gcmfaces analysis of the solution in /data19/llc270/run combo v42/1992 2017 ALL/iter50/mat//

February 15, 2019

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fit to in situ data

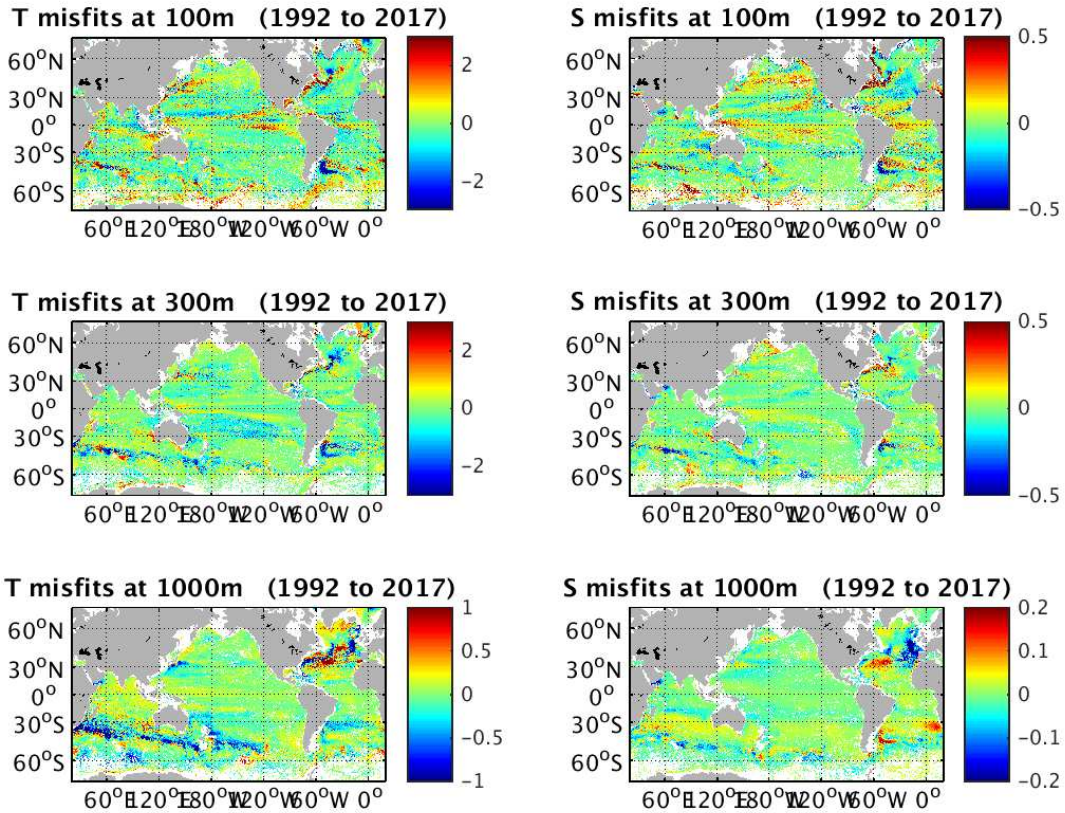


Figure : Time mean misfit (model-data) for in situ profiles, at various depths (rows), for T (left; in K) and S (right; in psu).

fit to in situ data

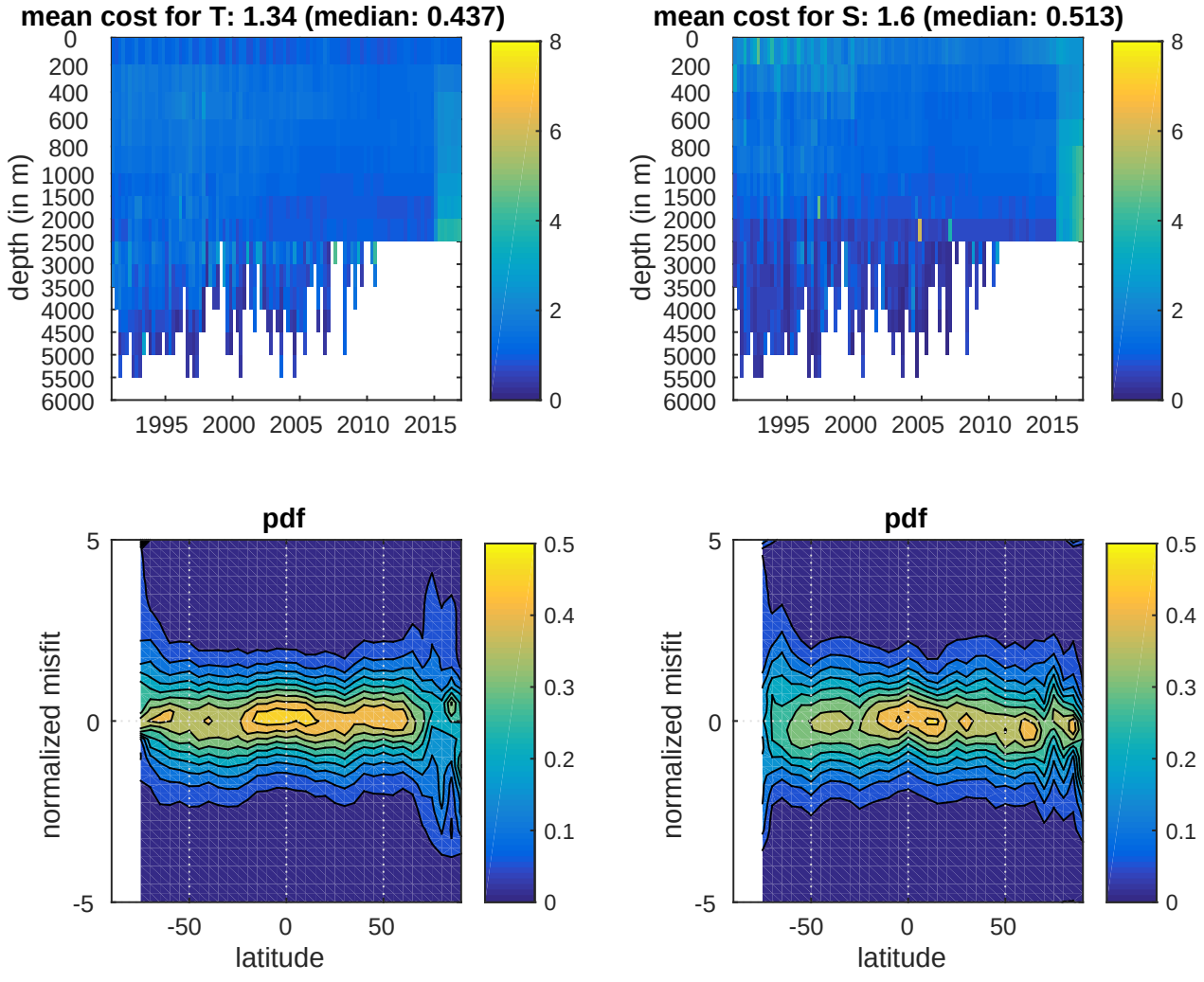


Figure : Cost function (top) for in situ profiles, as a function of depth and time. Distribution of normalized misfits (bottom) as a function of latitude. For T (left) and S (right).

fit to in situ data

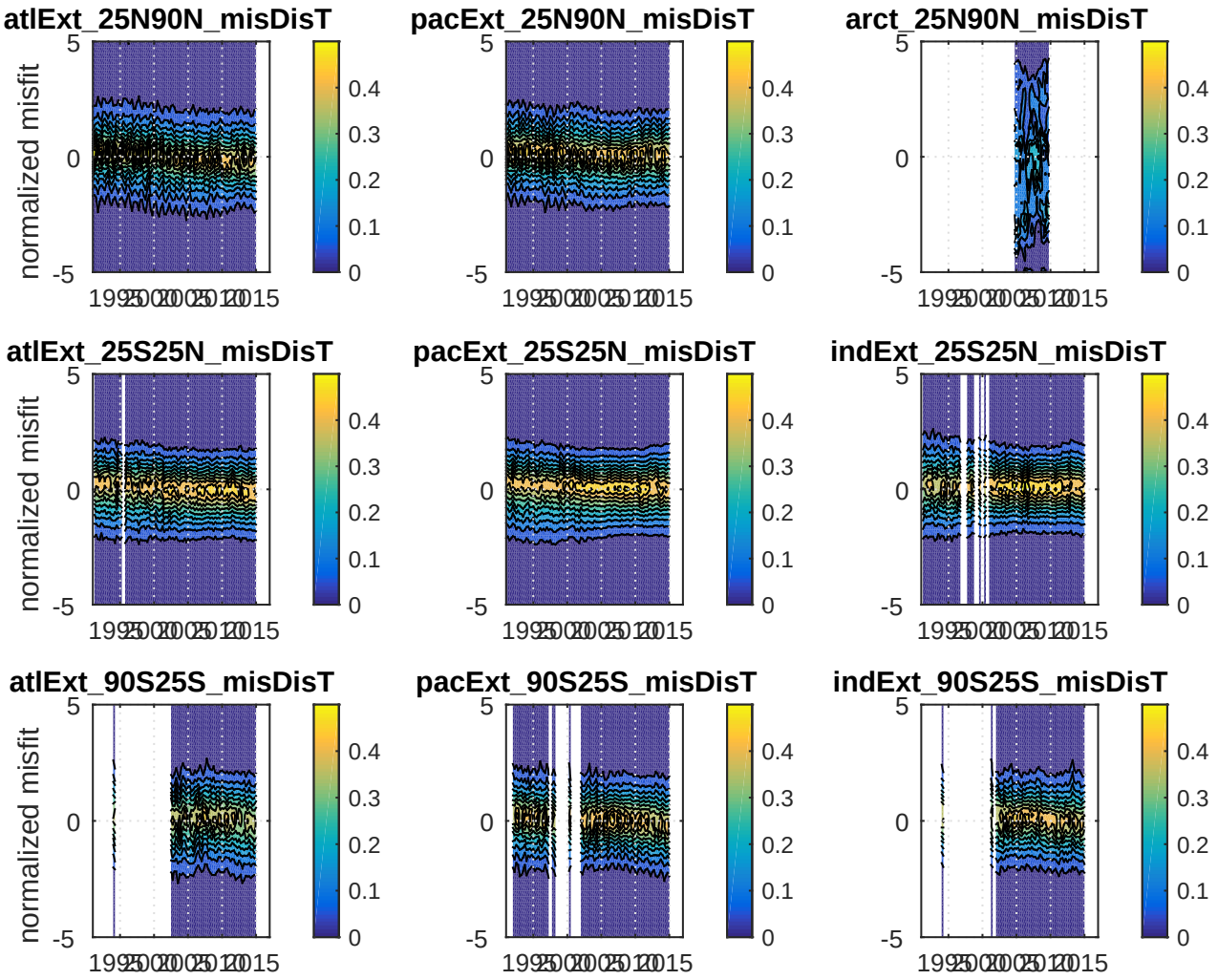


Figure : Distribution of normalized misfits per basin (panel) as a function of latitude, for T

fit to in situ data

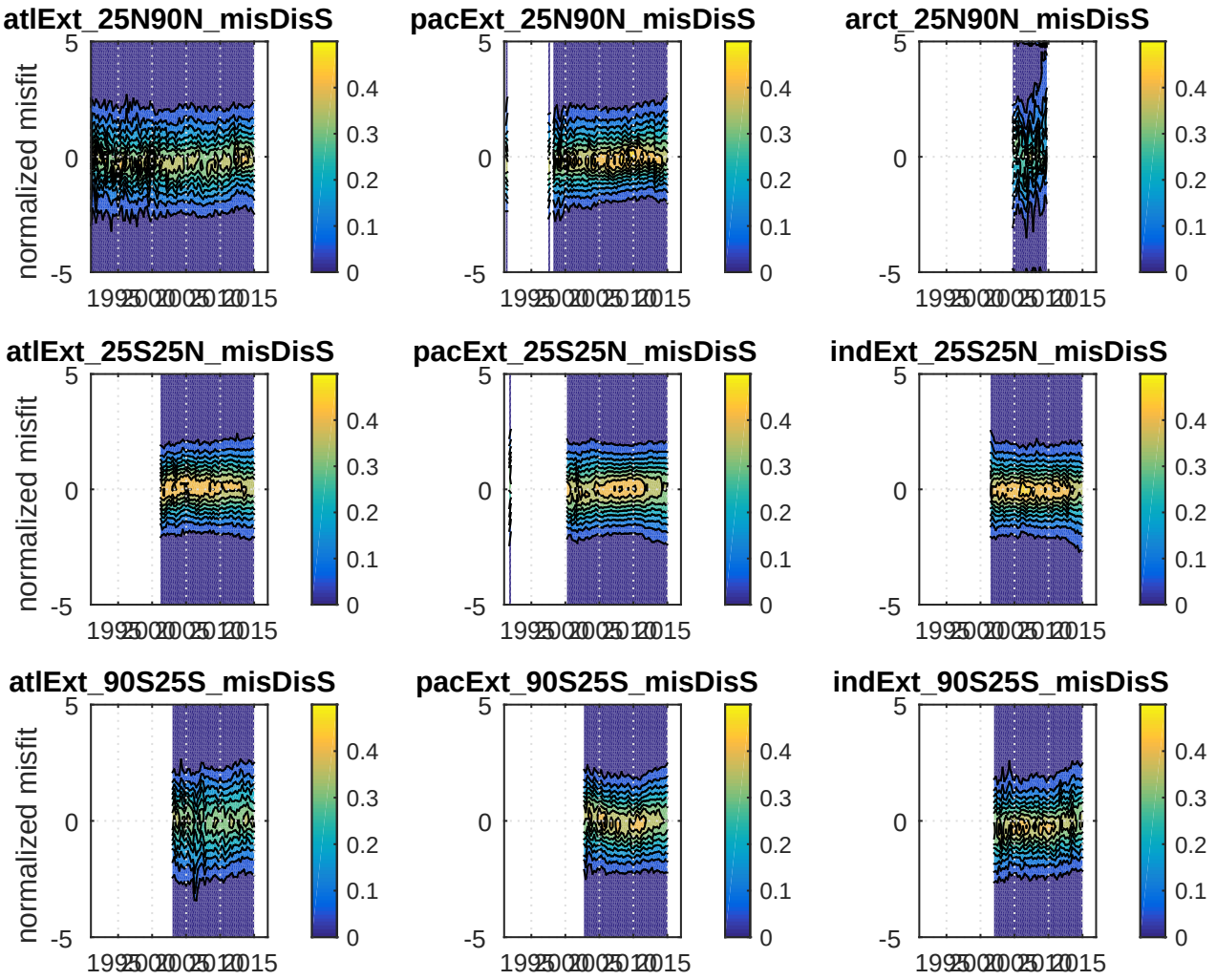


Figure : Distribution of normalized misfits per basin (panel) as a function of latitude, for S

fit to altimeter data (RADS)

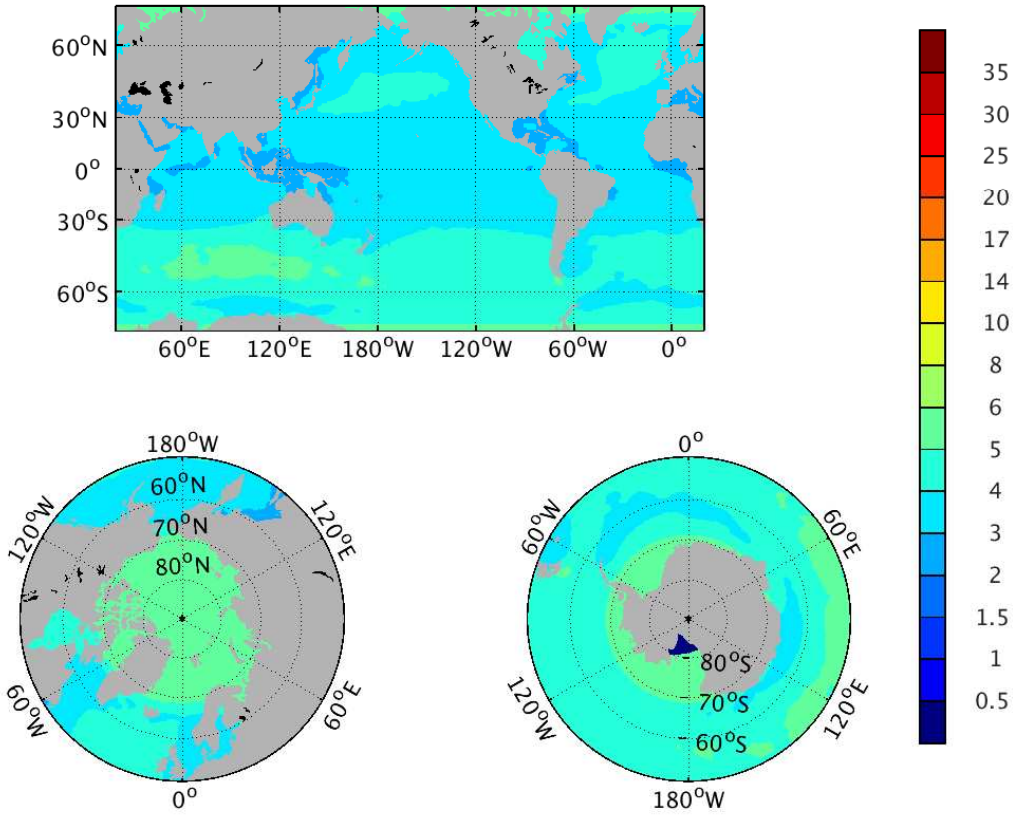


Figure : mean dynamic topography prior uncertainty (cm)

fit to altimeter data (RADS)

