

gcmfaces analysis of ECCO V4, Release 4 (1992-2017)

September 5, 2019

Table of contents

README

fit to data

- fit to in situ data
- fit to altimeter data (RADS)
- fit to grace r4 data

volume, heat and salt transports

- barotropic streamfunction
- meridional streamfunction
- meridional streamfunction (time series)
- meridional heat transport
- meridional freshwater transport
- meridional salt transport
- meridional transports (time series)
- transects transport

mean and variance maps

- sea surface height
- 3D state variables
- air-sea heat flux
- air-sea freshwater flux
- surface wind stress

global, zonal, regional averages

- zonal mean tendencies
- equatorial sections
- global mean properties
- zonal mean properties
- zonal mean properties (surface)
- seaice time series

budgets : volume, heat and salt (top to bottom)

mixed layer depth fields

seaice and snow fields

- Monthly Thickness Distribution
- Sea Ice Concentration (unitless): March

Snow Thickness (m): September

Sea Ice+Snow Streamfunction (megaton/s): September

Sea Ice+Snow Convergence (kiloton/s): September

Sea Ice Concentration (unitless): March

Sea Ice Thickness (m): March

Snow Thickness (m): March

Sea Ice+Snow Streamfunction (megaton/s): March

Sea Ice+Snow Convergence (kiloton/s): March

Sea Ice Concentration (unitless): September

Sea Ice Thickness (m): September

Snow Thickness (m): September

Sea Ice+Snow Streamfunction (megaton/s): September

Sea Ice+Snow Convergence (kiloton/s): September

atmospheric controls: uncertainty and statistics

control prior uncertainty

rms of control adjustment

std of control adjustment

mean of control adjustment

control prior uncertainty

rms of control adjustment

std of control adjustment

mean of control adjustment

control prior uncertainty

rms of control adjustment

std of control adjustment

mean of control adjustment

control prior uncertainty

rms of control adjustment

std of control adjustment

mean of control adjustment

control prior uncertainty

rms of control adjustment

This document contains a set of analysis plots for ECCO V4r4, covering the time period 1992-2017. In the cost-related plots, the area-scaling factor (γ) and the other spatial scaling factor have been removed in computing the costs. The plots are generated using the Matlab analysis toolbox `gcmfaces` (http://wwwcvms.mitgcm.org/viewvc/MITgcm/MITgcm_contrib/gael/matlab_class/gcmfaces.pdf?view=co). Although not exhaustive, this document provides a convenient visual description of the run for users.

fit to in situ data

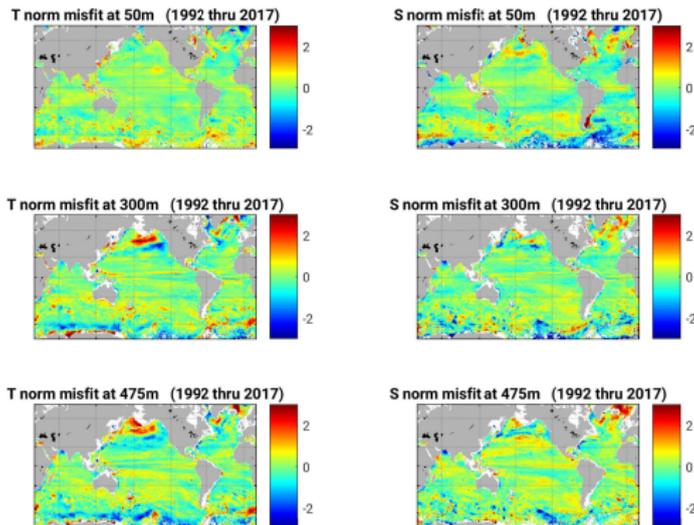


Figure : Time mean normalized misfit $(model - data)/sigma$ for in situ profiles, at depths (rows), for T (left) and S (right).

fit to in situ data

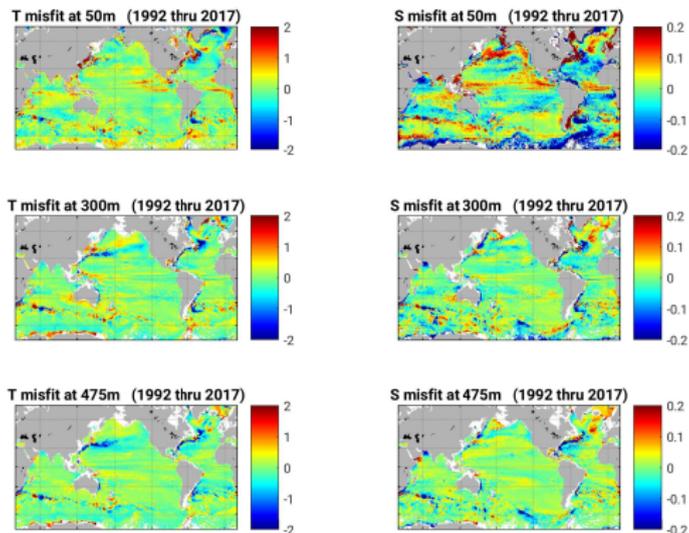


Figure : Time mean misfit ($model - data$) for in situ profiles, at depths (rows), for T (left; K) and S (right; in psu).

fit to in situ data

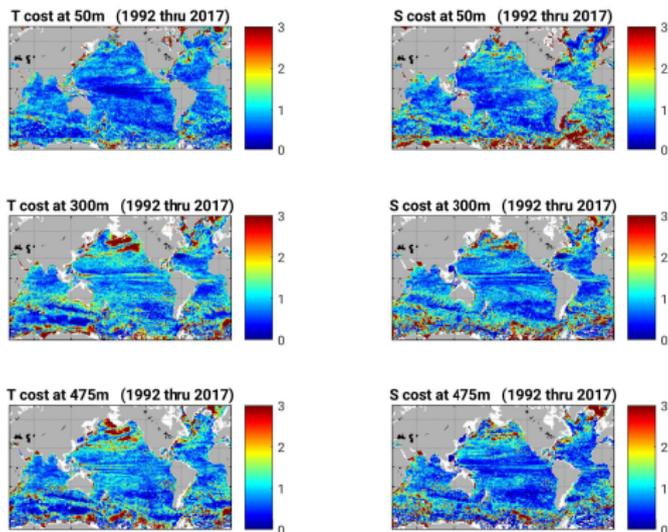
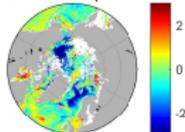


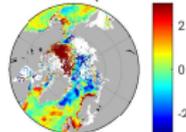
Figure : Time mean cost $(model - data)^2 / \sigma^2$ for in situ profiles, at depths (rows), for T (left) and S (right).

fit to in situ data

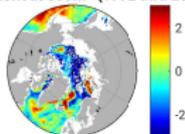
T norm misfit at 50m (1992 thru 2017)



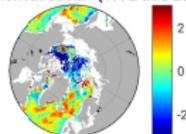
S norm misfit at 50m (1992 thru 2017)



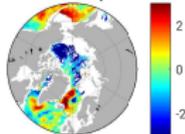
T norm misfit at 300m (1992 thru 2017)



S norm misfit at 300m (1992 thru 2017)



T norm misfit at 475m (1992 thru 2017)



S norm misfit at 475m (1992 thru 2017)

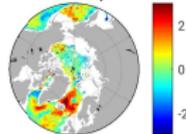


Figure : Time mean normalized misfit $(model - data)/sigma$ for in situ profiles, at depths (rows), for T (left) and S (right).

fit to in situ data

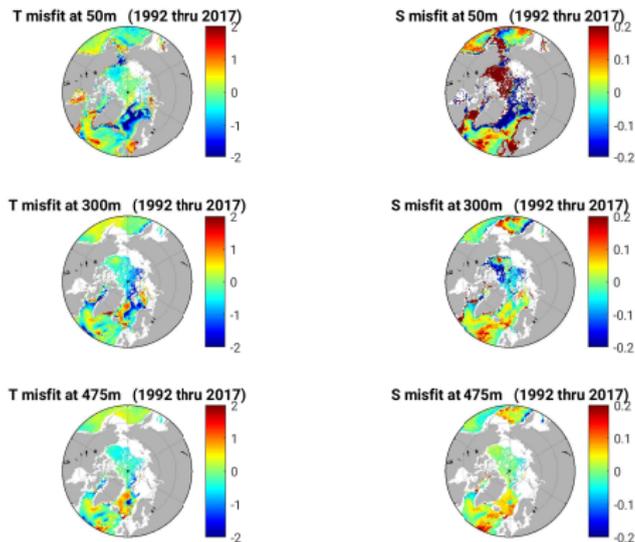


Figure : Time mean misfit ($model - data$) for in situ profiles, at depths (rows), for T (left; K) and S (right; in psu).

fit to in situ data

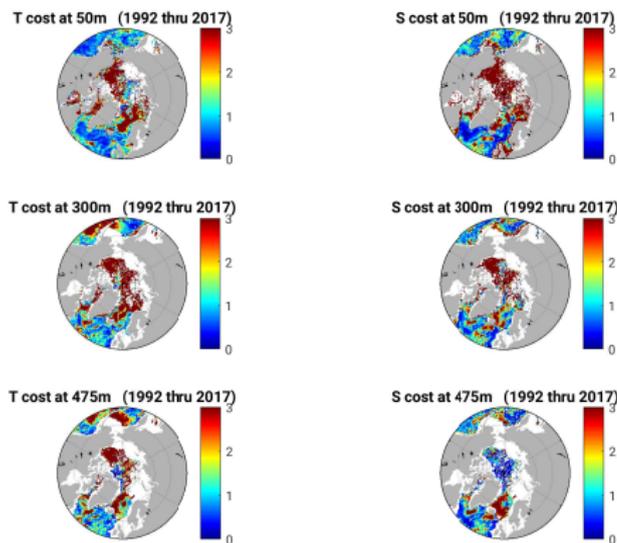


Figure : Time mean cost $(model - data)^2 / \sigma^2$ for in situ profiles, at depths (rows), for T (left) and S (right).

fit to in situ data

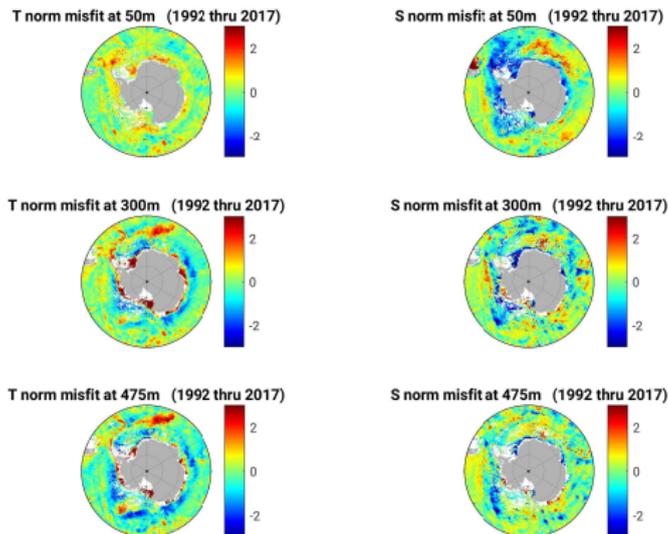


Figure : Time mean normalized misfit $(model - data)/sigma$ for in situ profiles, at depths (rows), for T (left) and S (right).

fit to in situ data

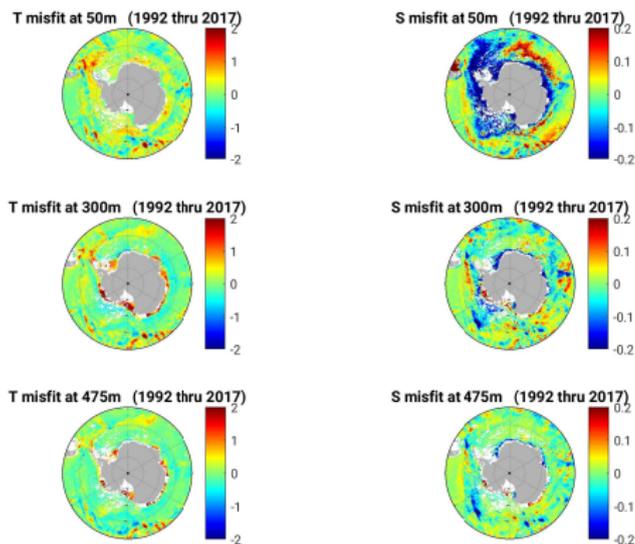


Figure : Time mean misfit ($model - data$) for in situ profiles, at depths (rows), for T (left; K) and S (right; in psu).

fit to in situ data

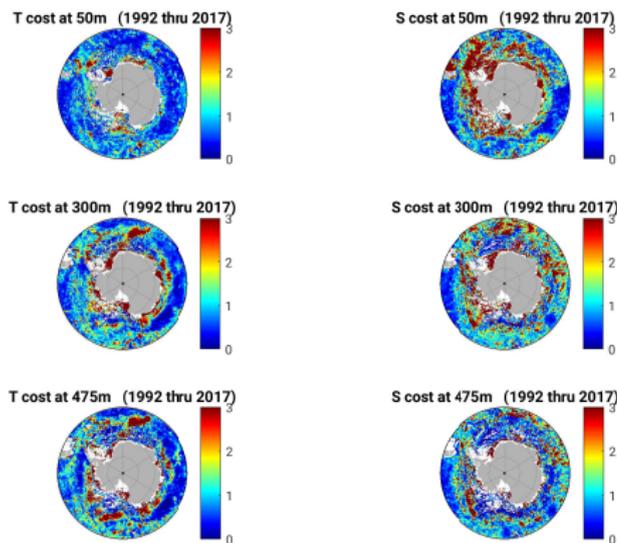


Figure : Time mean cost $(model - data)^2 / \sigma^2$ for in situ profiles, at depths (rows), for T (left) and S (right).

fit to altimeter data (RADS)

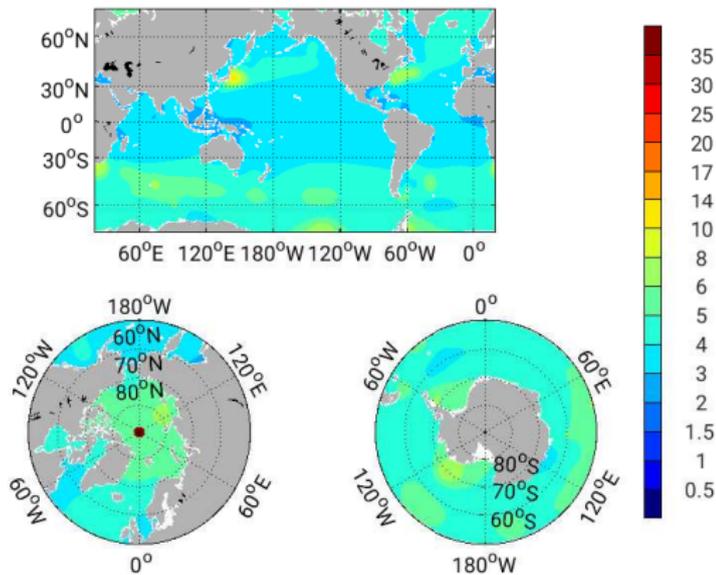


Figure : Mean Dynamic Topography Prior Uncertainty (cm)

fit to altimeter data (RADS)

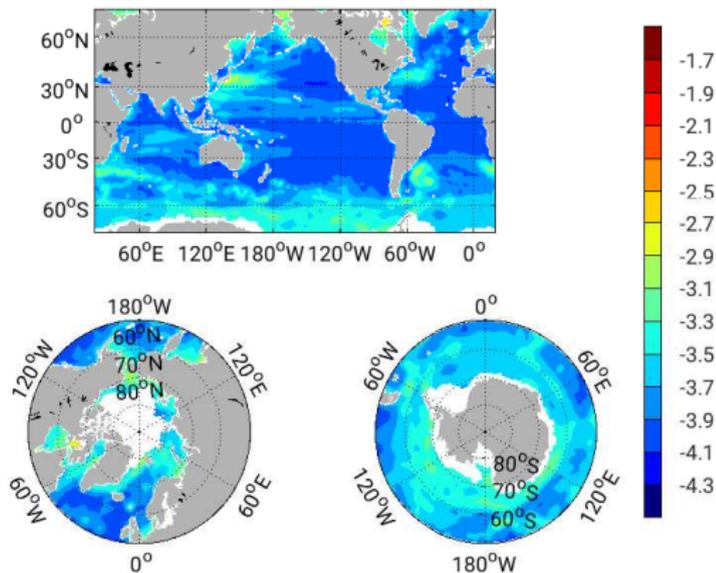


Figure : Sea Level Anomaly, Large Scale: $\log(\text{prior error variance})$ (m^2)

fit to altimeter data (RADS)

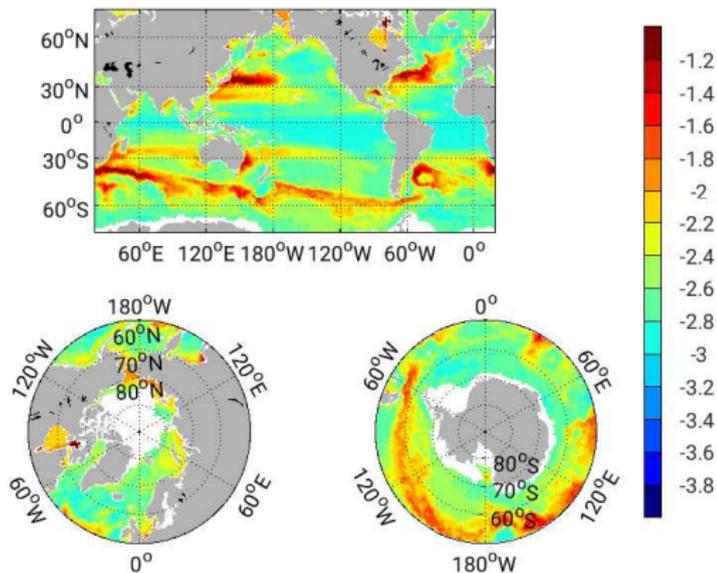


Figure : Sea Level Anomaly, Pointwise: $\log(\text{prior error variance})$ (m^2)

fit to altimeter data (RADS)

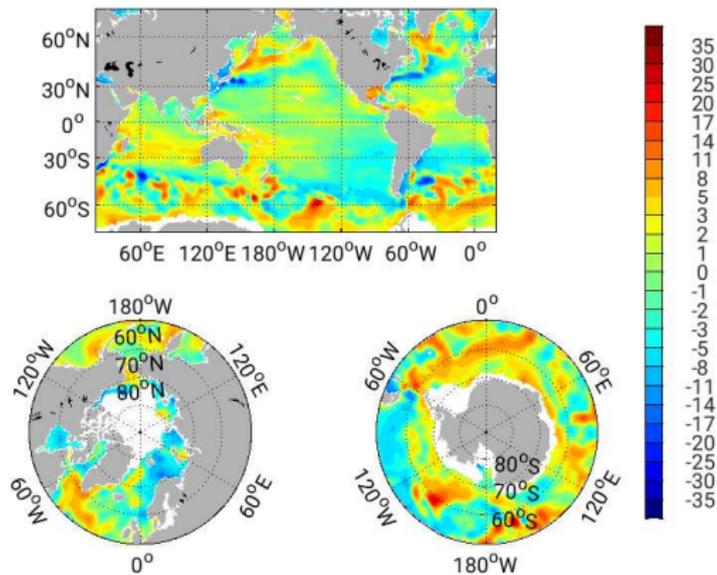


Figure : Mean Dynamic Topography Misfit (cm)

fit to altimeter data (RADS)

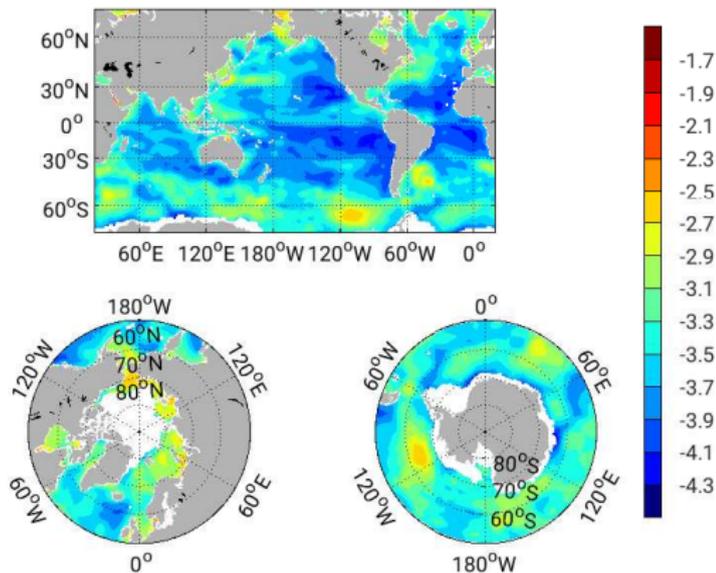


Figure : Sea Level Anomaly, Large Scale: Modeled-Data
 $\log(\text{variance}) (m^2)$

fit to altimeter data (RADS)

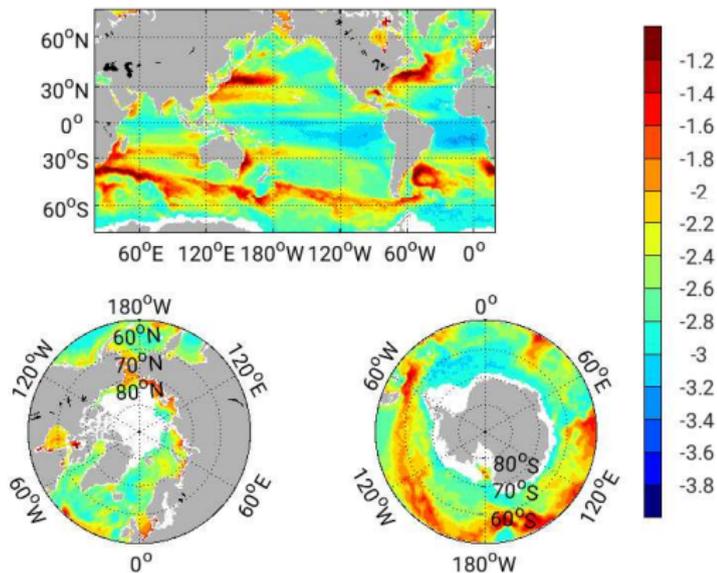


Figure : Sea Level Anomaly, Pointwise: Modeled-Data
 $\log(\text{variance})$ (m^2)

fit to altimeter data (RADS)

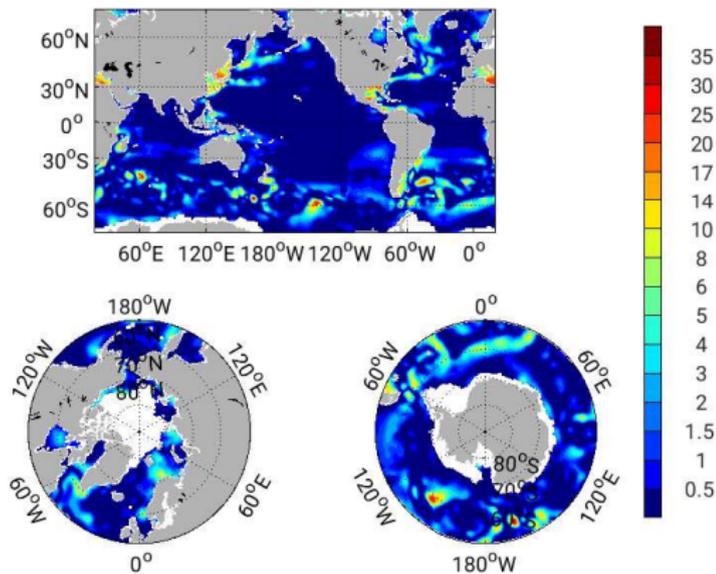


Figure : Mean Dynamic Topography: Modeled-Data Cost

fit to altimeter data (RADS)

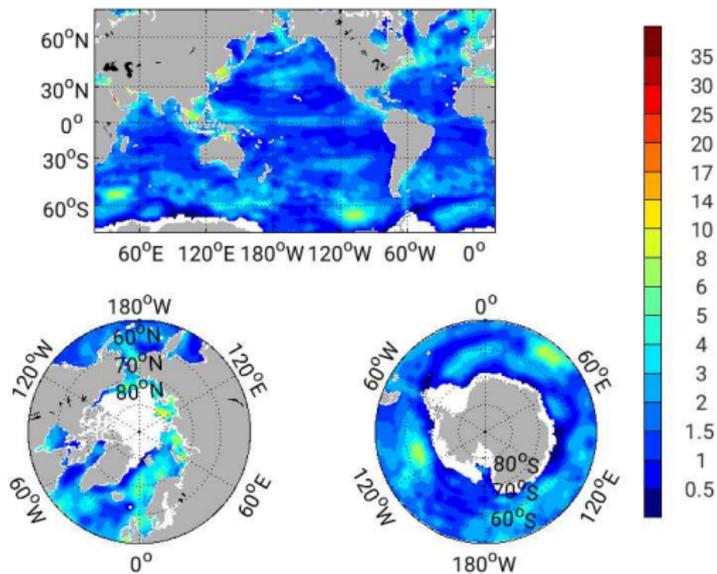


Figure : Sea Level Anomaly, Large Scale: Modeled-Data Cost

fit to altimeter data (RADS)

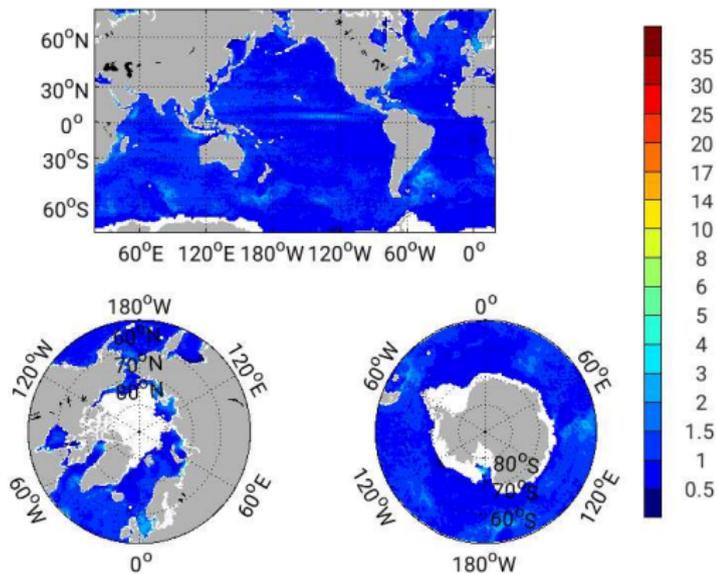


Figure : Sea Level Anomaly, Pointwise: Modeled-Data Cost

fit to altimeter data (RADS)

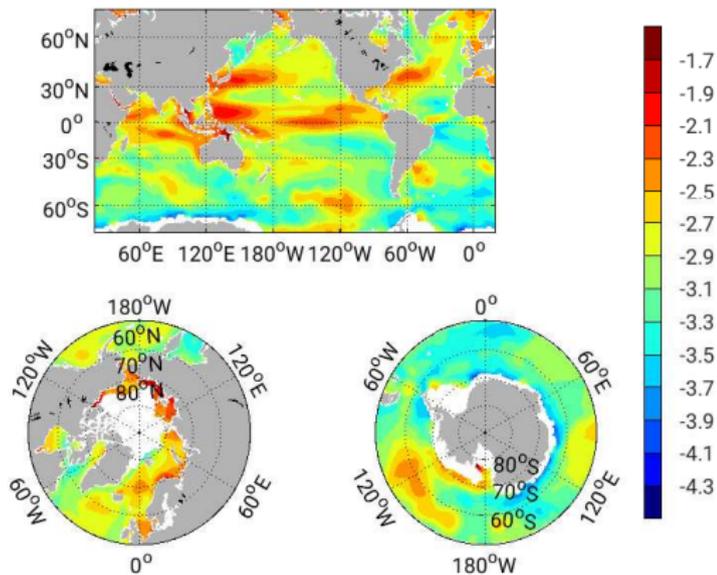


Figure : Sea Level Anomaly, Large Scale: Data log(variance) (m^2)

fit to altimeter data (RADS)

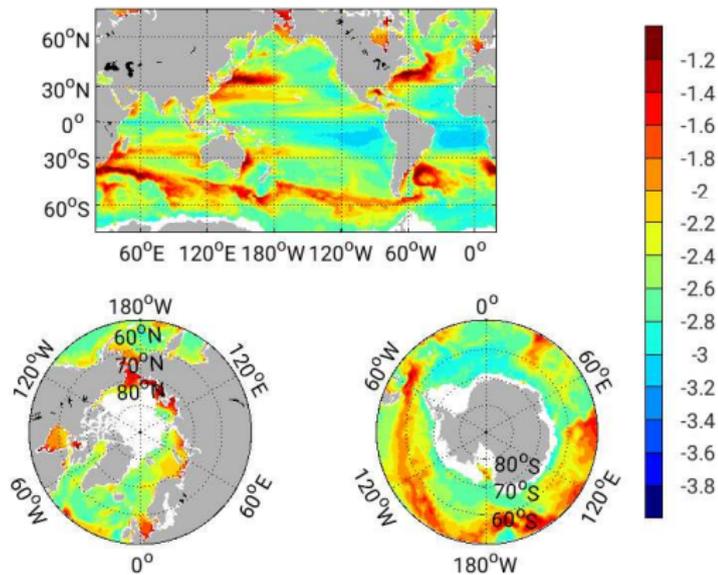


Figure : Sea Level Anomaly, Pointwise: Data log(variance) (m^2)

fit to altimeter data (RADS)

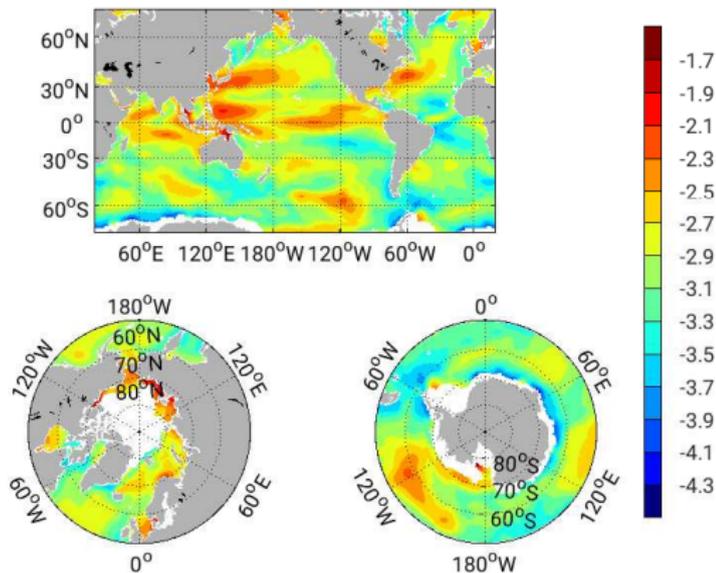


Figure : Sea Level Anomaly, Large Scale: Modeled log(variance) (m^2)

fit to altimeter data (RADS)

