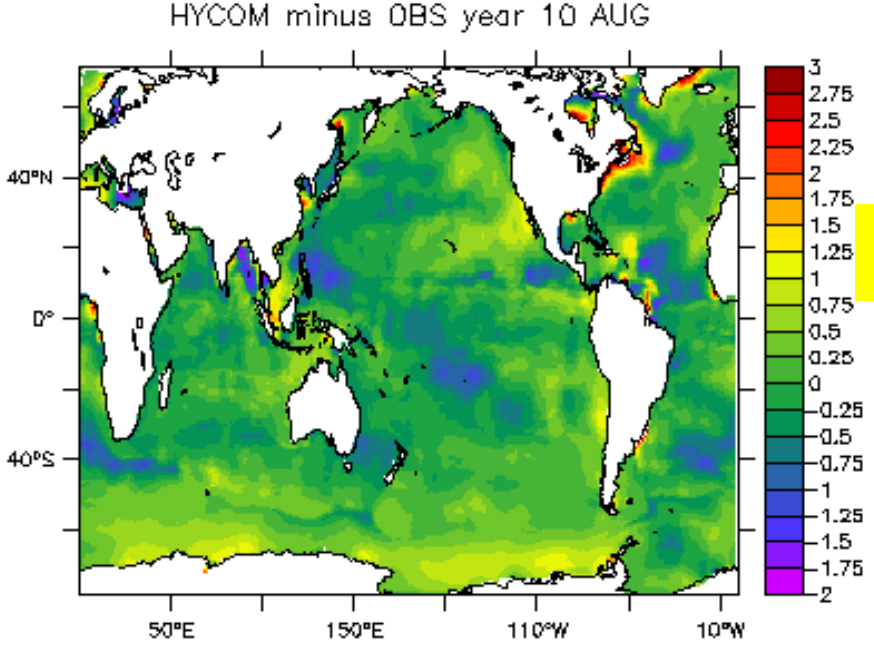
HYCOM minus OBS





FEB





AUG

Summary

- HYCOM is T/S conserving;
- AMOC is steady in HYCOM forced by CORE II;
- Large regional temperature and salinity biases (blame forcing fields?)
- Suggestion to HYCOM group: a temperature/salinity conservation plot should always be included in future publications