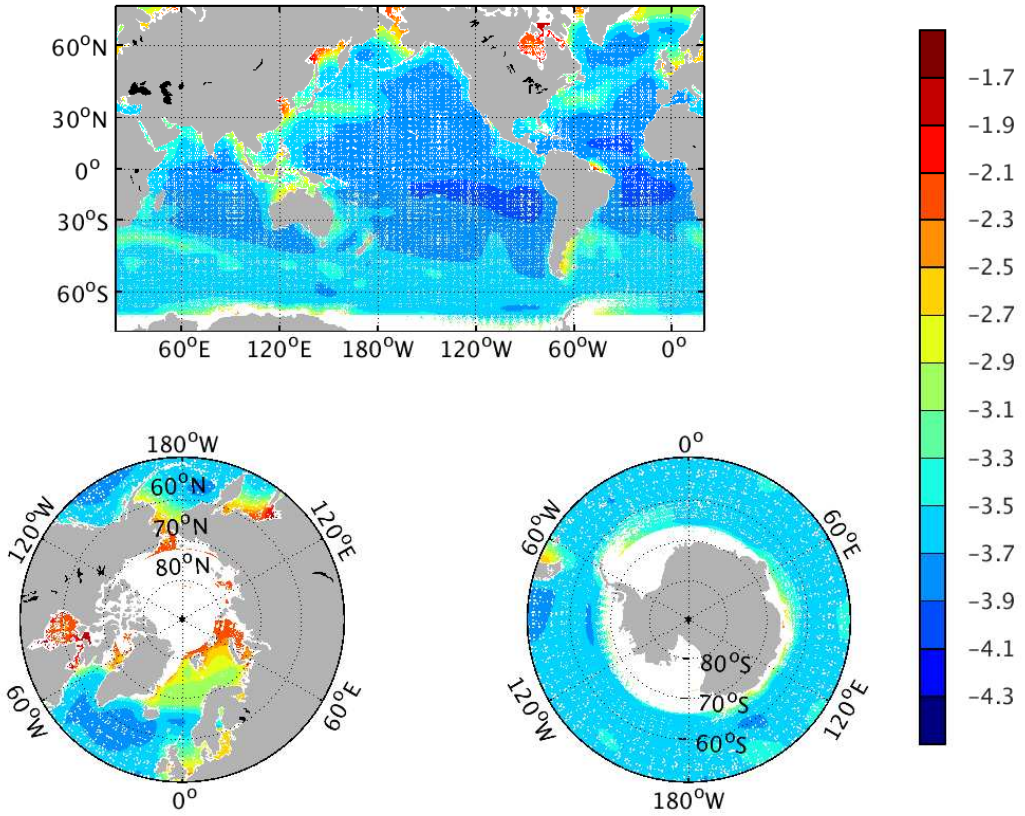


Figure : log(prior error variance) – sea level anomaly (m^2) – large space/time scales

fit to altimeter data (RADS)

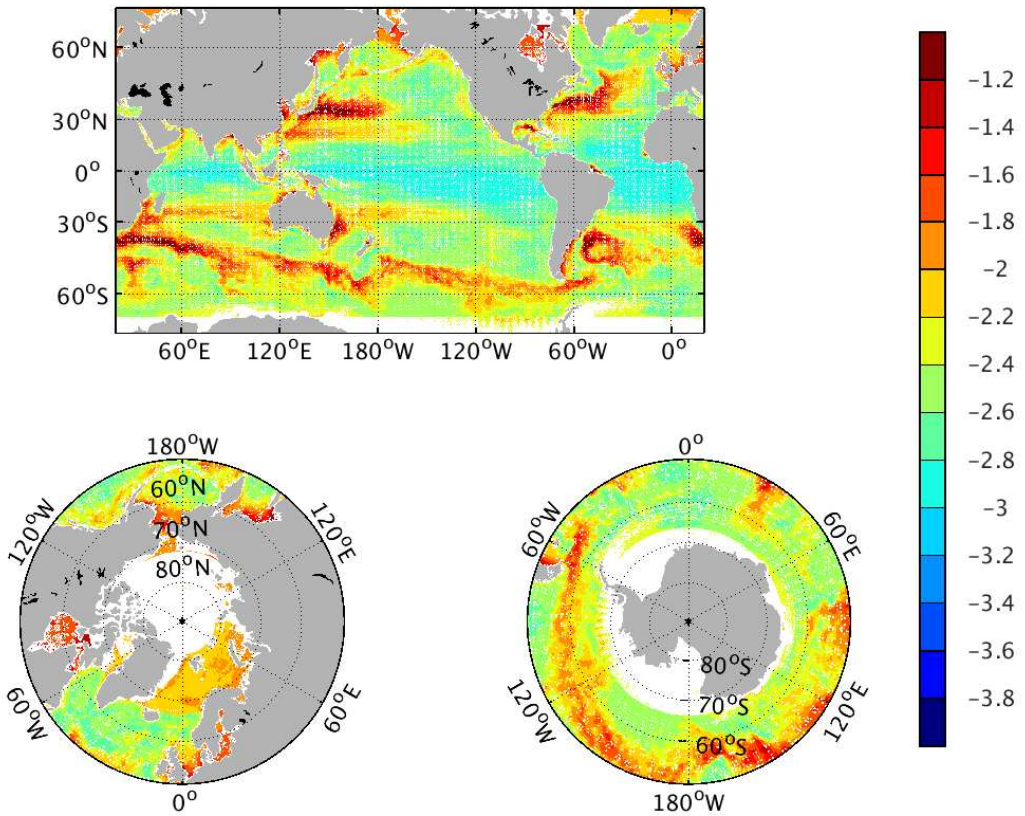
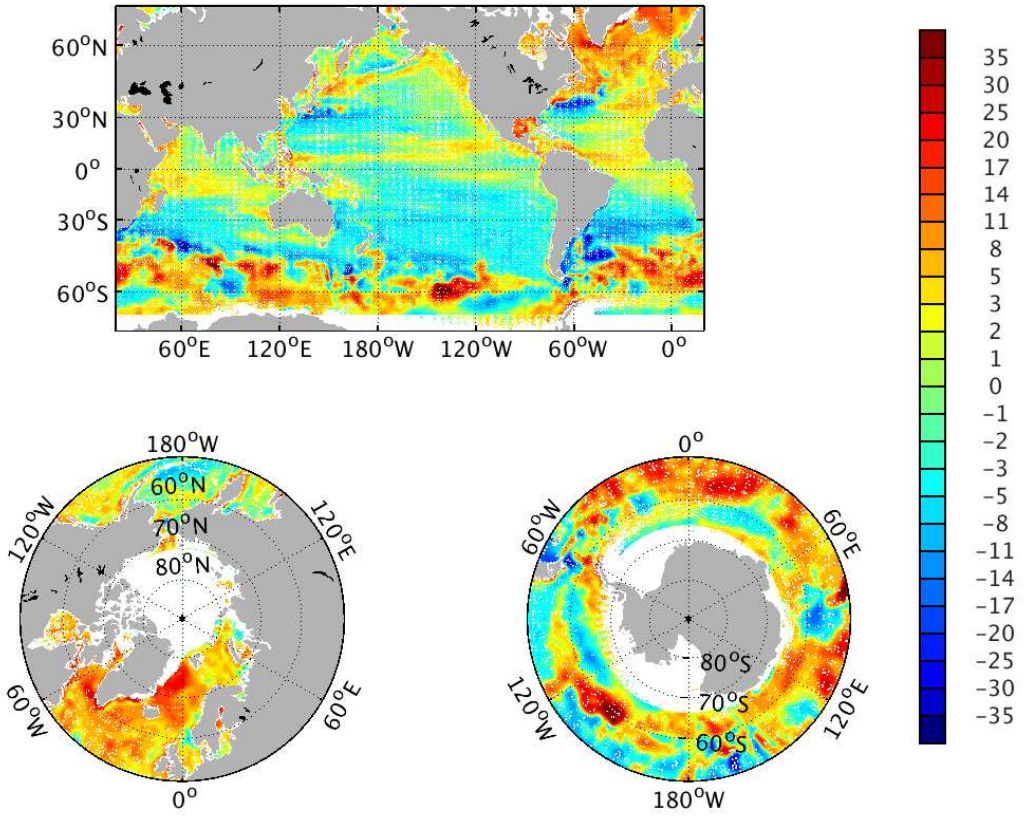


Figure : log(prior error variance) – sea level anomaly (m^2) – pointwise

fit to altimeter data (RADS)



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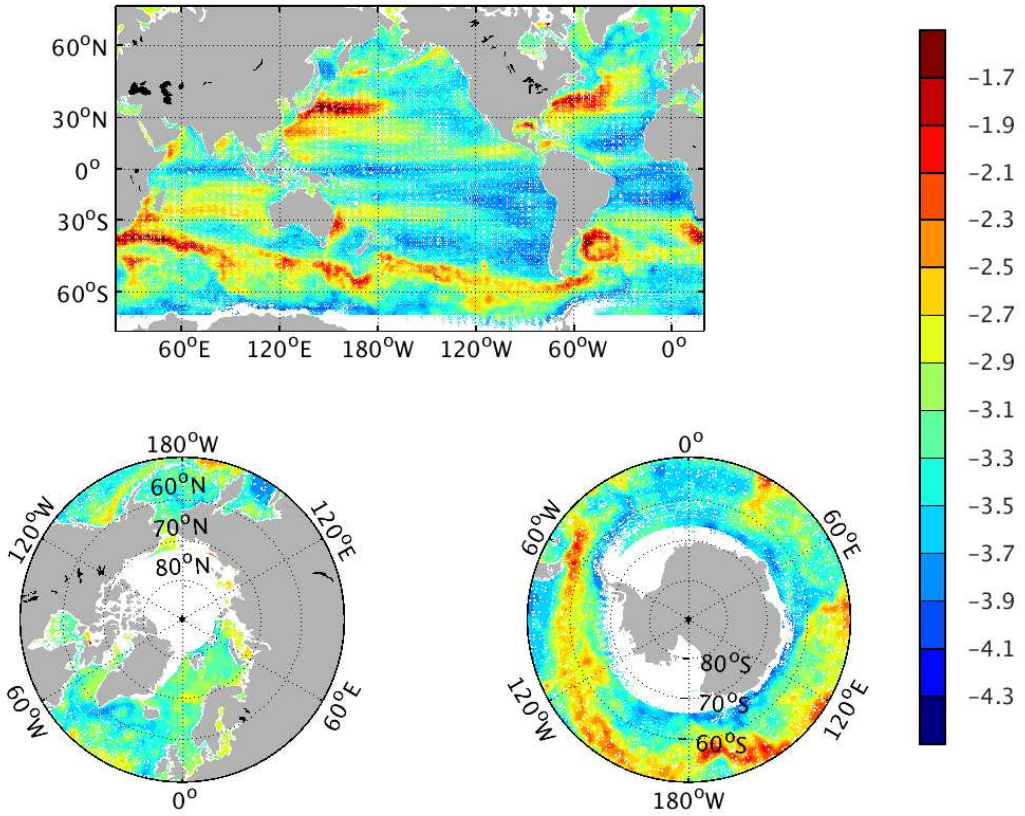

Figure : modeled-observed log(variance) – sea level anomaly (m^2) – large space/time scales

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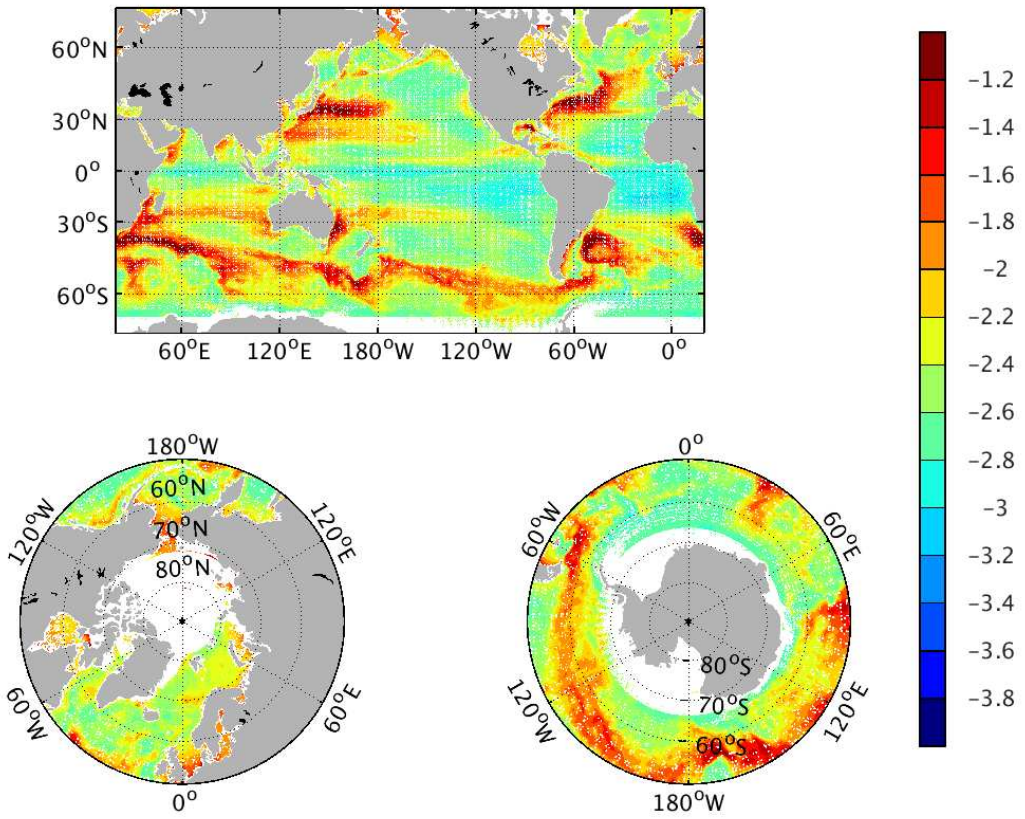

Figure : modeled-observed log(variance) – sea level anomaly (m^2) – pointwise

fit to altimeter data (RADS)

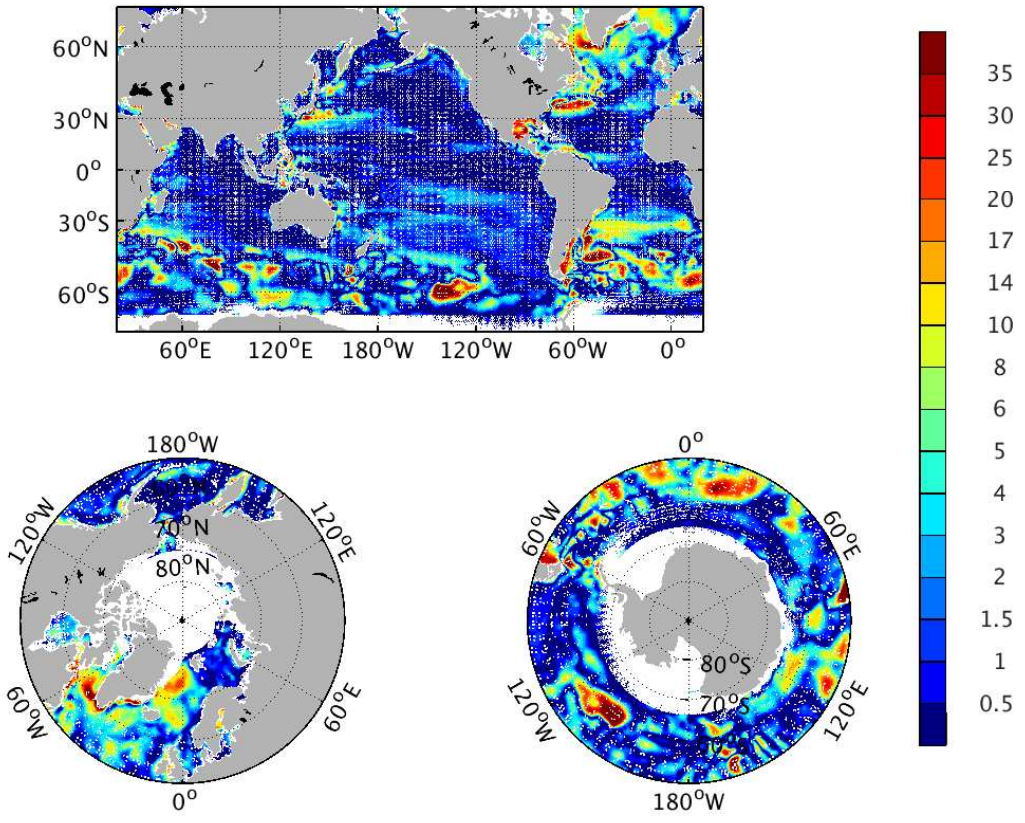

Figure : modeled-observed cost – mean dynamic topography

fit to altimeter data (RADS)