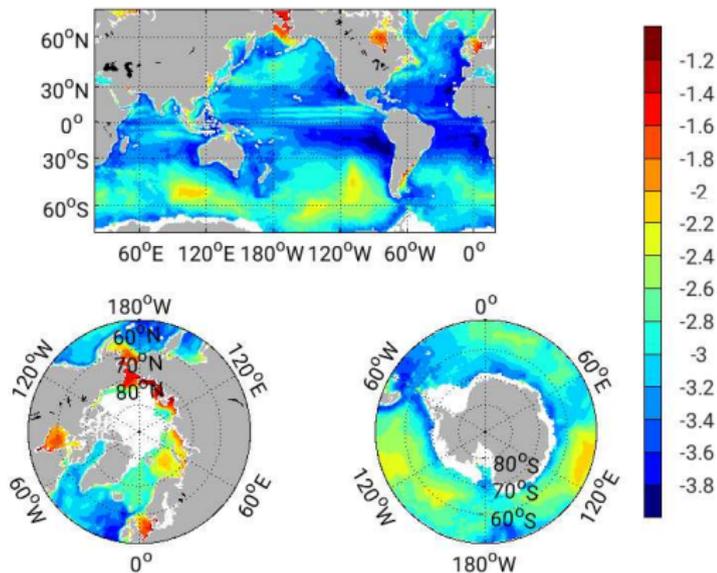


Figure : Sea Level Anomaly, Pointwise: Modeled log(variance) (m^2)

fit to grace r4 data

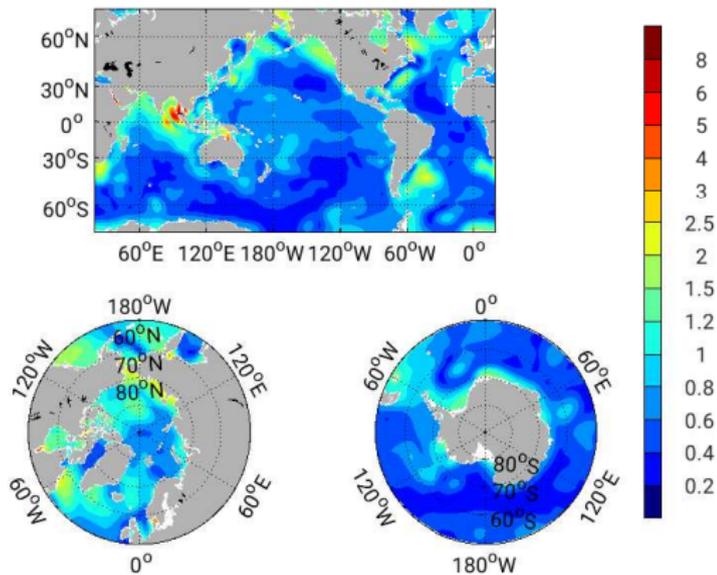


Figure : Bottom Pressure (cm): RMS of Modeled-Data

fit to grace r4 data

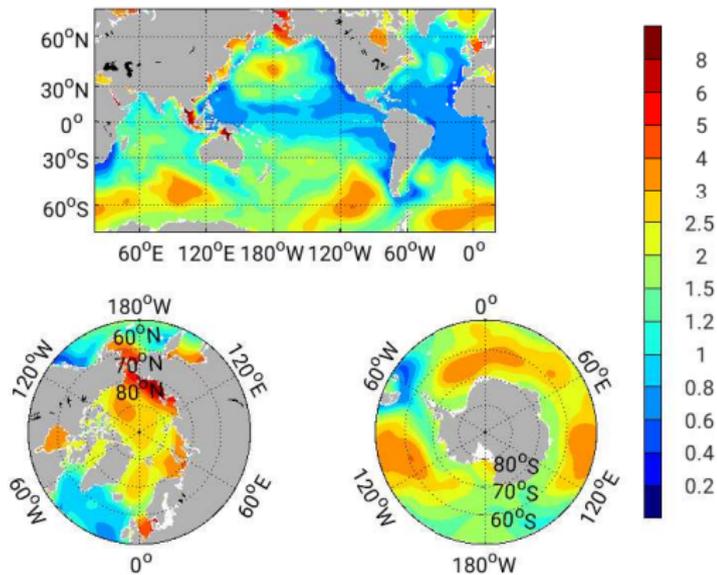


Figure : Bottom Pressure (cm): RMS of Modeled

fit to grace r4 data

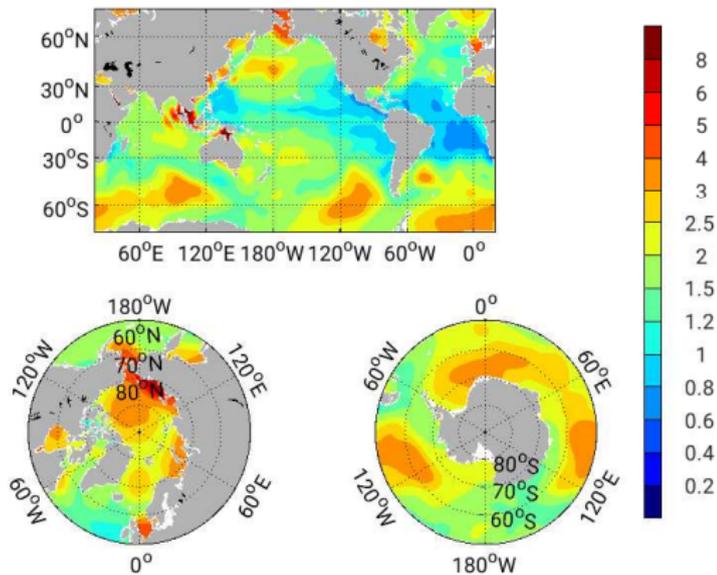


Figure : Bottom Pressure (cm): RMS of Data

fit to grace r4 data

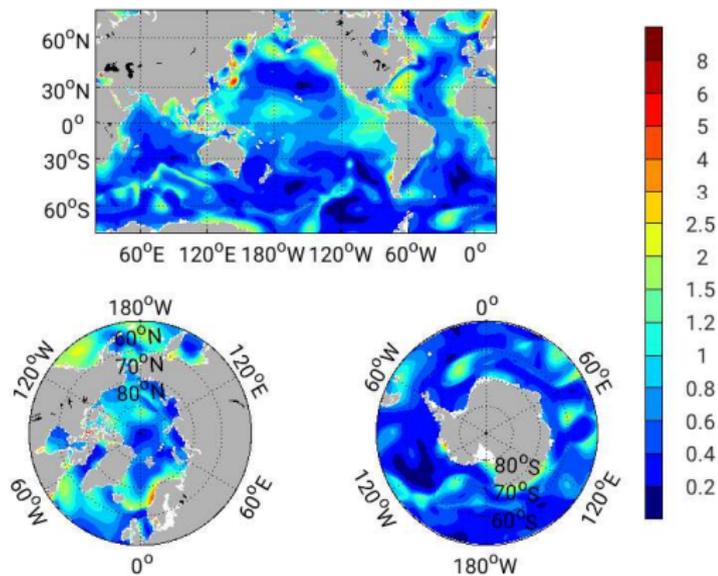


Figure : Bottom Pressure (cm): Cost function

barotropic streamfunction

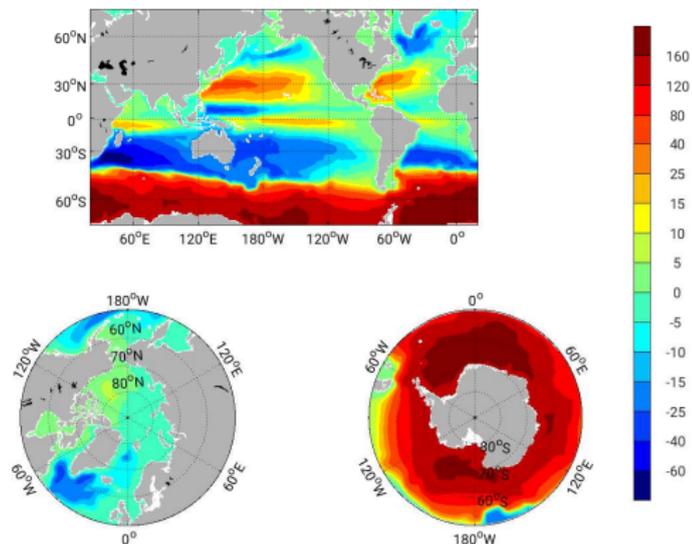


Figure : Barotropic Streamfunction (Sv): 1992 thru 2017 Mean

barotropic streamfunction

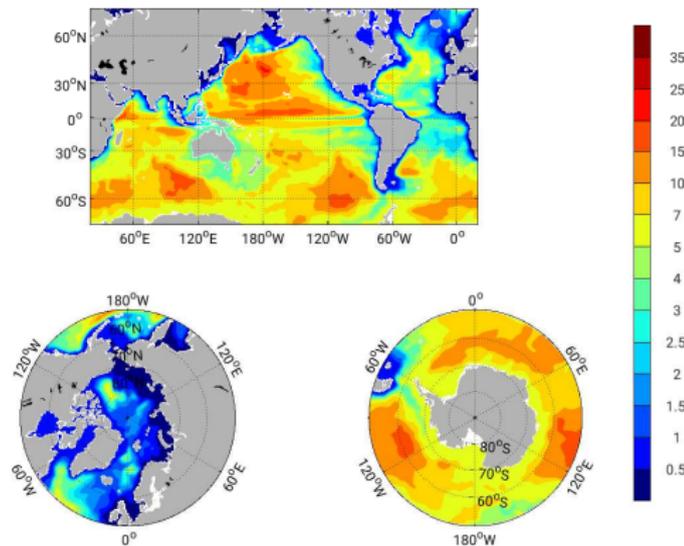


Figure : Barotropic Streamfunction (Sv): Standard Deviation, 1992 thru 2017

meridional streamfunction

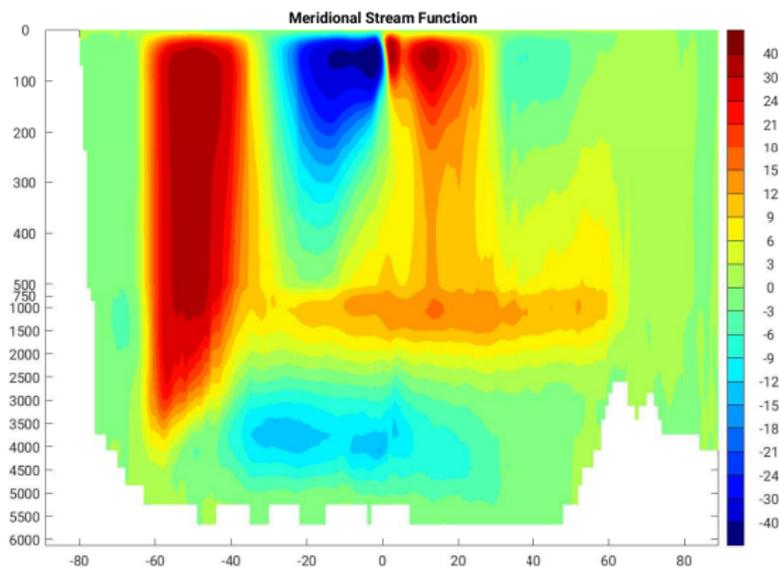


Figure : Overturning Streamfunction (S_v): 1992 thru 2017 Mean

meridional streamfunction

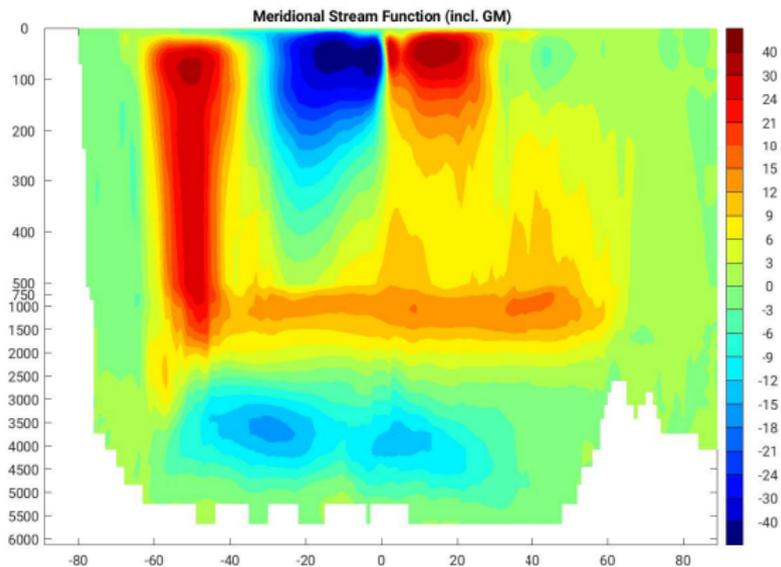


Figure : Overturning Streamfunction incl. GM (S_v): 1992 thru 2017 Mean

meridional streamfunction

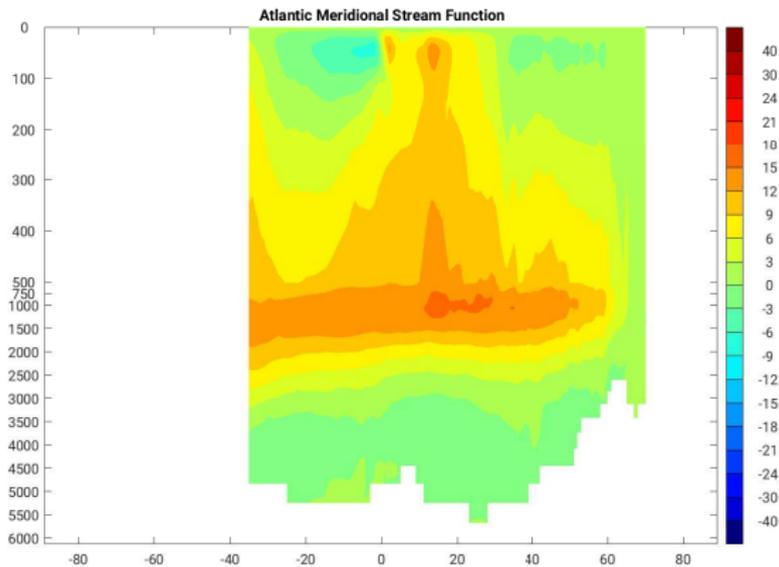


Figure : Atlantic Overturning Streamfunction (Sv): 1992 thru 2017 Mean

meridional streamfunction

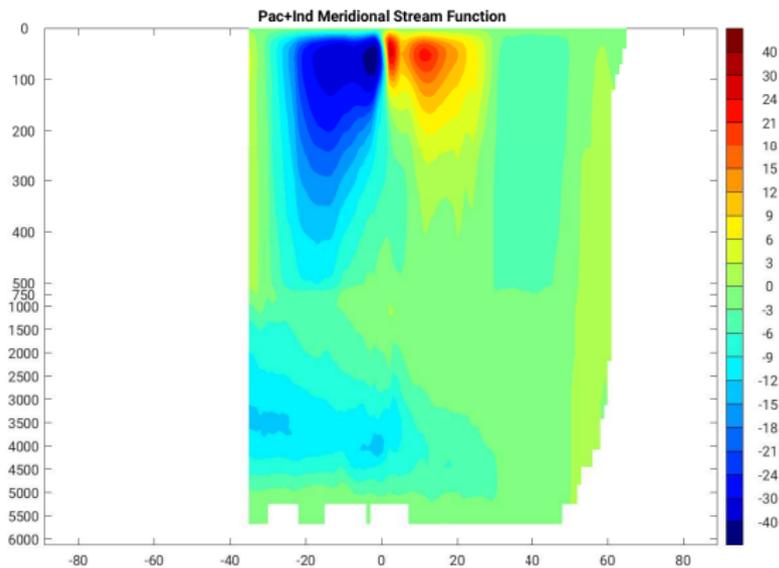


Figure : Pac+Ind Overturning Streamfunction (Sv): 1992 thru 2017 Mean

meridional streamfunction

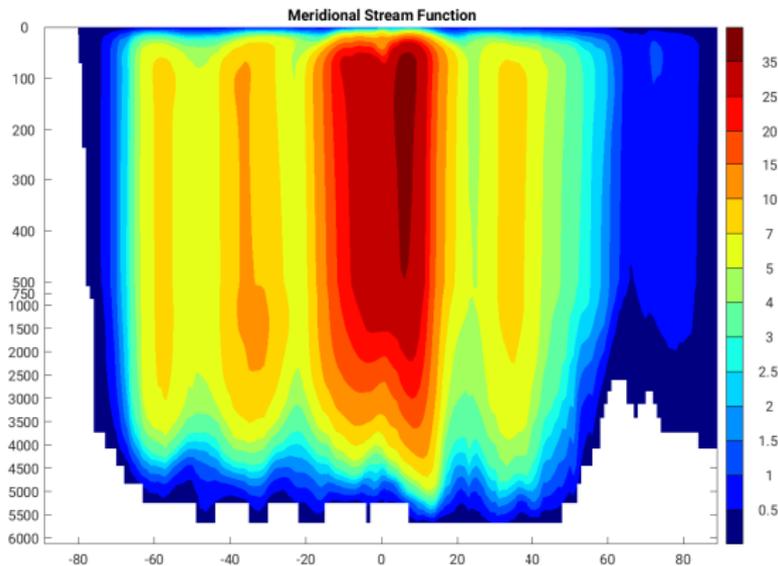


Figure : Overturning Streamfunction (S_v): Standard Deviation, 1992 thru 2017

meridional streamfunction

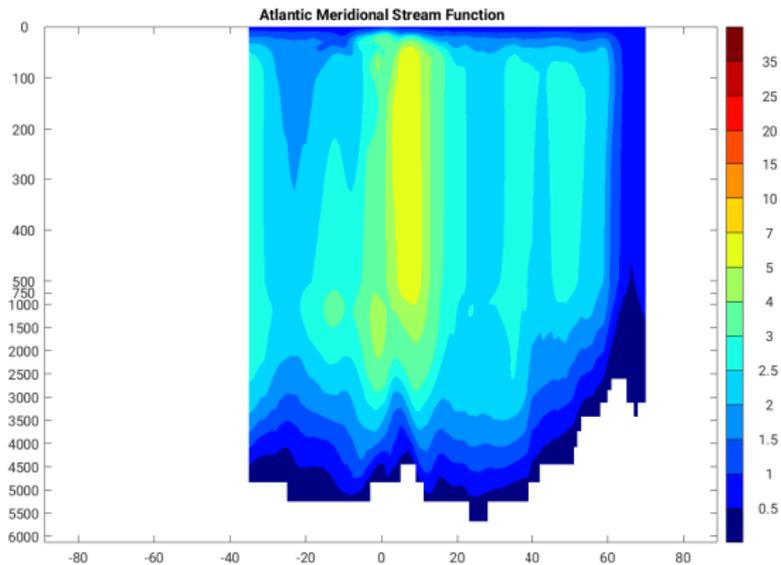


Figure : Atlantic Overturning Streamfunction (S_v): Standard Deviation, 1992 thru 2017

meridional streamfunction (time series)

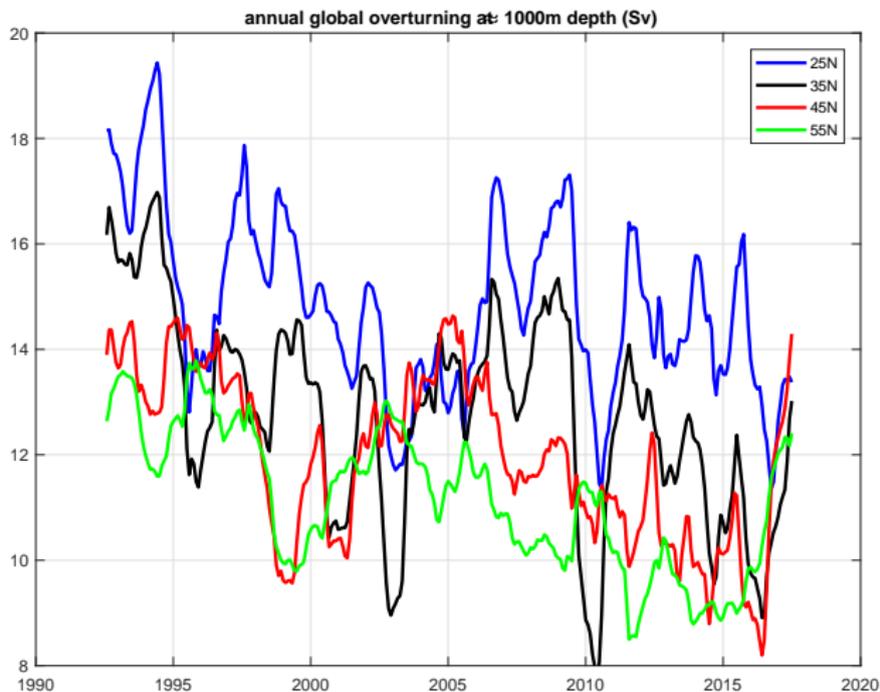


Figure : Annual Global Overturning at Select Latitudes at \approx 1000m Depth

meridional streamfunction (time series)

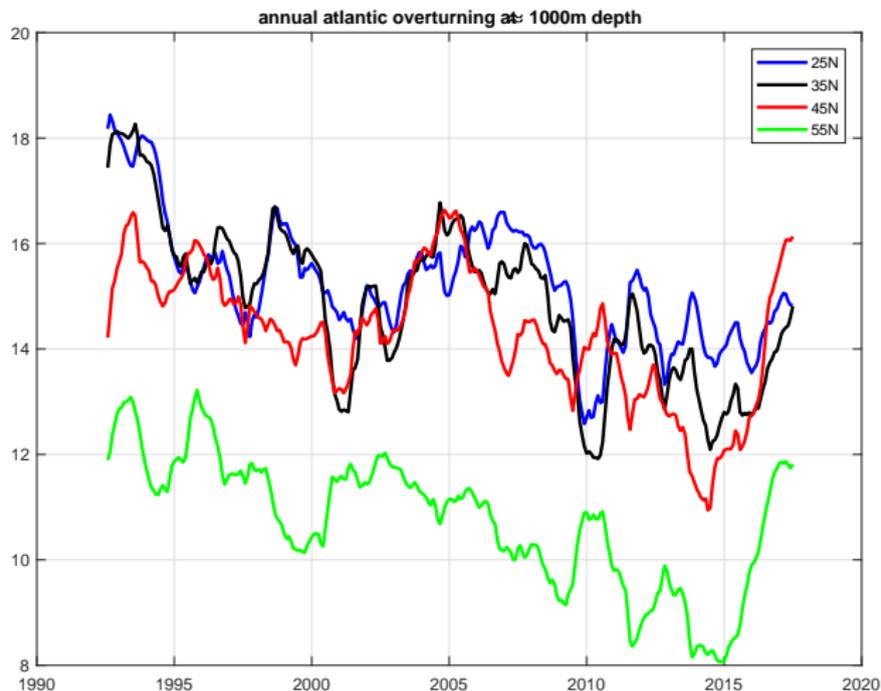


Figure : Annual Atlantic Overturning at Select Latitudes at \approx 1000m Depth (Sv)

meridional heat transport

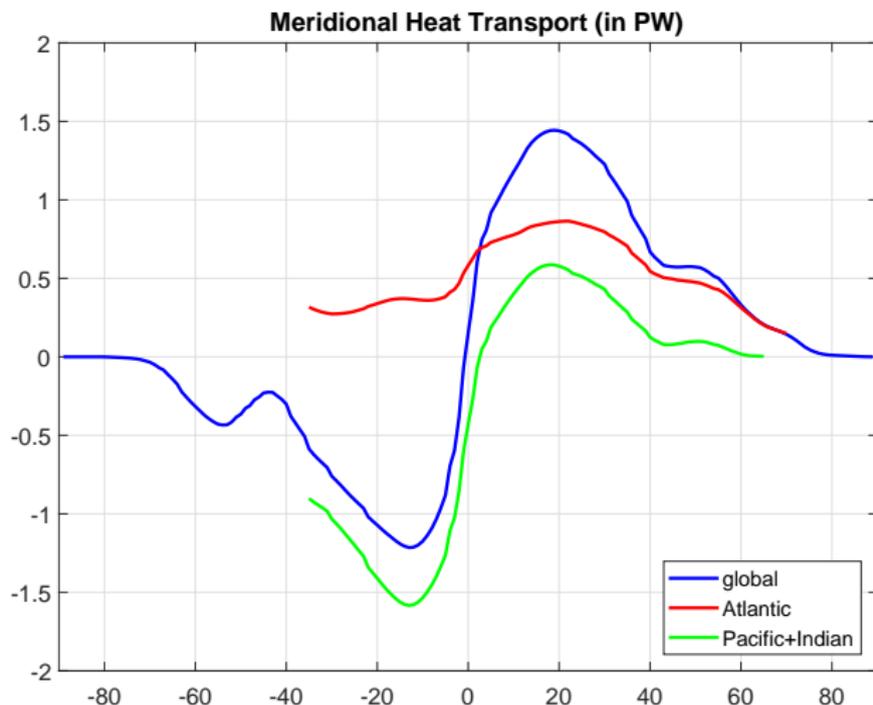


Figure : Meridional Heat Transport (PW): 1992 thru 2017 Mean

meridional heat transport

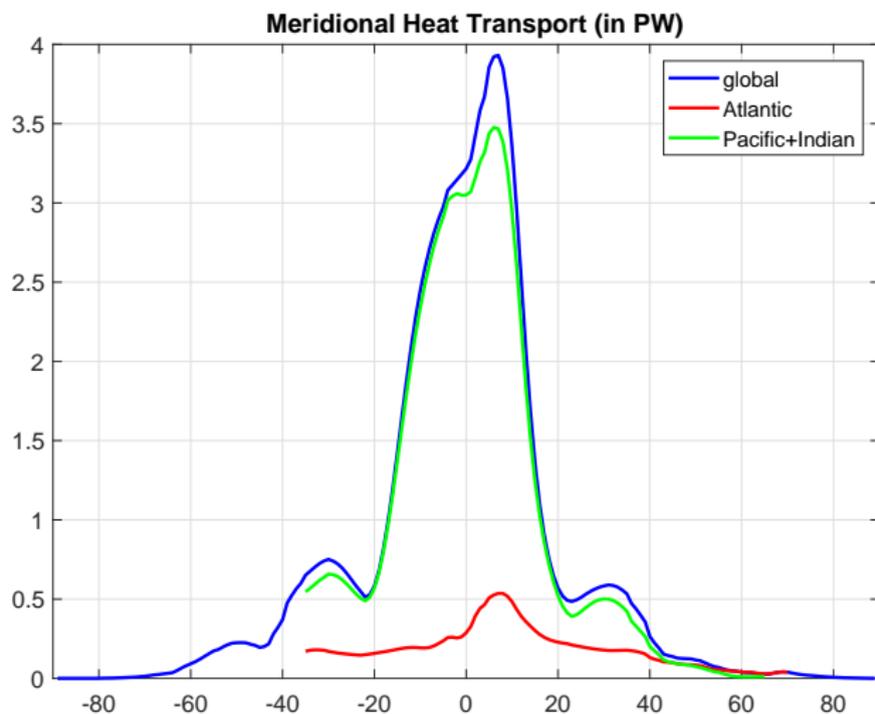


Figure : Meridional Heat Transport (PW): Standard Deviation, 1992 thru 2017

meridional freshwater transport

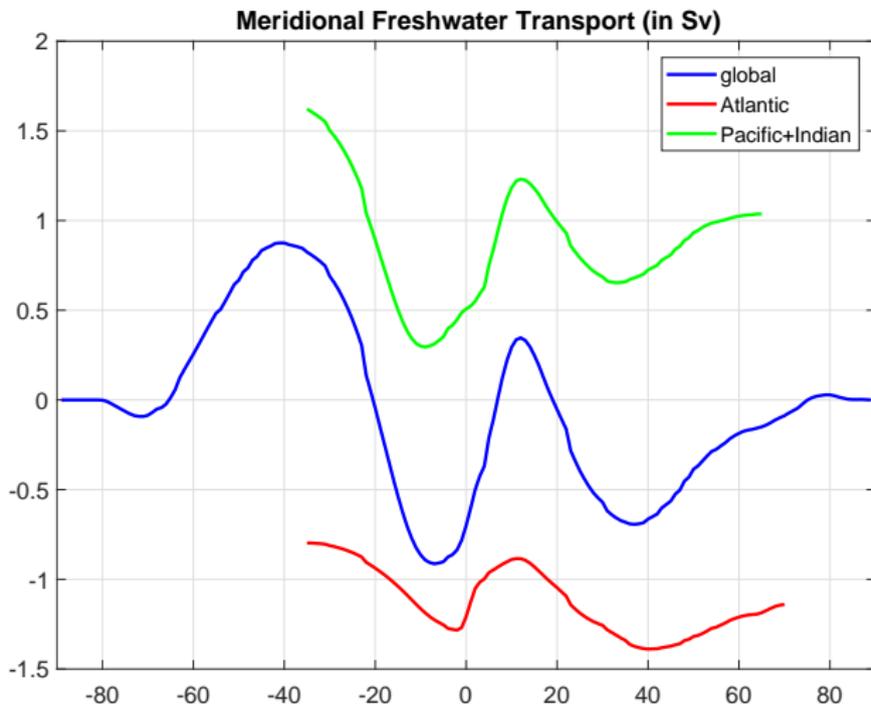


Figure : Meridional Freshwater Transport (Sv): 1992 thru 2017 Mean

meridional freshwater transport

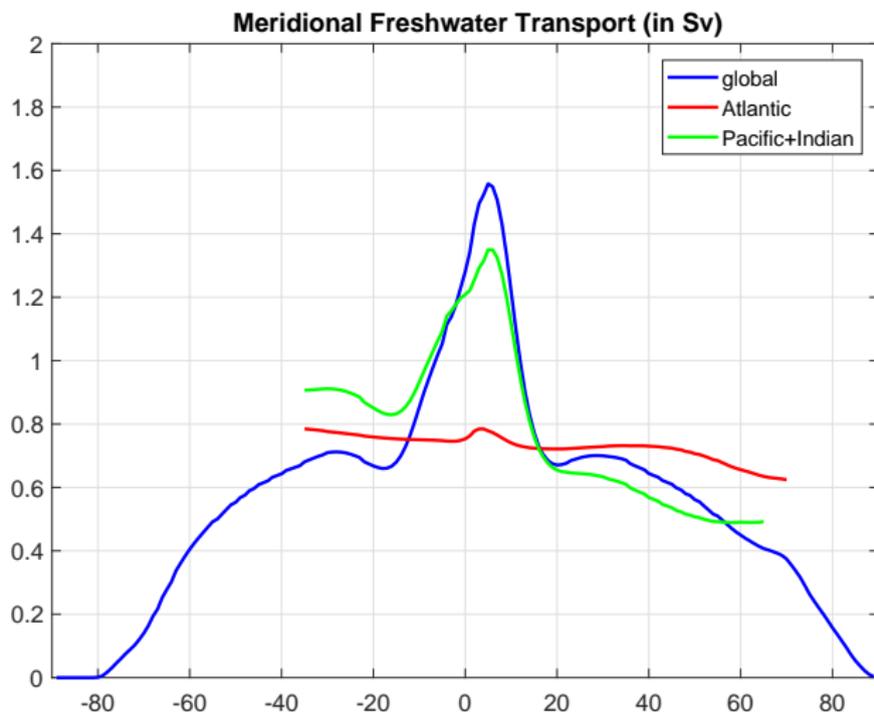


Figure : Meridional Freshwater Transport (Sv): Standard Deviation, 1992 thru 2017

meridional salt transport

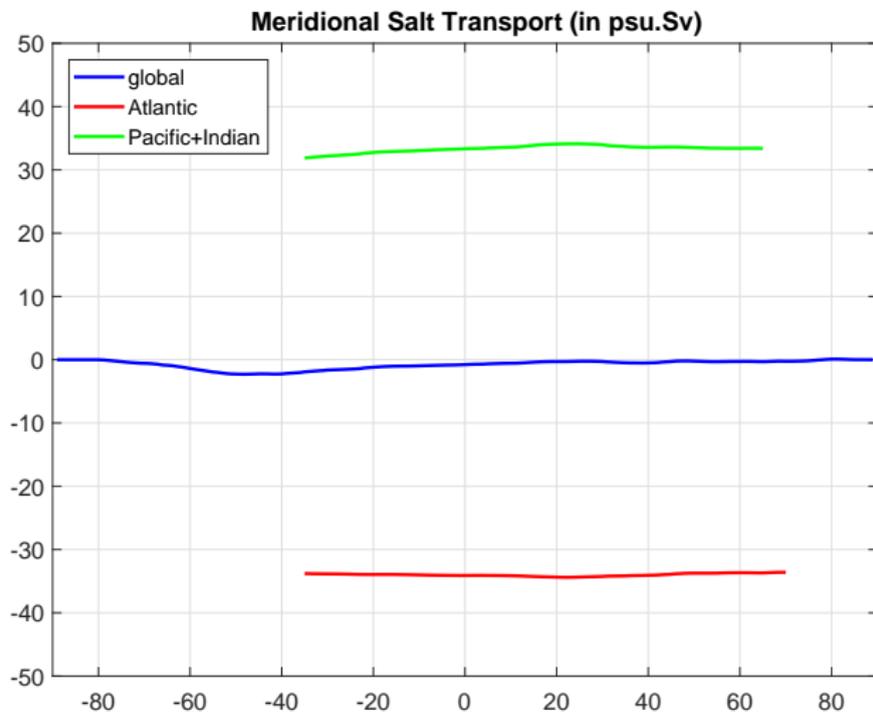


Figure : Meridional Salt Transport (psu.Sv): 1992 thru 2017 Mean

meridional salt transport

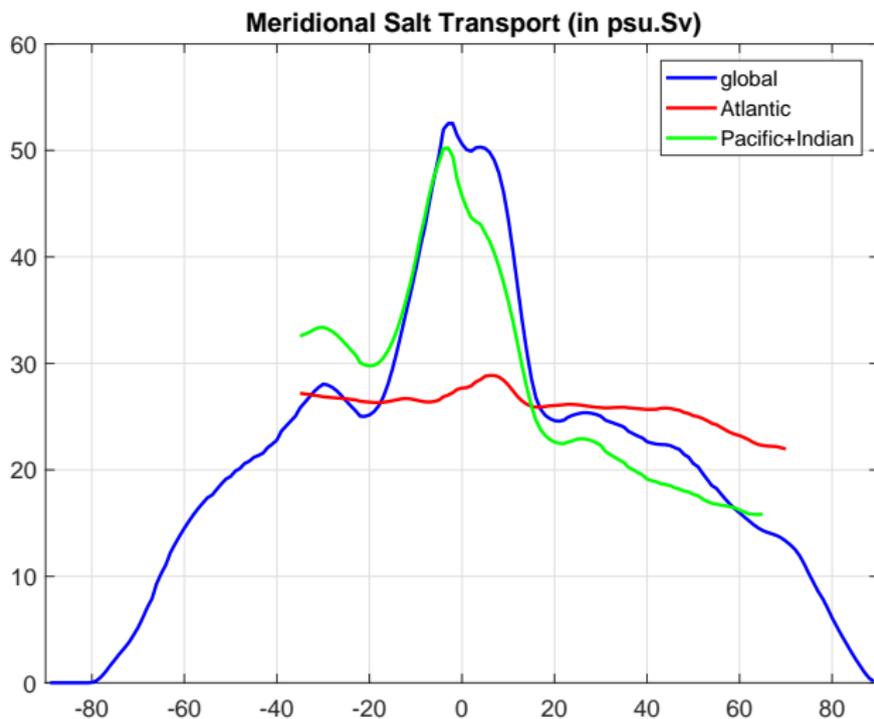


Figure : Meridional Salt Transport (psu.Sv): Standard Deviation, 1992 thru 2017

meridional transports (time series)

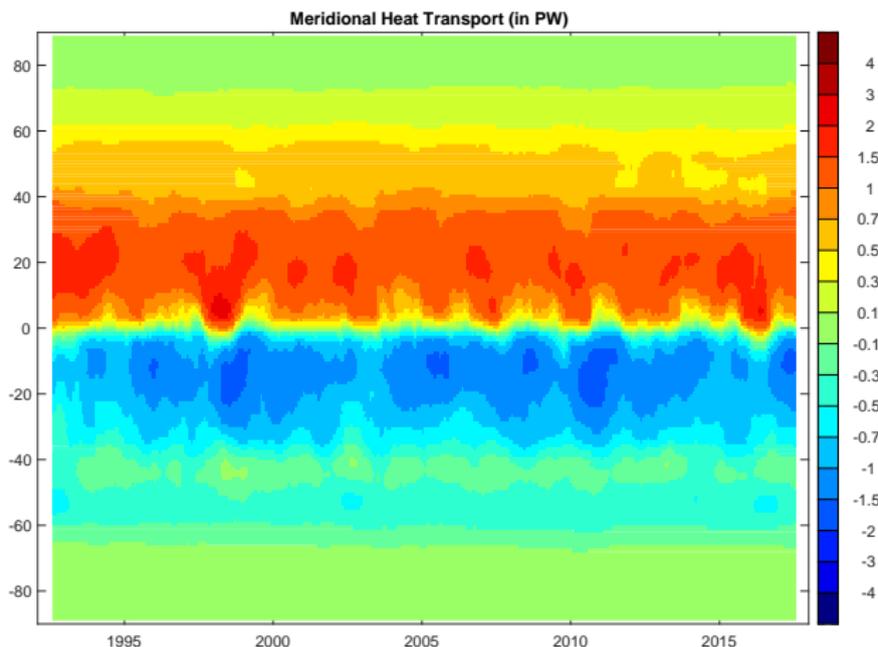


Figure : Meridional Heat Transport (PW, annual mean)

meridional transports (time series)

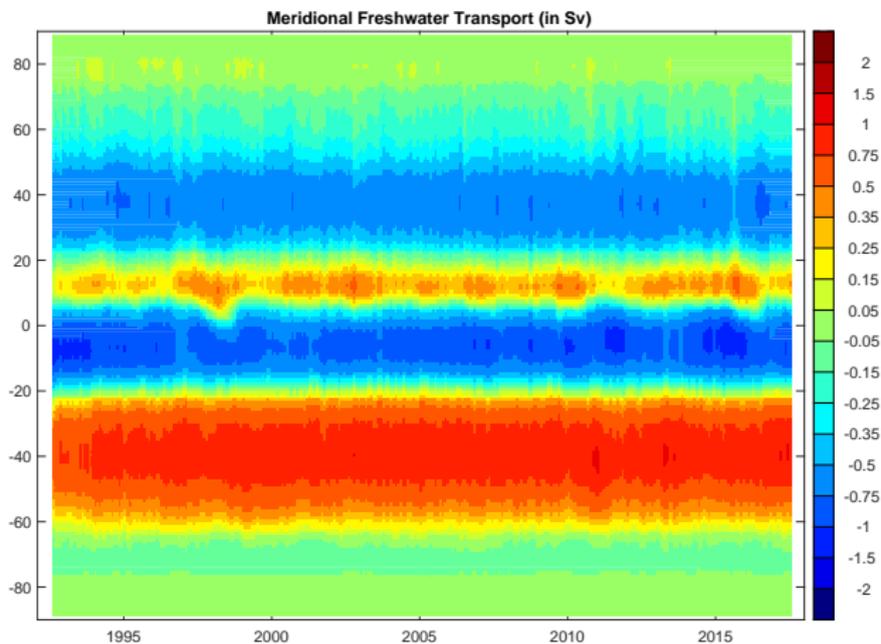


Figure : Meridional Freshwater Transport (Sv, annual mean)

meridional transports (time series)

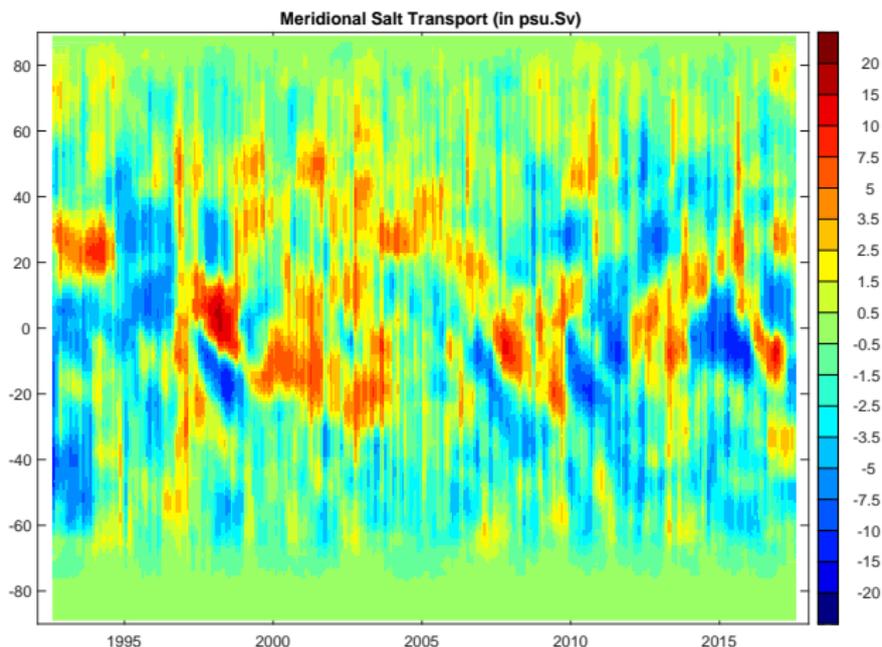


Figure : Meridional Salt Transport (psu.Sv, annual mean)

transects transport

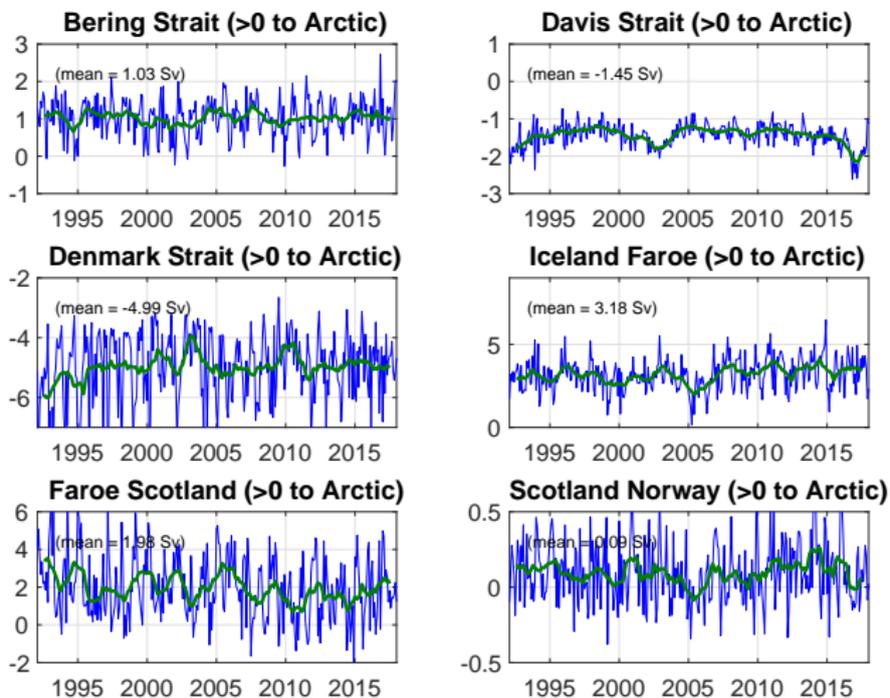


Figure : Volume Transports Entering the Arctic (Sv, annual mean)

transects transport

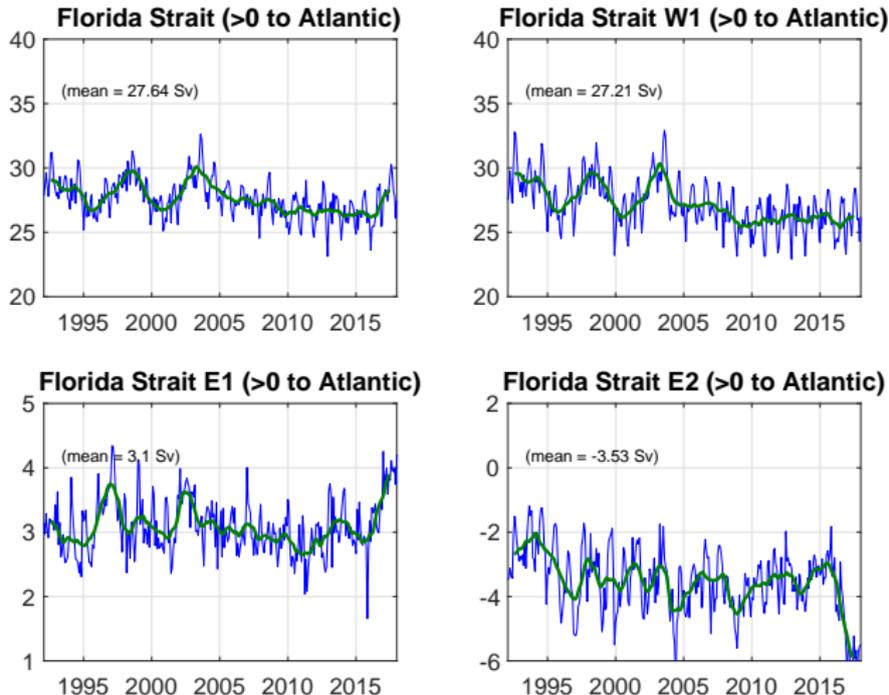


Figure : Volume Transports Entering the Atlantic (Sv, annual mean)

transects transport

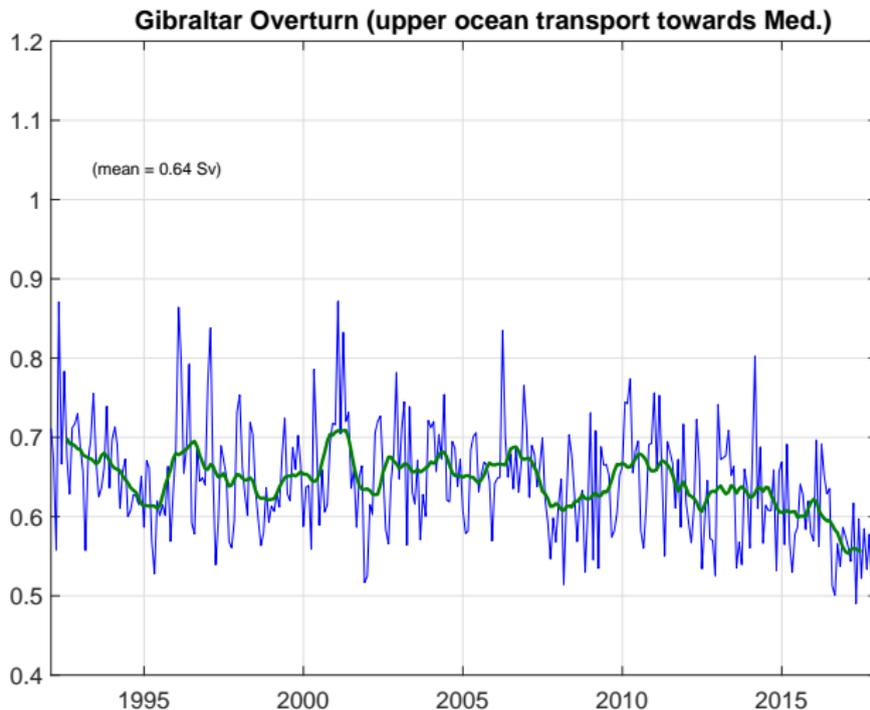


Figure : Gibraltar Overturn (Sv, annual mean)

transects transport

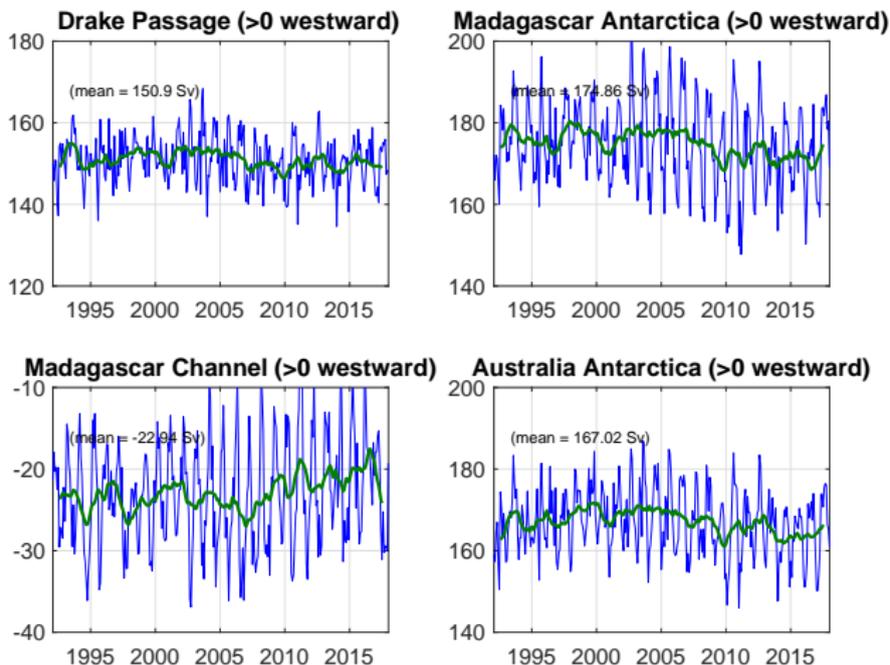


Figure : ACC Volume Transports (Sv, annual mean)

transects transport

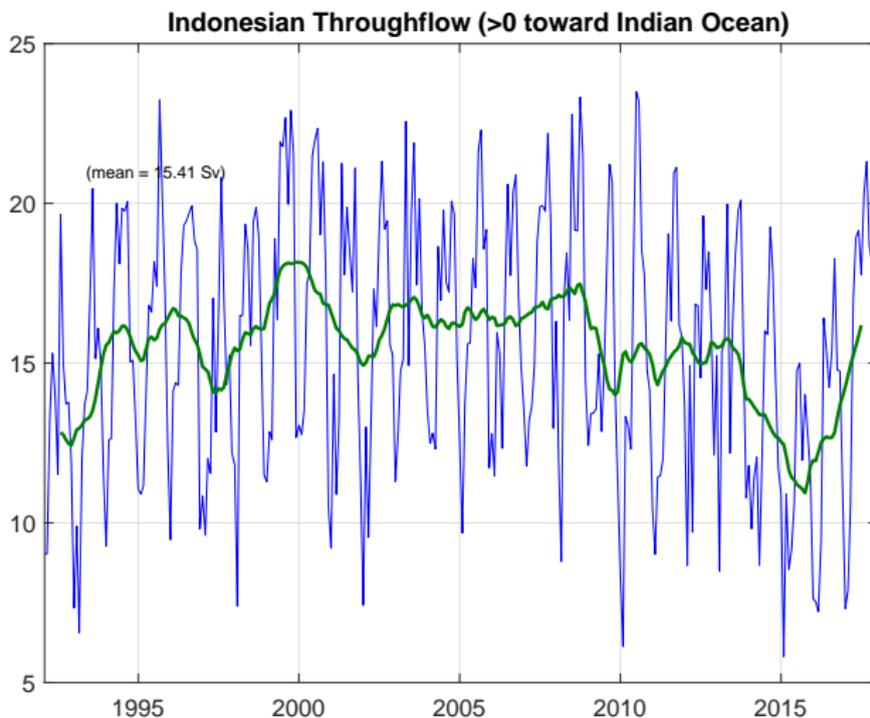


Figure : Indonesian Throughflow (Sv, annual mean)

sea surface height

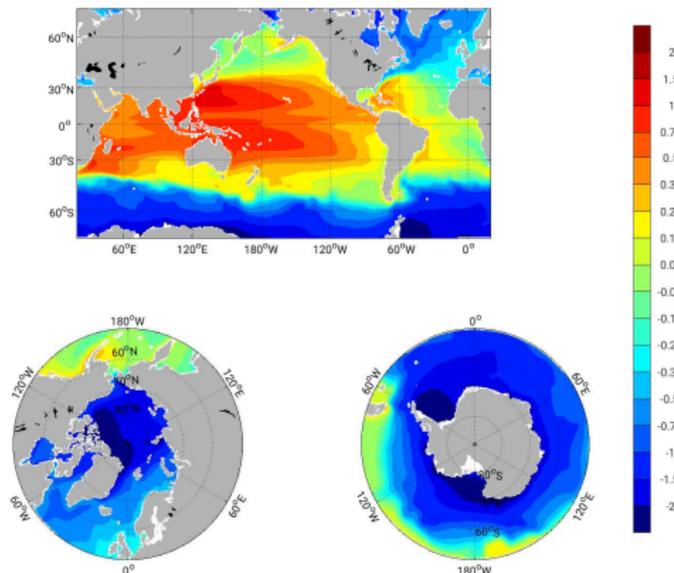


Figure : Sea Surface Height (EXCLUDING sea ice, in m): 1992 thru 2017 Mean

sea surface height

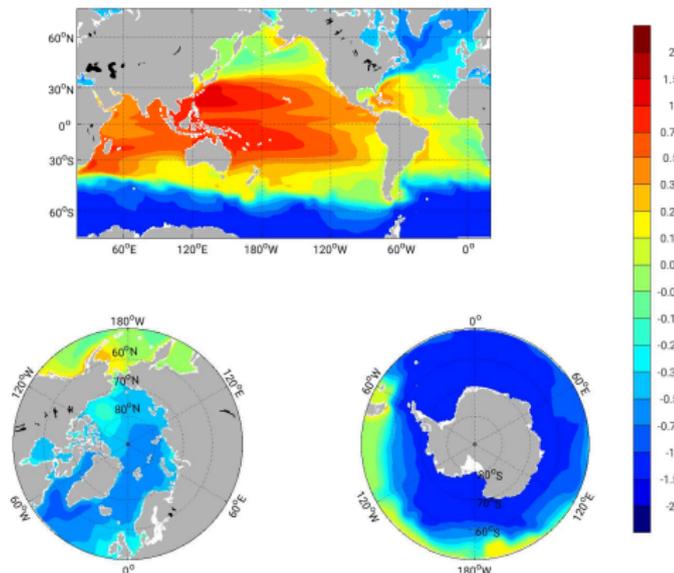


Figure : Sea Surface Height (INCLUDING sea ice, in m): 1992 thru 2017 Mean

sea surface height

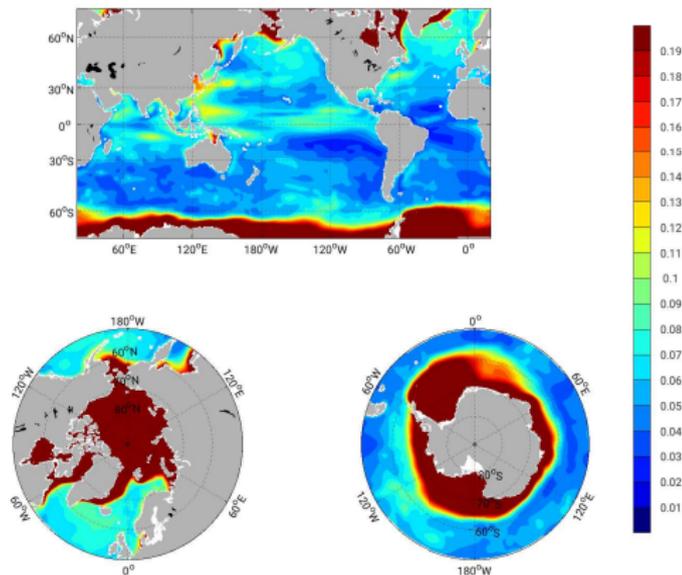


Figure : Sea Surface Height (EXCLUDING sea ice, in m):
Standard Deviation, 1992 thru 2017

sea surface height

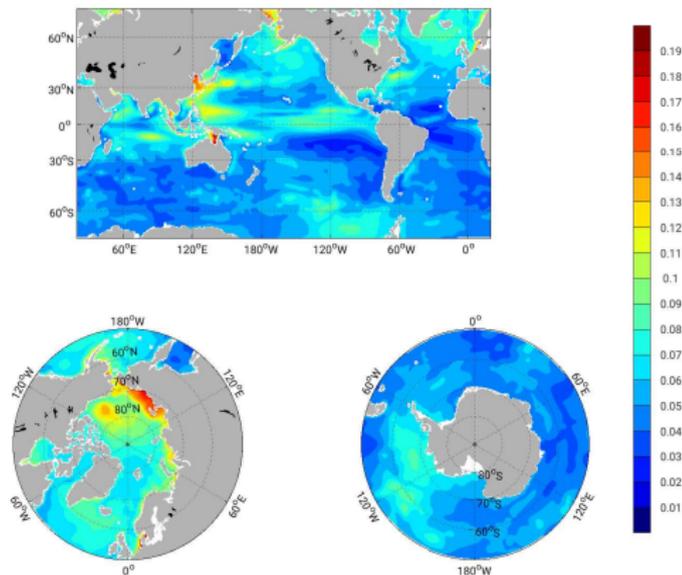


Figure : Sea Surface Height (INCLUDING sea ice, in m): Standard Deviation, 1992 thru 2017