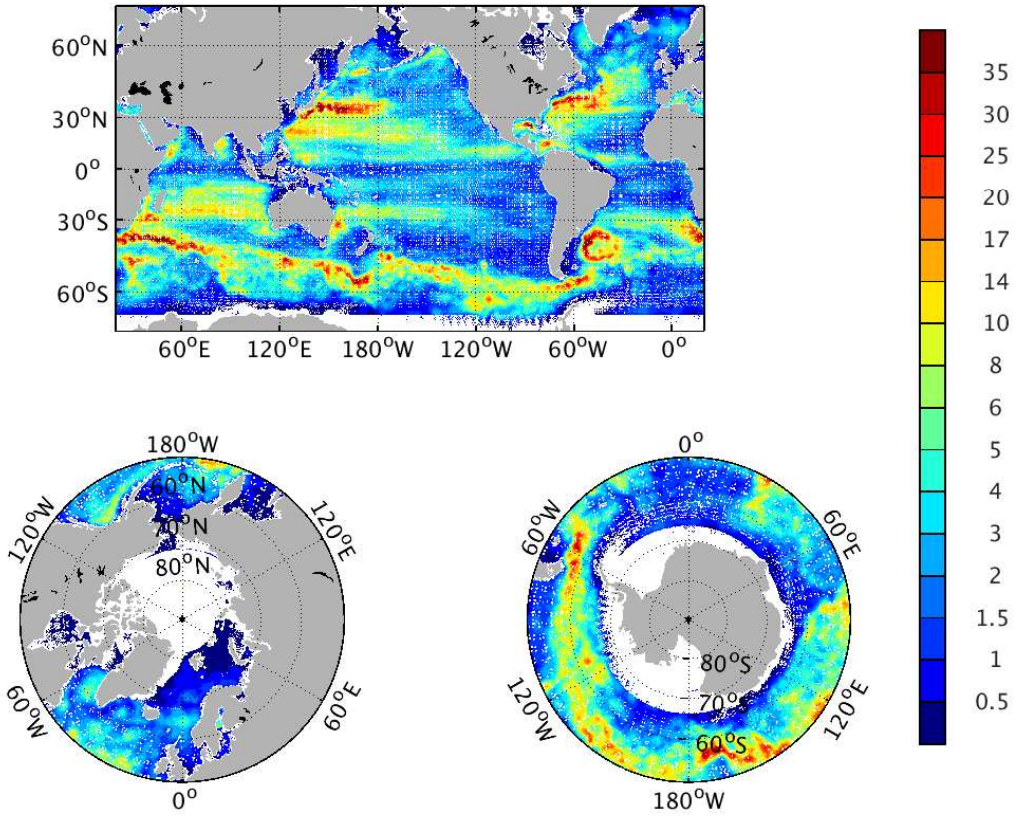

Figure : modeled-observed cost – sea level anomaly – large space/time scales

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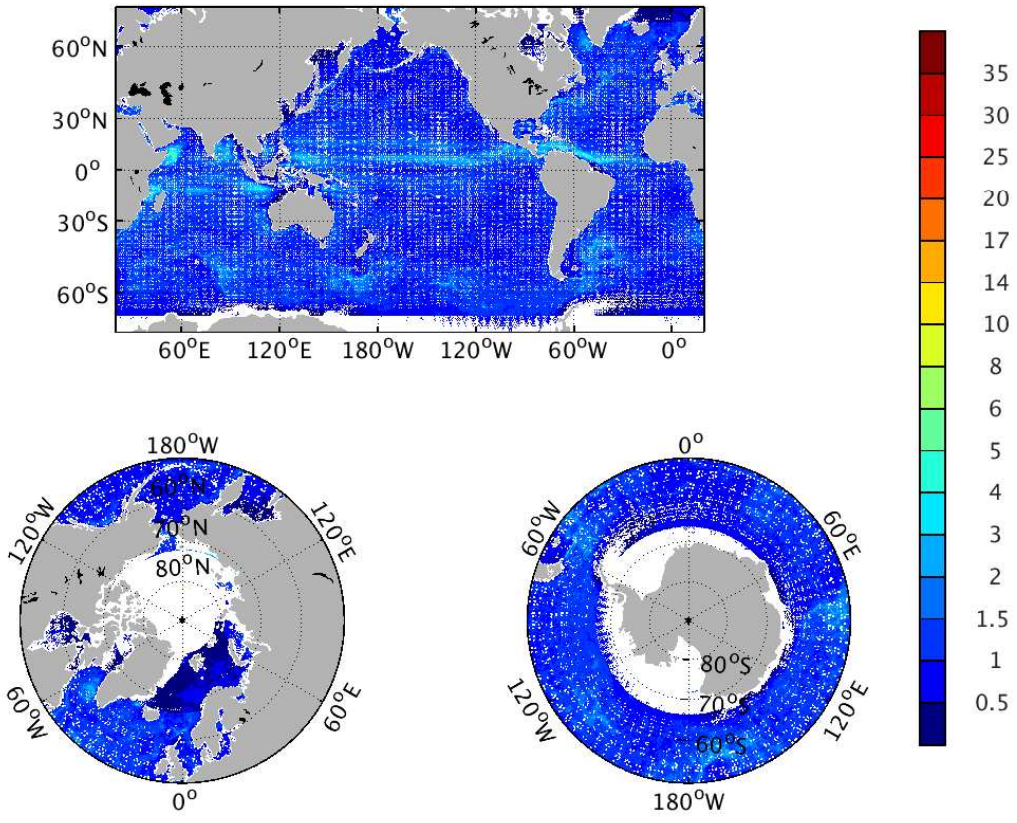

Figure : modeled-observed cost – sea level anomaly – pointwise

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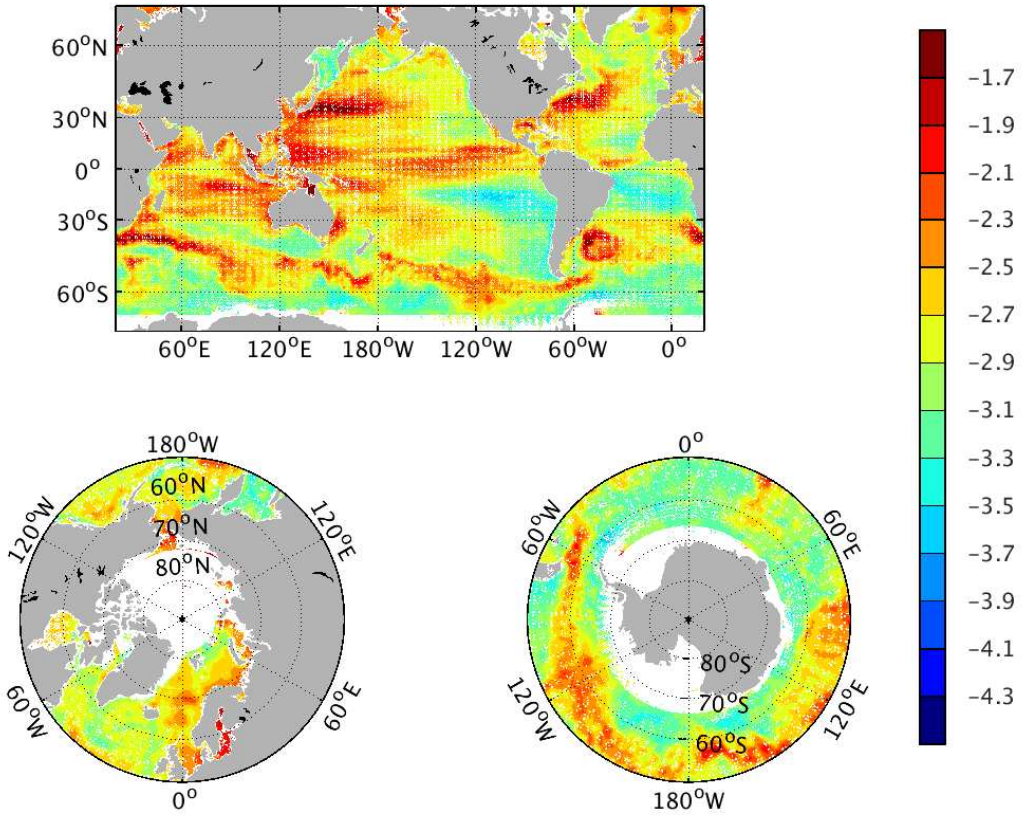
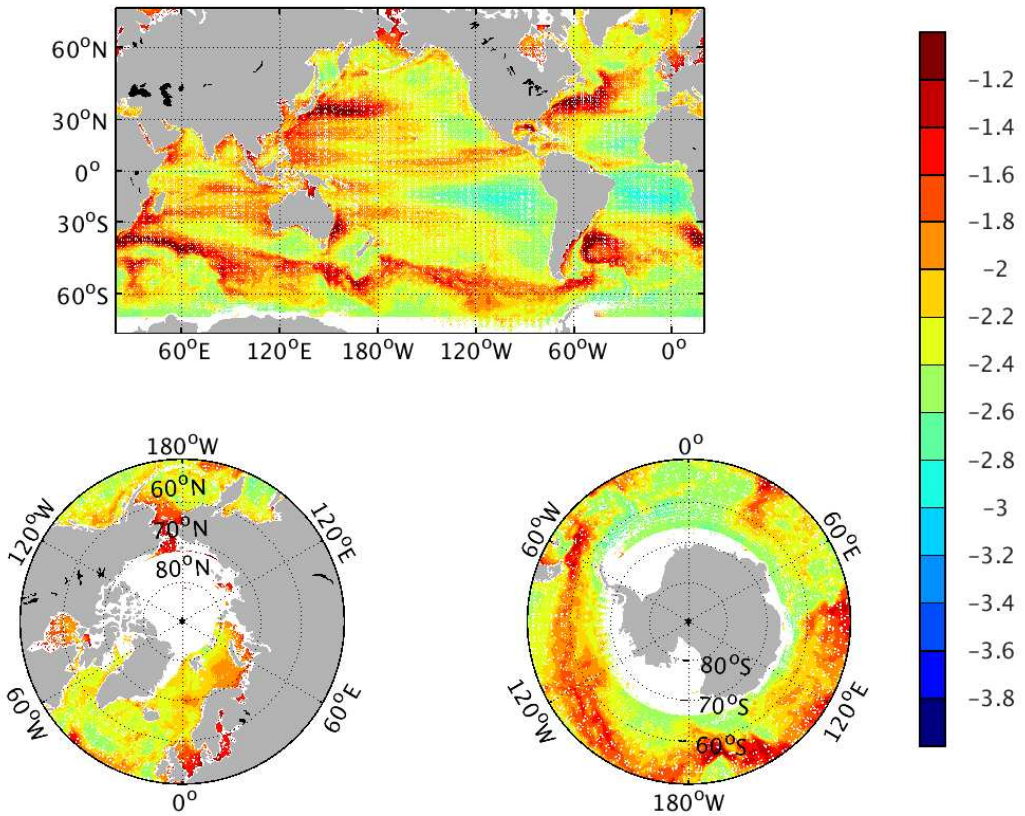


Figure : observed log(variance) – sea level anomaly (m^2) – large space/time scales

fit to altimeter data (RADS)



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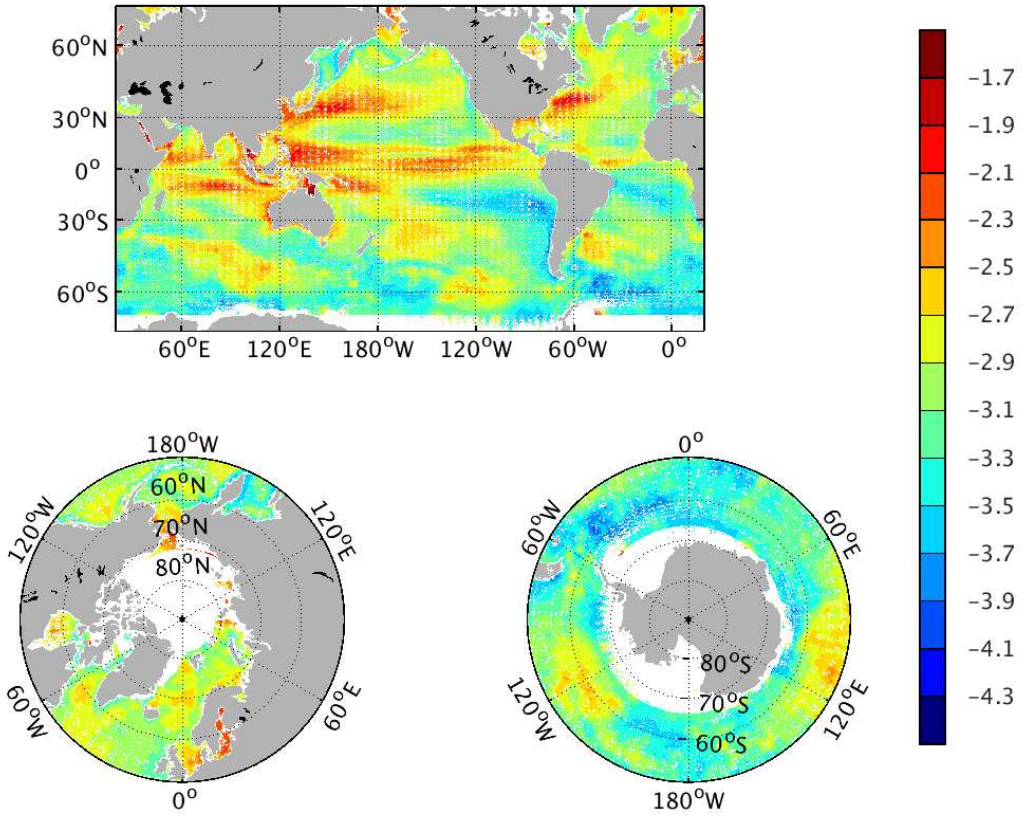

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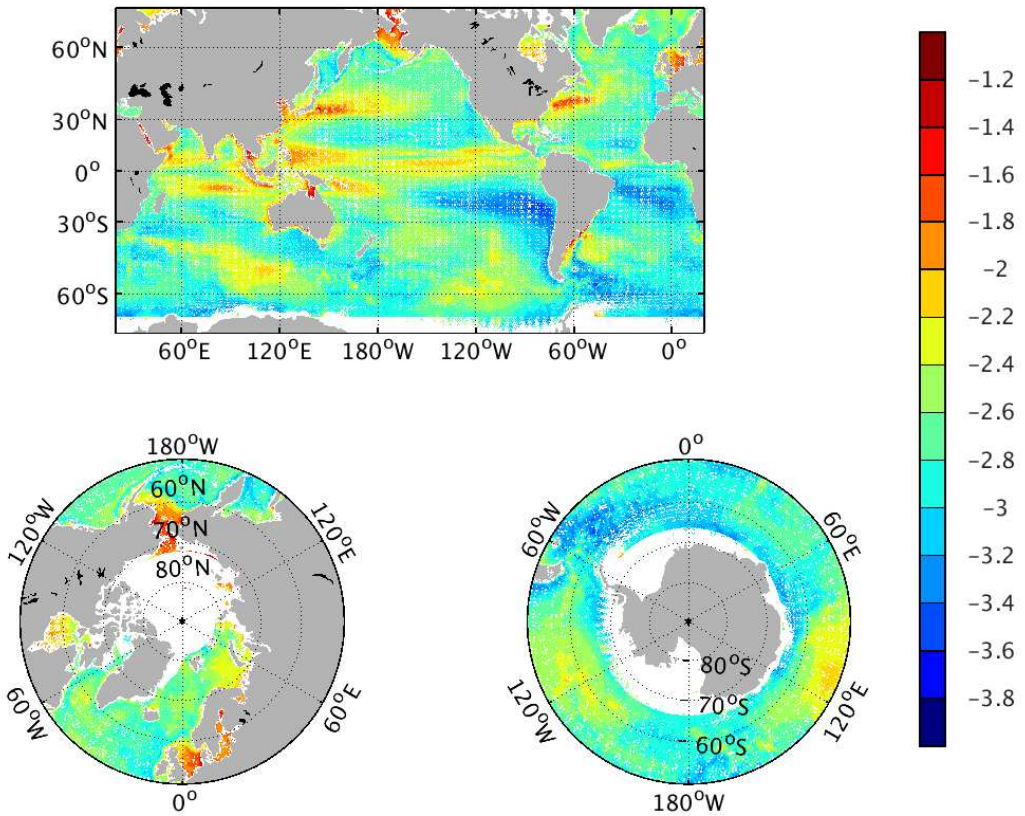
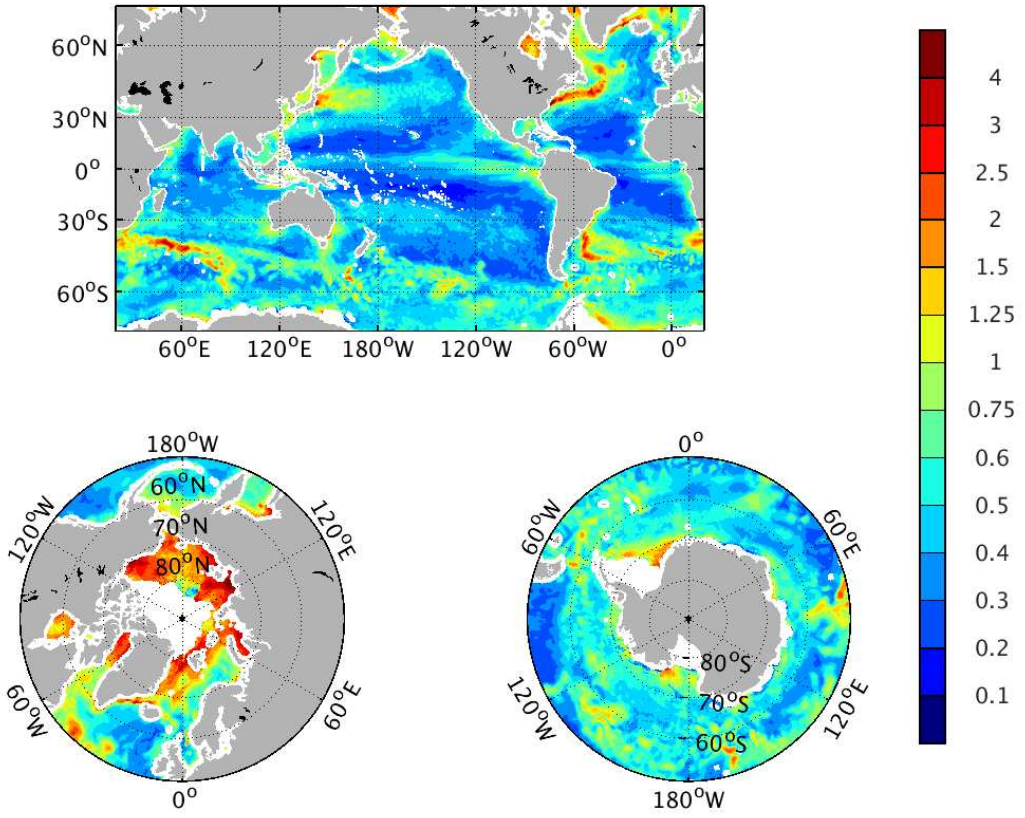