3D state variables

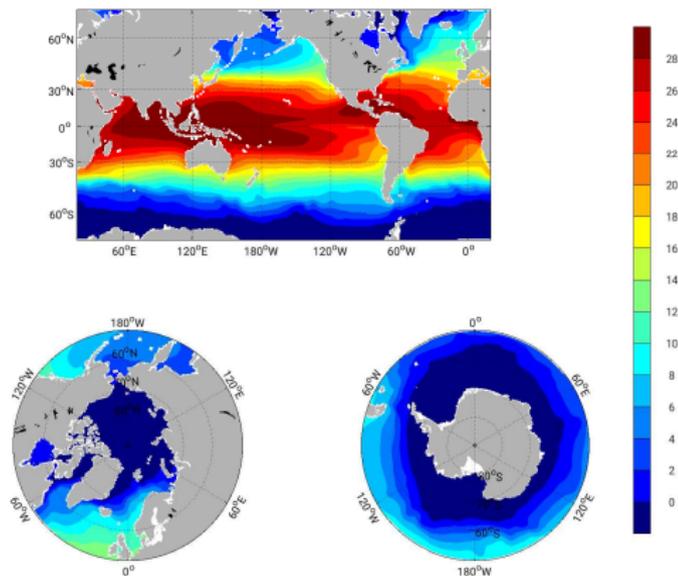


Figure : Temperature (C) at 5m : 1992 thru 2017 Mean

3D state variables

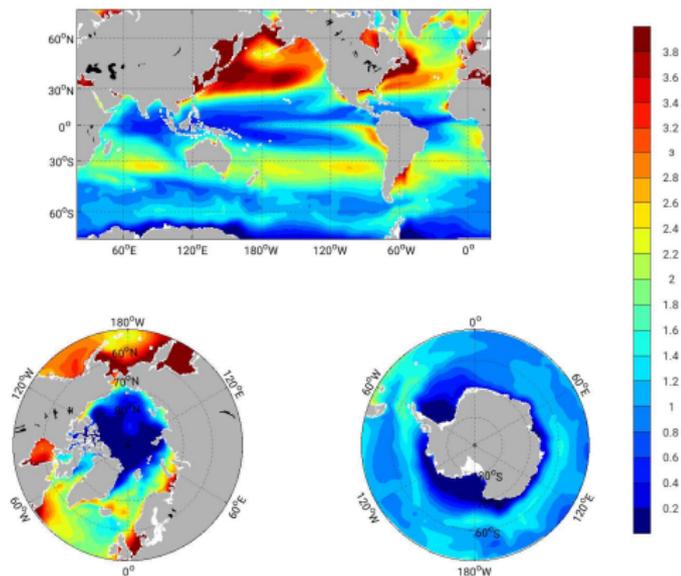


Figure : Temperature (C) at 5m : Standard Deviation, 1992 thru 2017

3D state variables

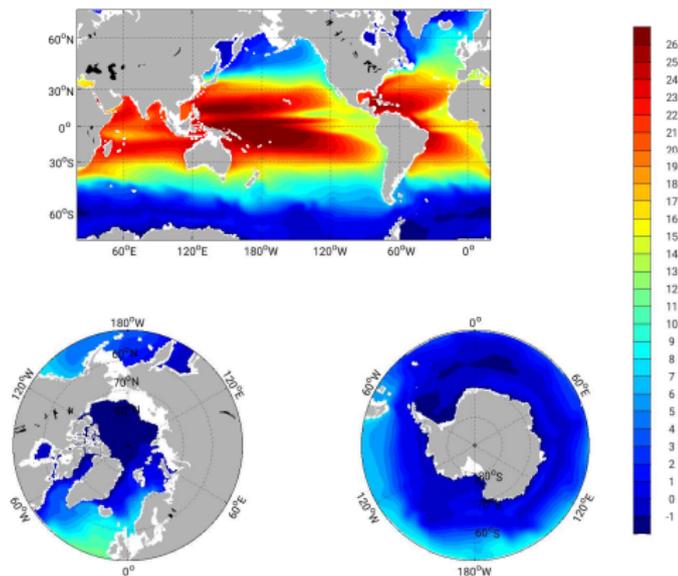


Figure : Temperature (C) at 105m : 1992 thru 2017 Mean

3D state variables

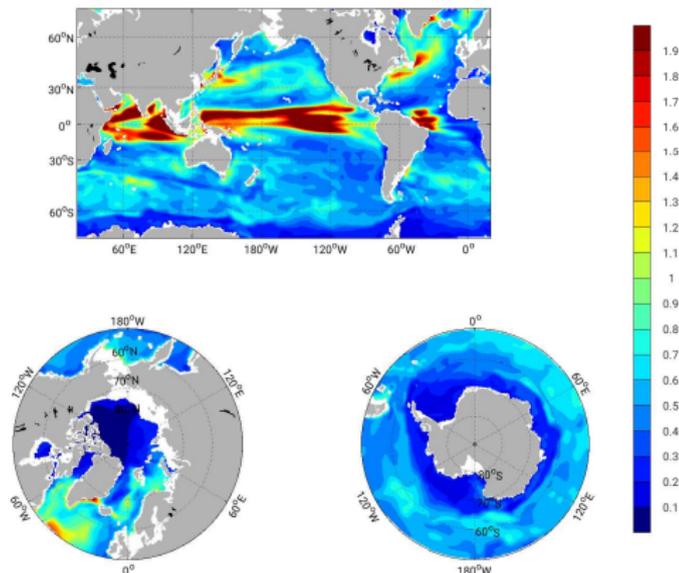


Figure : Temperature (C) at 105m : Standard Deviation, 1992 thru 2017

3D state variables

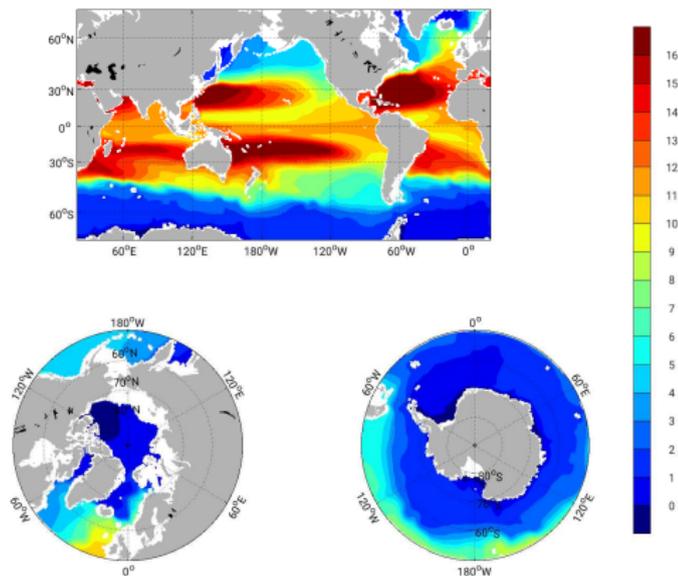


Figure : Temperature (C) at 300m : 1992 thru 2017 Mean

3D state variables

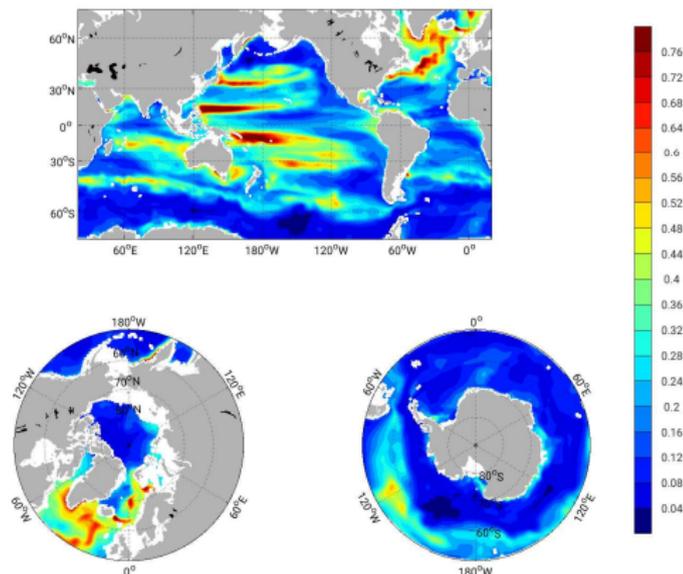


Figure : Temperature (C) at 300m : Standard Deviation, 1992 thru 2017

3D state variables

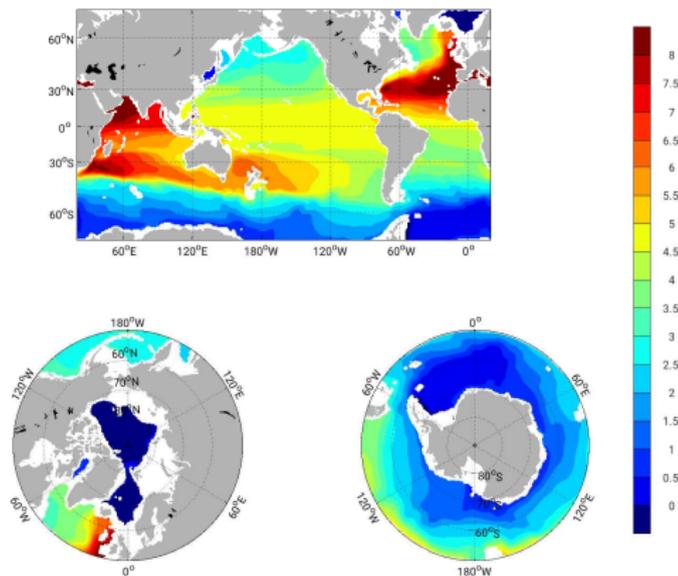


Figure : Temperature (C) at 910m : 1992 thru 2017 Mean

3D state variables

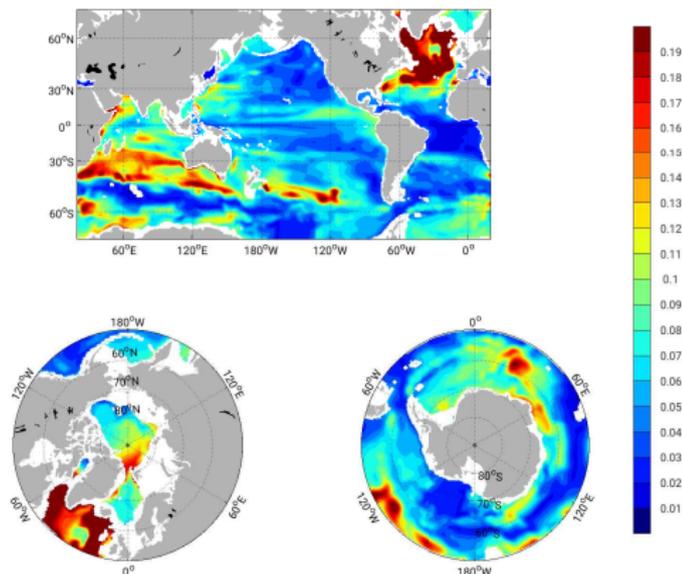


Figure : Temperature (C) at 910m : Standard Deviation, 1992 thru 2017

3D state variables

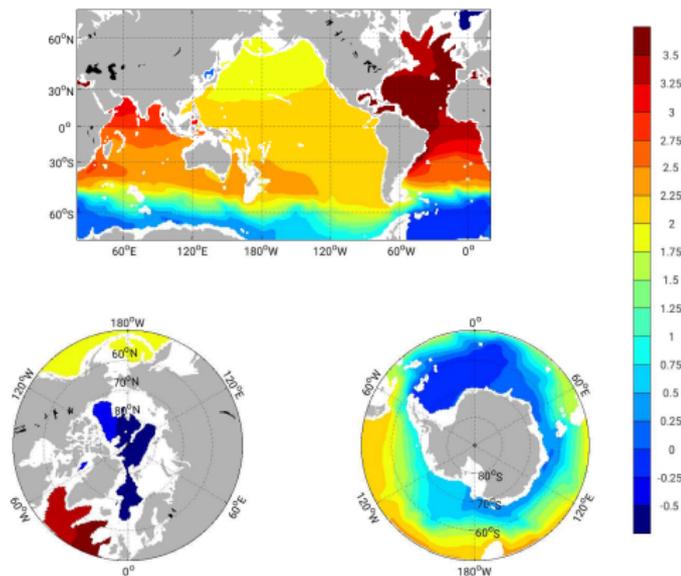


Figure : Temperature (C) at 1914m : 1992 thru 2017 Mean

3D state variables

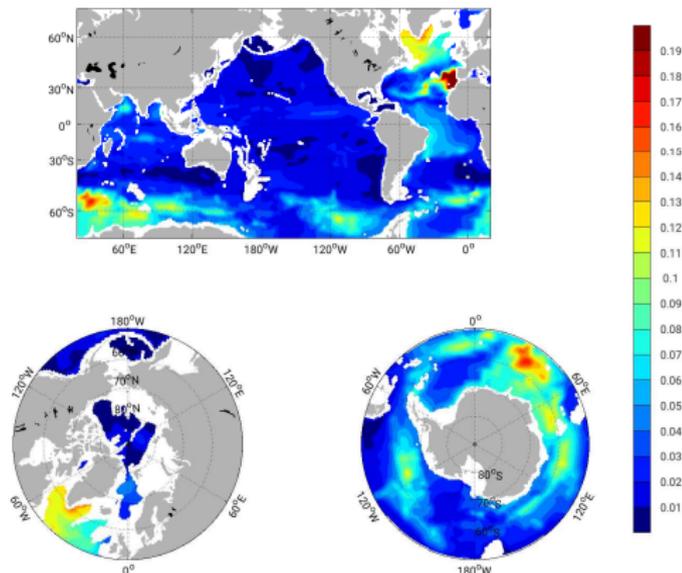


Figure : Temperature (C) at 1914m : Standard Deviation, 1992 thru 2017

3D state variables

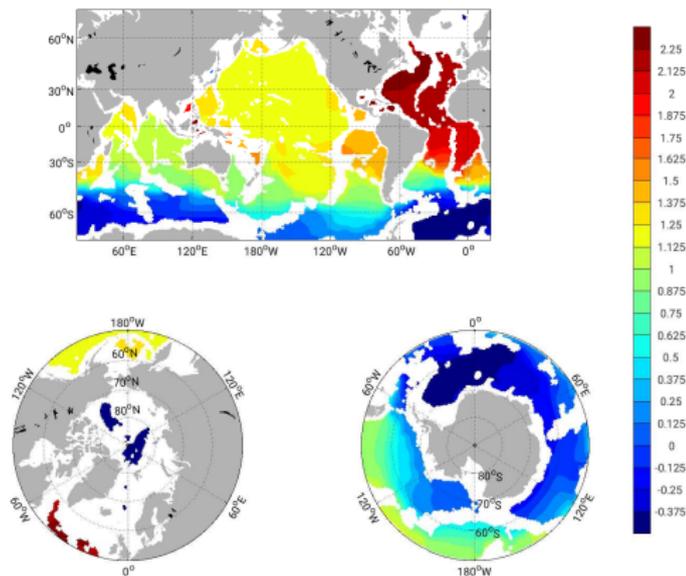


Figure : Temperature (C) at 3581m : 1992 thru 2017 Mean

3D state variables

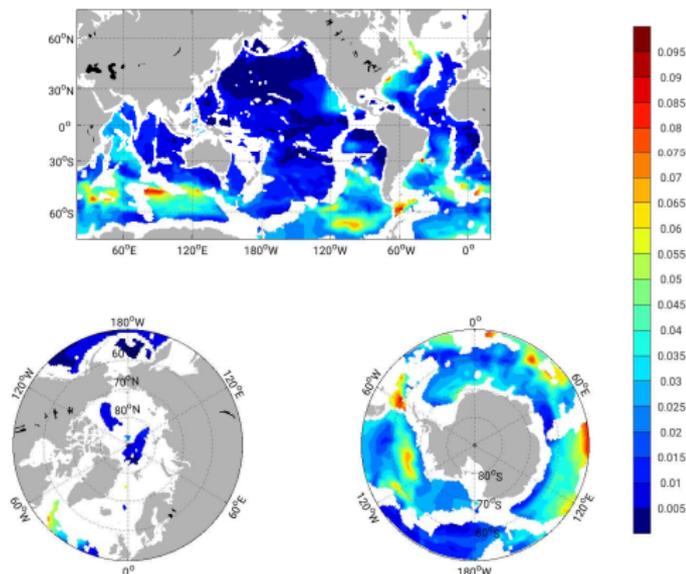


Figure : Temperature (C) at 3581m : Standard Deviation, 1992 thru 2017

3D state variables

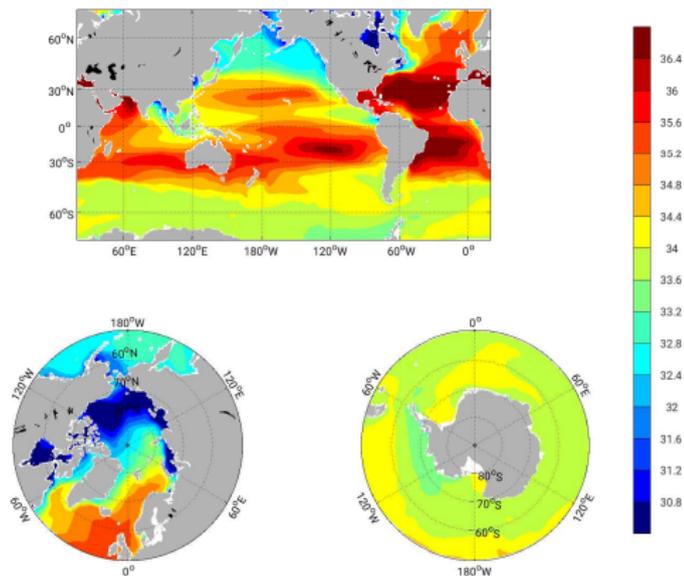


Figure : Salinity (psu) at 5m : 1992 thru 2017 Mean

3D state variables

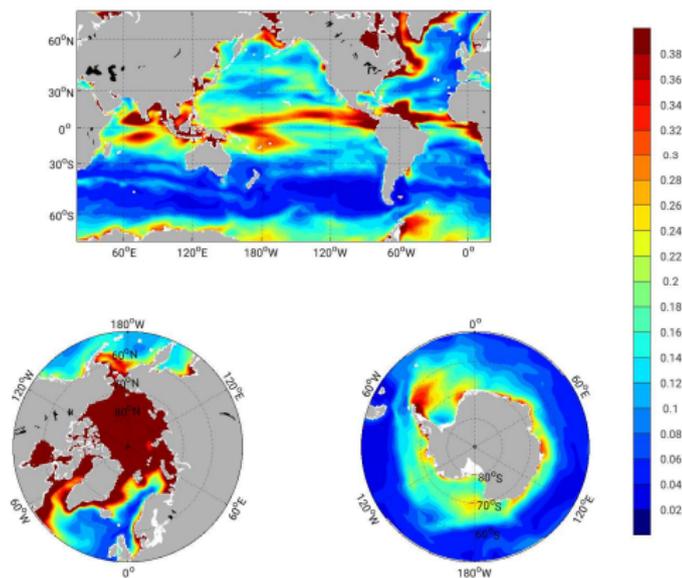


Figure : Salinity (psu) at 5m : Standard Deviation, 1992 thru 2017

3D state variables

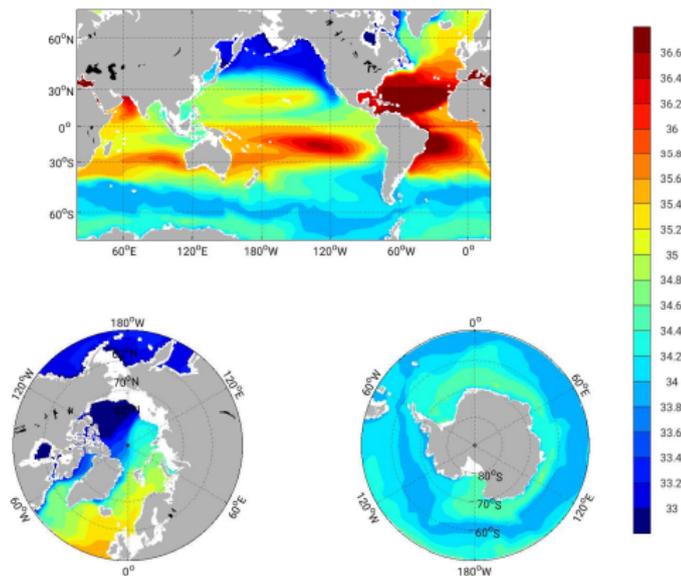


Figure : Salinity (psu) at 105m : 1992 thru 2017 Mean

3D state variables

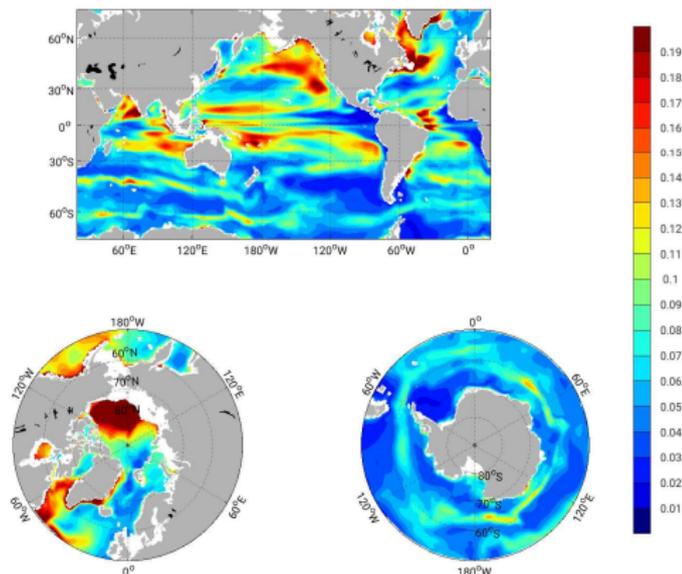


Figure : Salinity (psu) at 105m : Standard Deviation, 1992 thru 2017

3D state variables

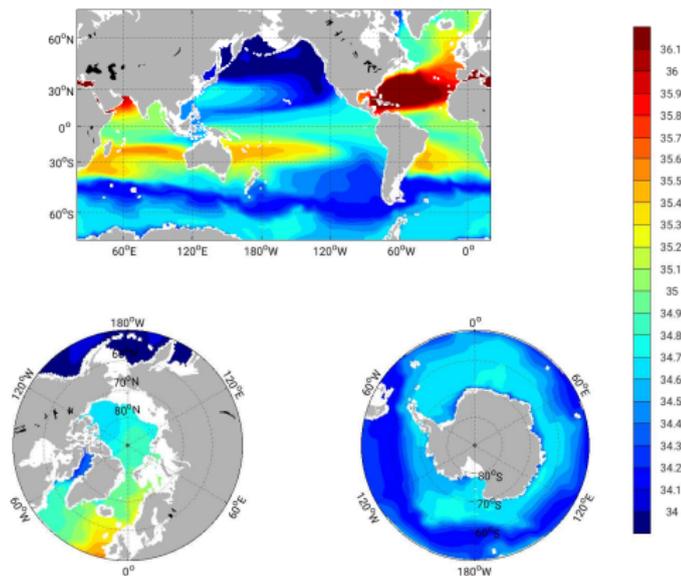


Figure : Salinity (psu) at 300m : 1992 thru 2017 Mean

3D state variables

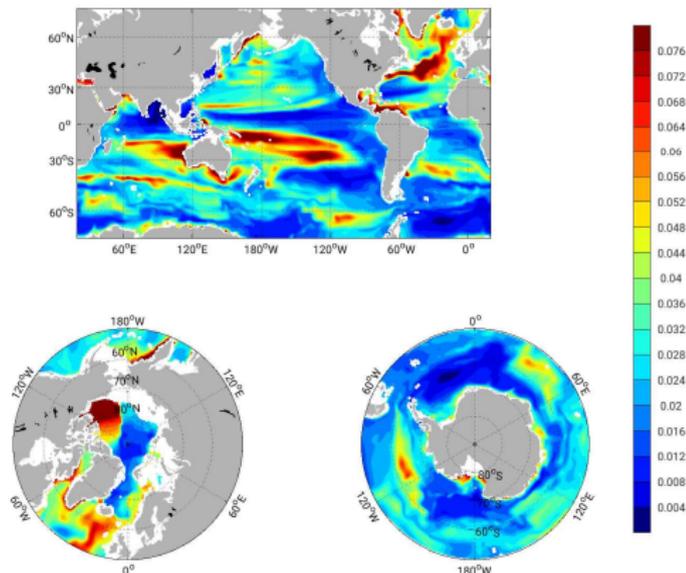


Figure : Salinity (psu) at 300m : Standard Deviation, 1992 thru 2017

3D state variables

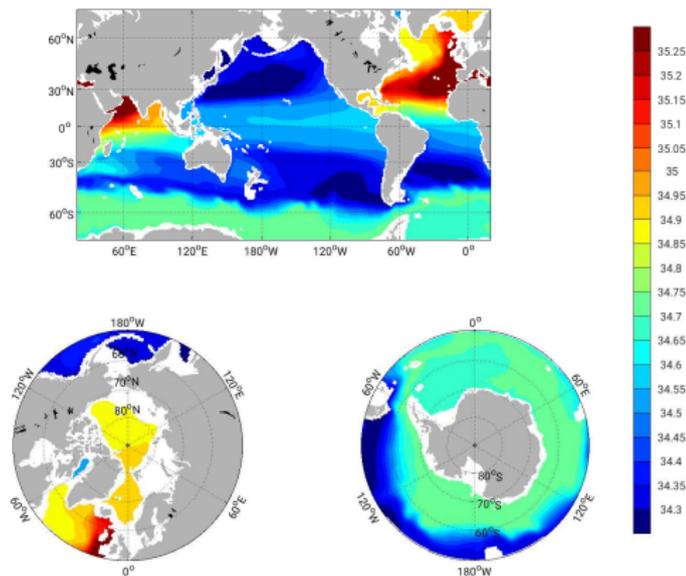


Figure : Salinity (psu) at 910m : 1992 thru 2017 Mean

3D state variables

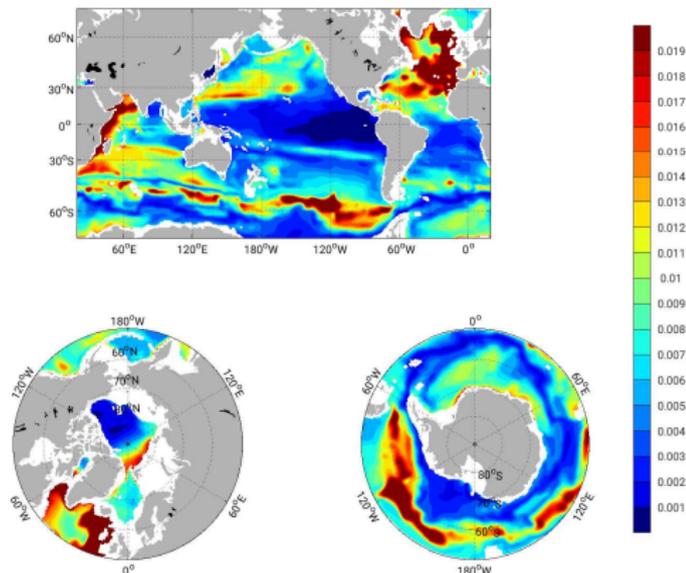


Figure : Salinity (psu) at 910m : Standard Deviation, 1992 thru 2017

3D state variables

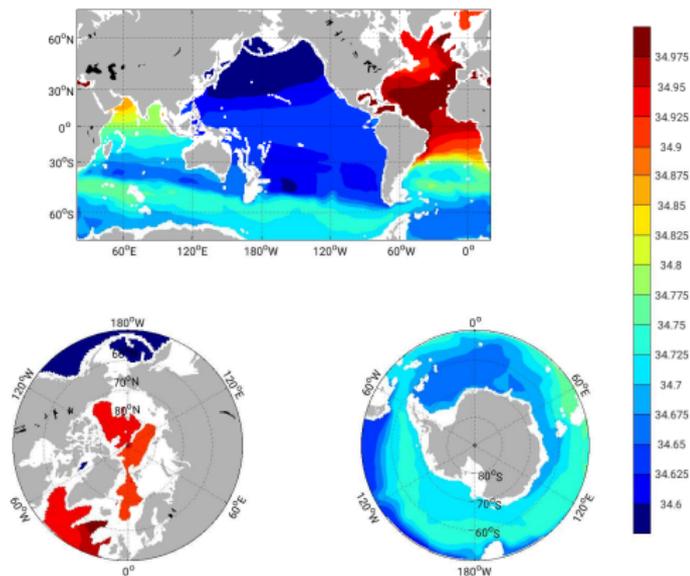


Figure : Salinity (psu) at 1914m : 1992 thru 2017 Mean

3D state variables

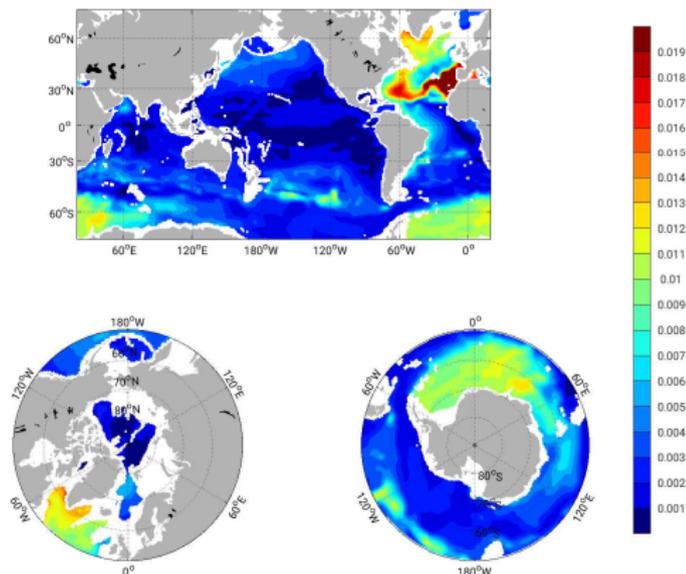


Figure : Salinity (psu) at 1914m : Standard Deviation, 1992 thru 2017

3D state variables

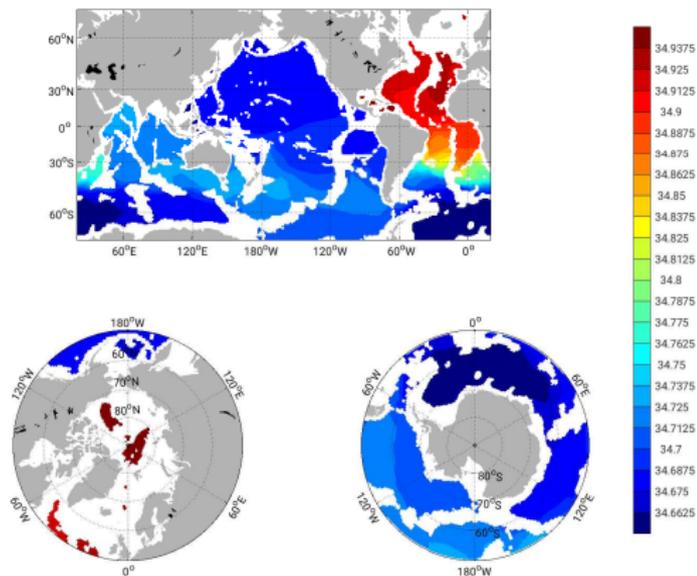


Figure : Salinity (psu) at 3581m : 1992 thru 2017 Mean

3D state variables

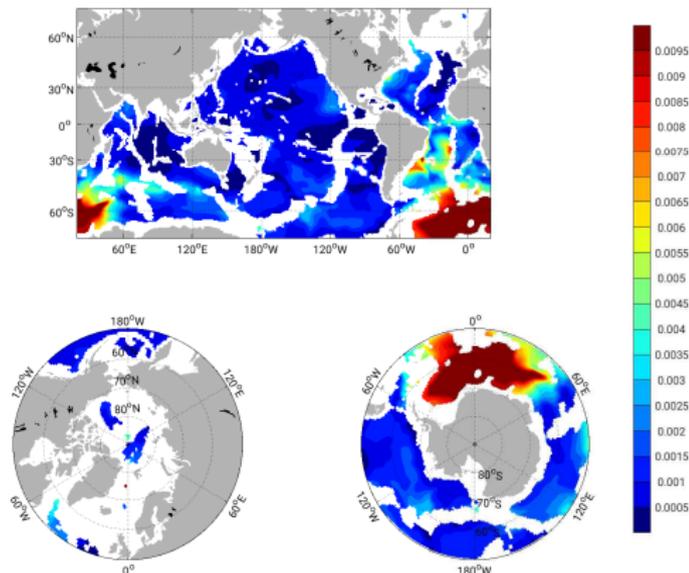


Figure : Salinity (psu) at 3581m : Standard Deviation, 1992 thru 2017

3D state variables

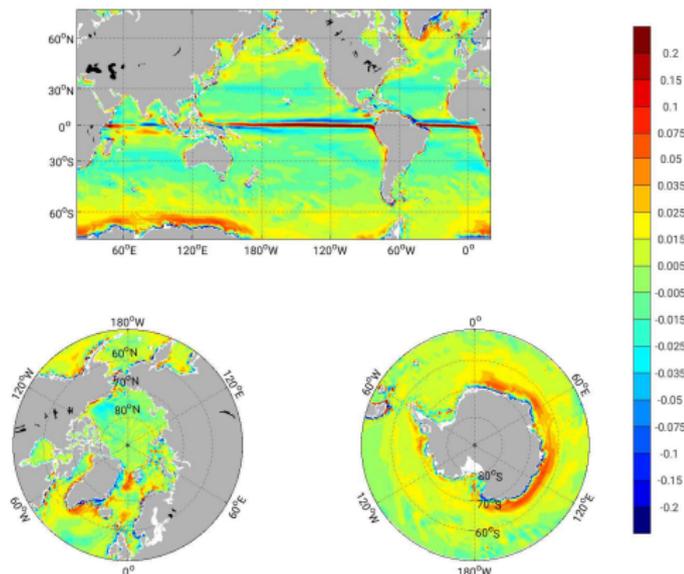


Figure : Vertical Velocity (mm/year) at 15m : 1992 thru 2017
Mean

3D state variables

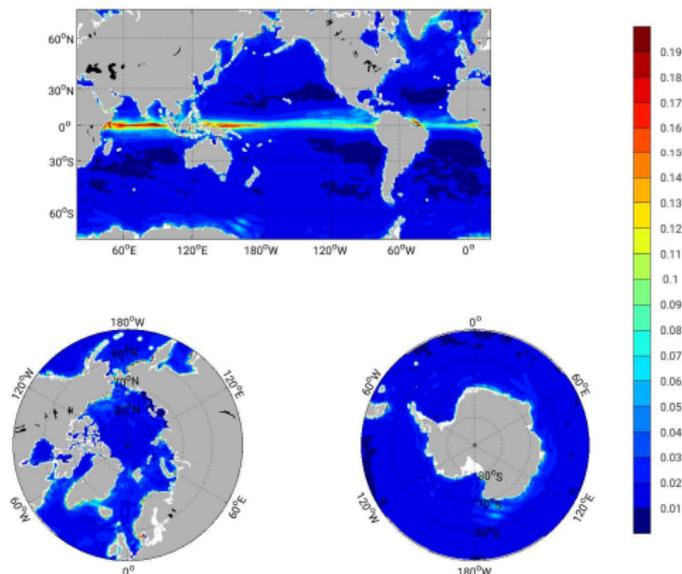


Figure : Vertical Velocity (mm/year) at 15m : Standard Deviation, 1992 thru 2017

3D state variables

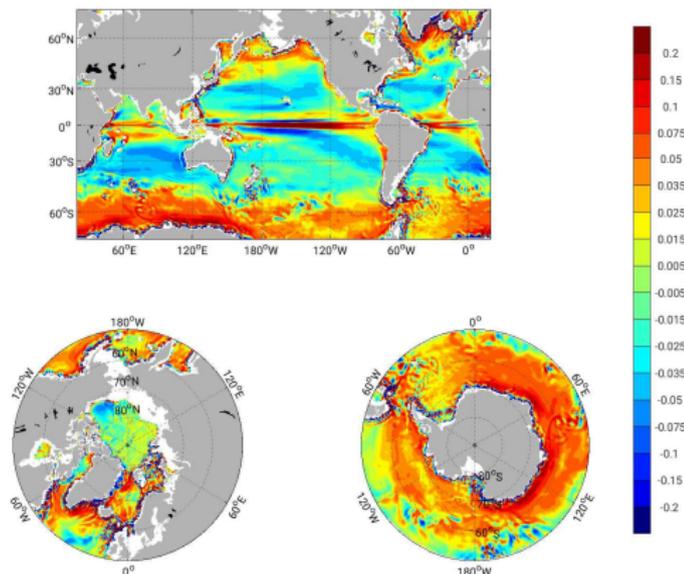


Figure : Vertical Velocity (mm/year) at 105m : 1992 thru 2017
Mean

3D state variables

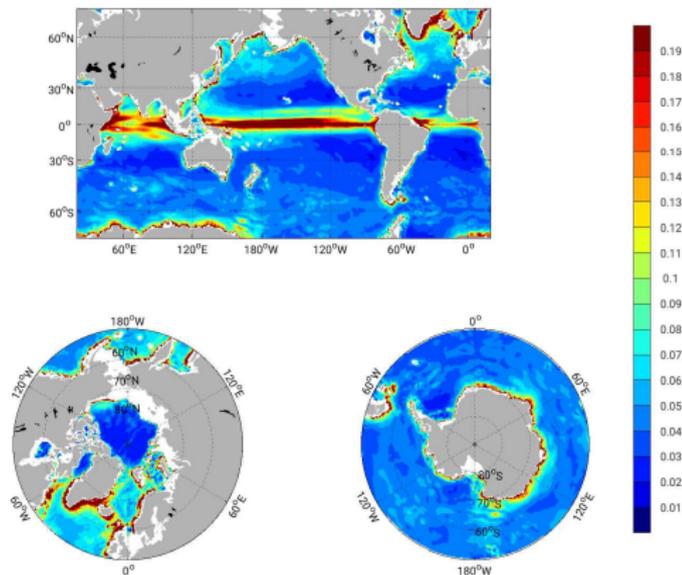


Figure : Vertical Velocity (mm/year) at 105m : Standard Deviation, 1992 thru 2017

3D state variables

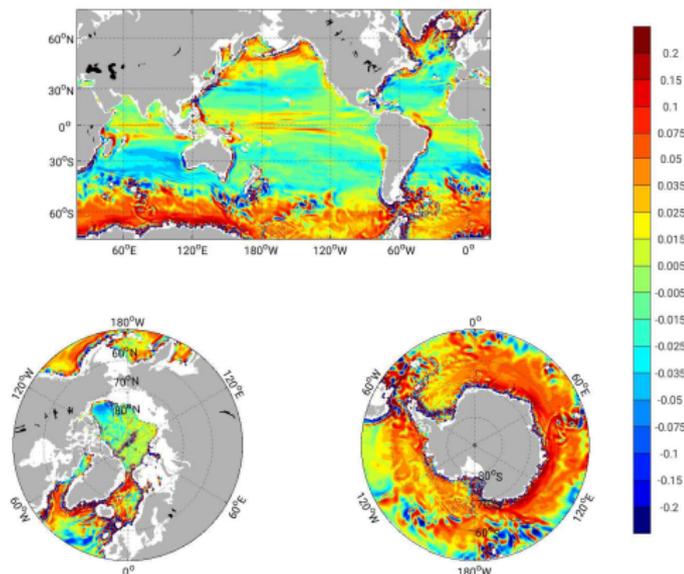


Figure : Vertical Velocity (mm/year) at 300m : 1992 thru 2017
Mean

3D state variables

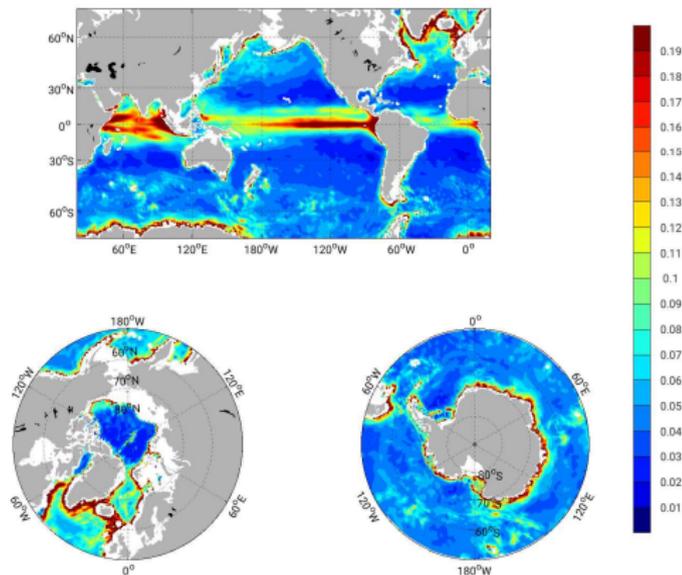


Figure : Vertical Velocity (mm/year) at 300m : Standard Deviation, 1992 thru 2017

3D state variables

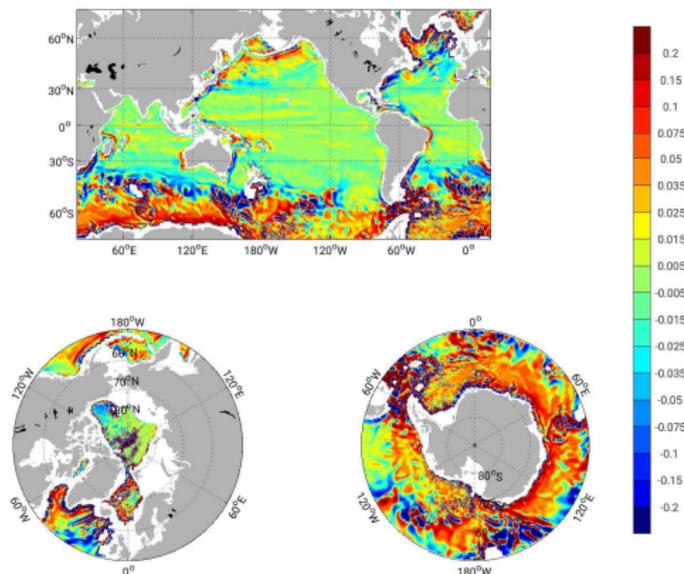


Figure : Vertical Velocity (mm/year) at 910m : 1992 thru 2017
Mean

3D state variables

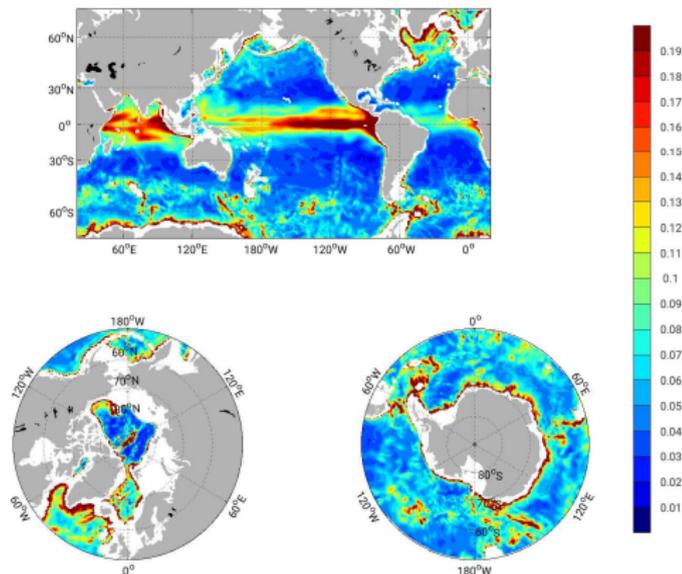


Figure : Vertical Velocity (mm/year) at 910m : Standard Deviation, 1992 thru 2017

3D state variables

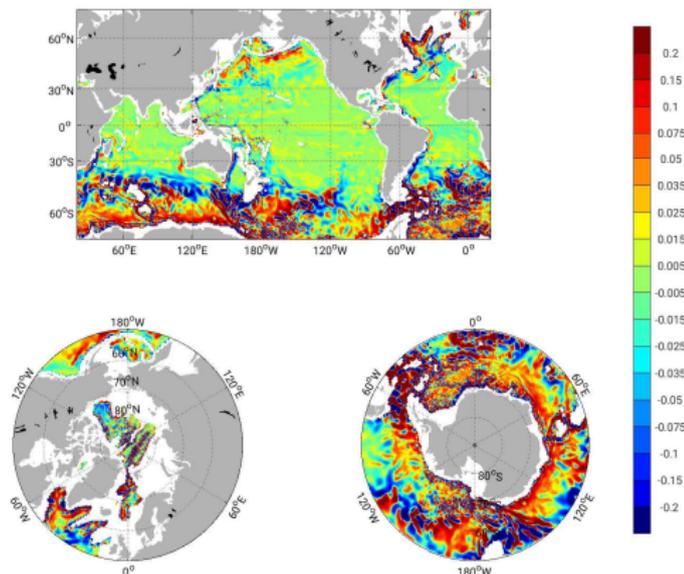


Figure : Vertical Velocity (mm/year) at 1914m : 1992 thru 2017
Mean

3D state variables

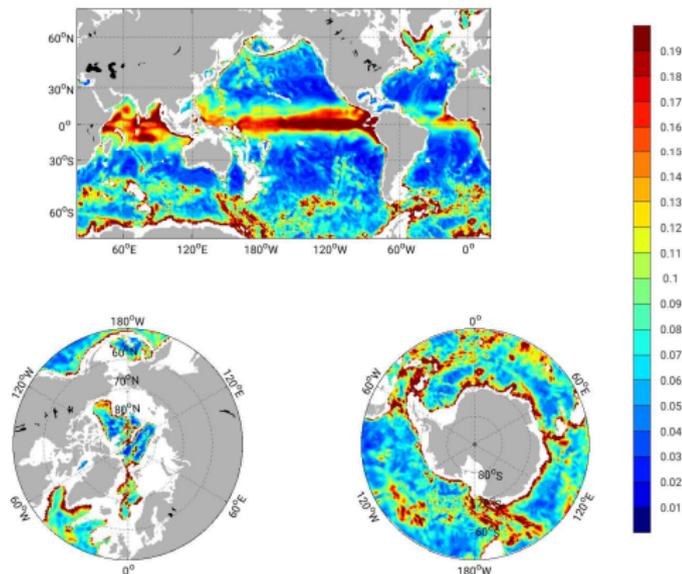


Figure : Vertical Velocity (mm/year) at 1914m : Standard Deviation, 1992 thru 2017

3D state variables

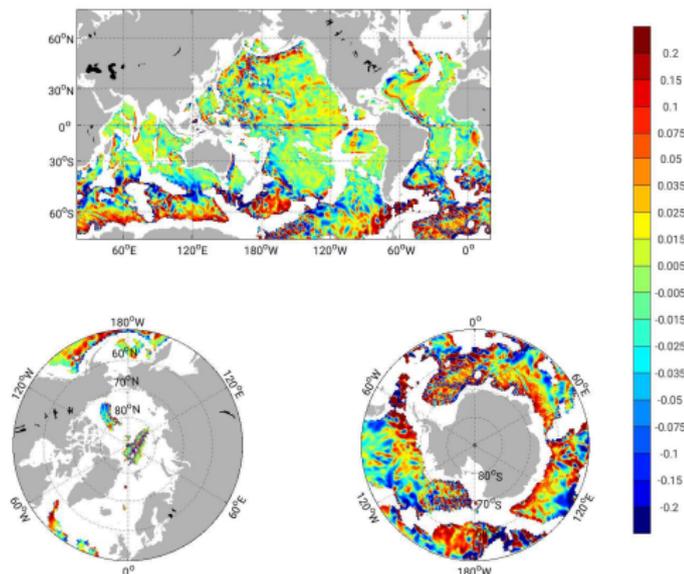


Figure : Vertical Velocity (mm/year) at 3581m : 1992 thru 2017
Mean

3D state variables

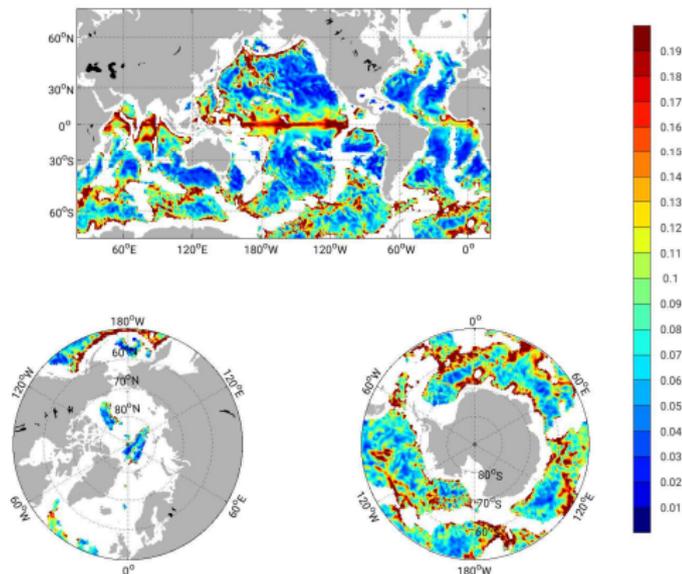


Figure : Vertical Velocity (mm/year) at 3581m : Standard Deviation, 1992 thru 2017