Figure : modeled log(variance) – sea level anomaly (m^2) – pointwise

fit to sst data



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fit to sst data

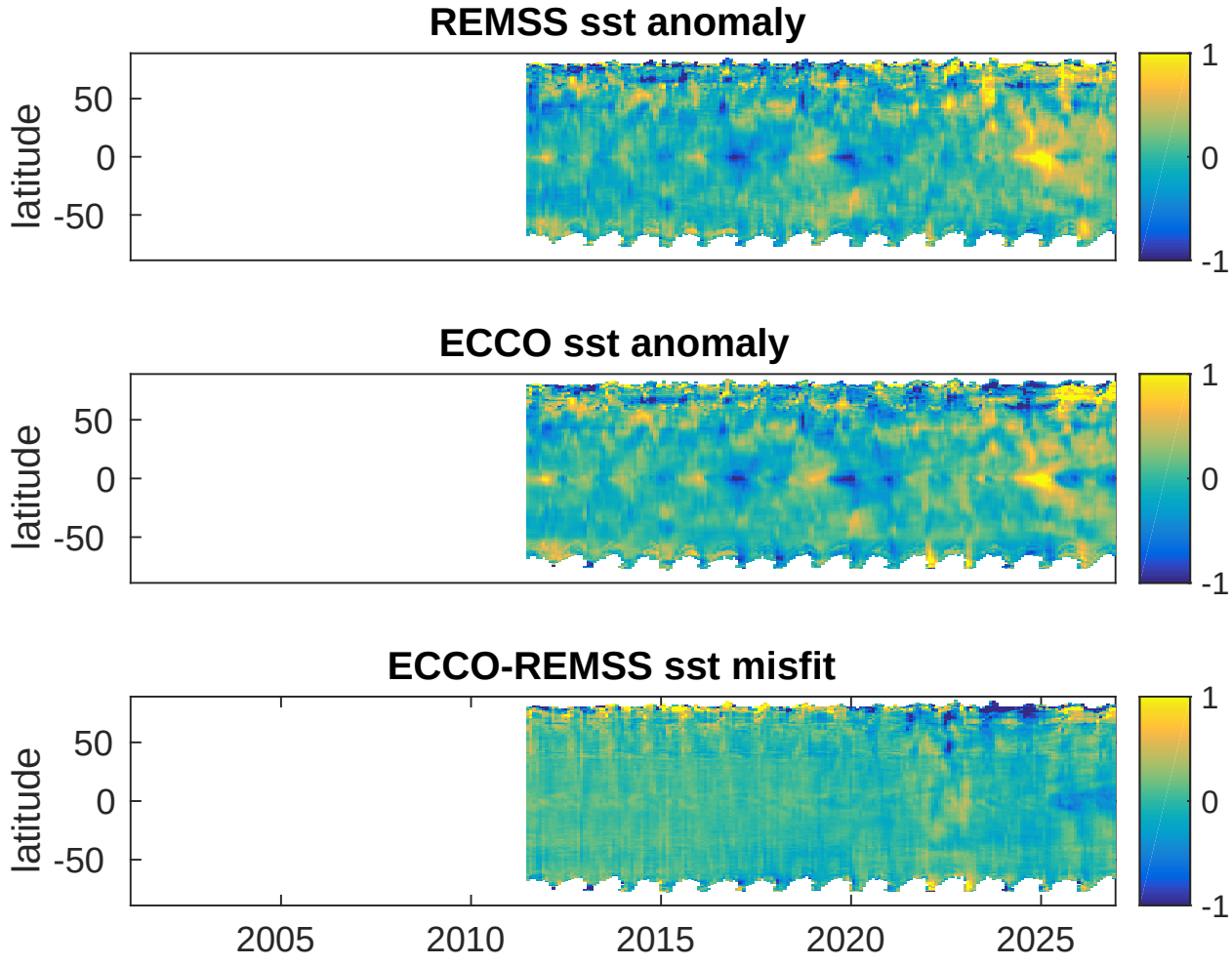

Figure : ECCO and REMSS zonal mean sst anomalies (K)

fit to grace r4 data

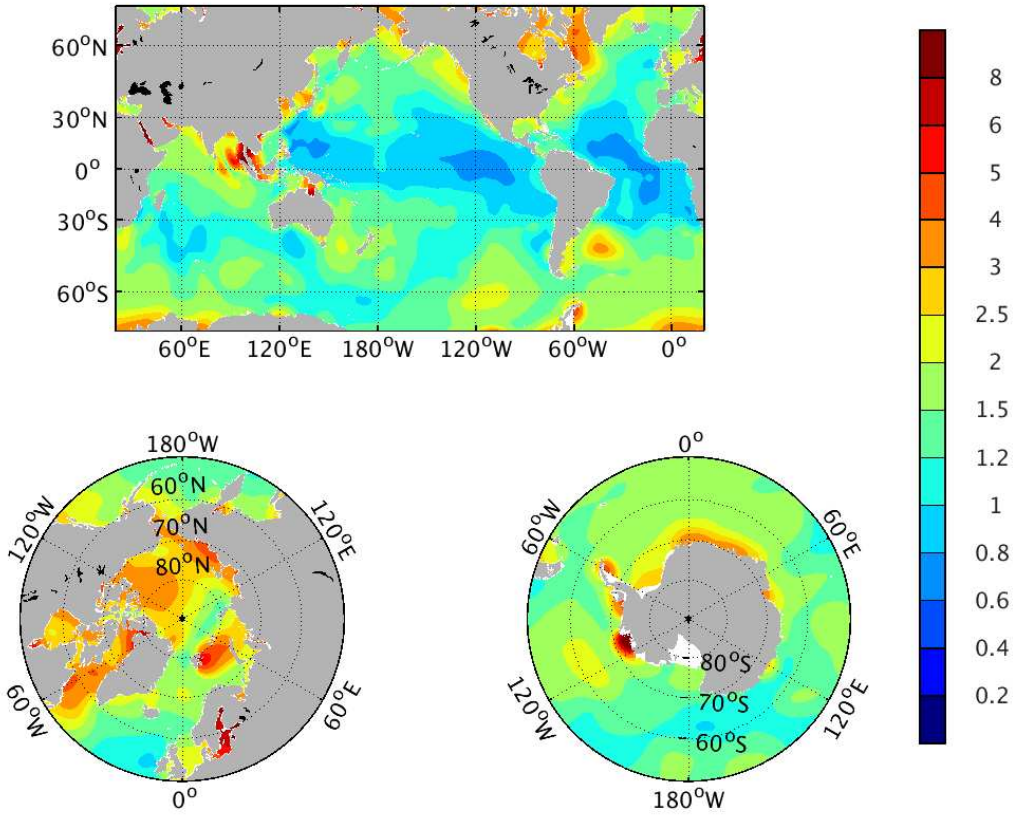

Figure : modeled-observed rms – bottom pressure (cm)

fit to grace r4 data

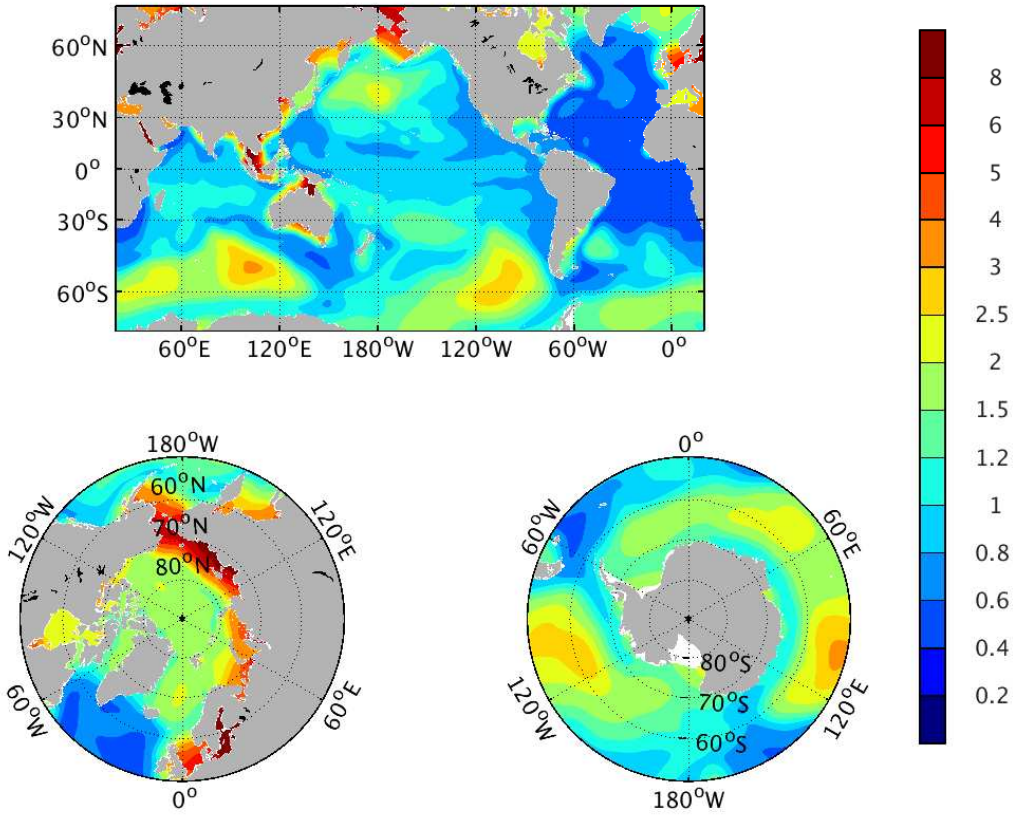

Figure : rms modeled – bottom pressure (cm)

fit to grace r4 data

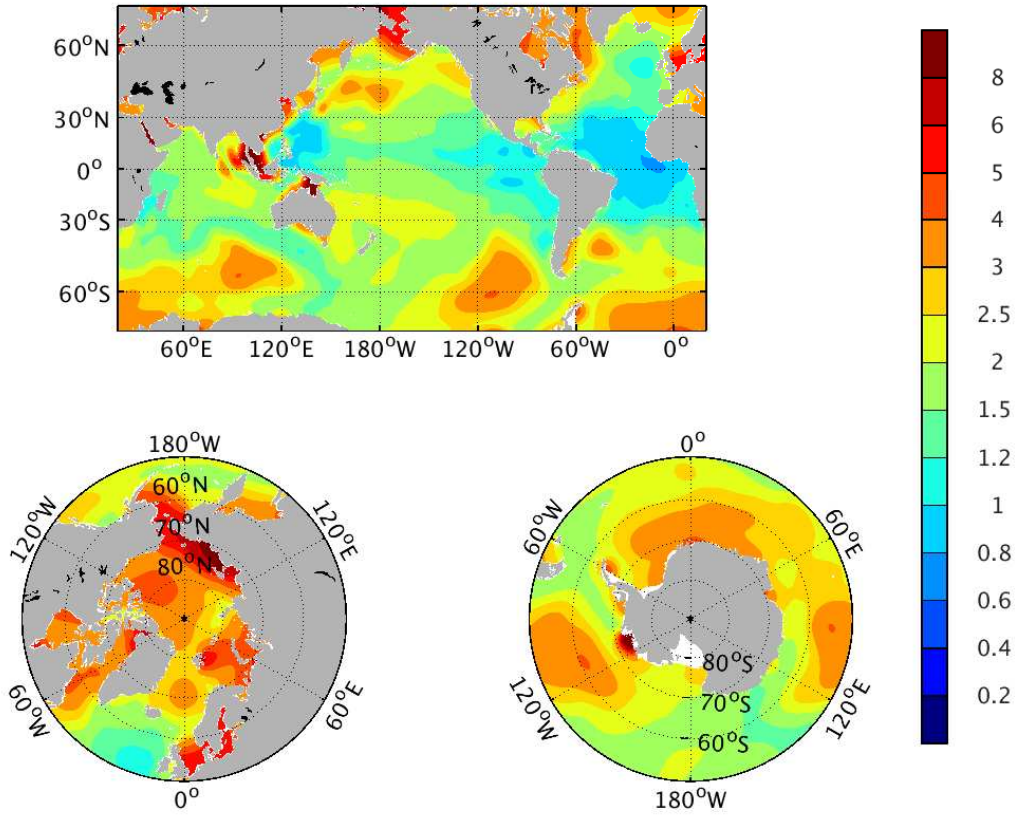

Figure : rms observed – bottom pressure (cm)

fit to grace r4 data

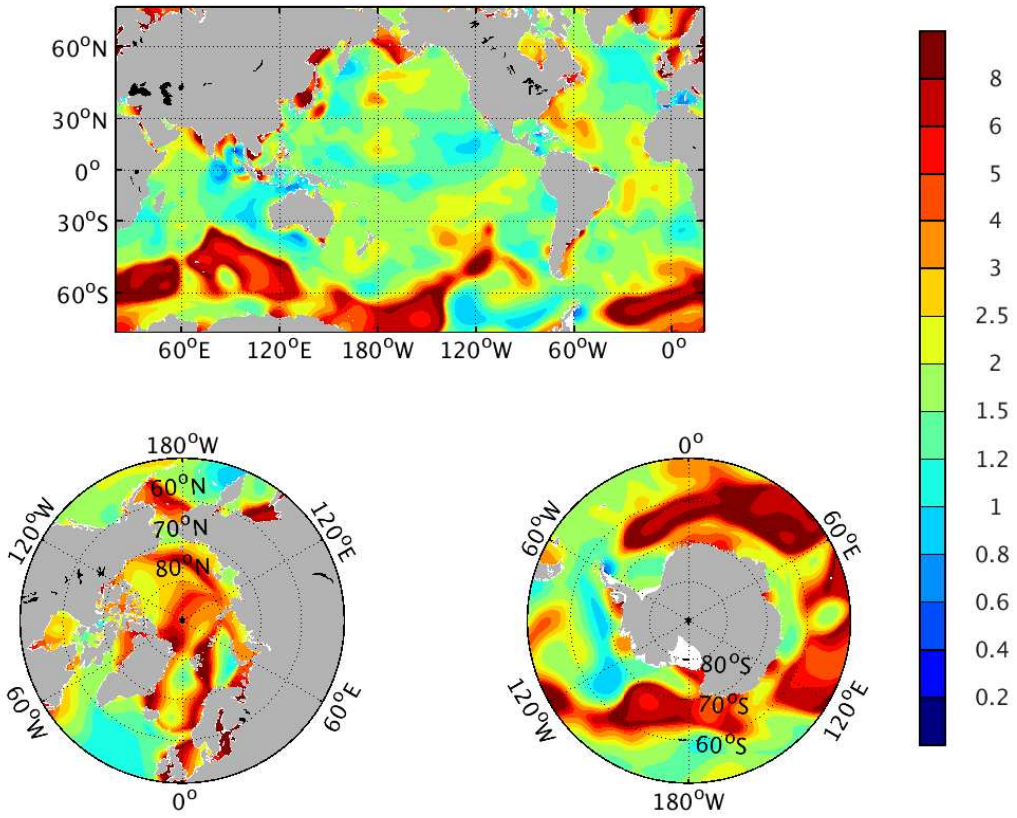

Figure : Cost function

fit to seaice data

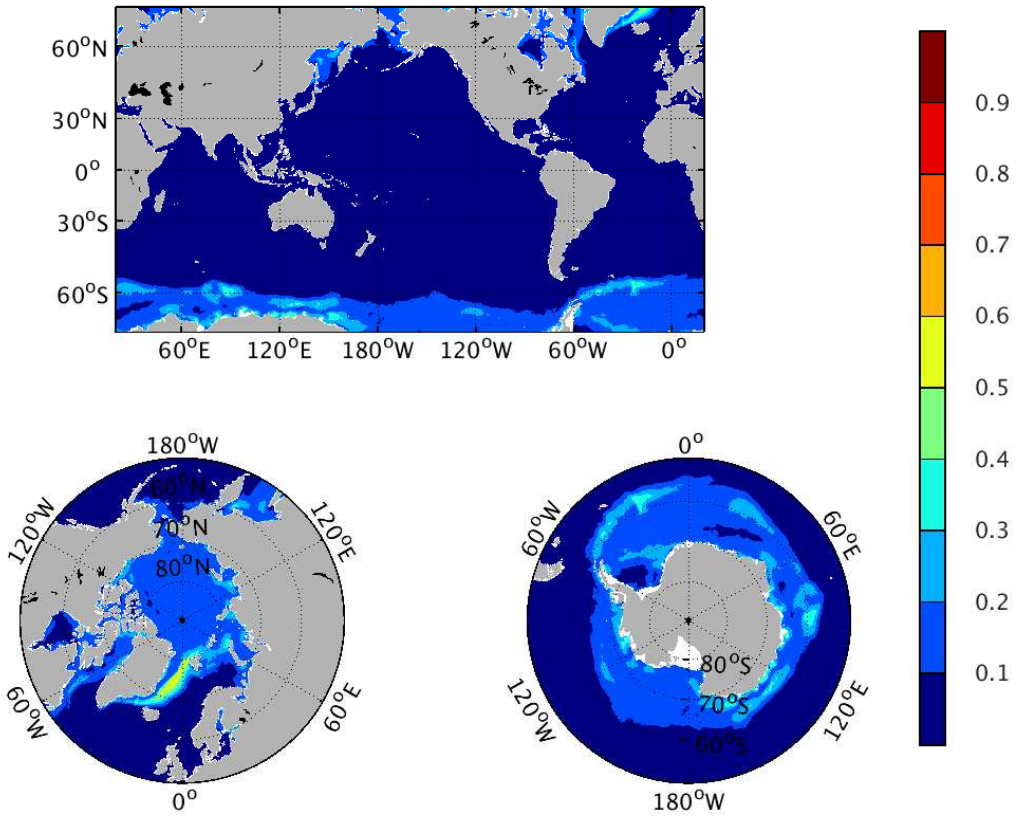

Figure : modeled-observed rms – sea ice concentration

fit to seaice data

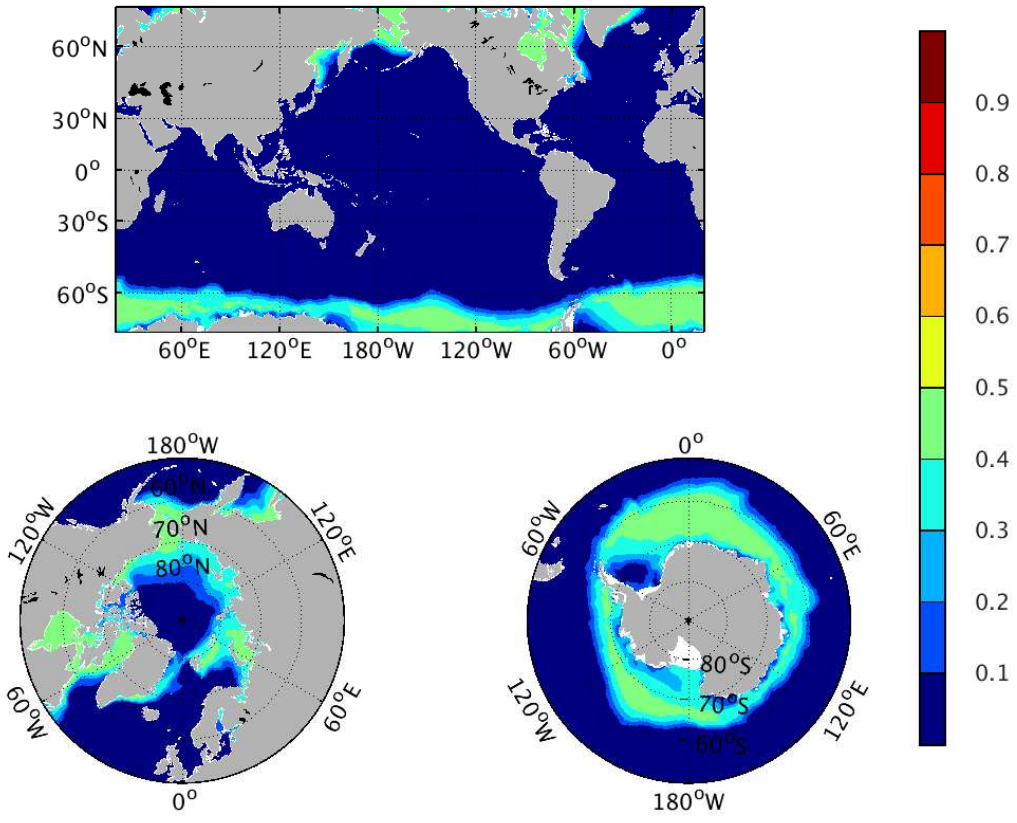

Figure : observed std – sea ice concentration

fit to seaice data

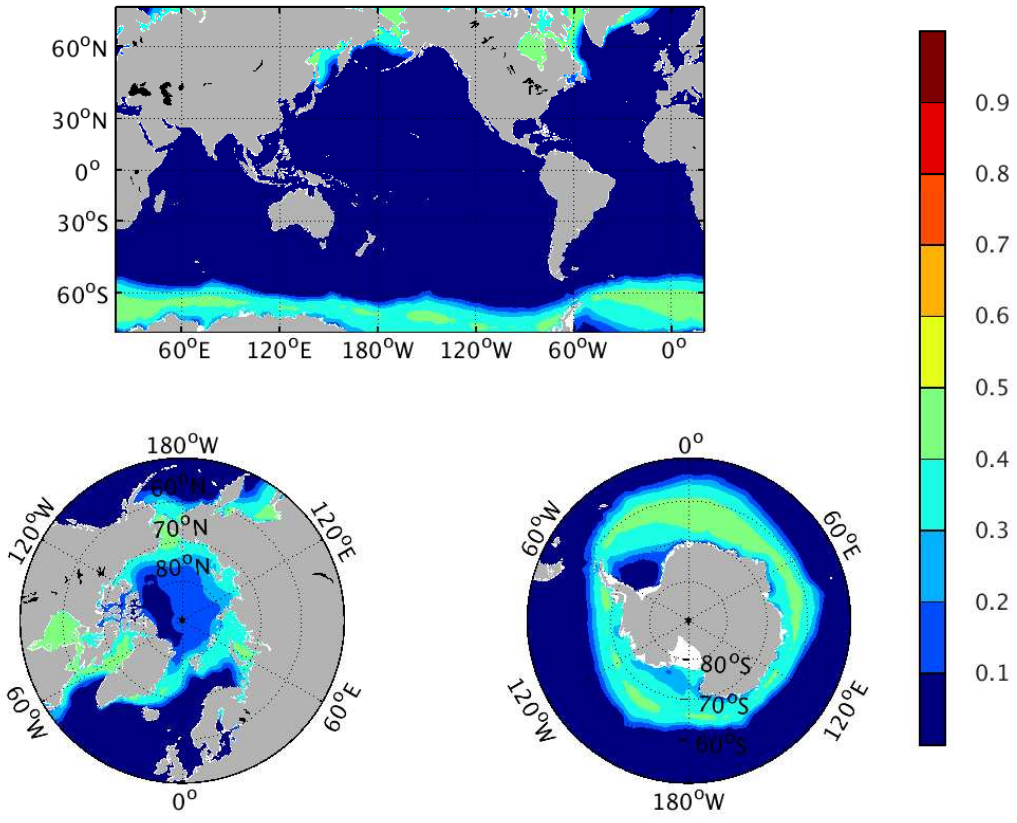

Figure : modelled std – sea ice concentration

fit to seaice data

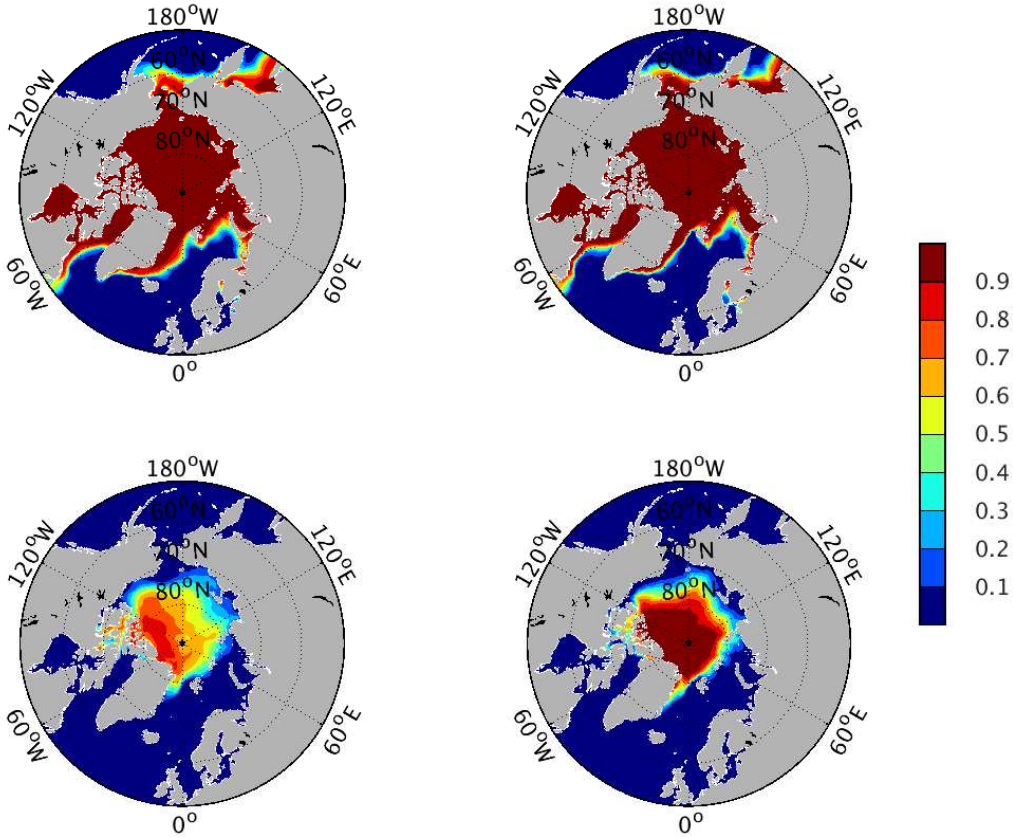

Figure : ECCO (left) and NSIDC (right, gsfc bootstrap) ice concentration in March (top) and September (bottom).

fit to seaice data

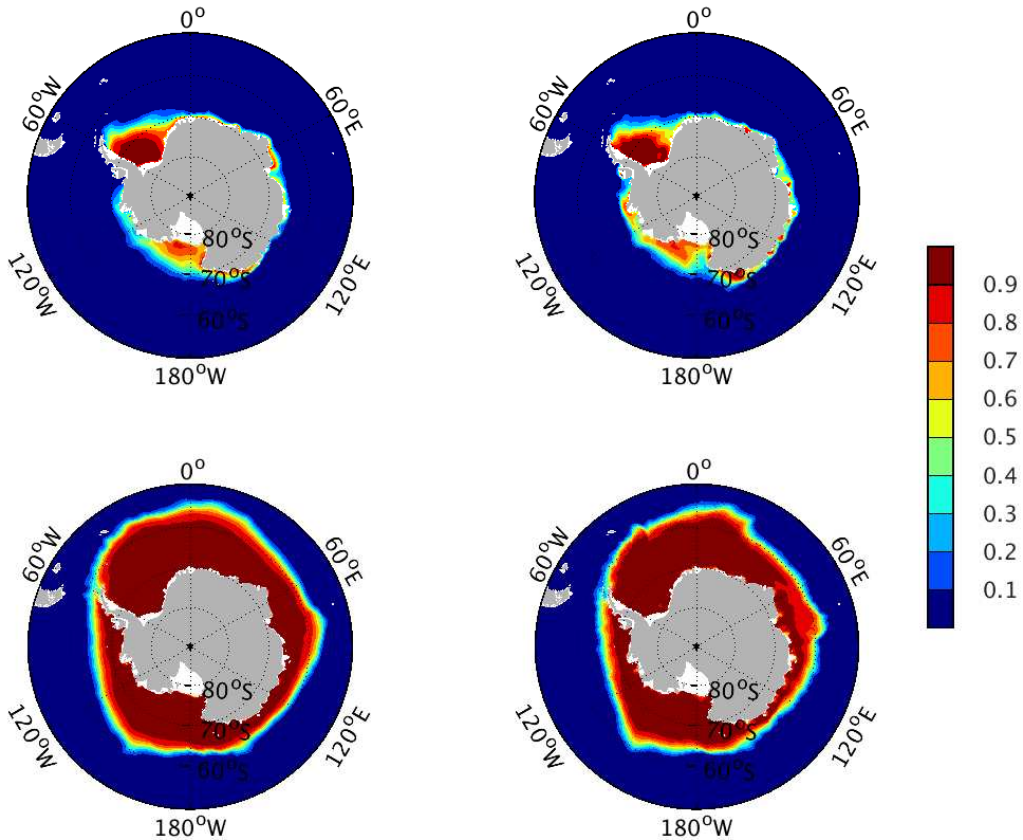

Figure : ECCO (left) and NSIDC (right, gsfc bootstrap) ice concentration in March (top) and September (bottom).

fit to seaice data

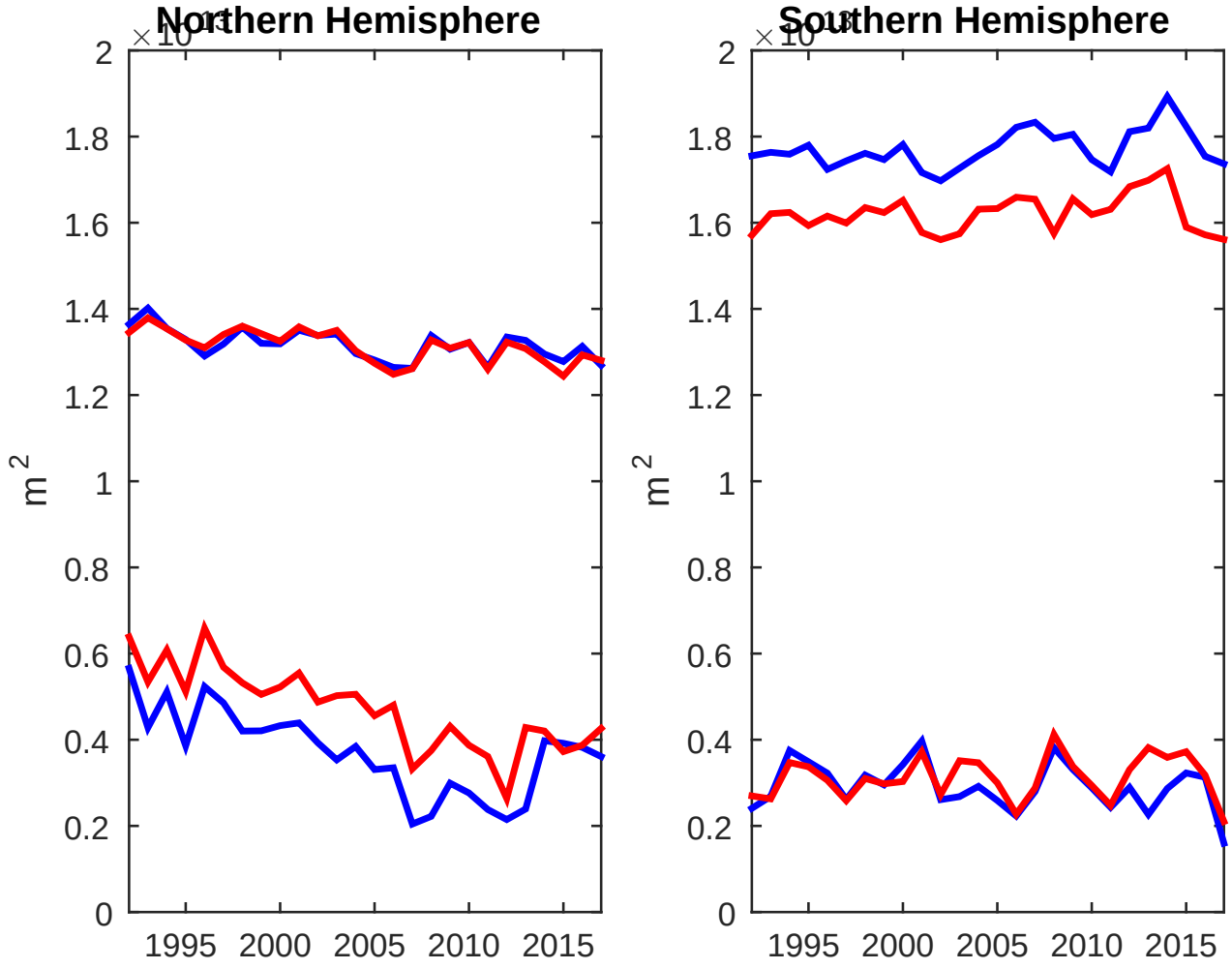

Figure : ECCO (blue) and NSIDC (red, gsfc bootstrap) ice concentration in March and September in Northern Hemisphere (left) and Southern Hemisphere (right)

fit to seaice data

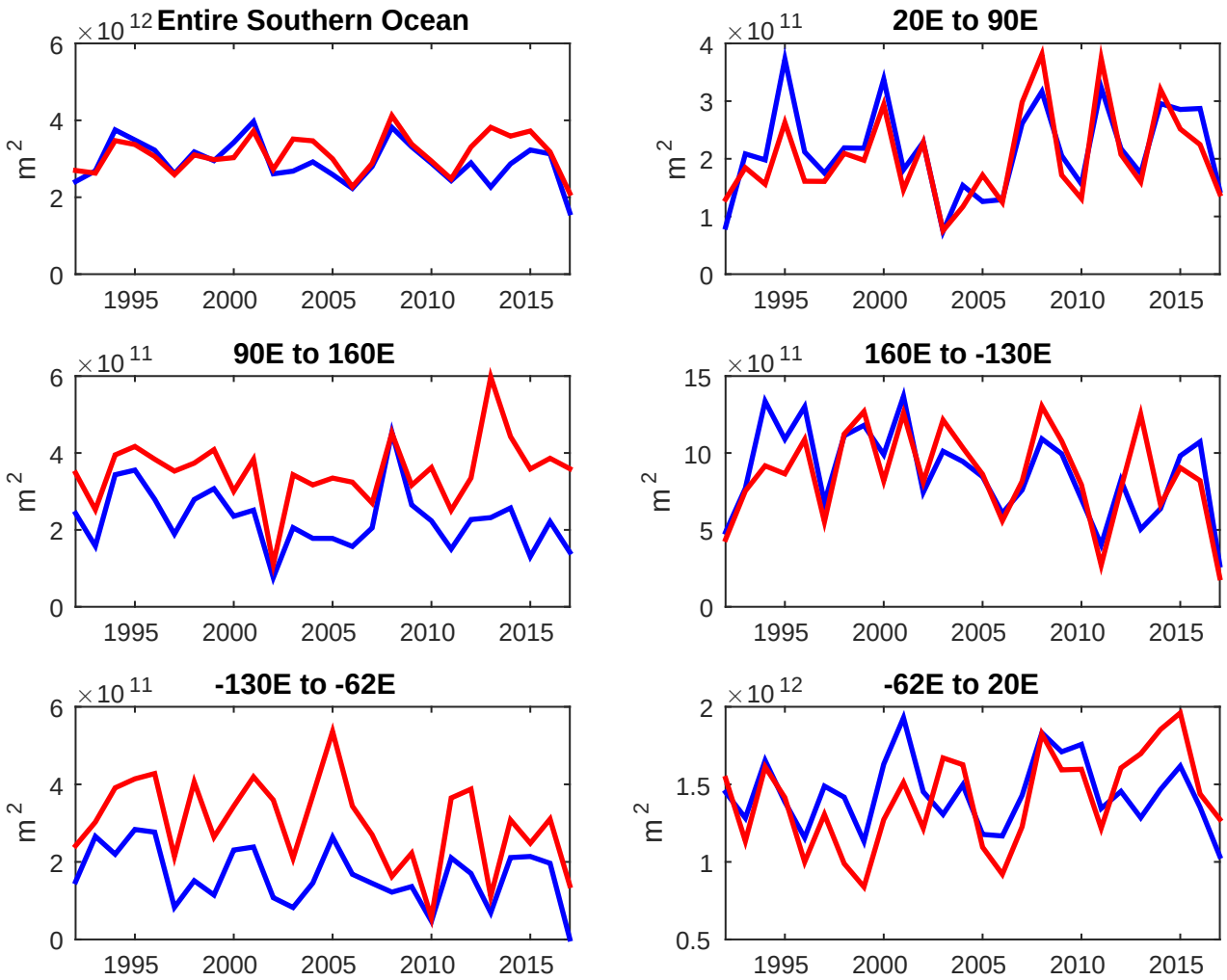

Figure : ECCO (blue) and NSIDC (red, gsfc bootstrap) ice concentration in March per Southern Ocean sector