air-sea heat flux

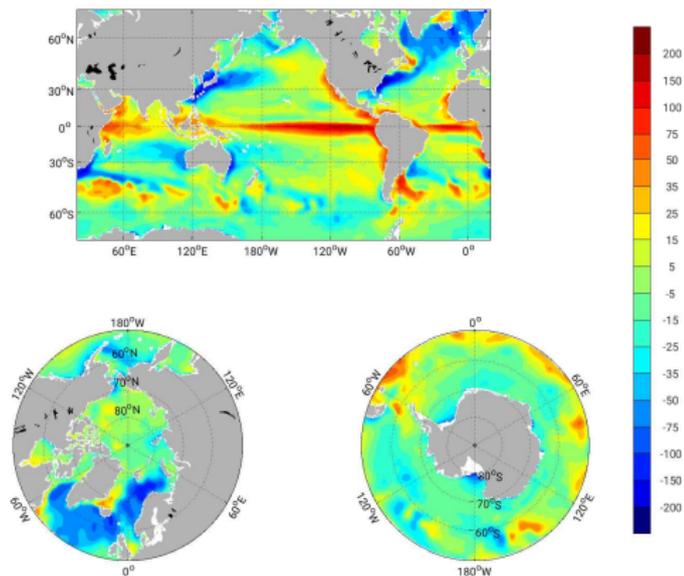


Figure : QNET to ocean+ice (W/m^2): 1992 thru 2017 Mean

air-sea heat flux

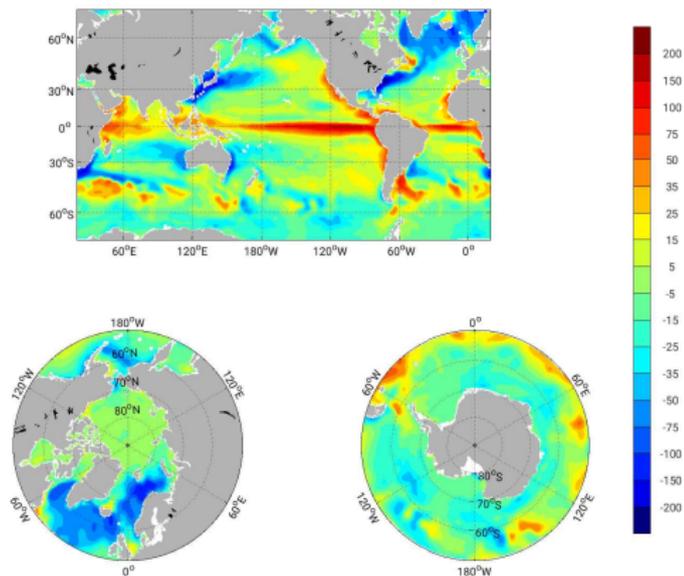


Figure : QNET to ocean (W/m^2): 1992 thru 2017 Mean

air-sea heat flux

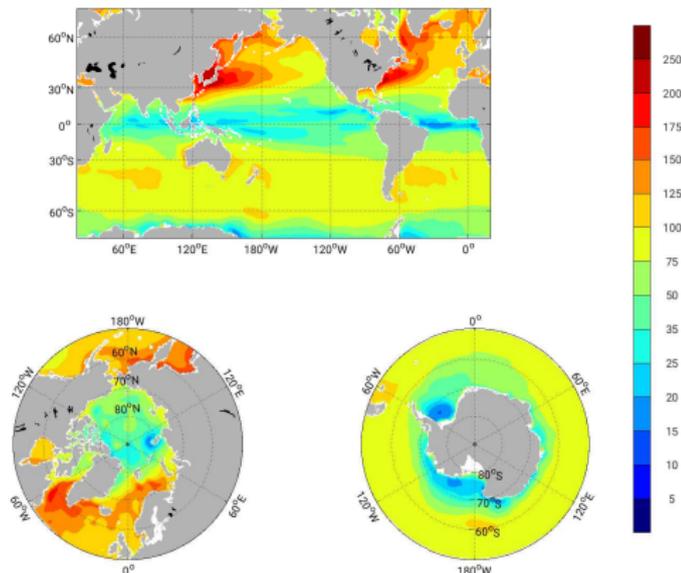


Figure : QNET to ocean+ice (W/m^2): Standard Deviation, 1992 thru 2017

air-sea heat flux

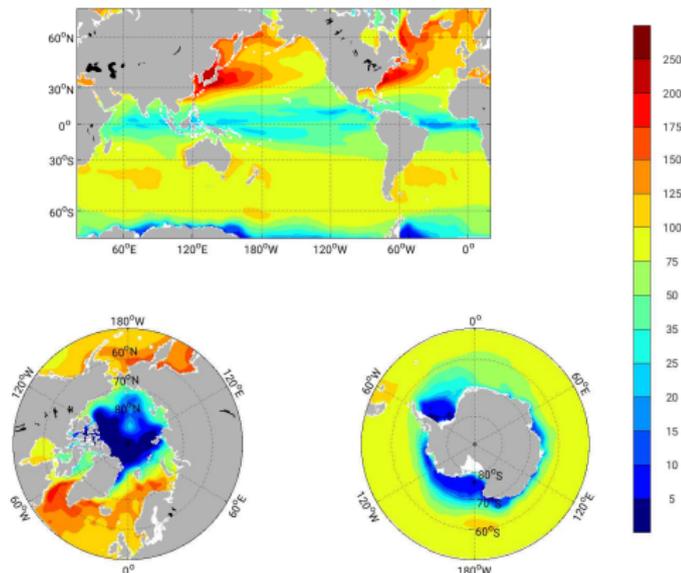


Figure : QNET to ocean (W/m^2): Standard Deviation, 1992 thru 2017

air-sea freshwater flux

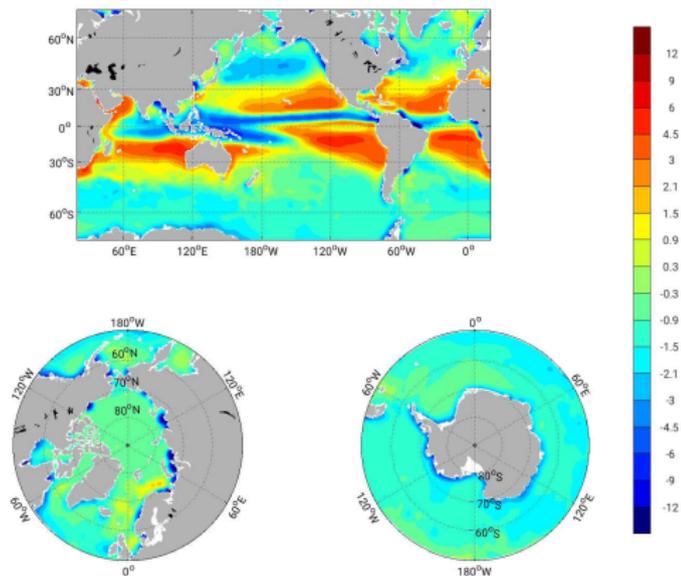


Figure : E-P-R from ocean+ice (mm/day): 1992 thru 2017 Mean

air-sea freshwater flux

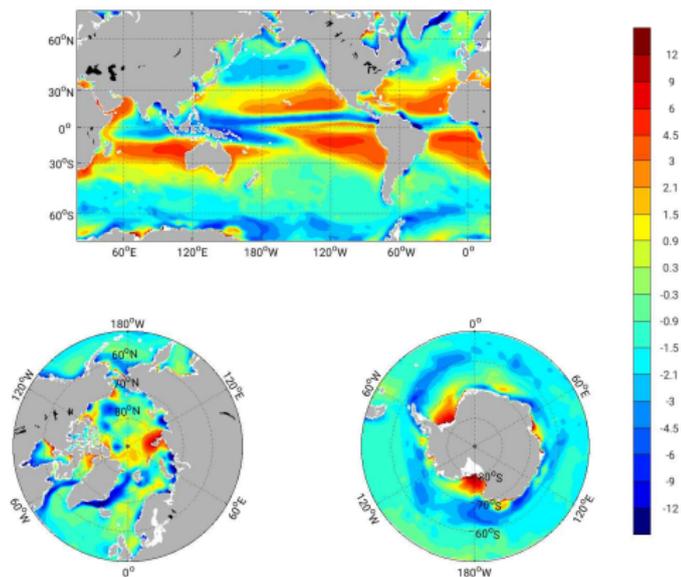


Figure : E-P-R from ocean (mm/day): 1992 thru 2017 Mean

air-sea freshwater flux

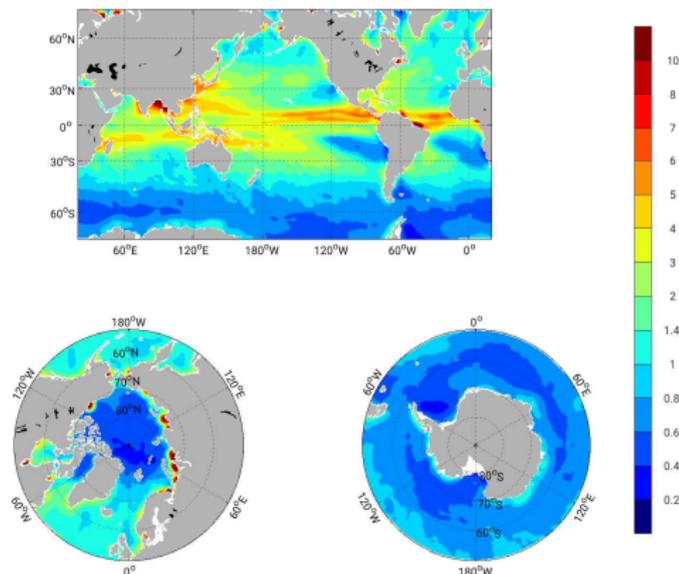


Figure : E-P-R to ocean+ice (mm/day): Standard Deviation, 1992 thru 2017

air-sea freshwater flux

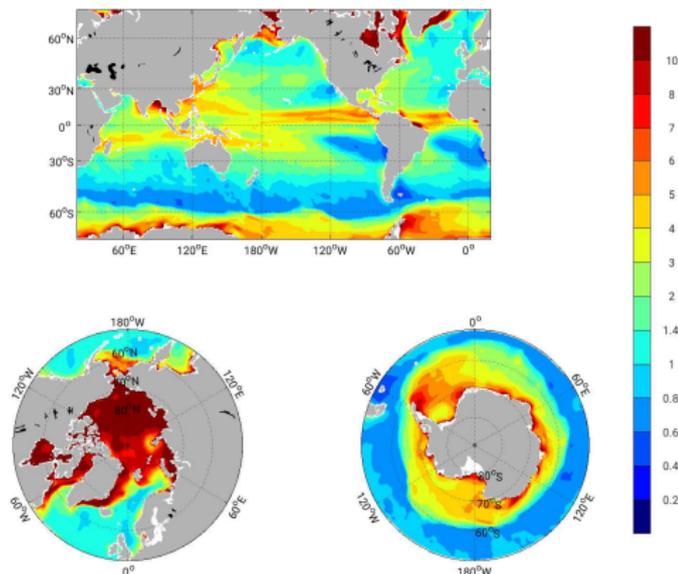


Figure : E-P-R to ocean (mm/day): Standard Deviation, 1992 thru 2017

surface wind stress

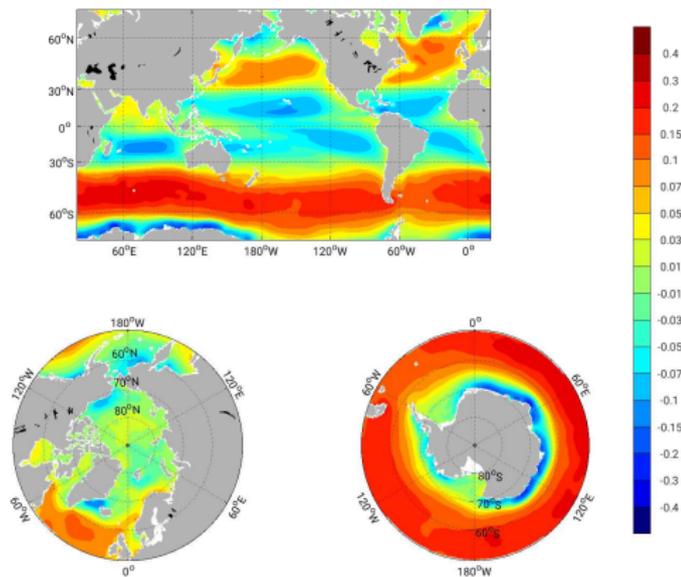


Figure : Zonal Wind Stress (N/m²): 1992 thru 2017 Mean

surface wind stress

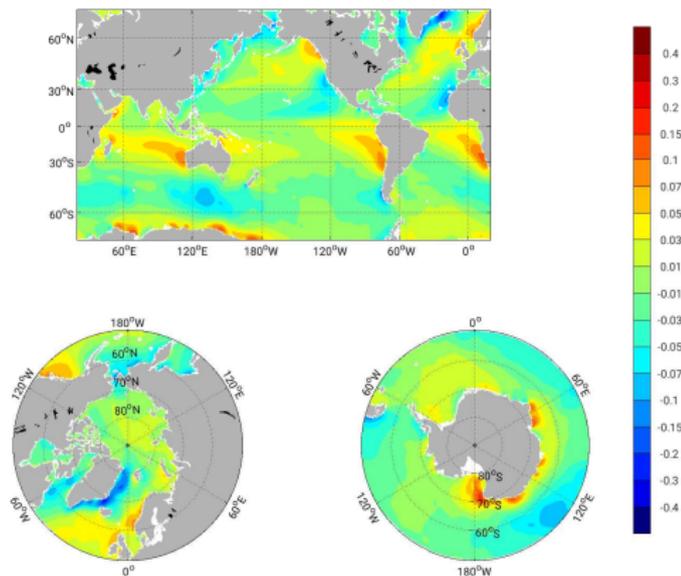


Figure : Meridional Wind Stress (N/m²): 1992 thru 2017 Mean

surface wind stress

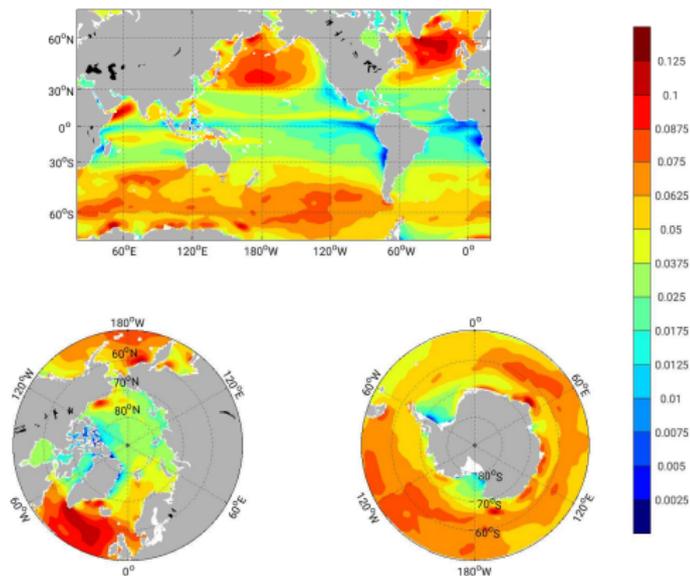


Figure : τ_Z (N/m^2): Standard Deviation, 1992 thru 2017

surface wind stress

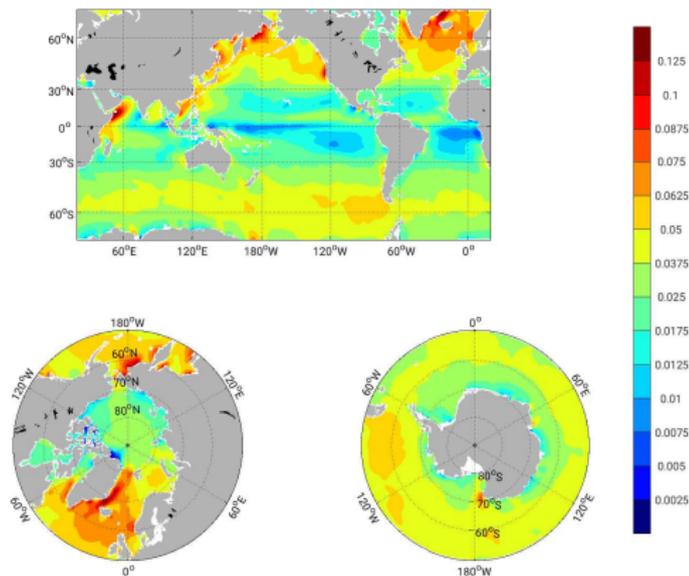


Figure : τ_M (N/m^2): Standard Deviation, 1992 thru 2017

zonal mean tendencies

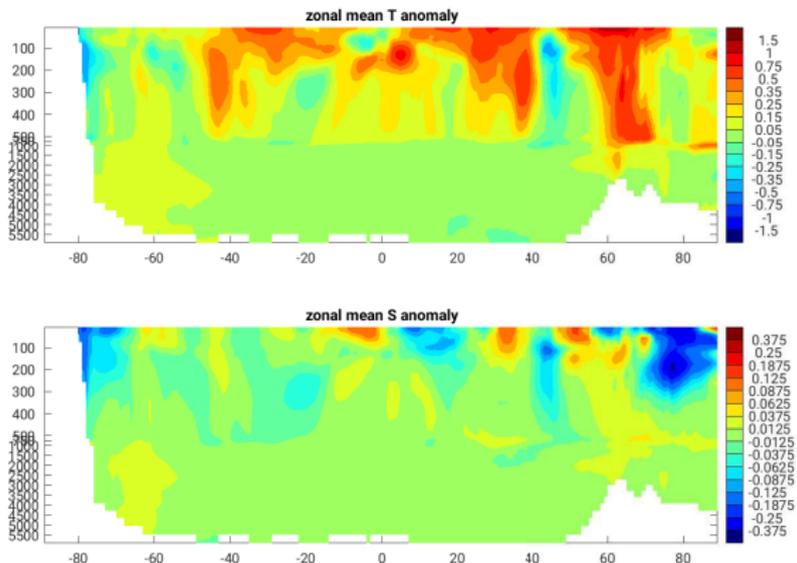


Figure : Last Year (2017) Minus First Year (1992) – Zonal Mean Temperature (C; top) and Salinity (psu; bottom)

equatorial sections

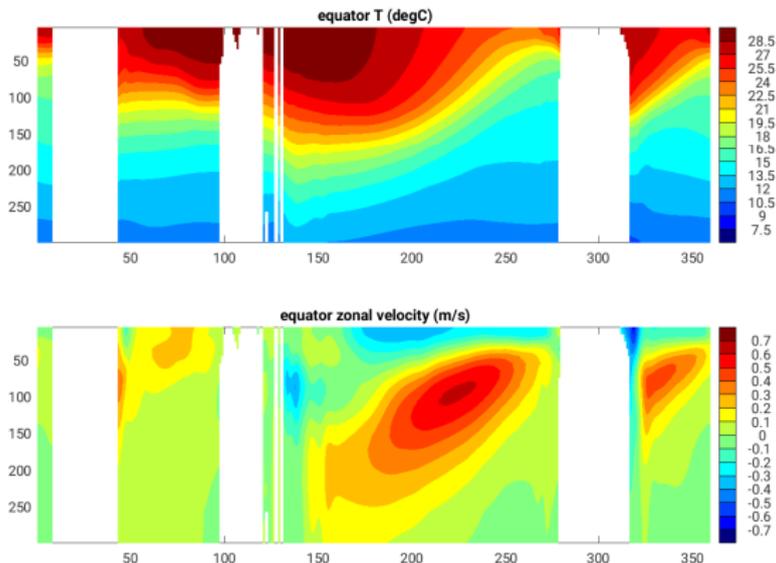


Figure : Equator Temperature (C;top) and Zonal Velocity (m/s;bottom): 1992 thru 2017 Mean

global mean properties

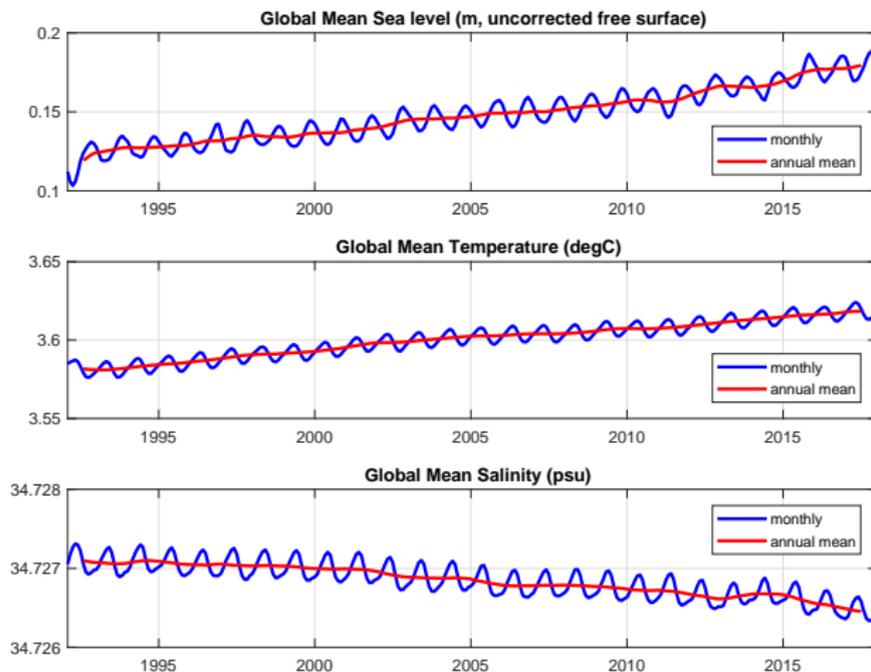


Figure : Global Mean T (C; top) and S (psu; bottom)

global mean properties

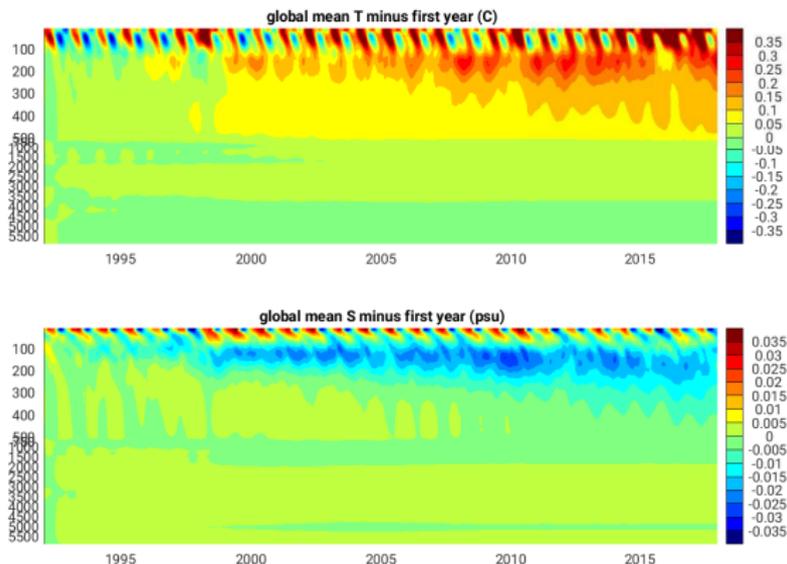


Figure : Global Mean Temperature (C; top) and Salinity (psu; bottom) Minus First Year

zonal mean properties

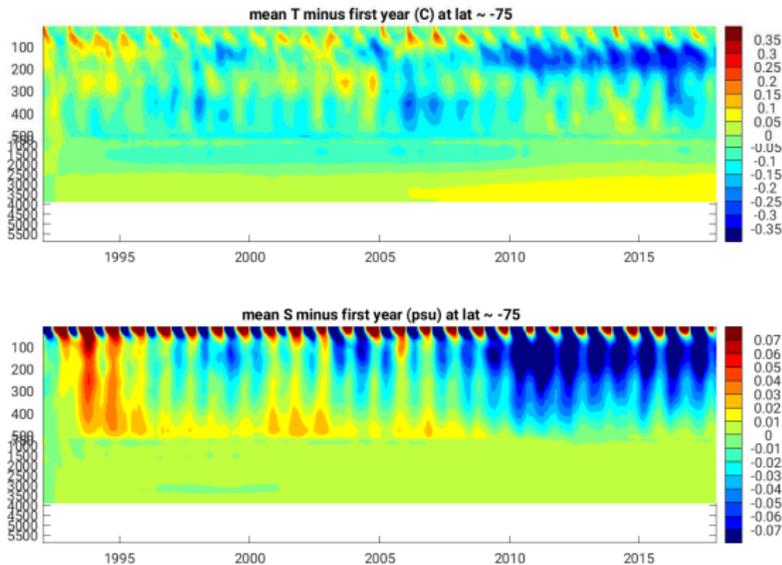


Figure : Mean Temperature (C; top) and Salinity (psu; bottom) Minus First Year at lat ≈ -75

zonal mean properties

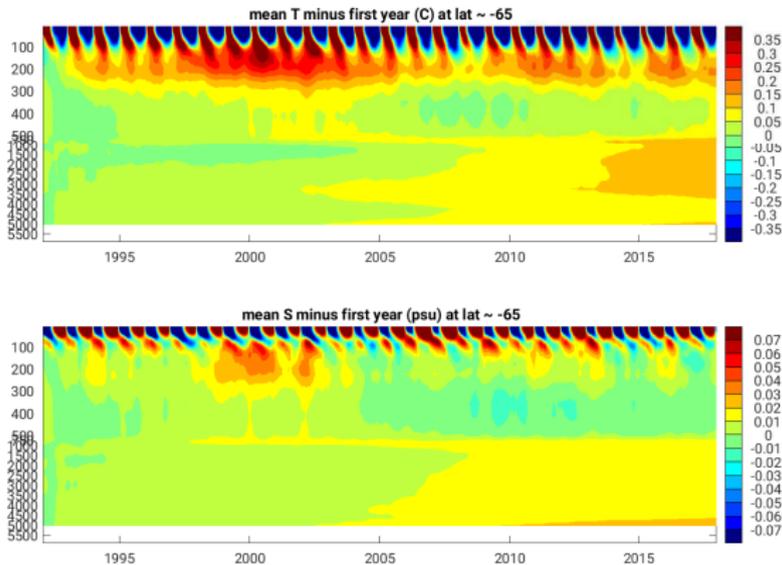


Figure : Mean Temperature (C; top) and Salinity (psu; bottom) Minus First Year at lat \approx -65

zonal mean properties

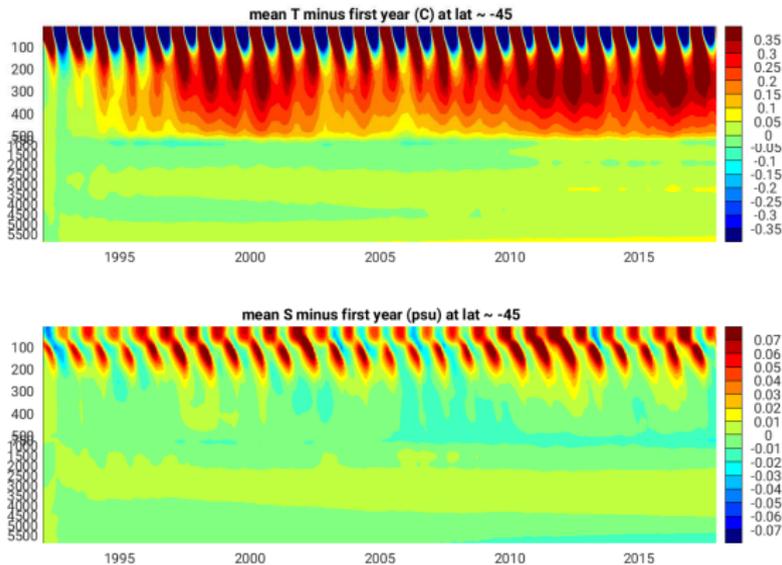


Figure : Mean Temperature (C; top) and Salinity (psu; bottom) Minus First Year at lat ≈ -45

zonal mean properties

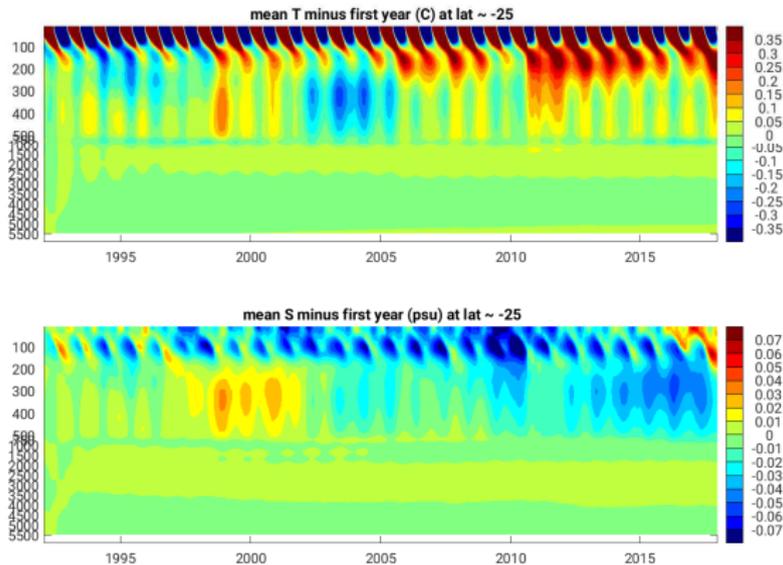


Figure : Mean Temperature (C; top) and Salinity (psu; bottom) Minus First Year at lat \approx -25

zonal mean properties

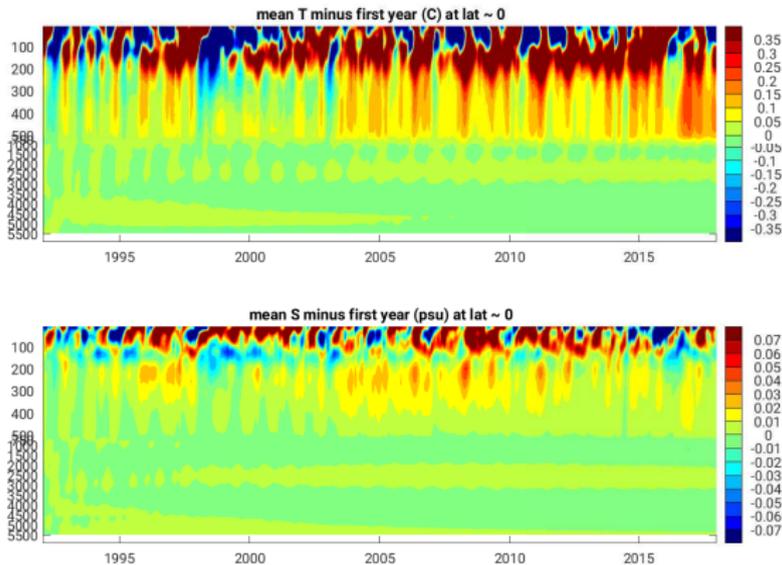


Figure : Mean Temperature (C; top) and Salinity (psu; bottom) Minus First Year at lat ≈ 0

zonal mean properties

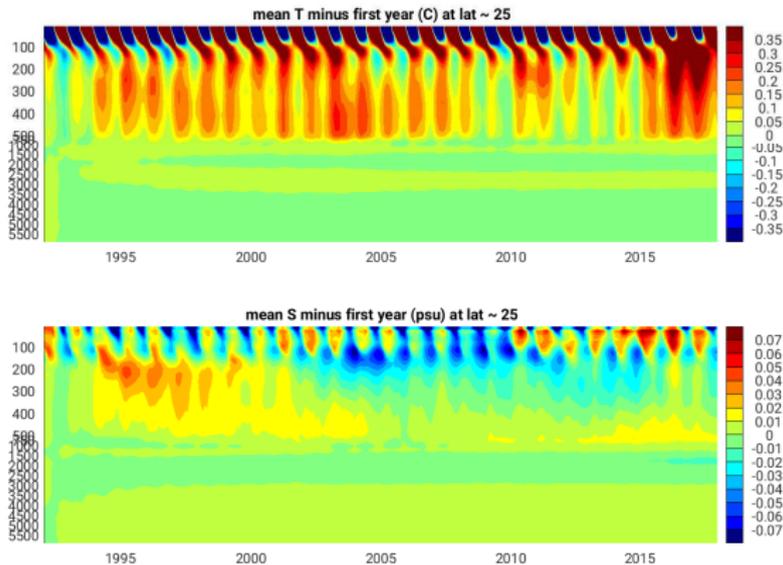


Figure : Mean Temperature (C; top) and Salinity (psu; bottom) Minus First Year at lat ≈ 25

zonal mean properties

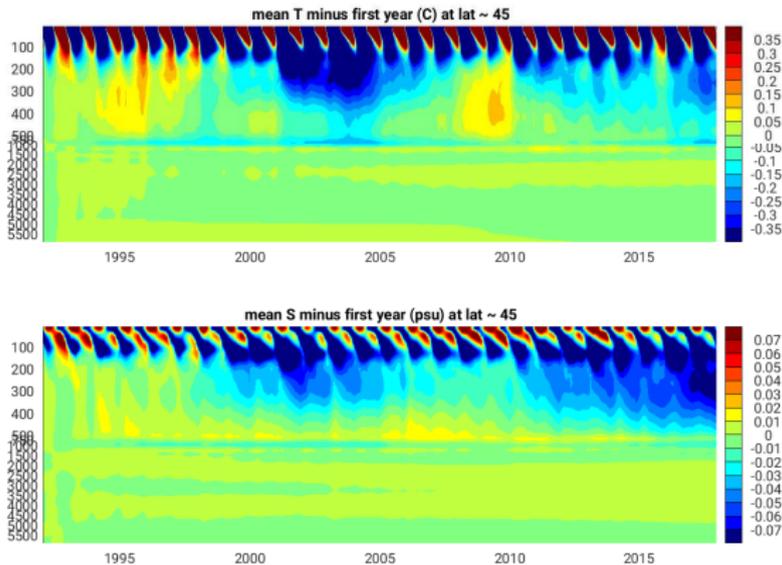


Figure : Mean Temperature (C; top) and Salinity (psu; bottom) Minus First Year at lat ≈ 45

zonal mean properties

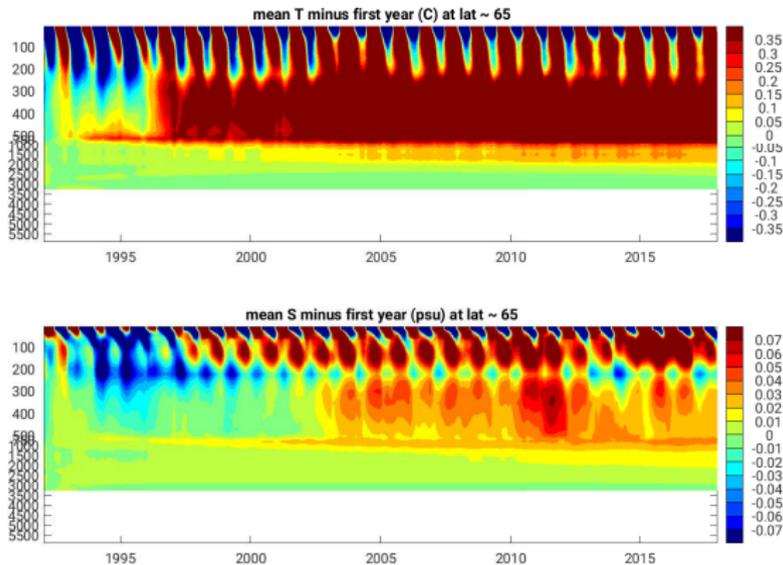


Figure : Mean Temperature (C; top) and Salinity (psu; bottom) Minus First Year at lat ≈ 65

zonal mean properties

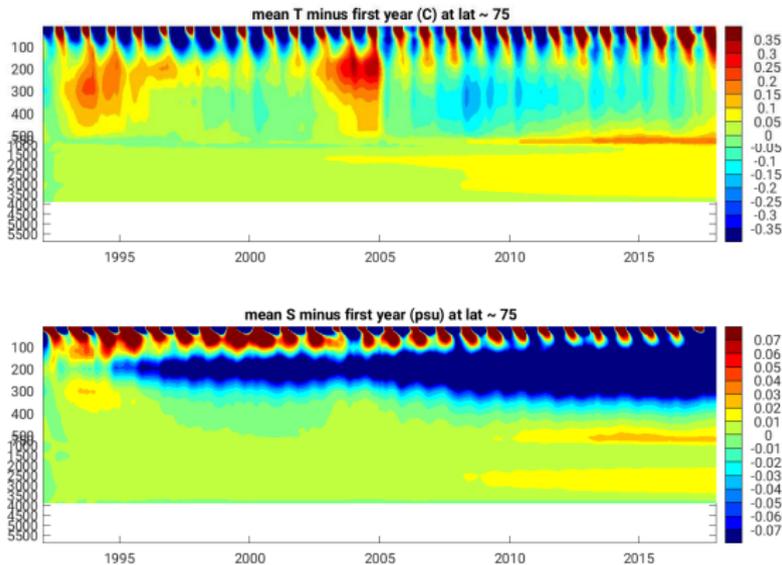


Figure : Mean Temperature (C; top) and Salinity (psu; bottom) Minus First Year at lat ≈ 75

zonal mean properties (surface)