fit to seaice data

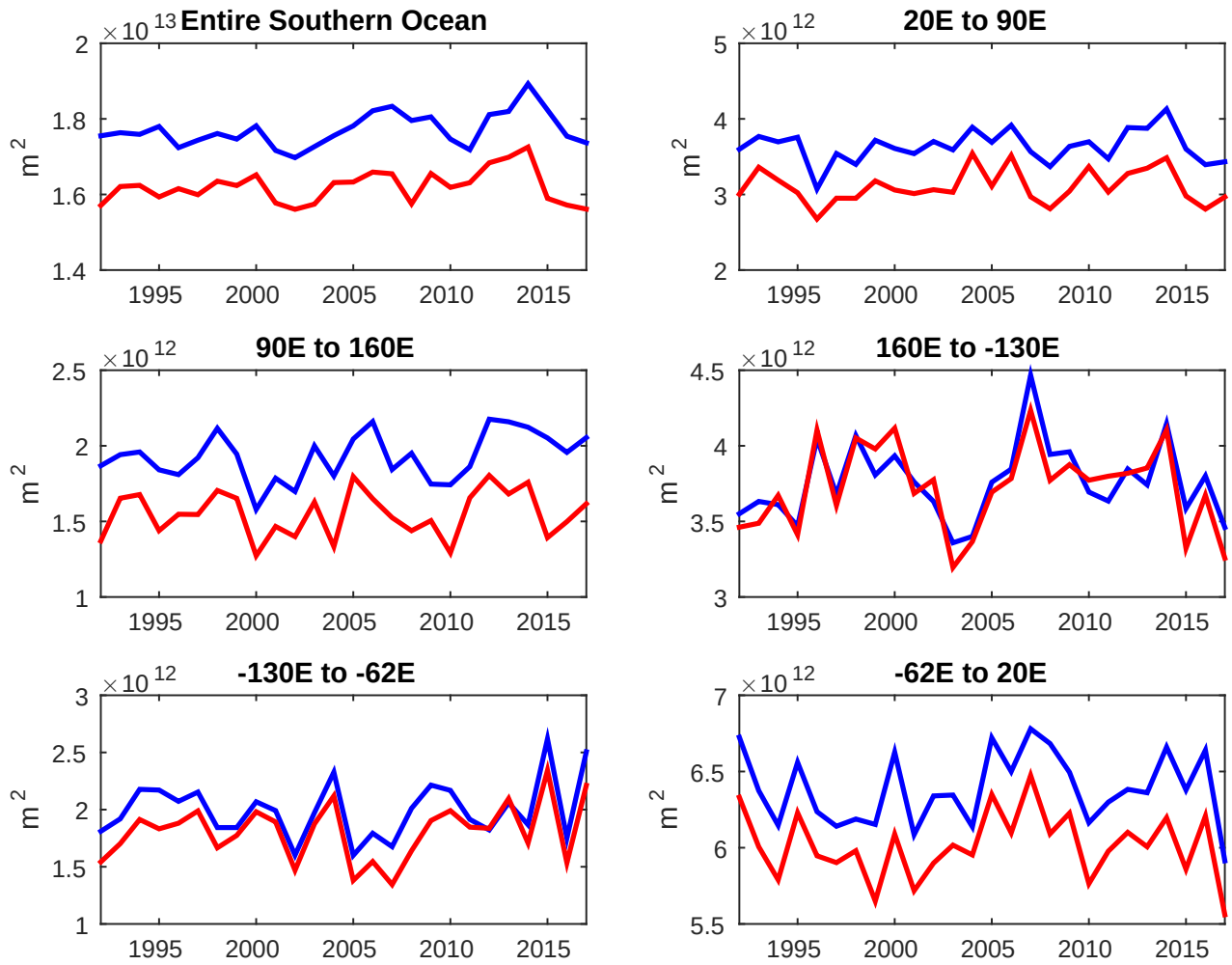

Figure : ECCO (blue) and NSIDC (red, gsfc bootstrap) ice concentration in September per Southern Ocean sector

barotropic streamfunction

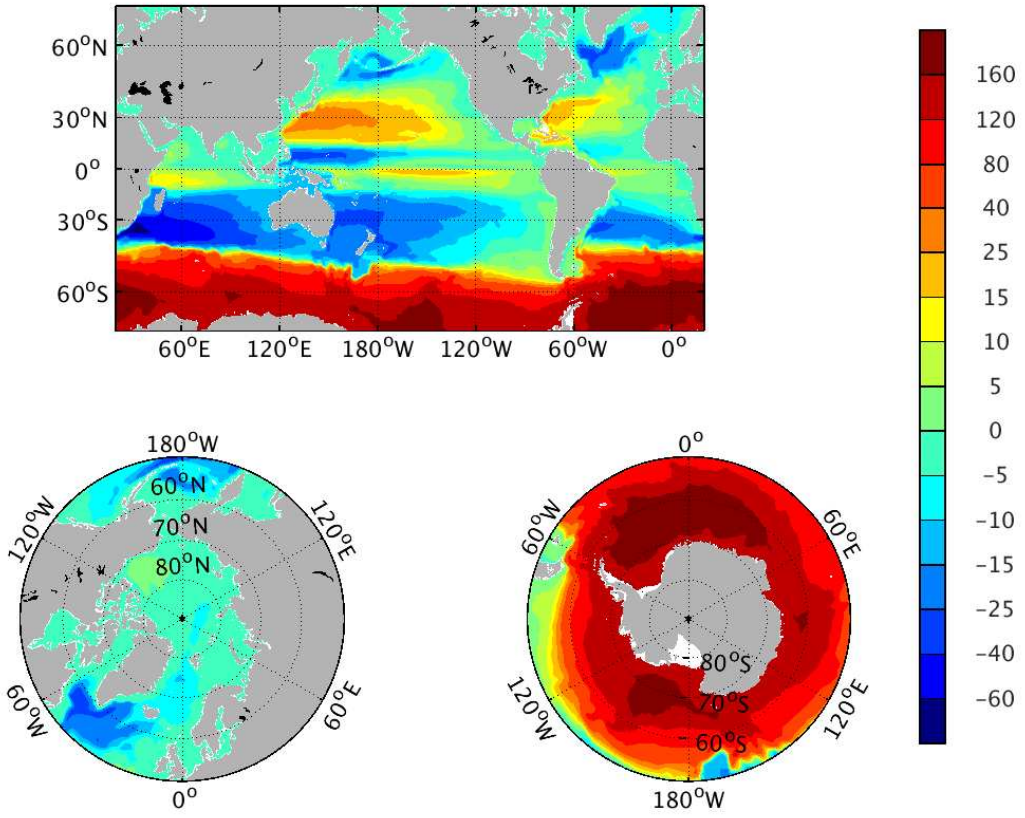

Figure : 1992-2017 mean – barotropic streamfunction (Sv)

barotropic streamfunction

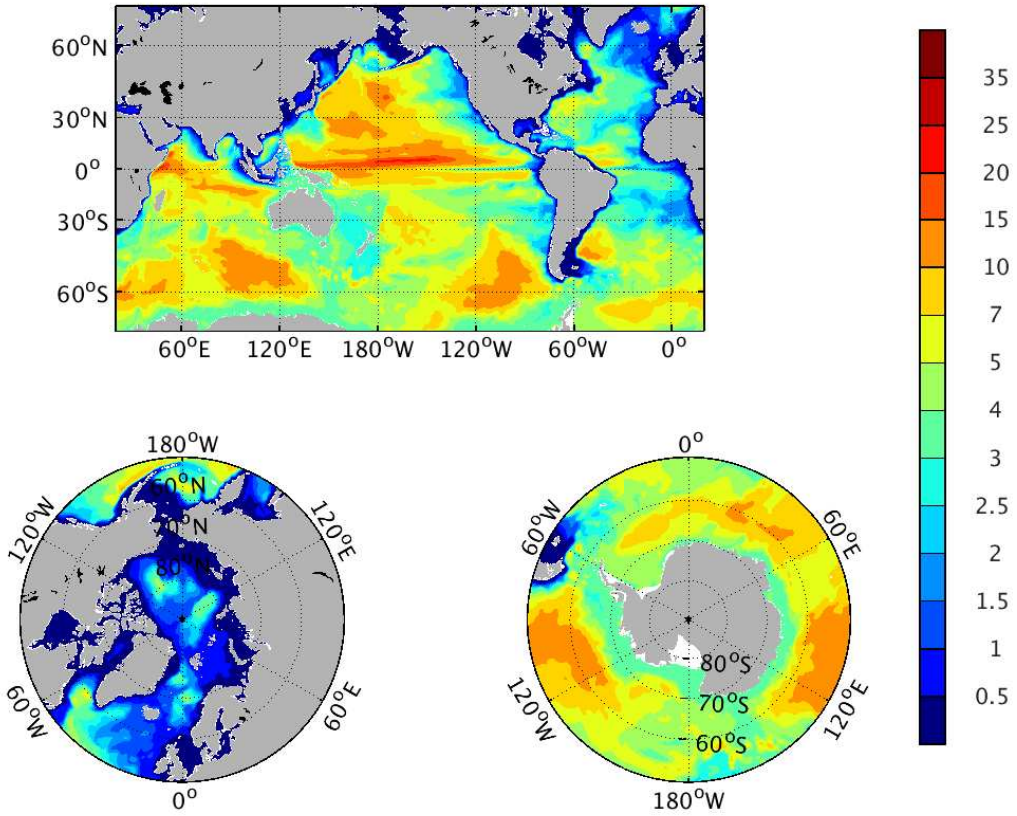

Figure : 1992-2017 standard deviation – barotropic streamfunction (Sv)

meridional streamfunction

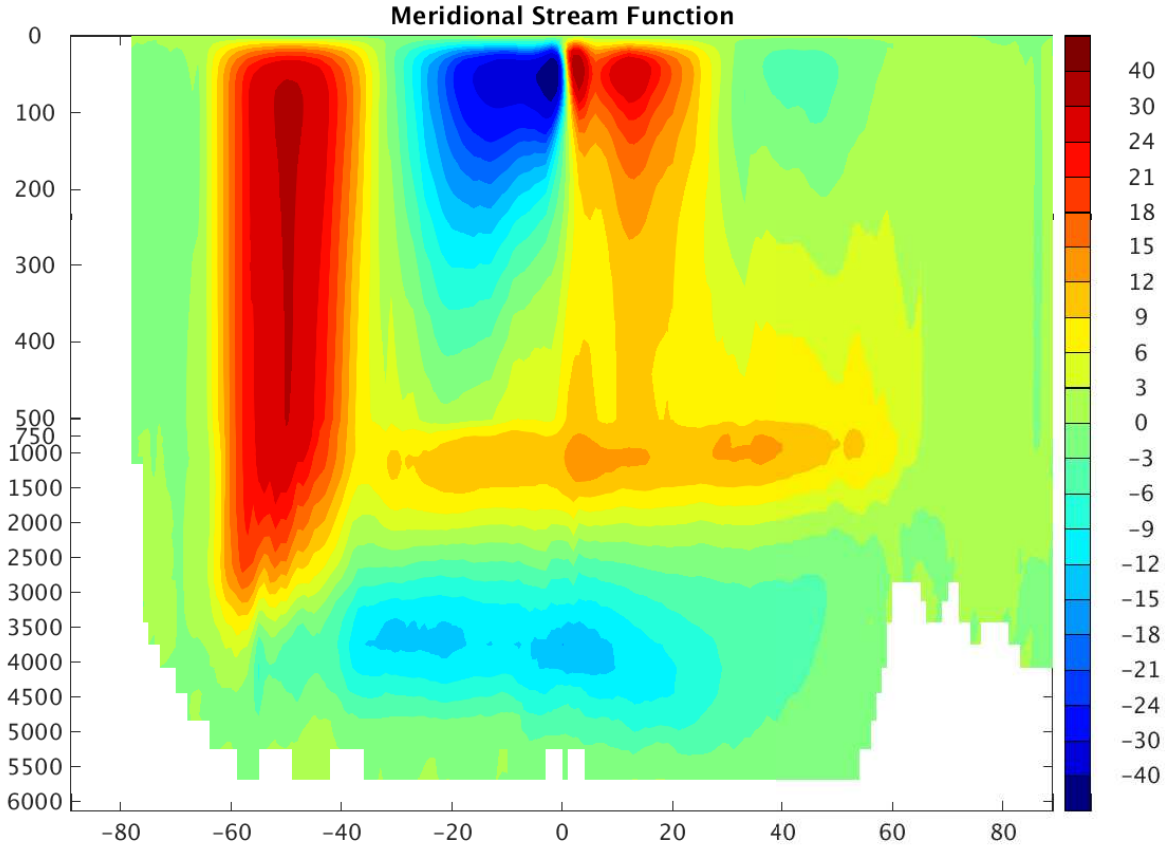

Figure : 1992-2017 mean – overturning streamfunction (Sv)

meridional streamfunction

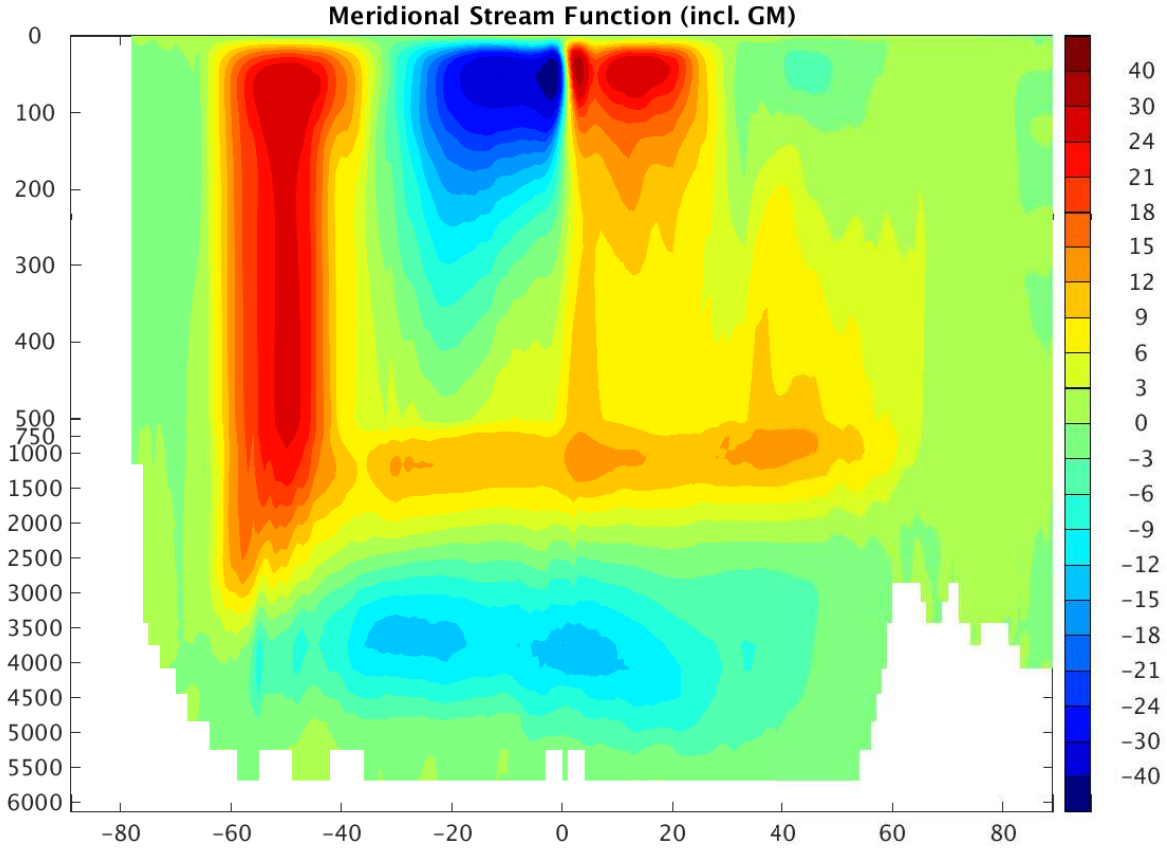

Figure : 1992-2017 mean – overturning streamfunction incl. GM (Sv)

meridional streamfunction

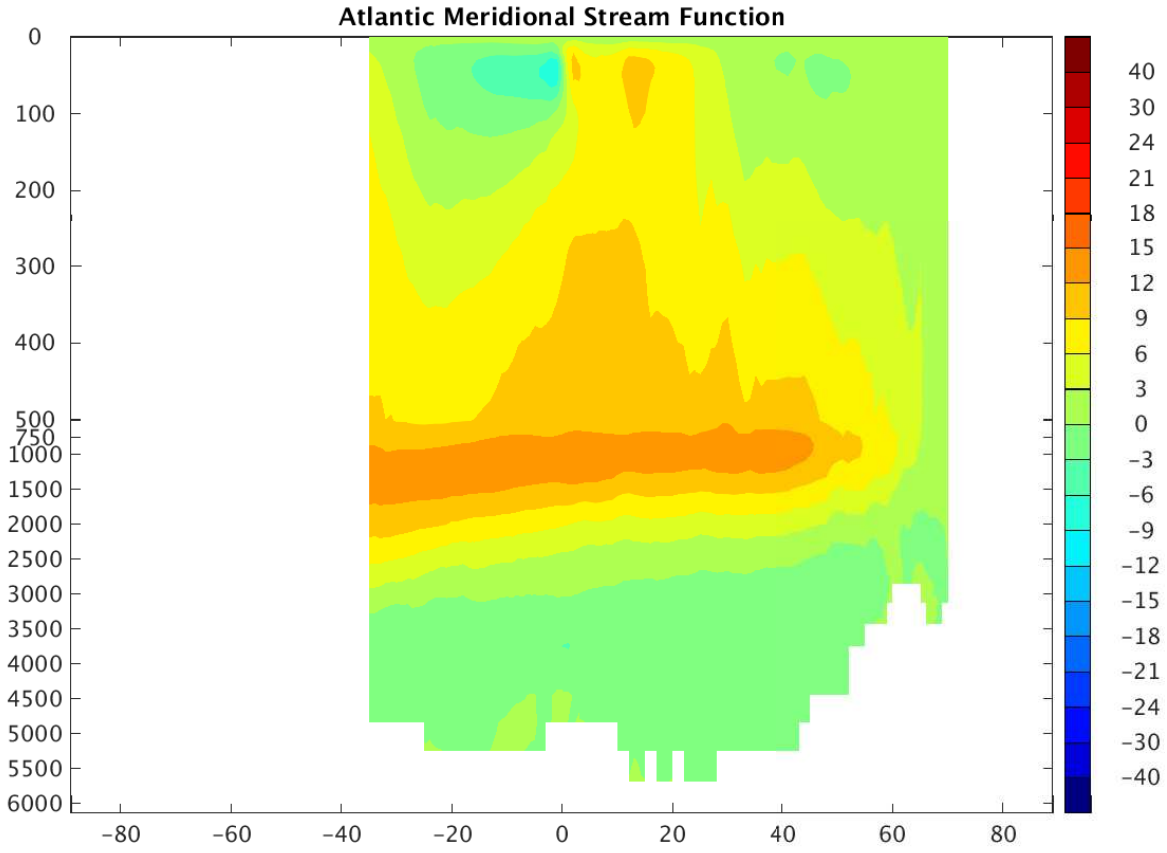

Figure : 1992-2017 mean – Atlantic overturning streamfunction (Sv)

meridional streamfunction

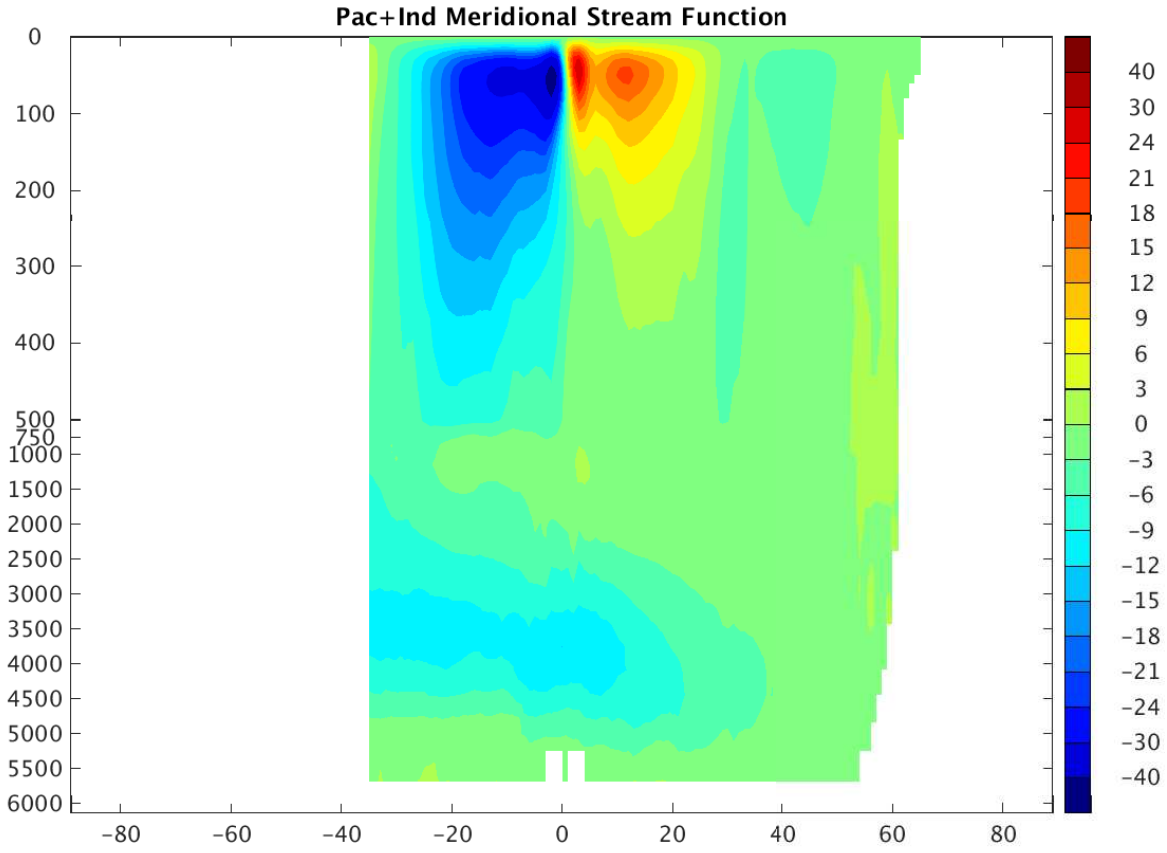

Figure : 1992-2017 mean – Pac+Ind overturning streamfunction (Sv)

meridional streamfunction

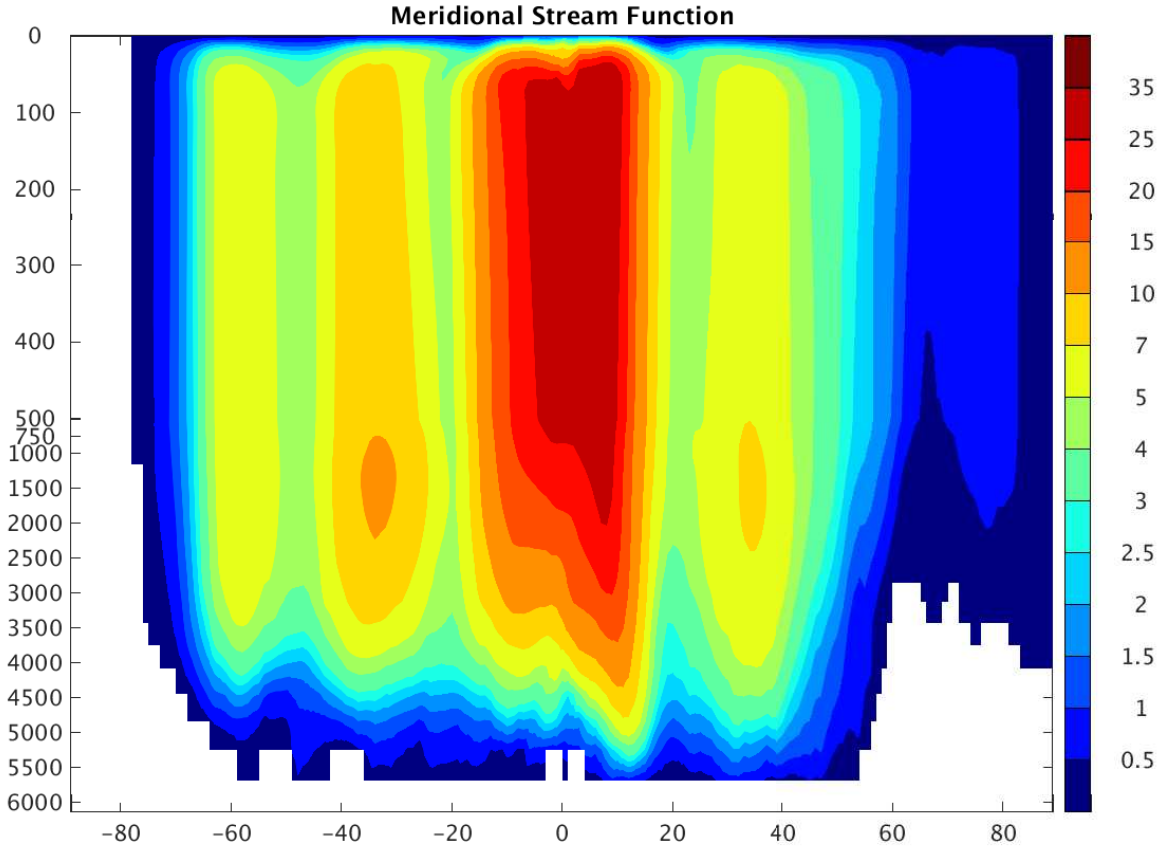

Figure : 1992-2017 standard deviation – overturning streamfunction (Sv)

meridional streamfunction

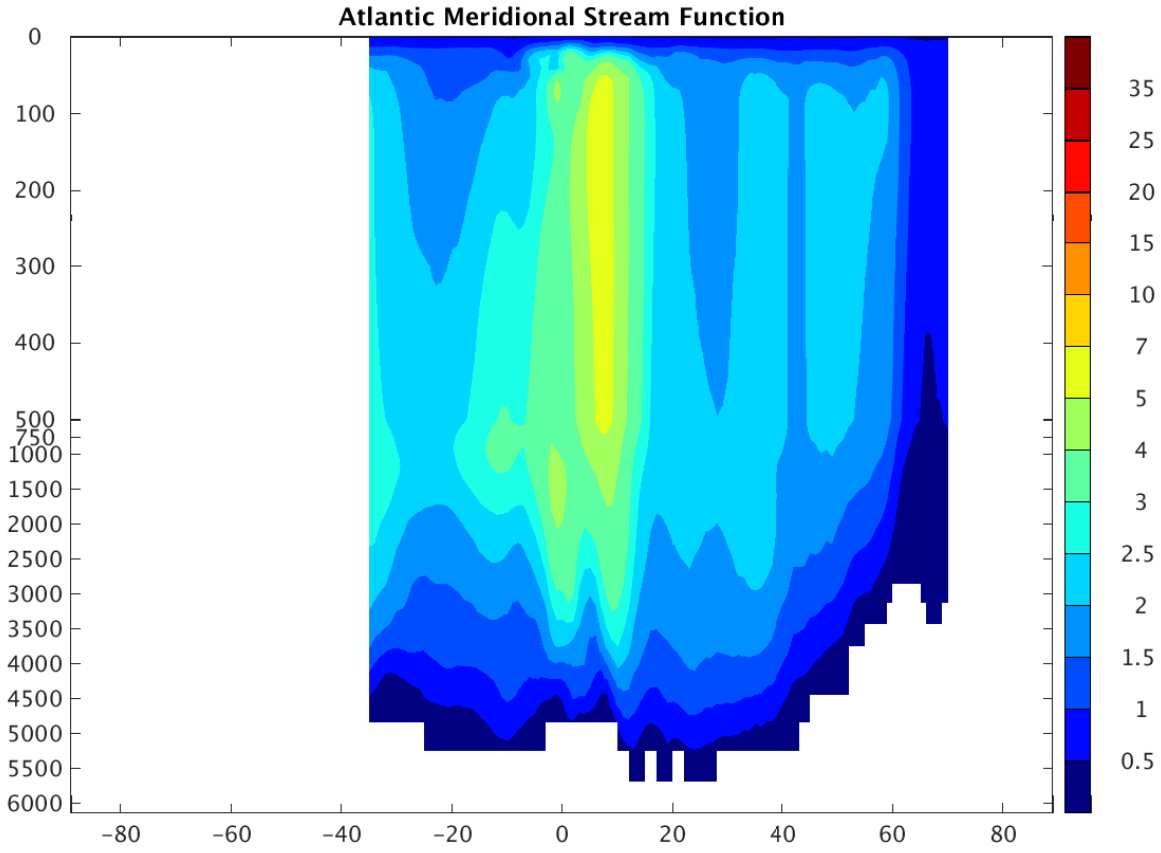

Figure : 1992-2017 standard deviation – Atlantic overturning streamfunction (Sv)

meridional streamfunction (time series)

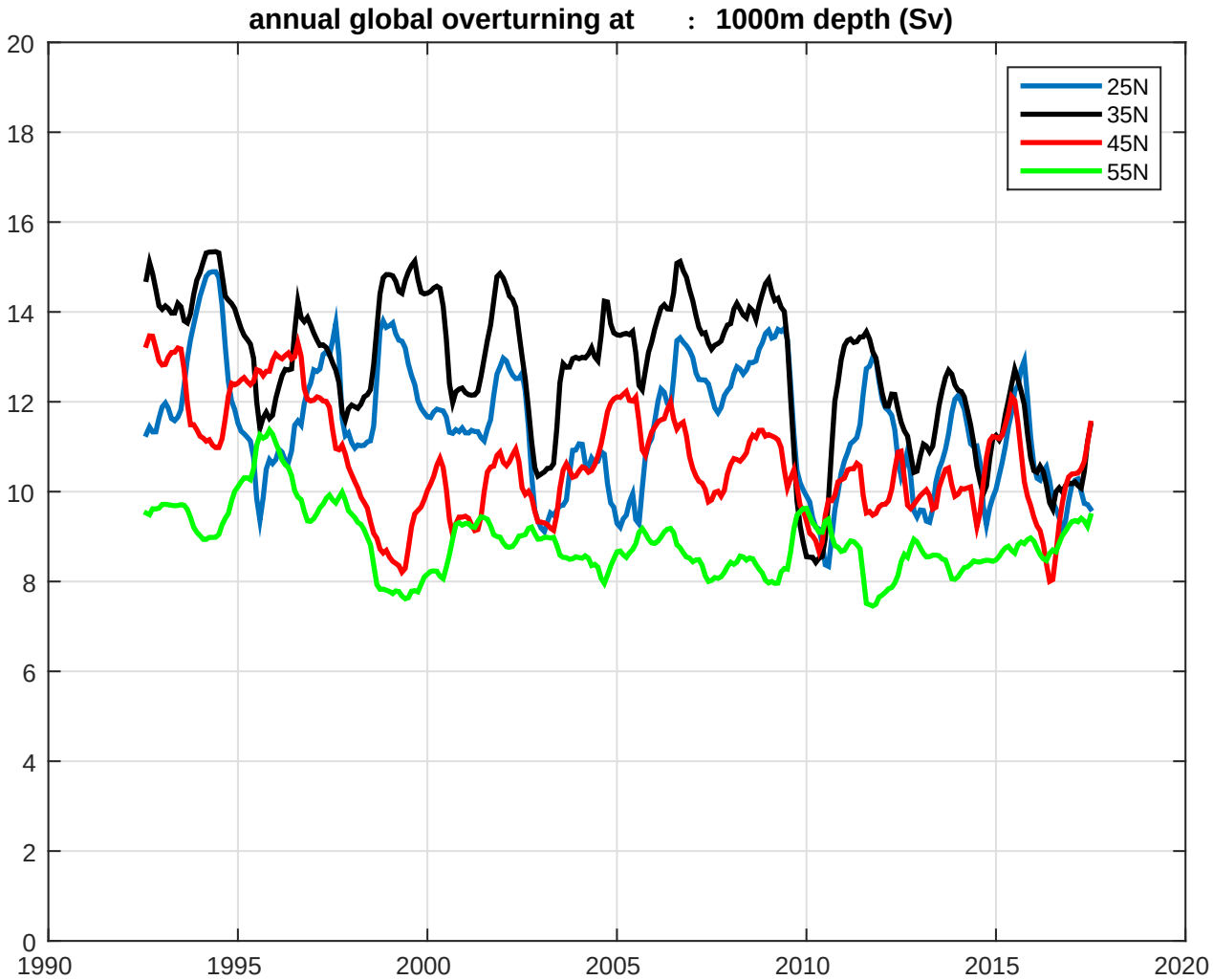

Figure : annual global overturning at select latitudes at $\approx$ 1000m depth

meridional streamfunction (time series)