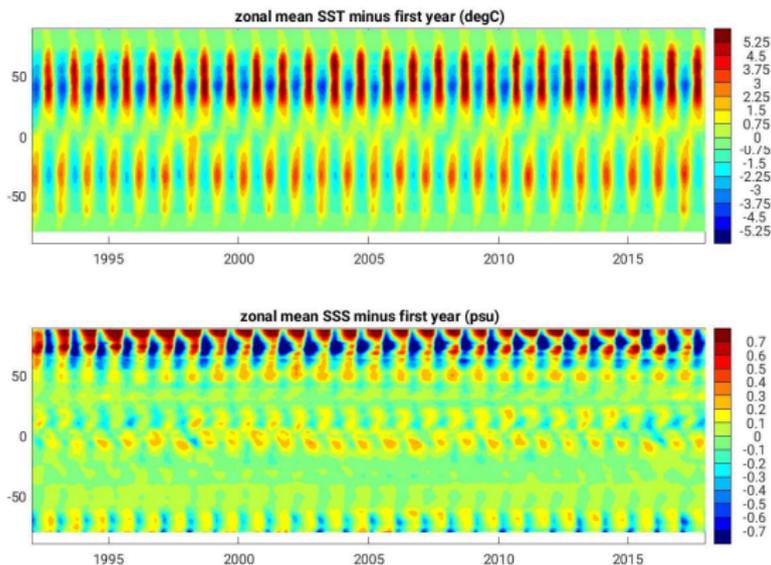


Figure : Zonal Mean Temperature (C; top) and Salinity (psu; bottom) minus first year (psu) at 5m depth

zonal mean properties (surface)

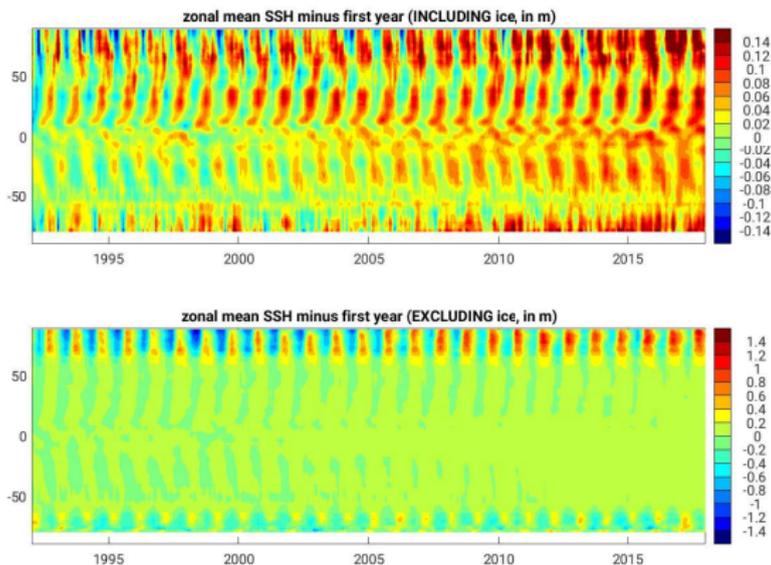


Figure : Zonal Mean SSH (m, uncorrected free surface) Minus First Year, Including Ice (top) and Below Ice (bottom)

zonal mean properties (surface)

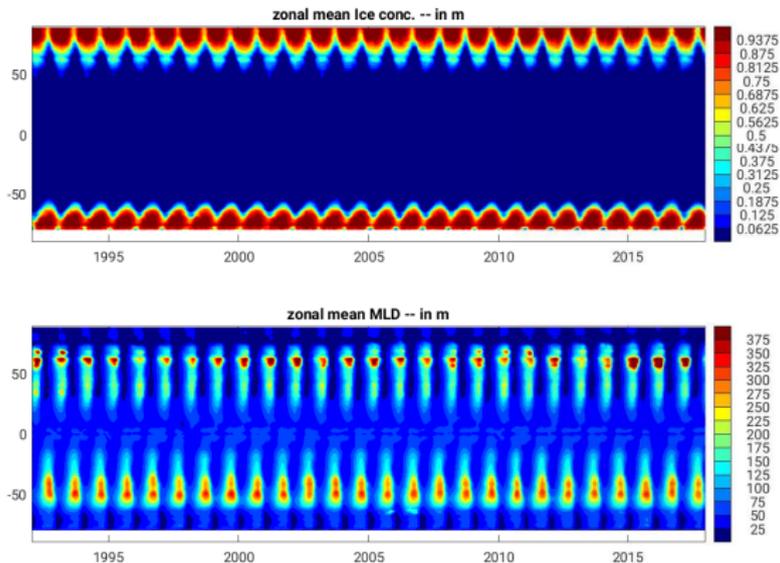


Figure : Zonal Mean Ice Concentration (no units) and Mixed Layer Depth (m)

seaice time series

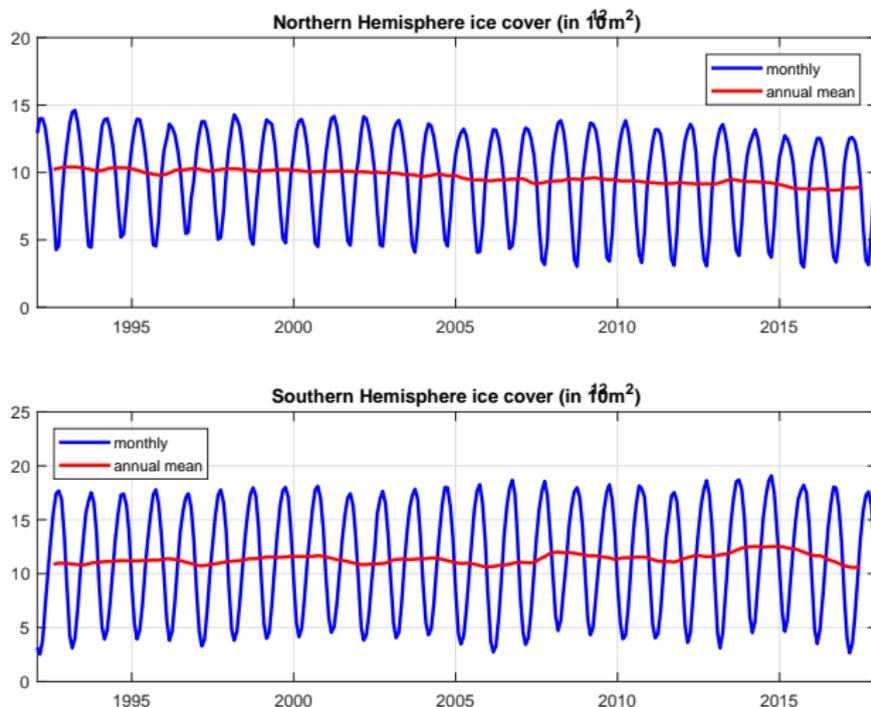


Figure : Sea Ice Cover (in $10^{12}m^2$) in Northern (top) and Southern (bottom) Hemisphere

seaice time series

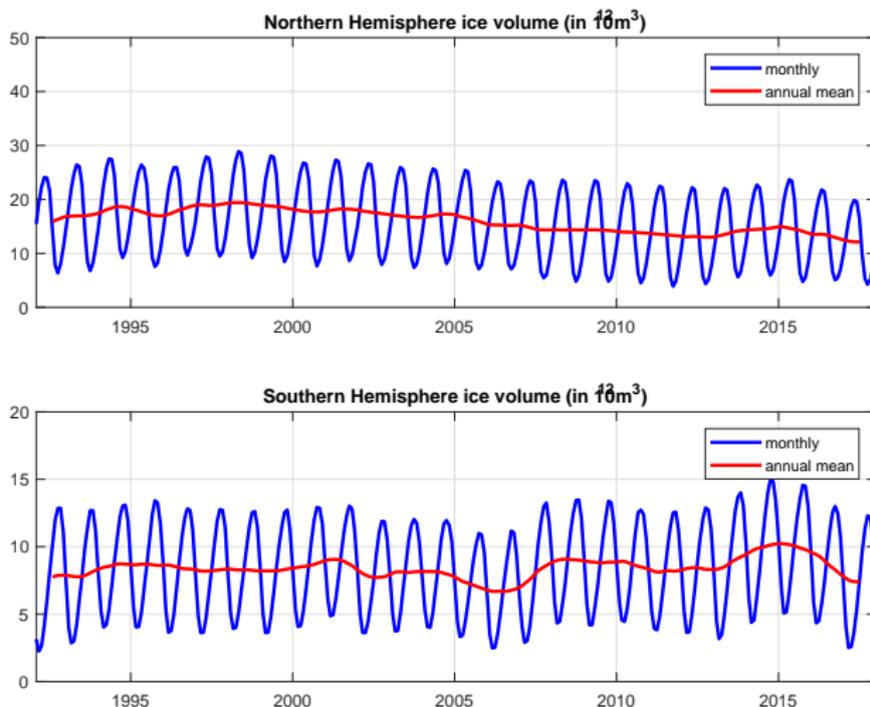


Figure : Sea Ice Volume (in $10^{12}m^3$) in Northern (top) and Southern (bottom) Hemisphere

seaice time series

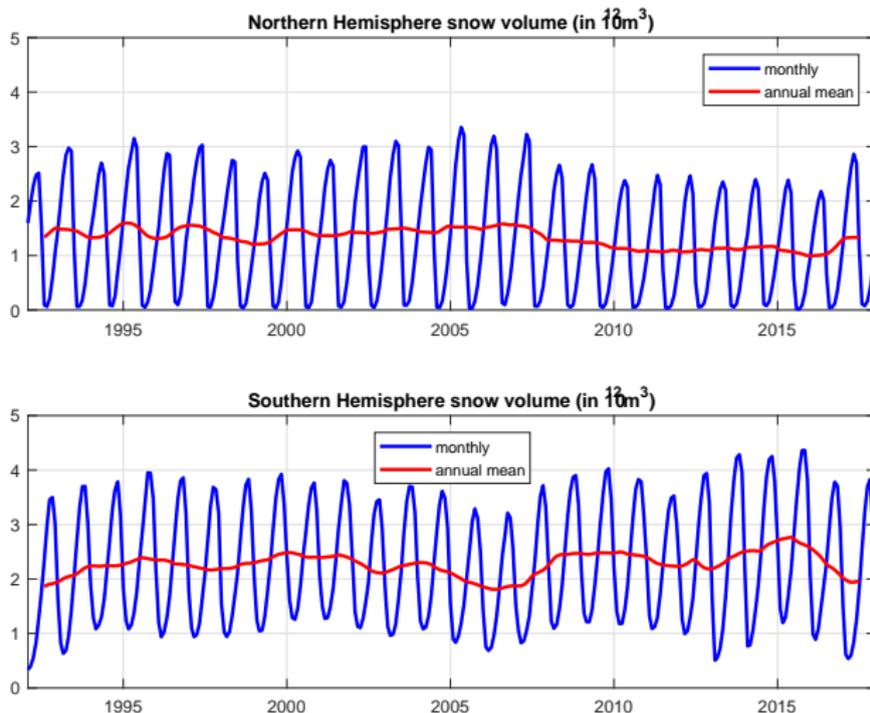


Figure : Snow Volume (in $10^{12} m^3$) in Northern (top) and Southern (bottom) Hemisphere

seaice time series

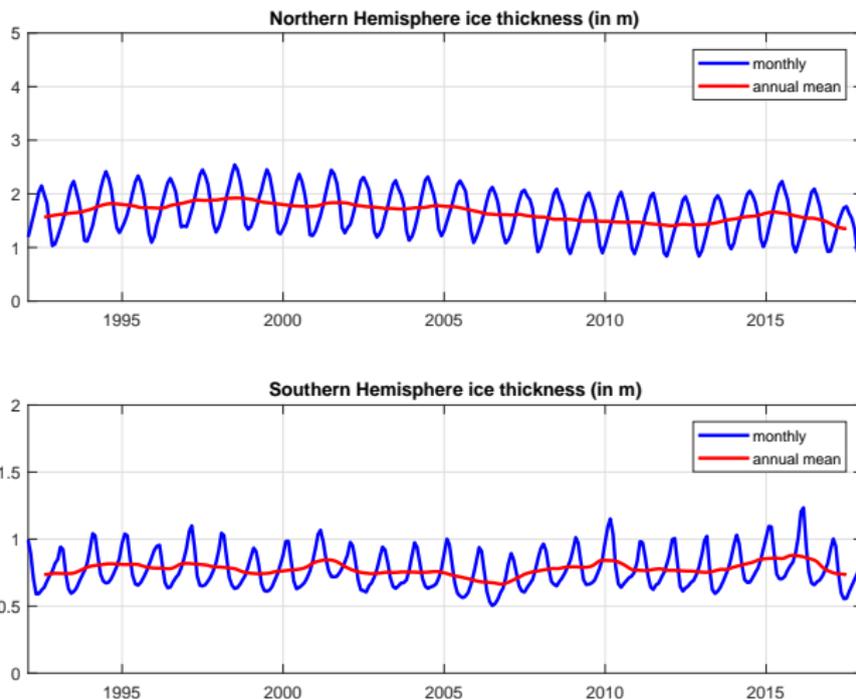


Figure : Sea Ice Thickness (in m) in Northern (top) and Southern (bottom) Hemisphere

seaice time series

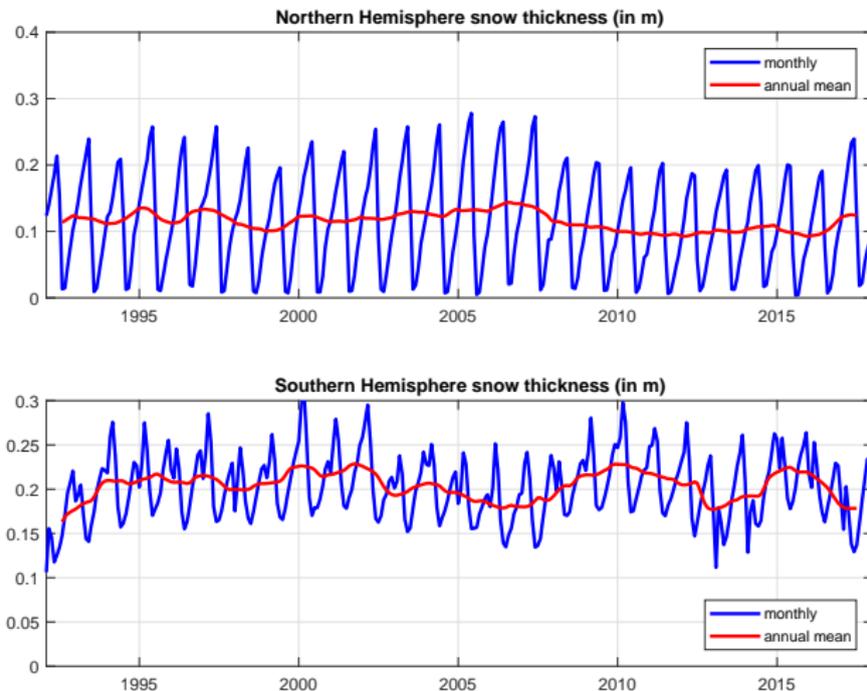


Figure : Snow Thickness (in m) in Northern (top) and Southern (bottom) Hemisphere

budgets : volume, heat and salt (top to bottom)

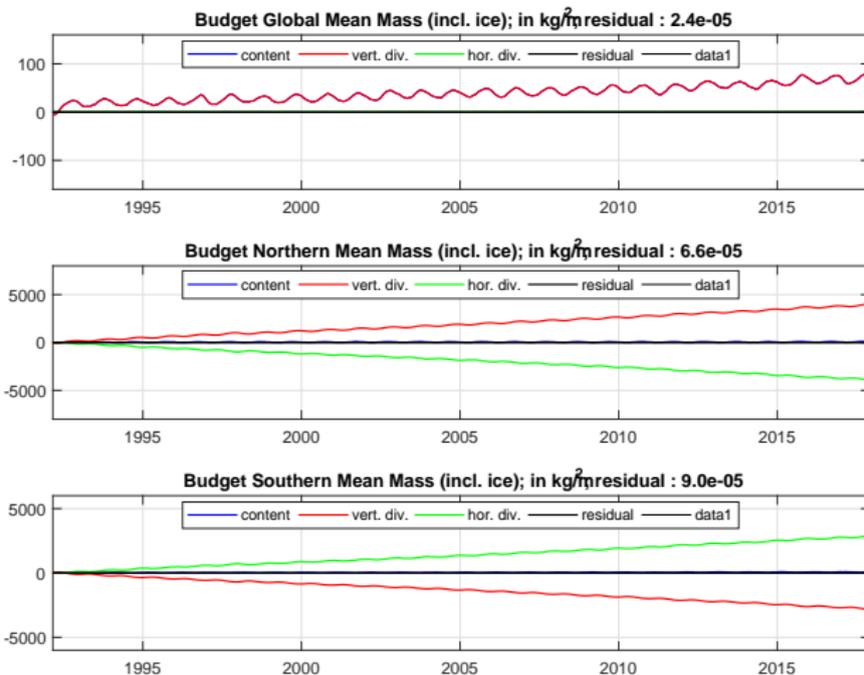


Figure : Global (upper), North (mid) and South (lower) Mass Budget (ocean+ice) in kg/m^2

budgets : volume, heat and salt (top to bottom)

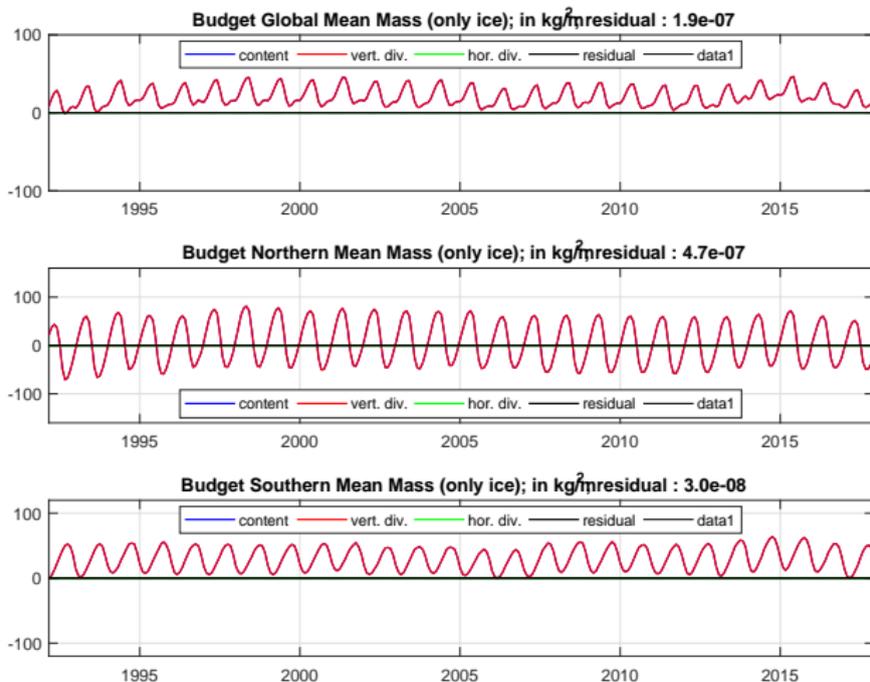


Figure : Global (upper), North (mid) and South (lower) Mass Budget (ice only) in kg/m^2

budgets : volume, heat and salt (top to bottom)

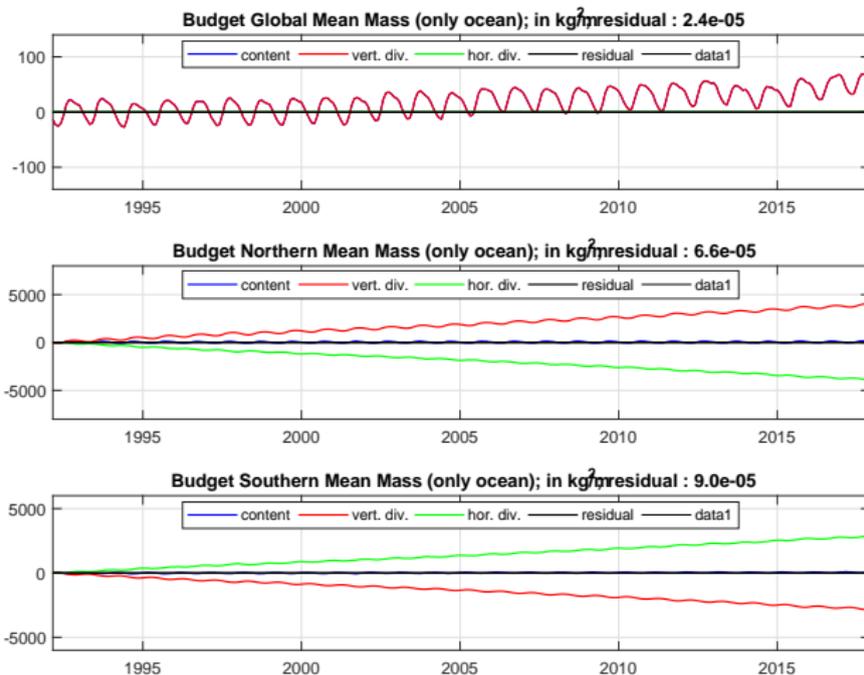


Figure : Global (upper), North (mid) and South (lower) Mass Budget (ocean only) in kg/m^2

budgets : volume. heat and salt (top to bottom)

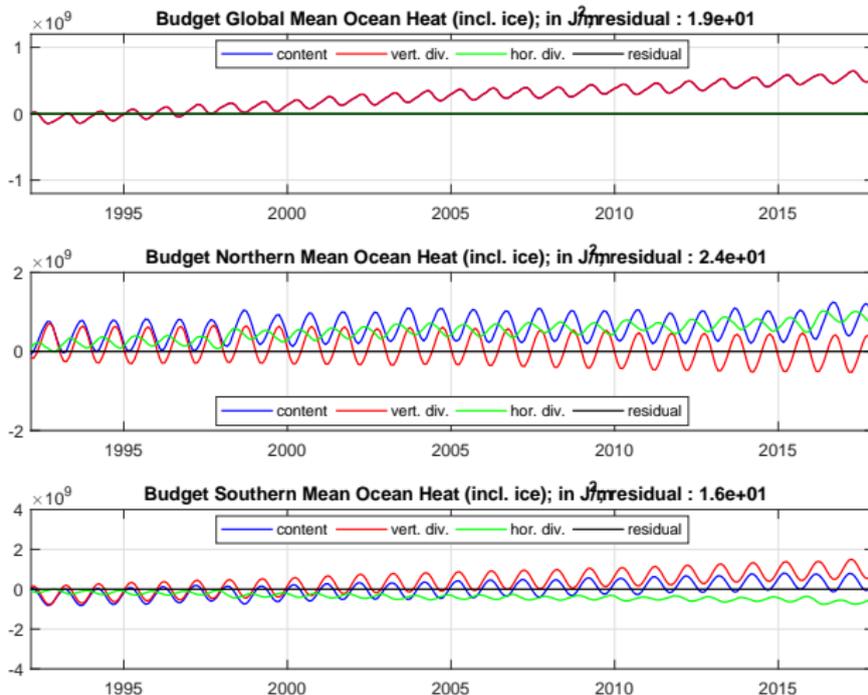


Figure : Global (upper), North (mid) and South (lower) Heat Budget (ocean+ice) in J/m^2

budgets : volume. heat and salt (top to bottom)

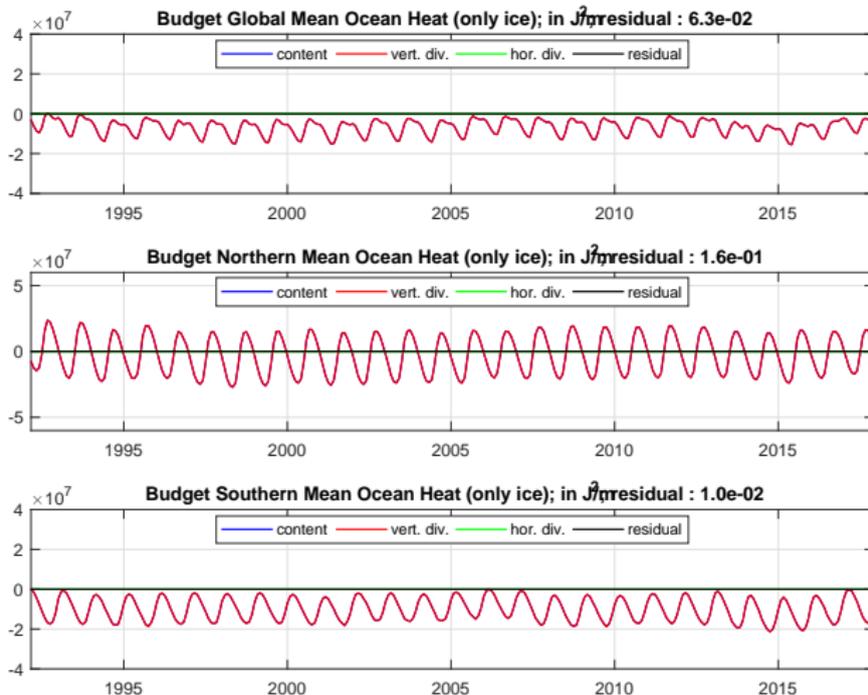


Figure : Global (upper), North (mid) and South (lower) Heat Budget (ice only) in J/m^2

budgets : volume. heat and salt (top to bottom)

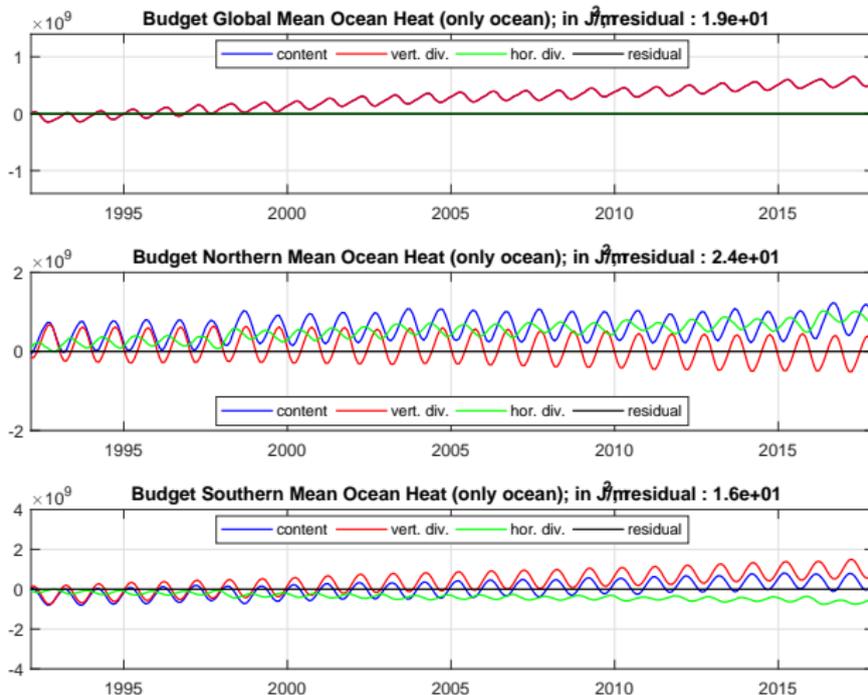


Figure : Global (upper), North (mid) and South (lower) Heat Budget (ocean only) in J/m^2

budgets : volume, heat and salt (top to bottom)

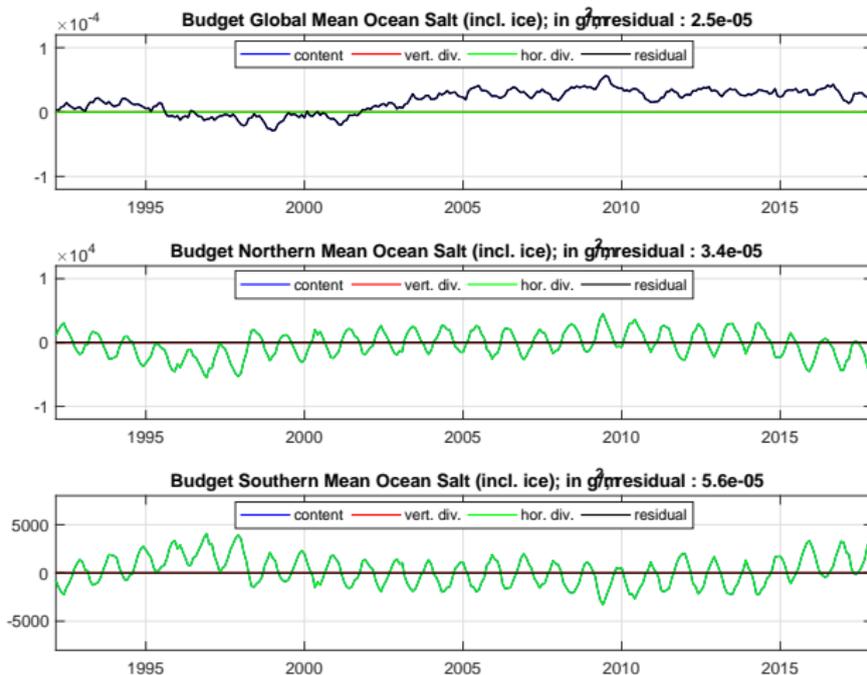


Figure : Global (upper), North (mid) and South (lower) Salt Budget (ocean+ice) in g/m^2

budgets : volume, heat and salt (top to bottom)

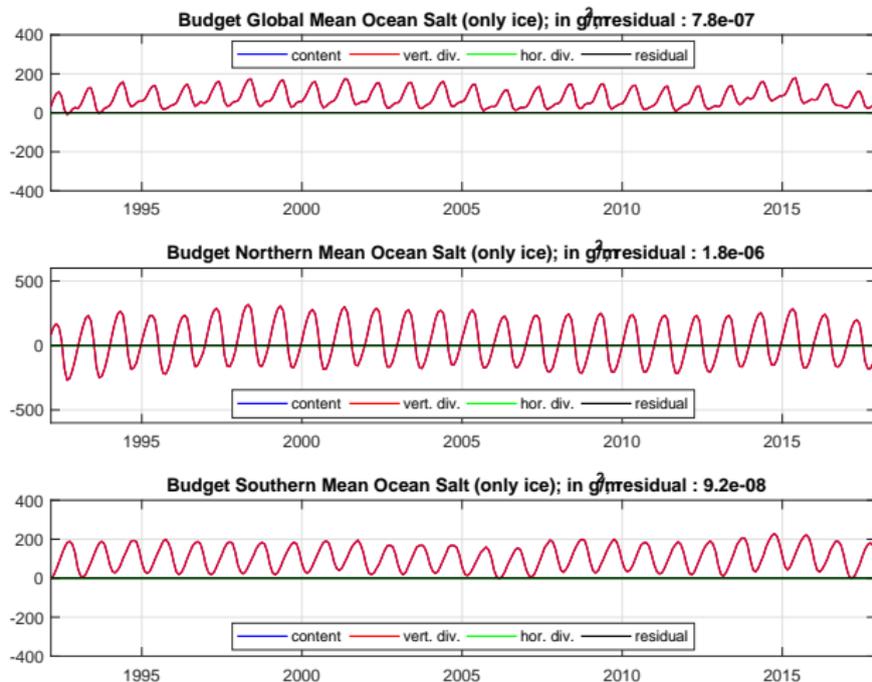


Figure : Global (upper), North (mid) and South (lower) Salt Budget (ice only) in g/m^2

budgets : volume, heat and salt (top to bottom)

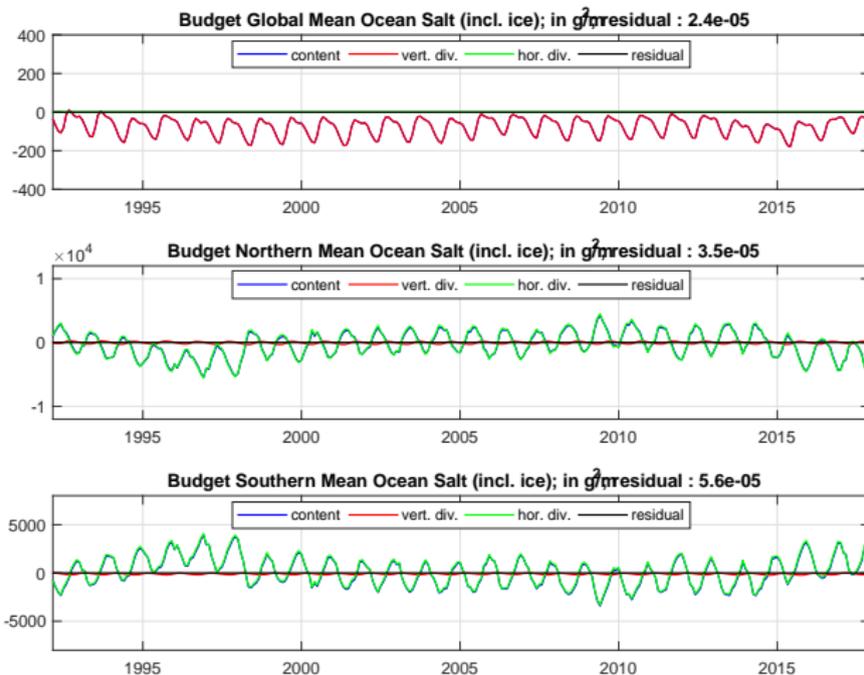


Figure : Global (upper), North (mid) and South (lower) Salt Budget (ocean only) in g/m^2

mixed layer depth fields

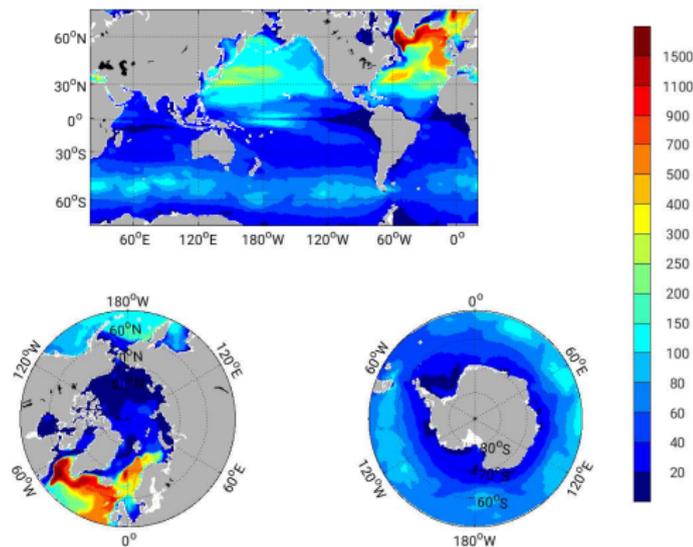


Figure : March Mixed Layer Depth per Kara Formula (m): 1992 thru 2017 Mean

mixed layer depth fields

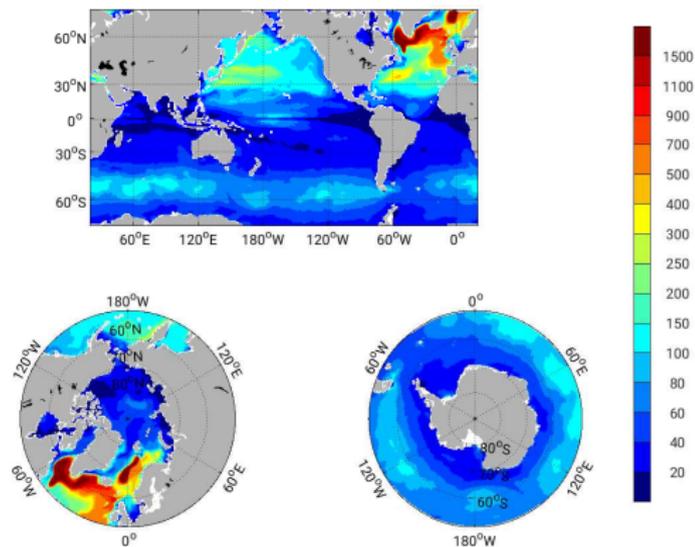


Figure : March Mixed Layer Depth per Suga Formula (m): 1992 thru 2017 Mean

mixed layer depth fields

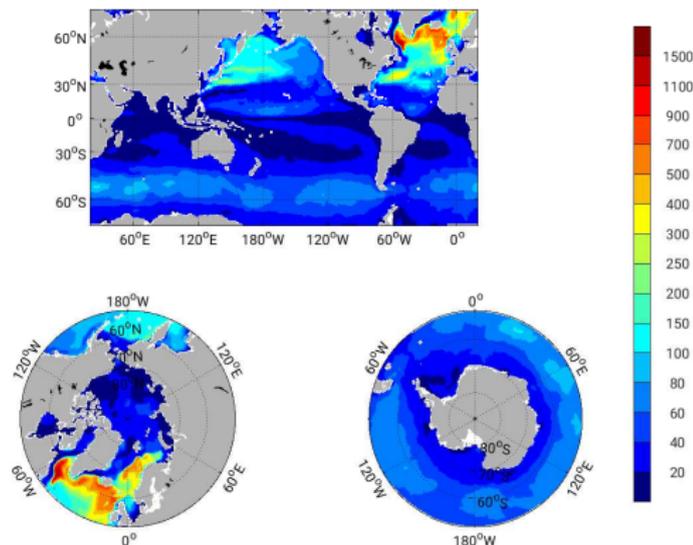


Figure : March Mixed Layer Depth per Boyer M. Formula (m):
1992 thru 2017 Mean

mixed layer depth fields

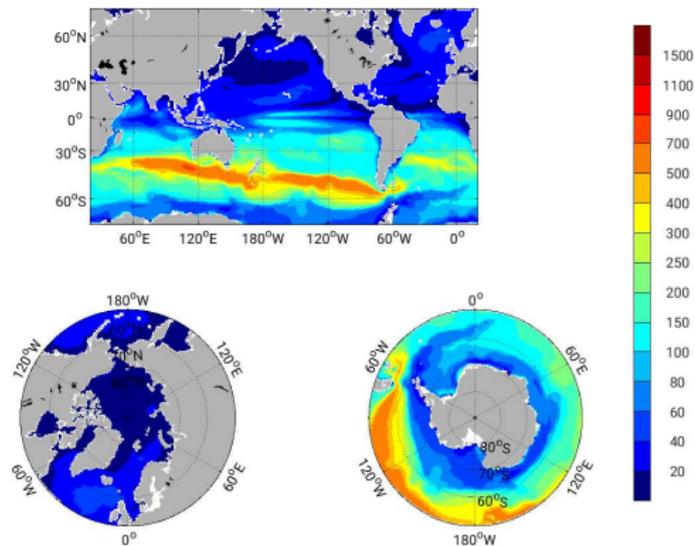


Figure : September Mixed Layer Depth per Kara Formula (m):
1992 thru 2017 Mean

mixed layer depth fields

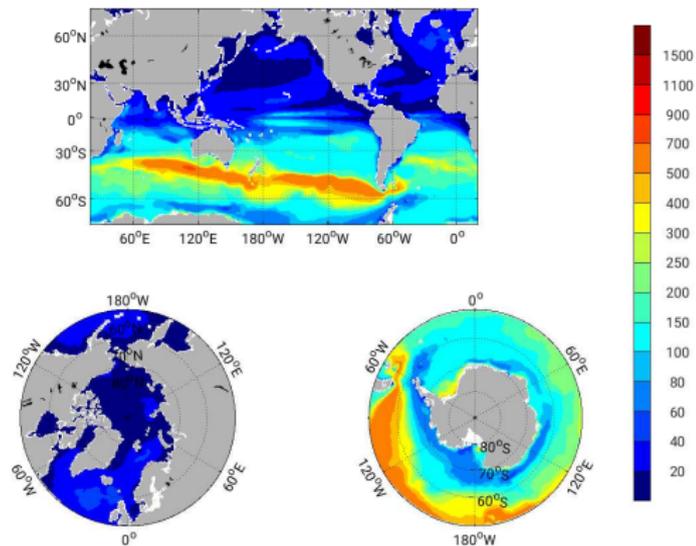


Figure : September Mixed Layer Depth per Suga Formula (m):
1992 thru 2017 Mean

mixed layer depth fields

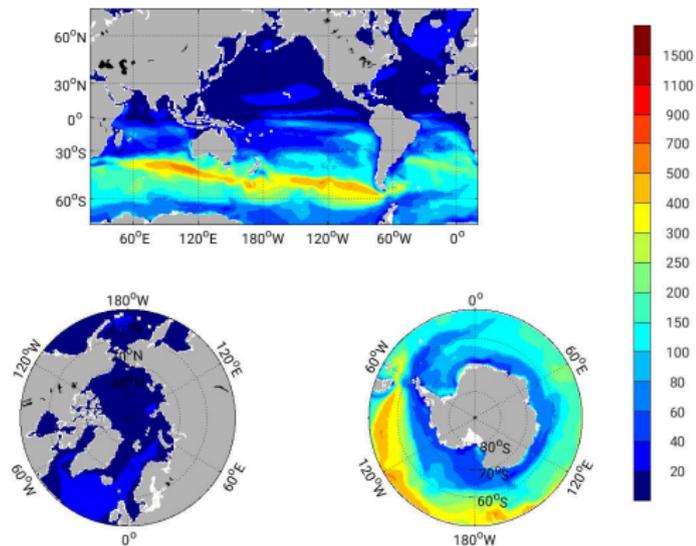


Figure : September Mixed Layer Depth per Boyer M. Formula (m):
1992 thru 2017 Mean

Monthly Thickness Distribution

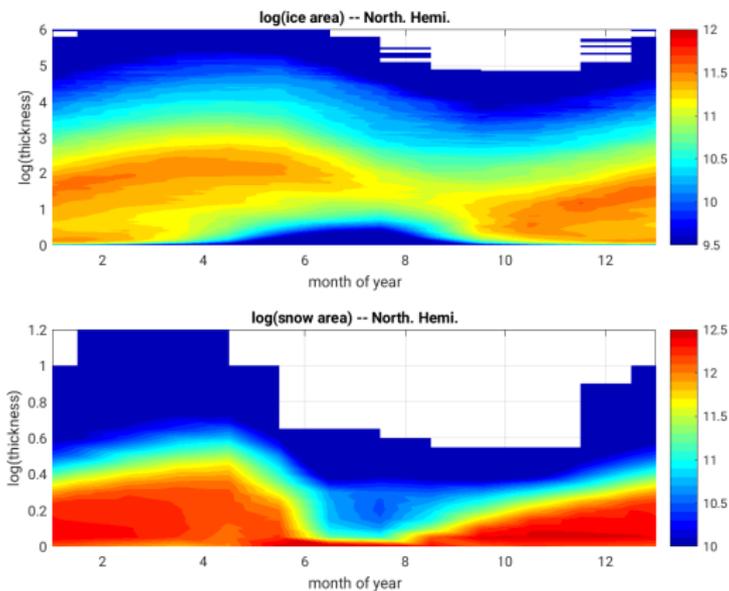


Figure : Northern Hemisphere Monthly Mean Sea Ice (top) and Snow (bottom) Thickness Distribution ($\log(\text{m}^2)$): 1992 thru 2017 Mean

Monthly Thickness Distribution

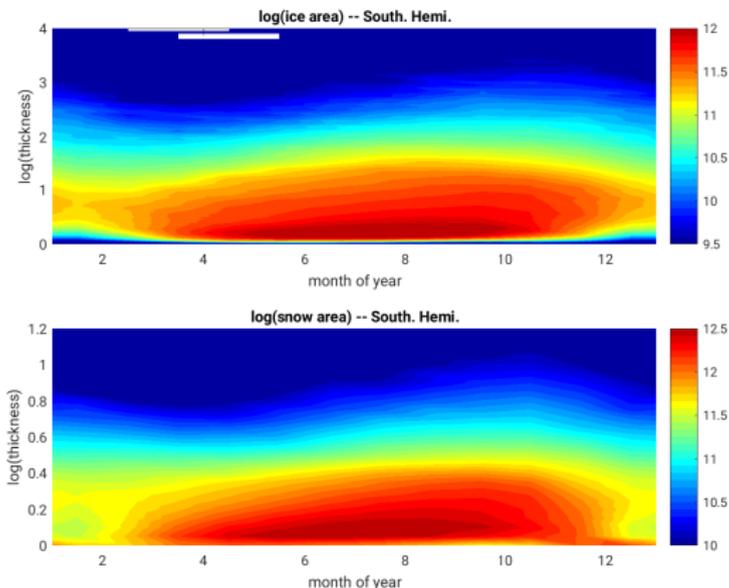


Figure : Southern Hemisphere Monthly Mean Sea Ice (top) and Snow (bottom) Thickness Distribution ($\log(\text{m}^2)$): 1992 thru 2017 Mean

Sea Ice Concentration (unitless): March

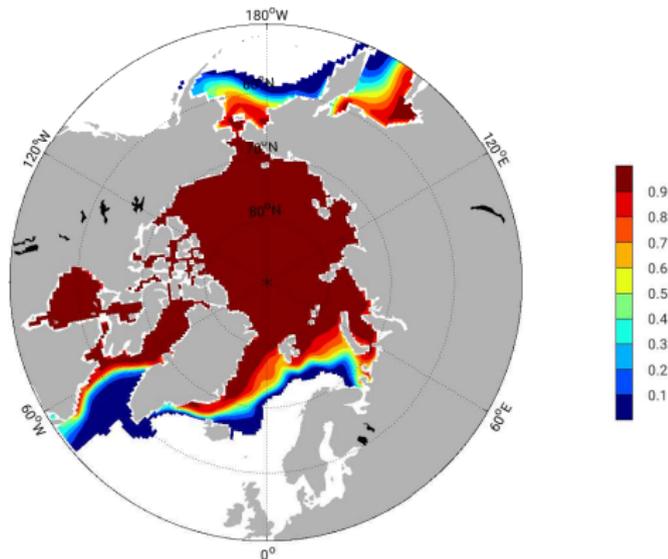


Figure : March Sea Ice Concentration (unitless): 1992 thru 2017 Mean

Sea Ice Thickness (m): March

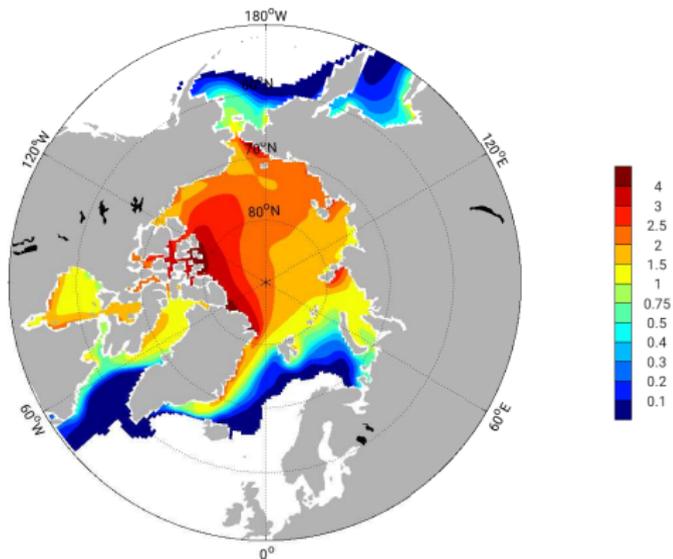


Figure : March Sea Ice Thickness (m): 1992 thru 2017 Mean

Snow Thickness (m): March

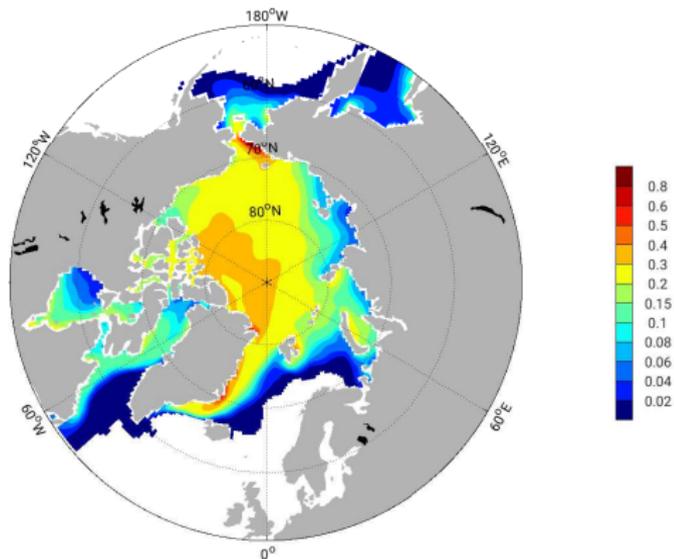


Figure : March Snow Thickness (m): 1992 thru 2017 Mean

Sea Ice+Snow Streamfunction (megaton/s): March

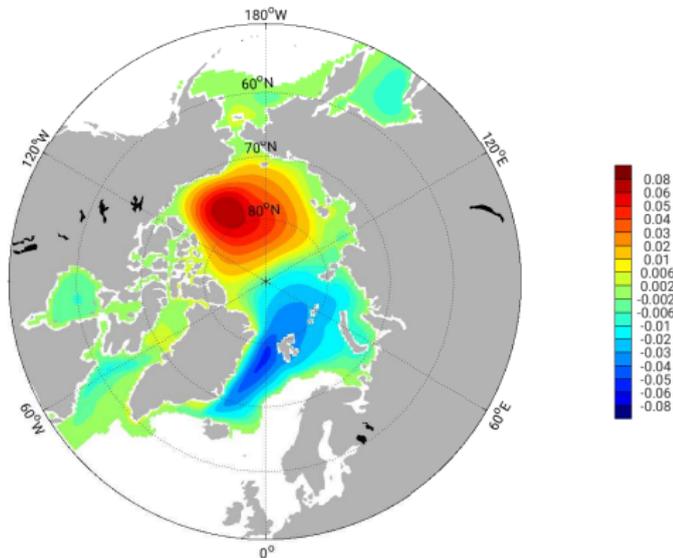


Figure : March Sea Ice+Snow Streamfunction (megaton/s): 1992
thru 2017 Mean

Sea Ice+Snow Convergence (kiloton/s): March

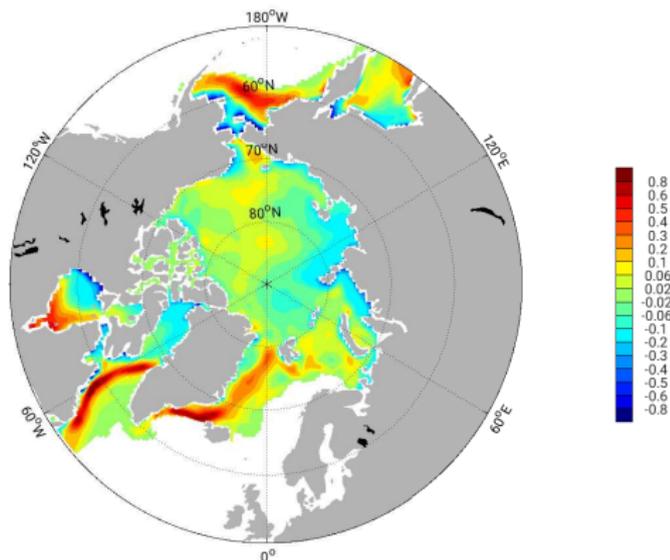


Figure : March Sea Ice+Snow Convergence (kiloton/s): 1992 thru 2017 Mean

Sea Ice Concentration (unitless): September

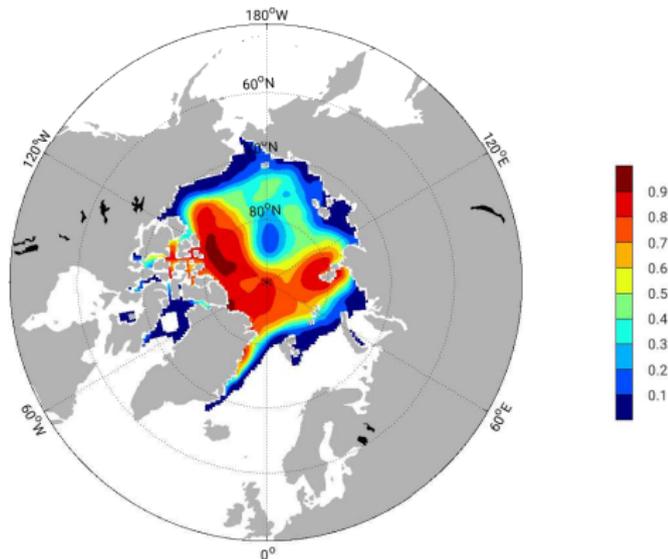


Figure : September Sea Ice Concentration (unitless): 1992 thru 2017 Mean

Sea Ice Thickness (m): September

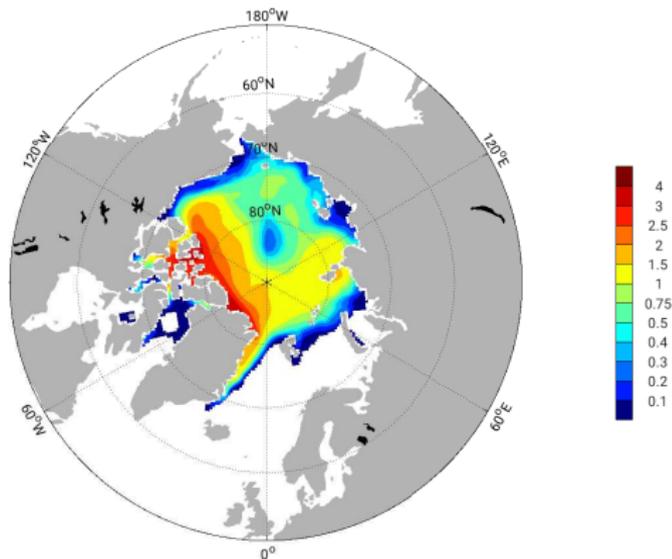


Figure : September Sea Ice Thickness (m): 1992 thru 2017 Mean

Snow Thickness (m): September

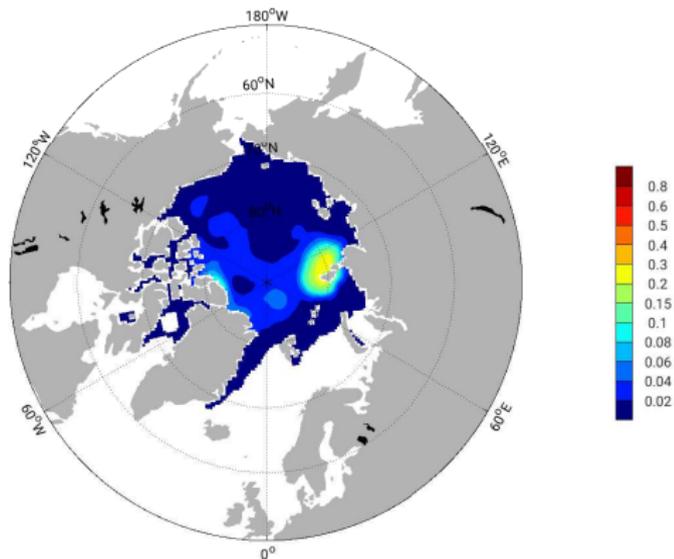


Figure : September Snow Thickness (m): 1992 thru 2017 Mean

Sea Ice+Snow Streamfunction (megaton/s): September

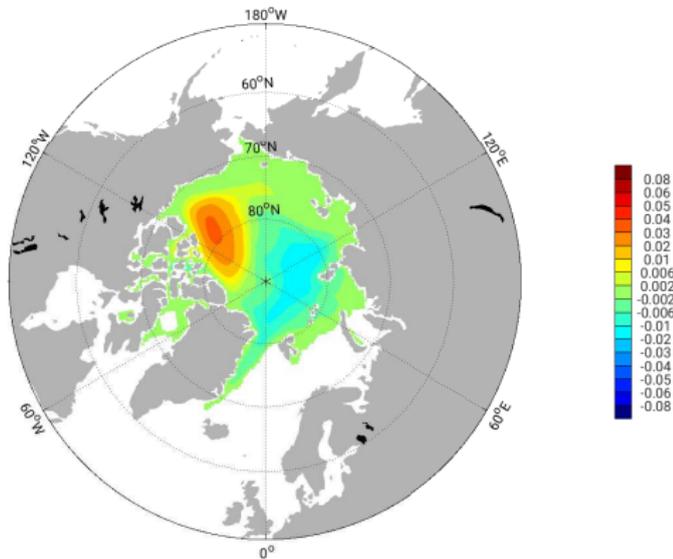


Figure : September Sea Ice+Snow Streamfunction (megaton/s):
1992 thru 2017 Mean

Sea Ice+Snow Convergence (kiloton/s): September

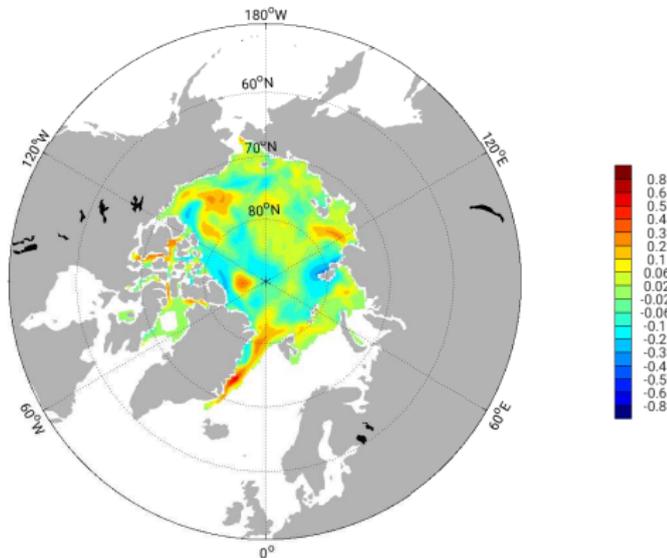


Figure : September Sea Ice+Snow Convergence (kiloton/s): 1992
thru 2017 Mean

Sea Ice Concentration (unitless): March

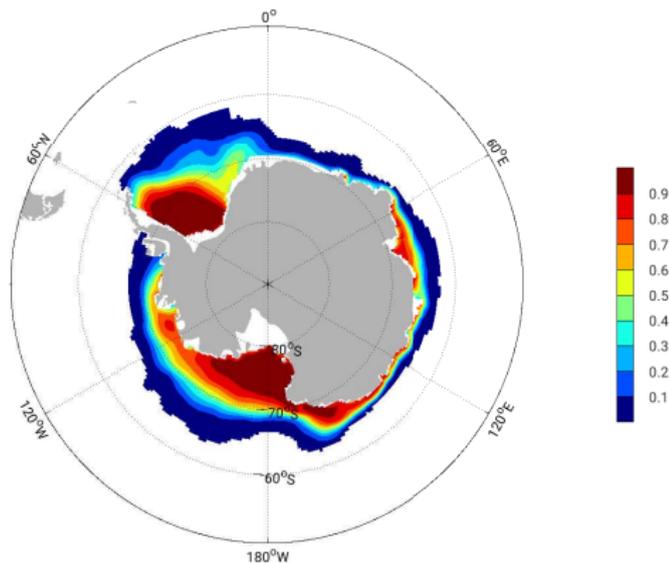


Figure : March Sea Ice Concentration (unitless): 1992 thru 2017 Mean

Sea Ice Thickness (m): March

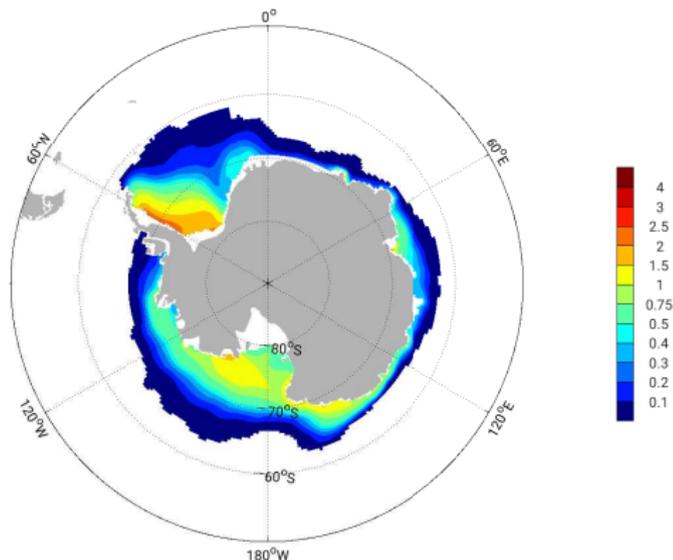


Figure : March Sea Ice Thickness (m): 1992 thru 2017 Mean

Snow Thickness (m): March

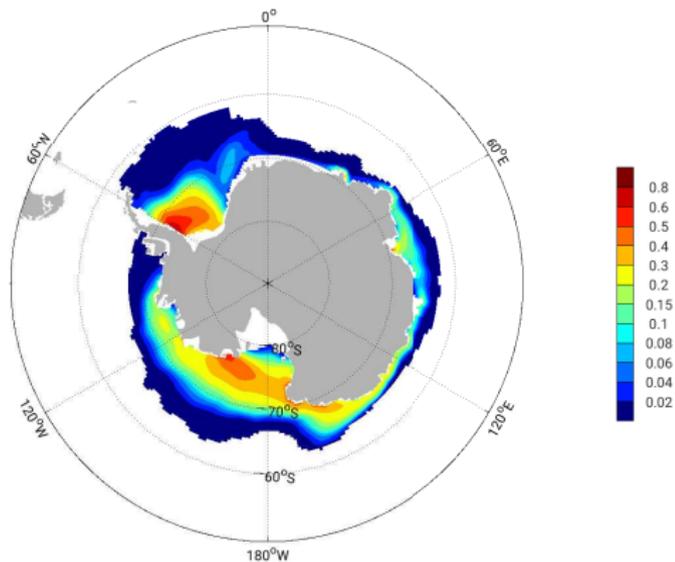


Figure : March Snow Thickness (m): 1992 thru 2017 Mean

Sea Ice+Snow Streamfunction (megaton/s): March

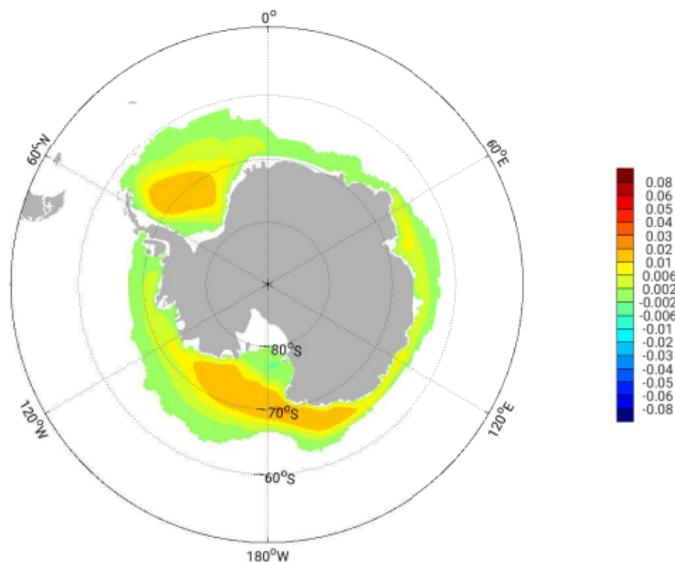


Figure : March Sea Ice+Snow Streamfunction (megaton/s): 1992
thru 2017 Mean

Sea Ice+Snow Convergence (kiloton/s): March

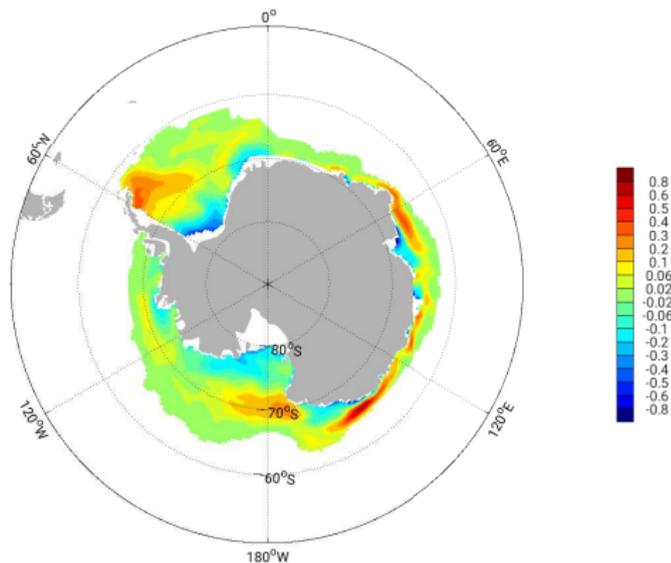


Figure : March Sea Ice+Snow Convergence (kiloton/s): 1992 thru 2017 Mean

Sea Ice Concentration (unitless): September

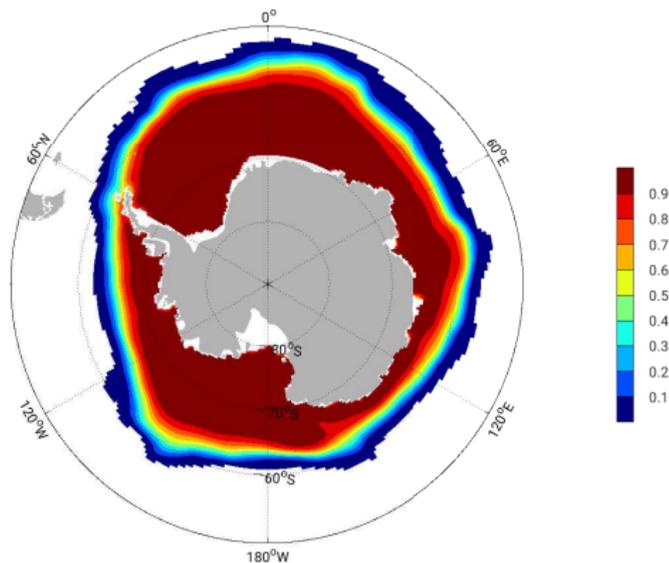


Figure : September Sea Ice Concentration (unitless): 1992 thru 2017 Mean

Sea Ice Thickness (m): September

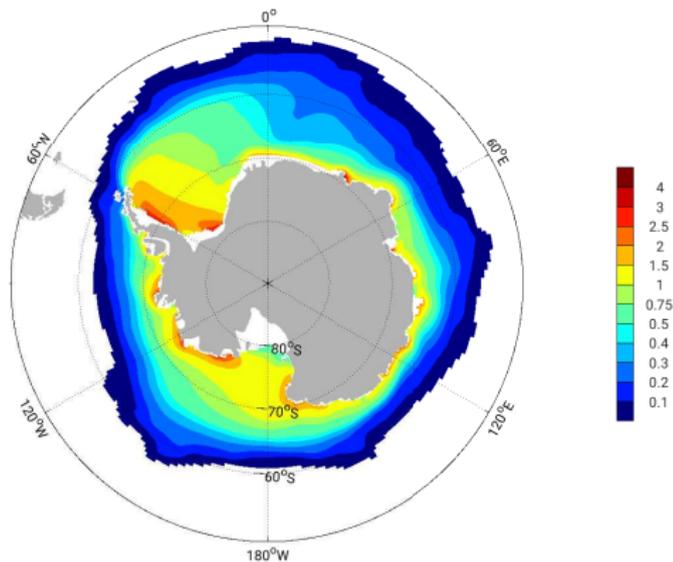


Figure : September Sea Ice Thickness (m): 1992 thru 2017 Mean

Snow Thickness (m): September

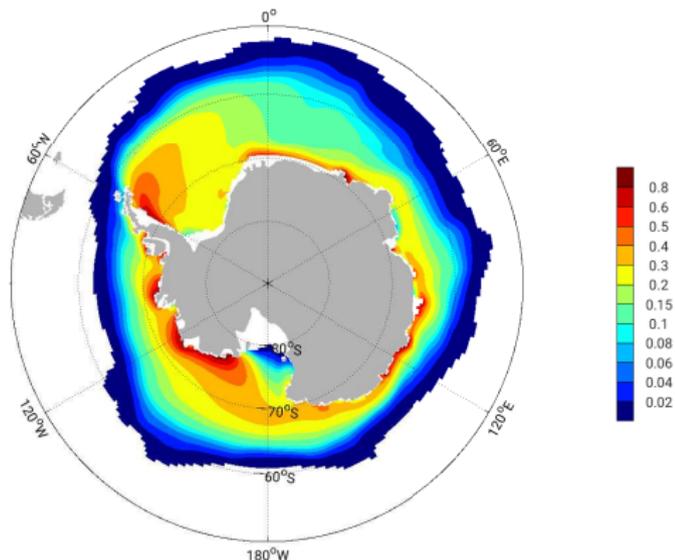


Figure : September Snow Thickness (m): 1992 thru 2017 Mean

Sea Ice+Snow Streamfunction (megaton/s): September

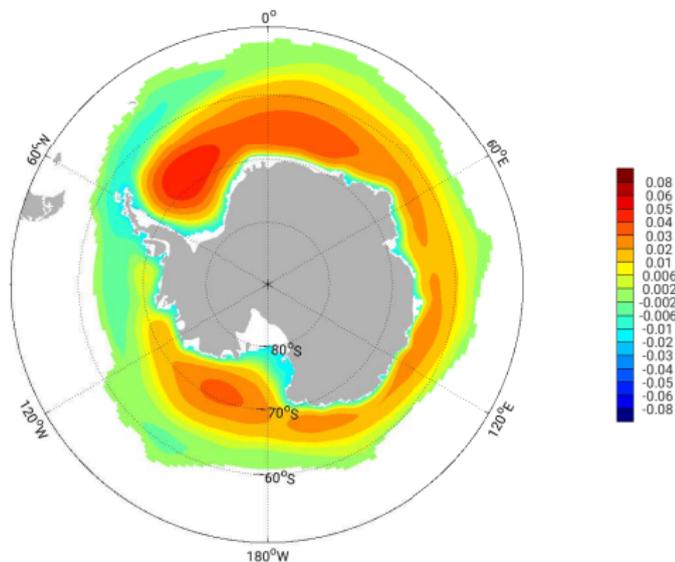


Figure : September Sea Ice+Snow Streamfunction (megaton/s):
1992 thru 2017 Mean

Sea Ice+Snow Convergence (kiloton/s): September

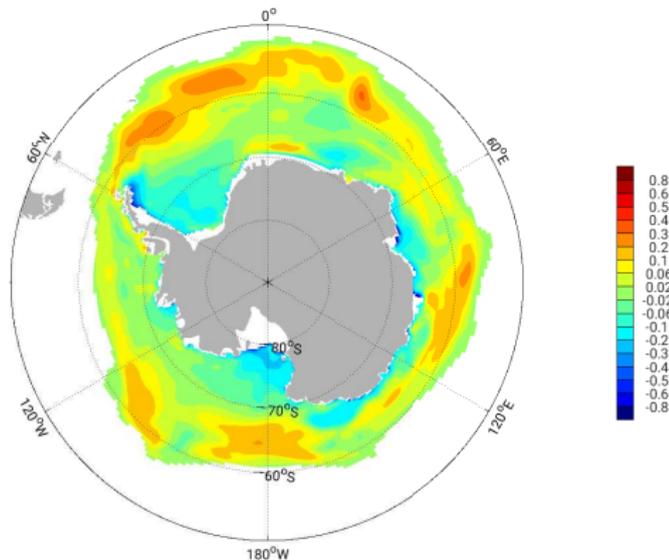


Figure : September Sea Ice+Snow Convergence (kiloton/s): 1992
thru 2017 Mean

control prior uncertainty

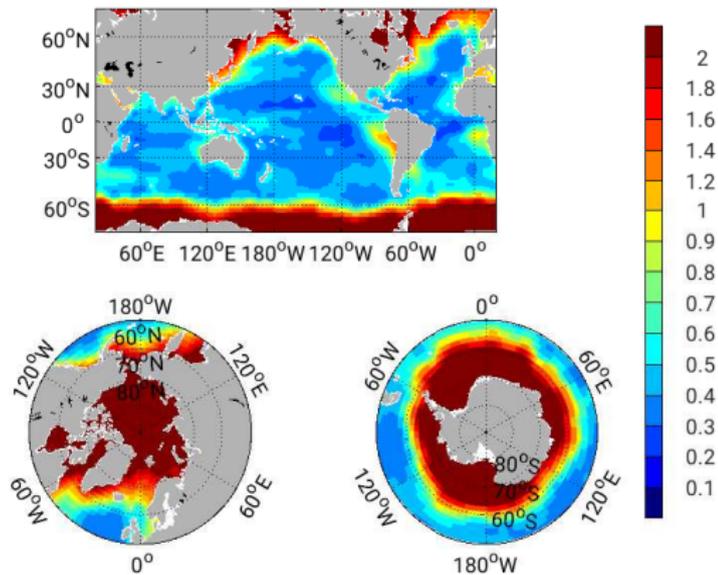


Figure : Prior Uncertainty (K): atemp

rms of control adjustment

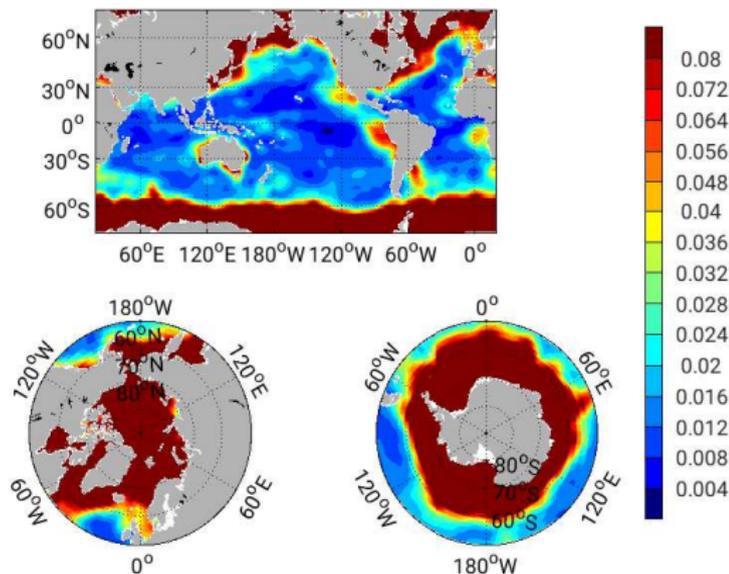


Figure : RMS of Adjustment (K): atemp

std of control adjustment

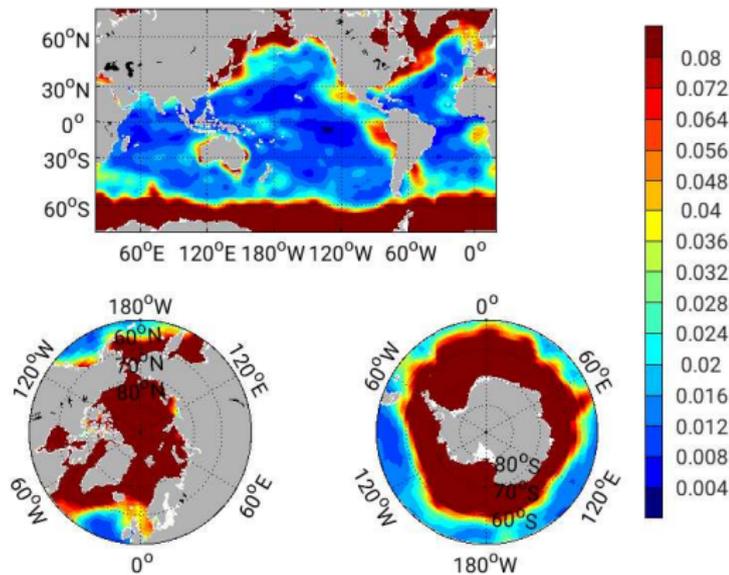


Figure : STD of Adjustment (K): atemp

mean of control adjustment

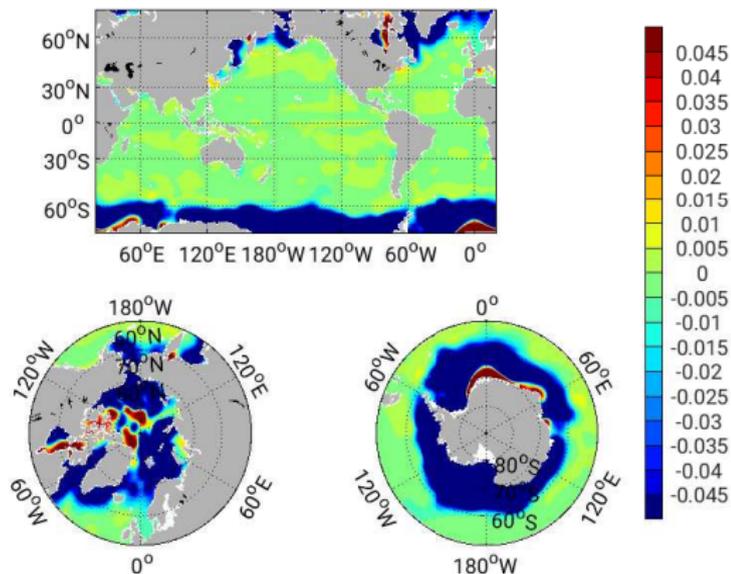


Figure : Mean of Adjustment (K): atemp

control prior uncertainty

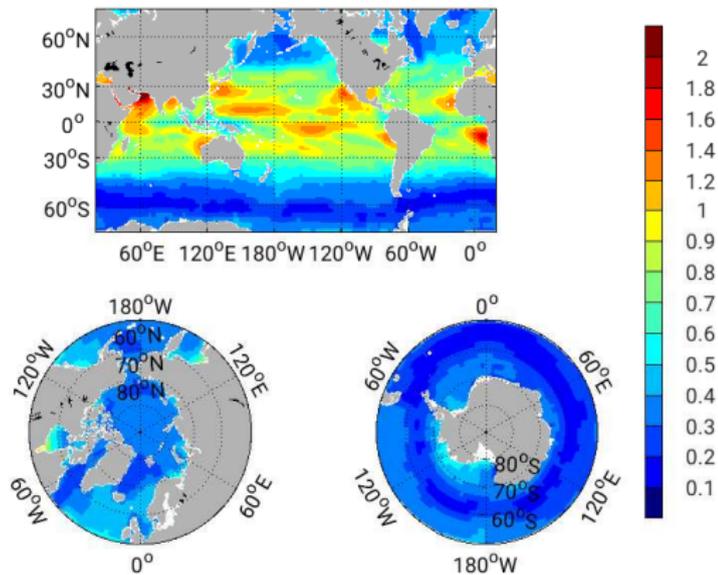


Figure : Prior Uncertainty (g/kg): aqh

rms of control adjustment

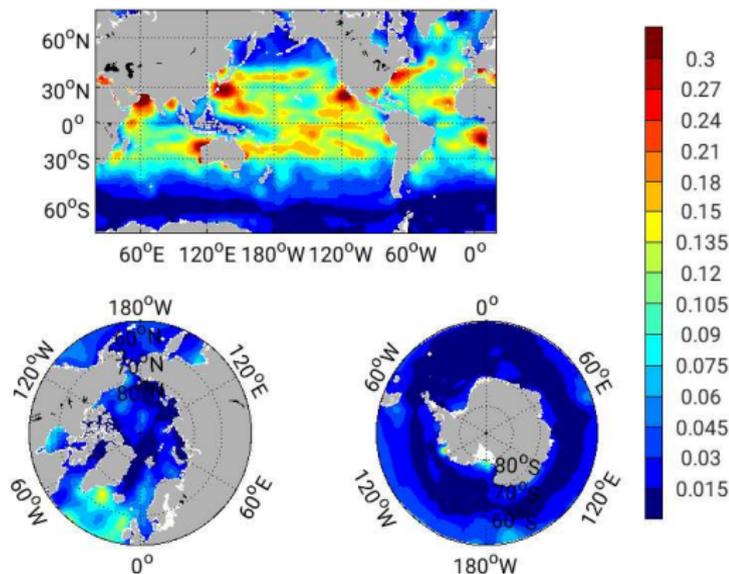


Figure : RMS of Adjustment (g/kg): aqh

std of control adjustment

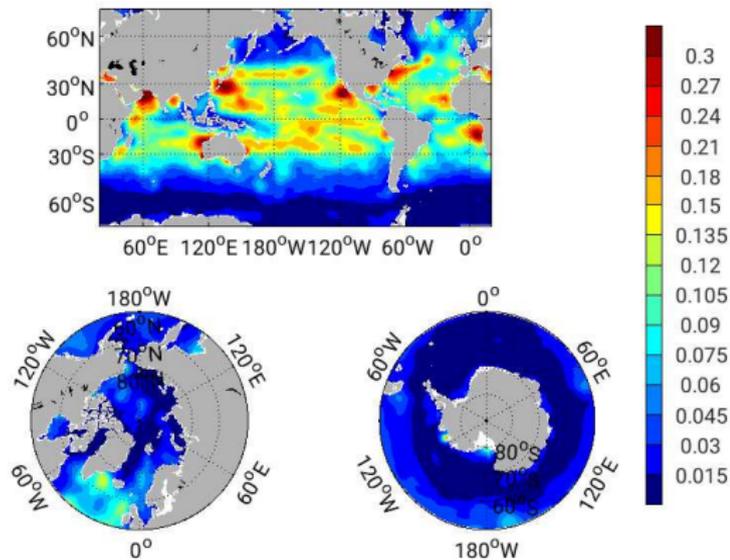


Figure : STD of Adjustment (g/kg): aqh

mean of control adjustment

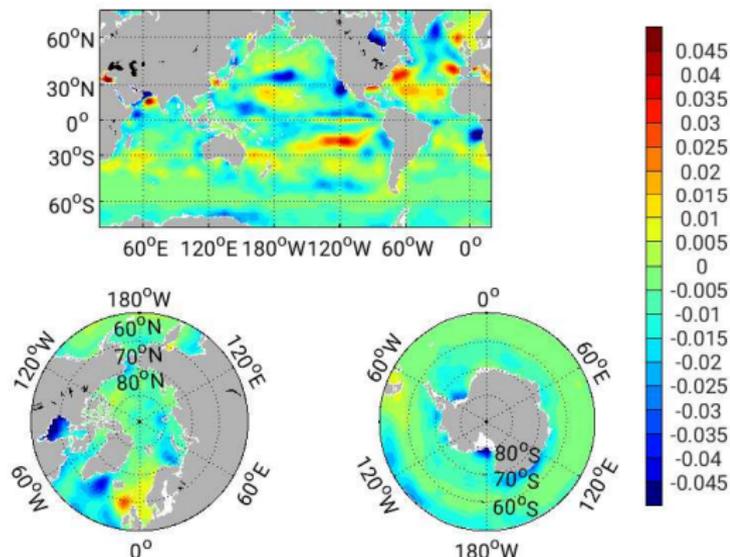


Figure : Mean of Adjustment (g/kg): aqh

control prior uncertainty

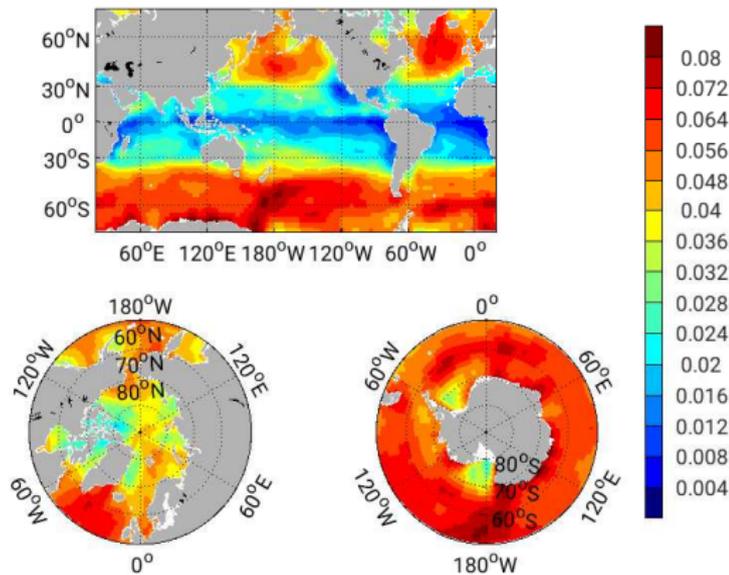


Figure : Prior Uncertainty (N/m²): τ_{uu}

rms of control adjustment

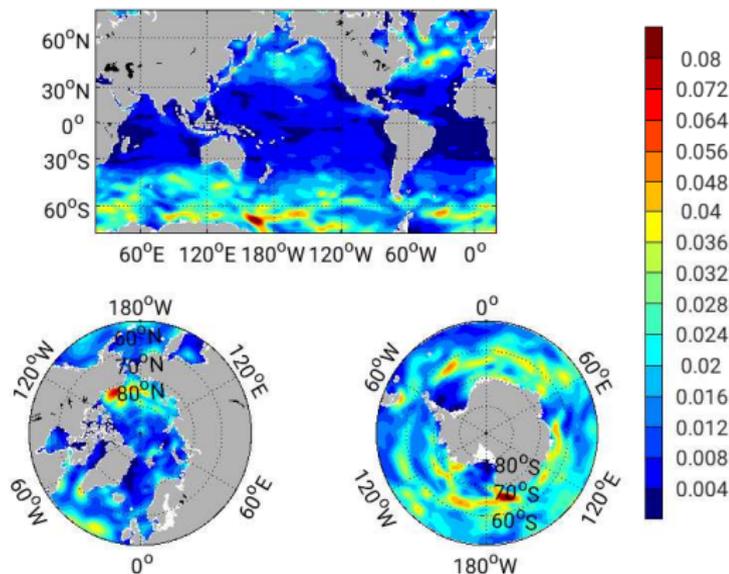


Figure : RMS of Adjustment (N/m²): tau

std of control adjustment

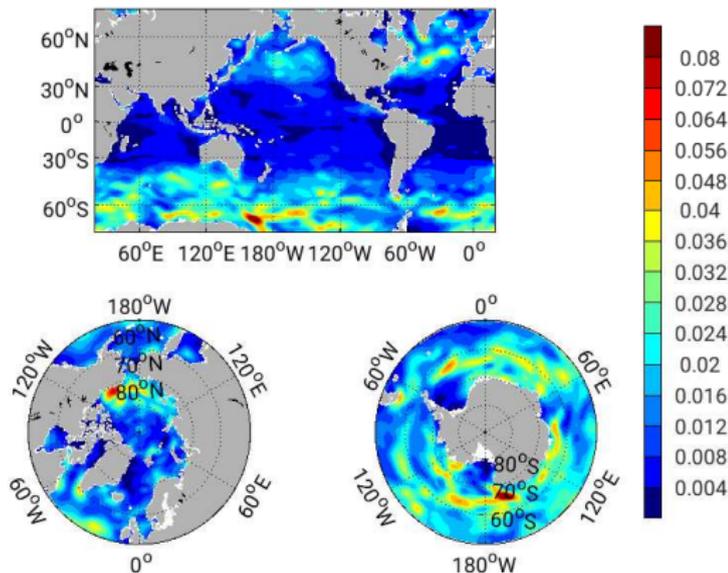


Figure : STD of Adjustment (N/m²): tau

mean of control adjustment

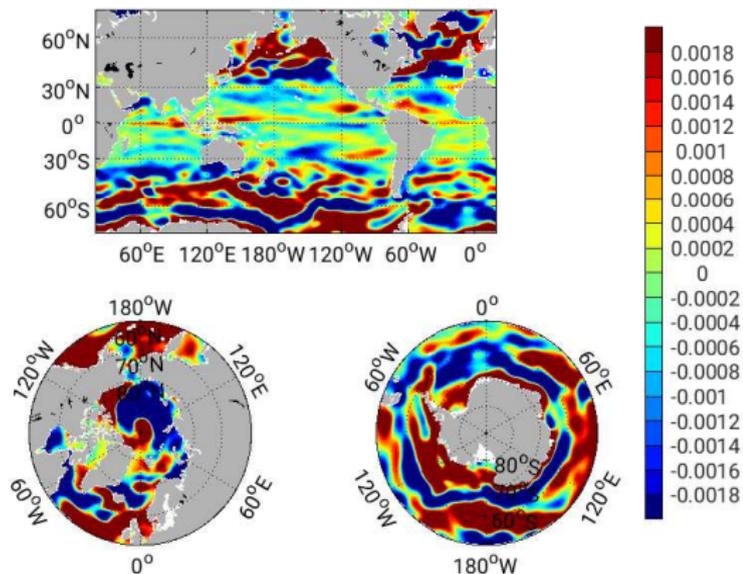


Figure : Mean of Adjustment (N/m^2): tauu

control prior uncertainty

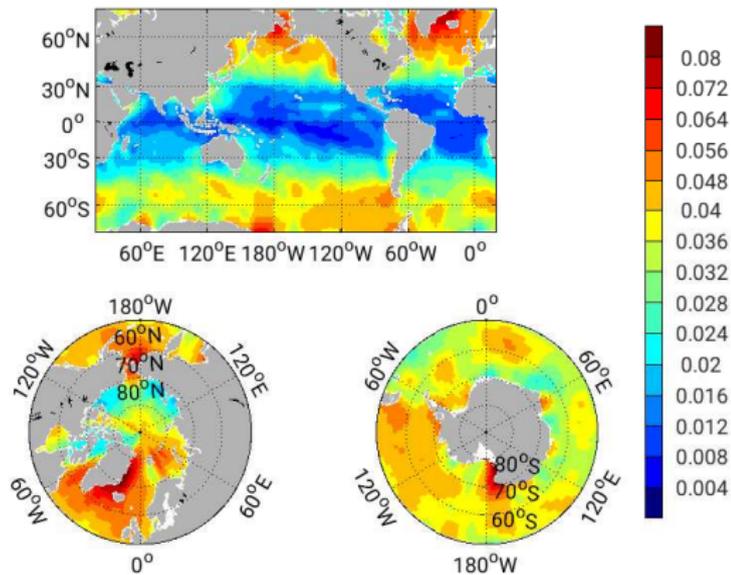


Figure : Prior Uncertainty (N/m²): τ_v

rms of control adjustment

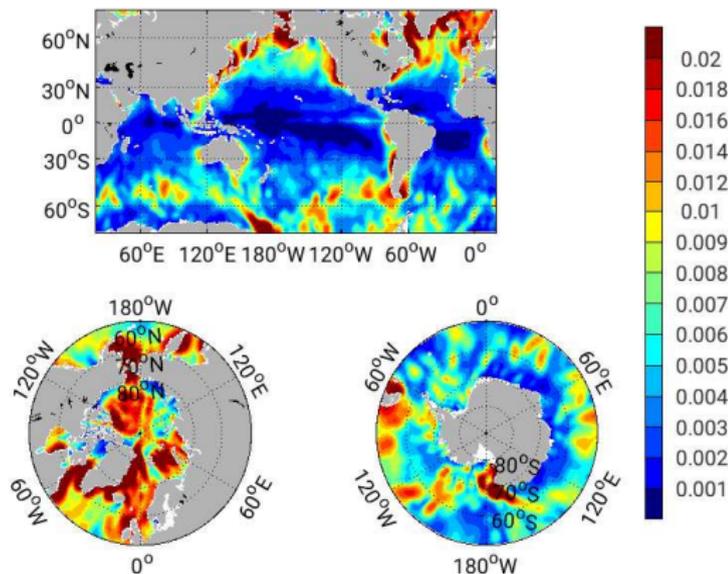


Figure : RMS of Adjustment (N/m^2): τ_v

std of control adjustment

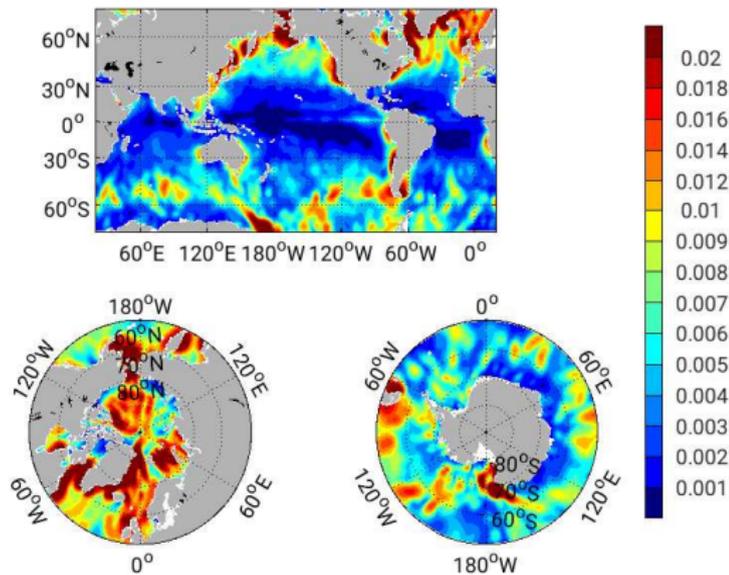


Figure : STD of Adjustment (N/m^2): τ_v

mean of control adjustment

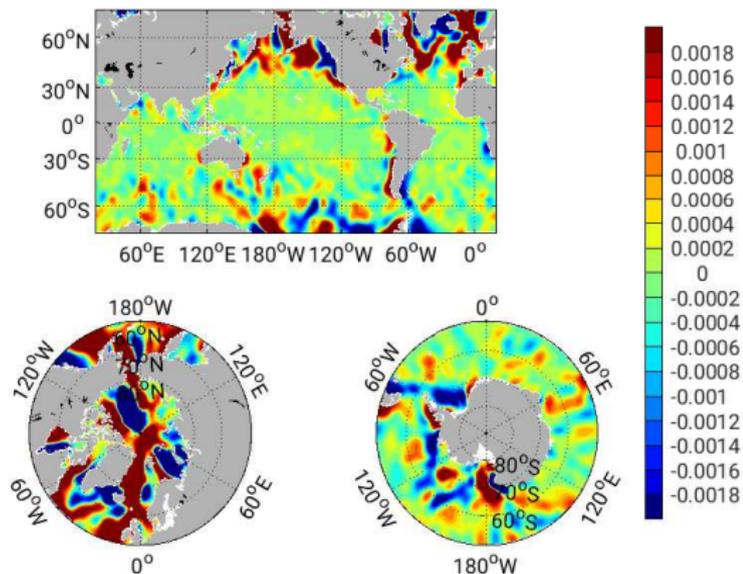


Figure : Mean of Adjustment (N/m^2): τ_v

control prior uncertainty

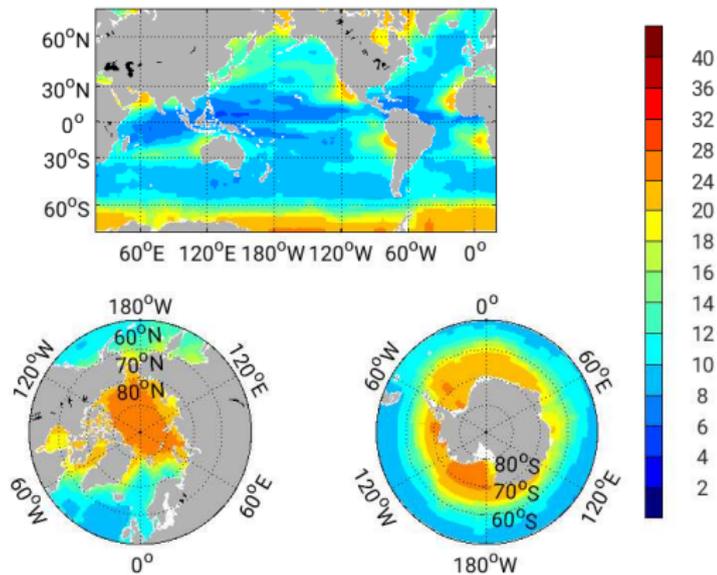


Figure : Prior Uncertainty (W/m^2): ldown

rms of control adjustment

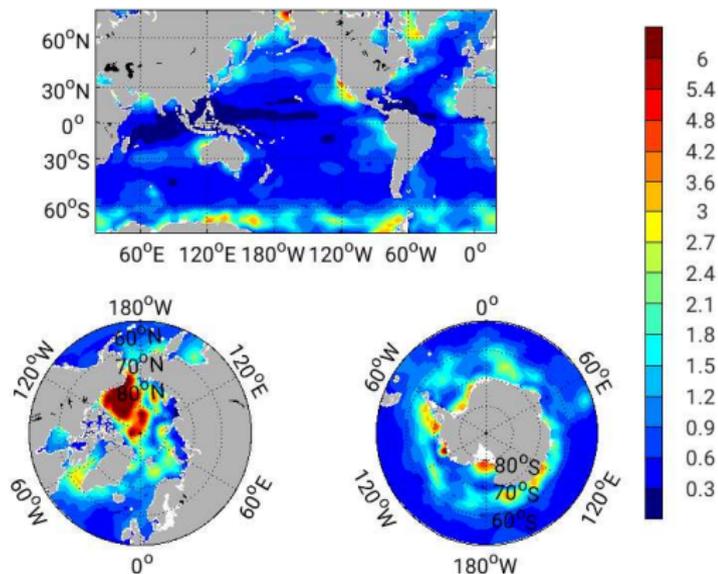


Figure : RMS of Adjustment (W/m²): lwdown

std of control adjustment

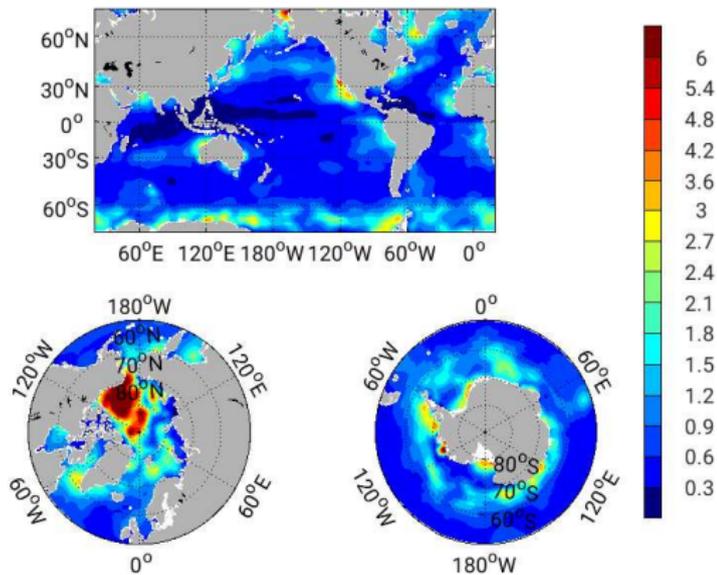


Figure : STD of Adjustment (W/m^2): lwdown

mean of control adjustment

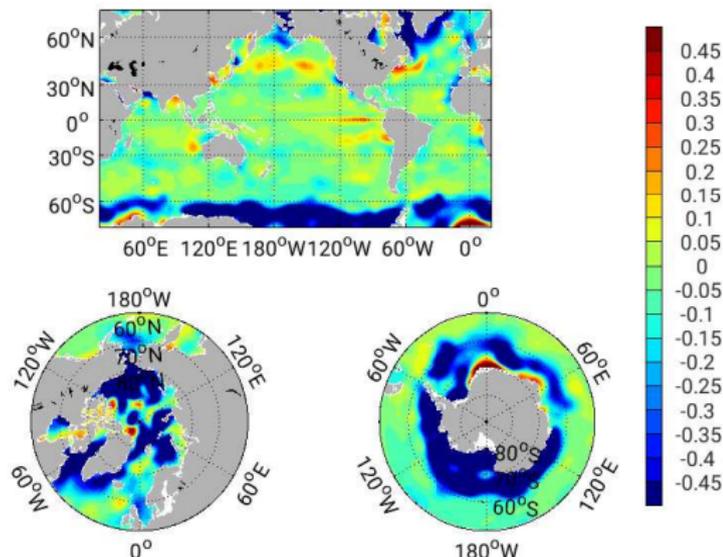


Figure : Mean of Adjustment (W/m^2): lwdn

control prior uncertainty

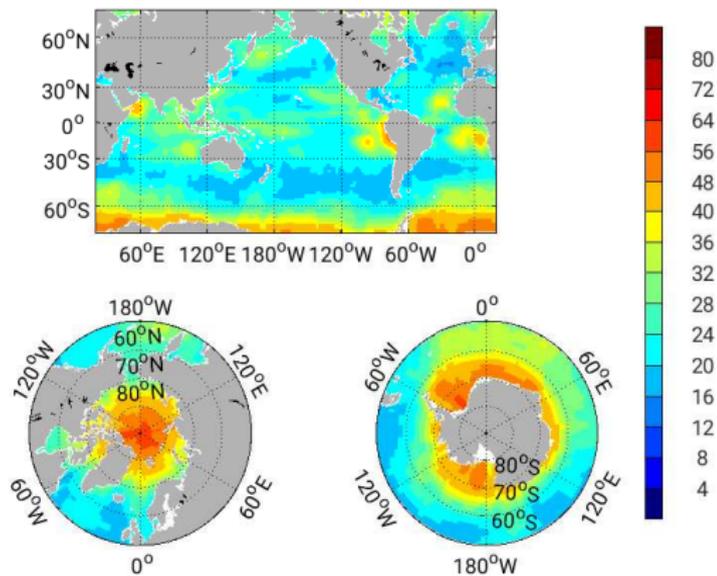


Figure : Prior Uncertainty (W/m^2): swdown

rms of control adjustment

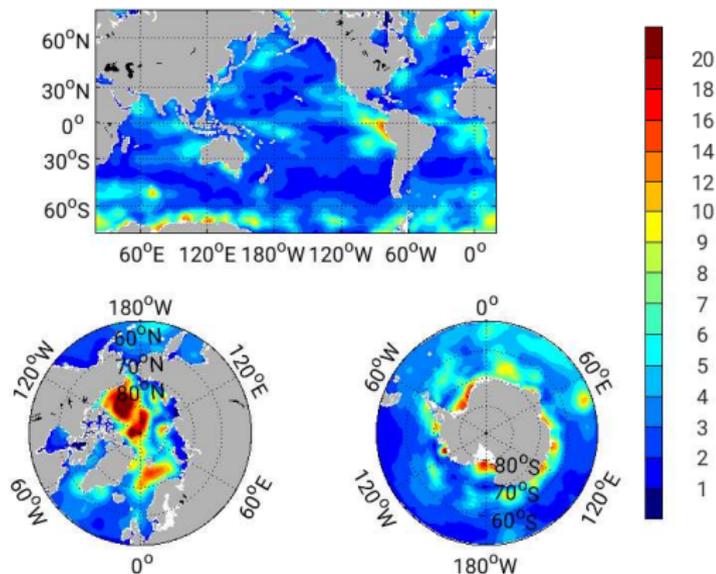


Figure : RMS of Adjustment (W/m²): swdown

std of control adjustment

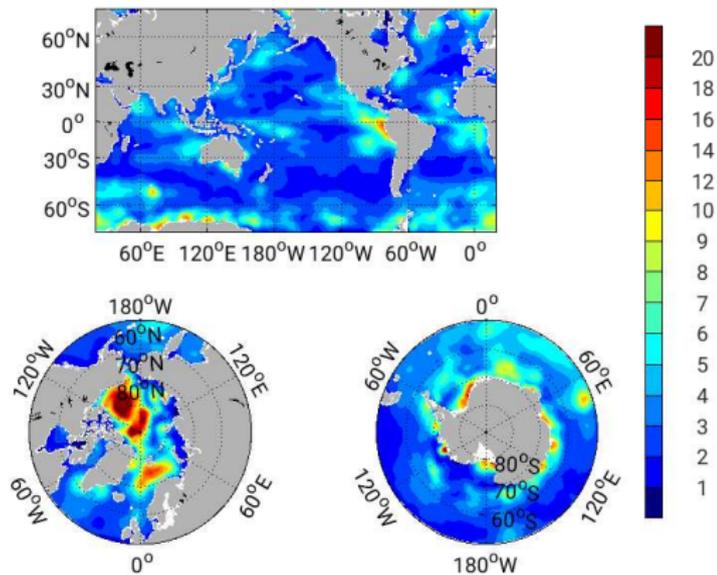


Figure : STD of Adjustment (W/m^2): swdown

mean of control adjustment

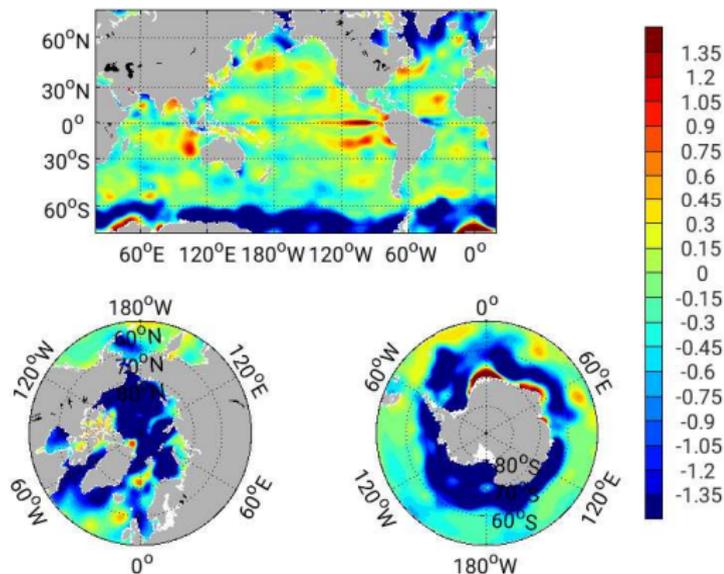


Figure : Mean of Adjustment (W/m²): sdown