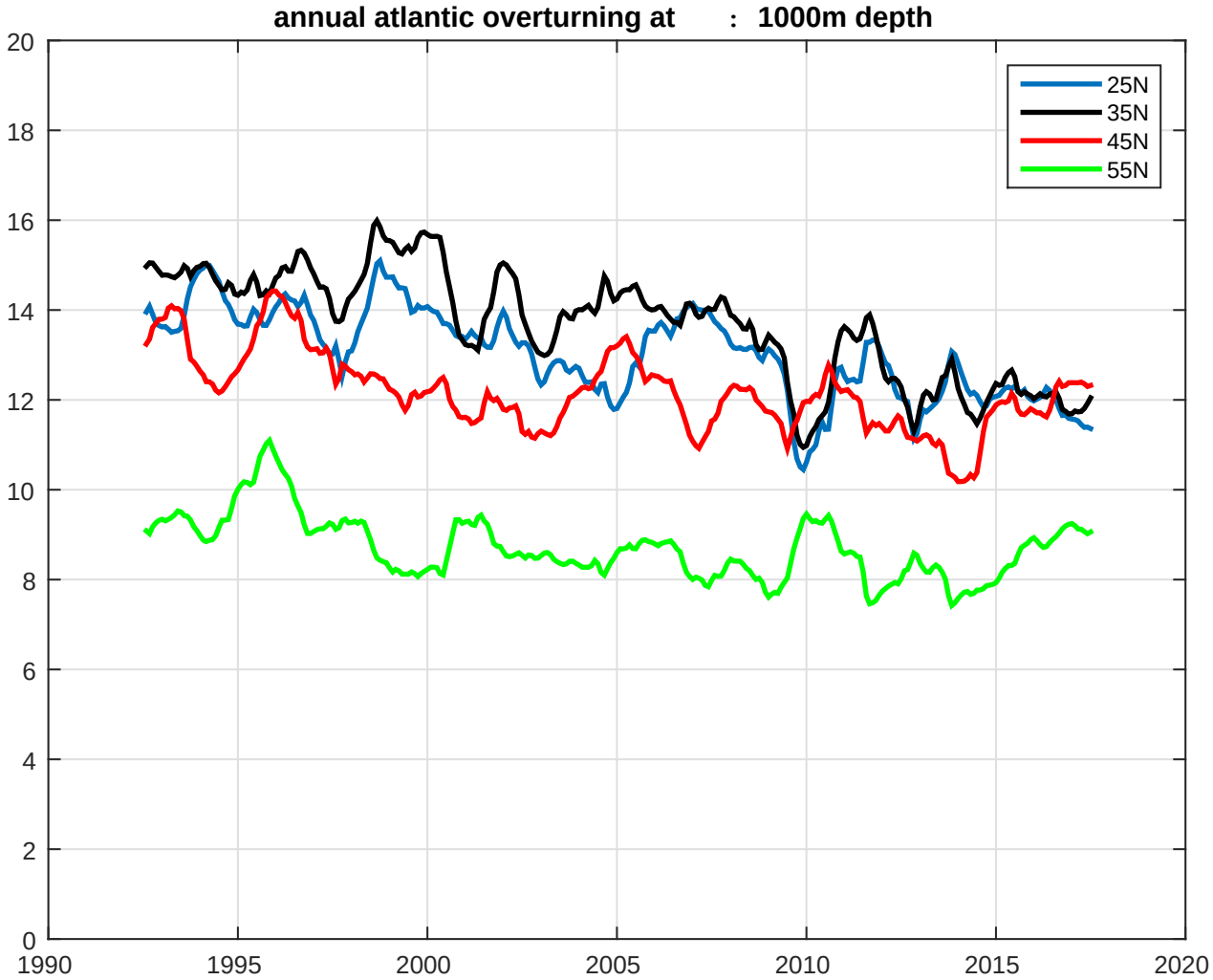

Figure : annual Atlantic overturning at select latitudes at $\approx$ 1000m depth (Sv)

meridional heat transport

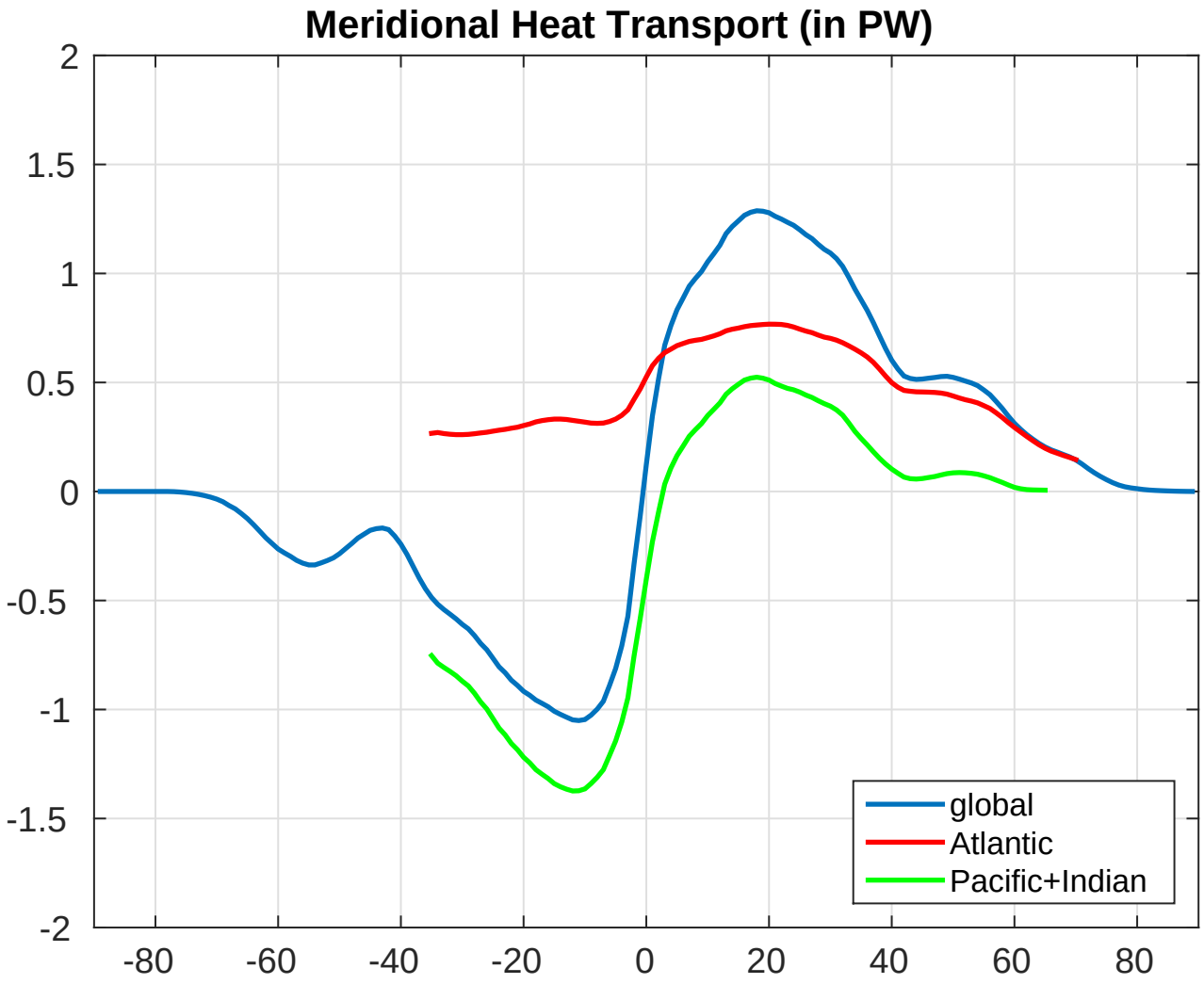

Figure : 1992-2017 mean – meridional heat transport (PW)

meridional heat transport

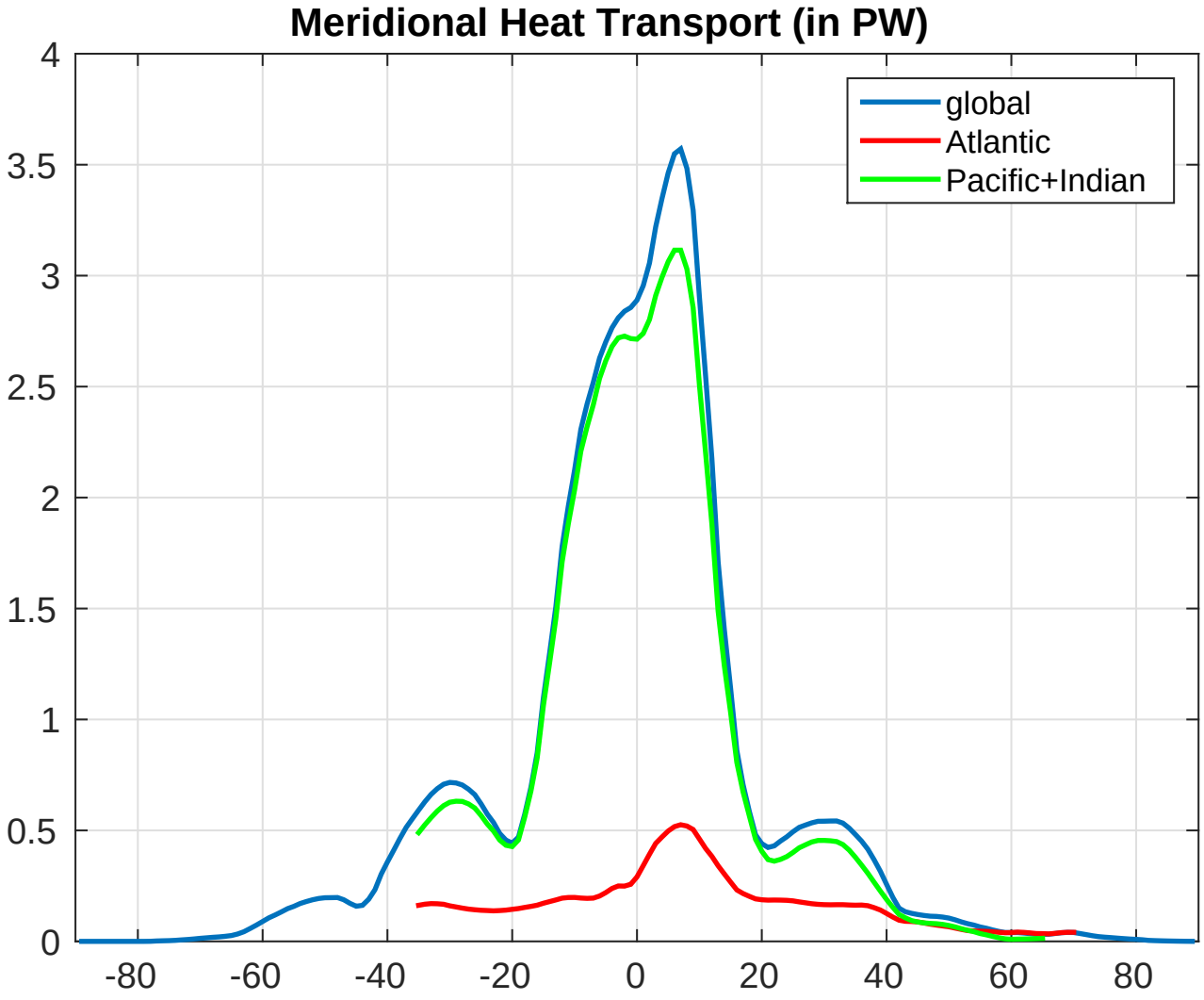

Figure : 1992-2017 standard deviation – meridional heat transport (PW)

meridional freshwater transport

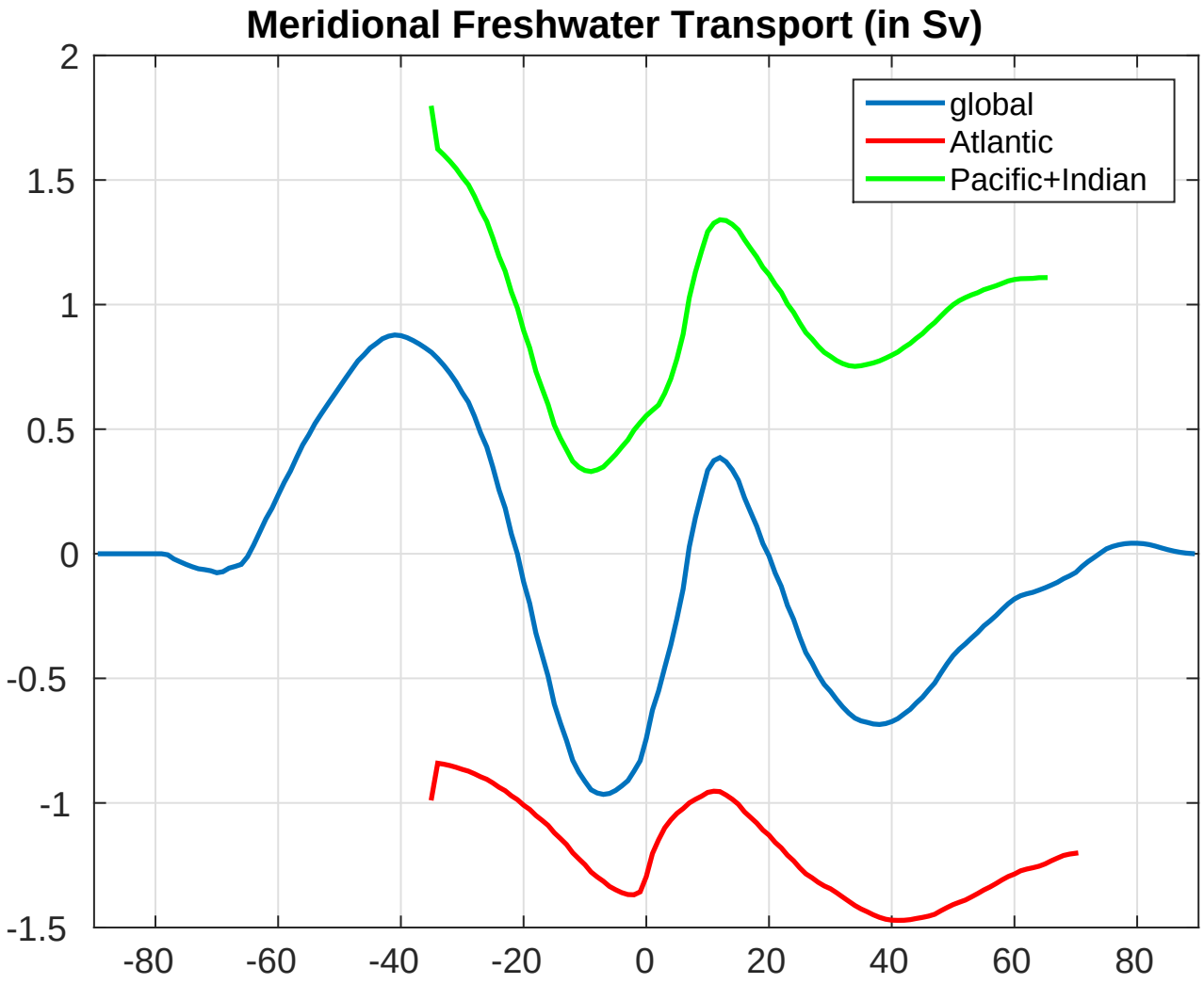

Figure : 1992-2017 mean – meridional freshwater transport (Sv)

meridional freshwater transport

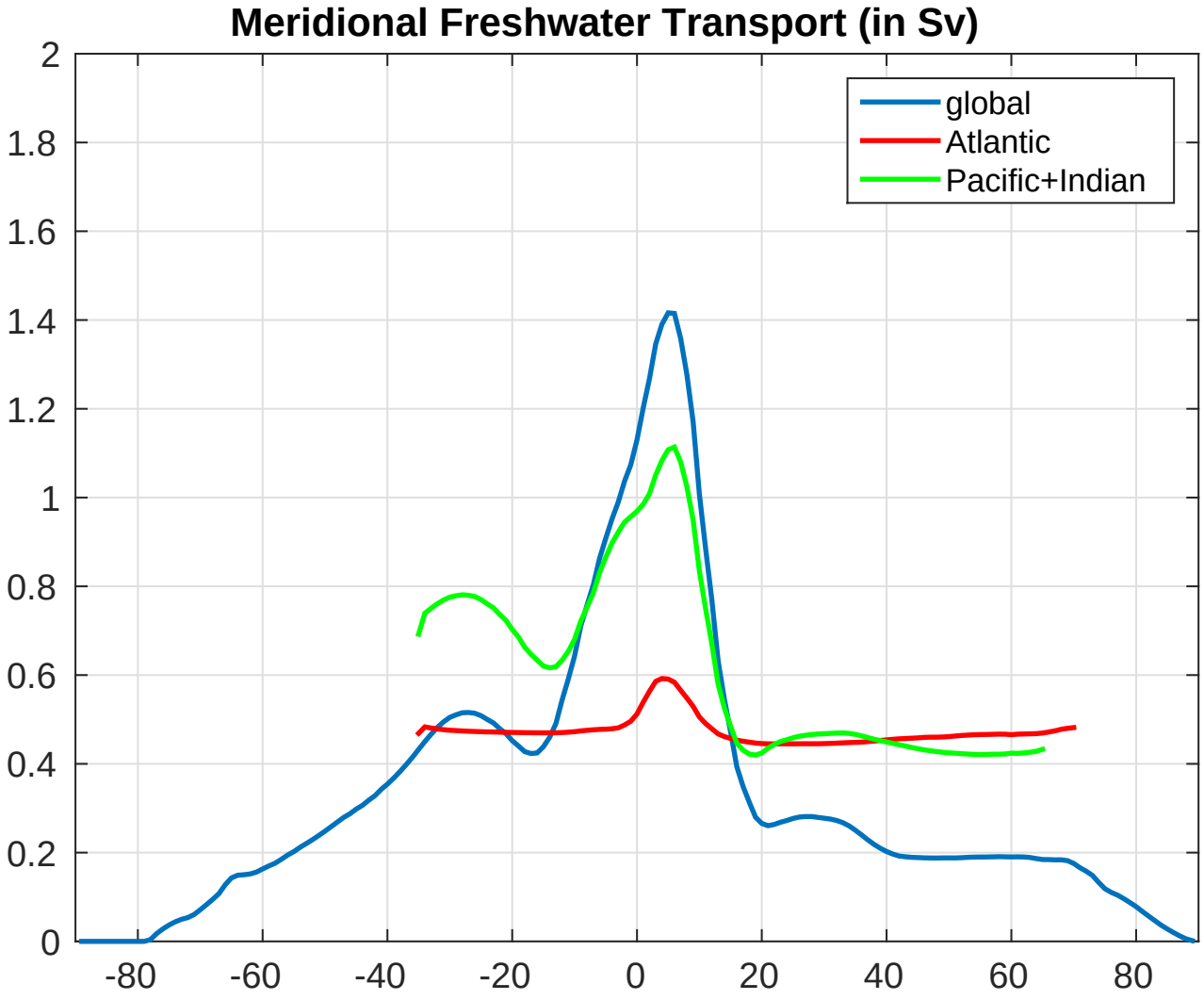

Figure : 1992-2017 standard deviation – meridional freshwater transport (Sv)

meridional salt transport

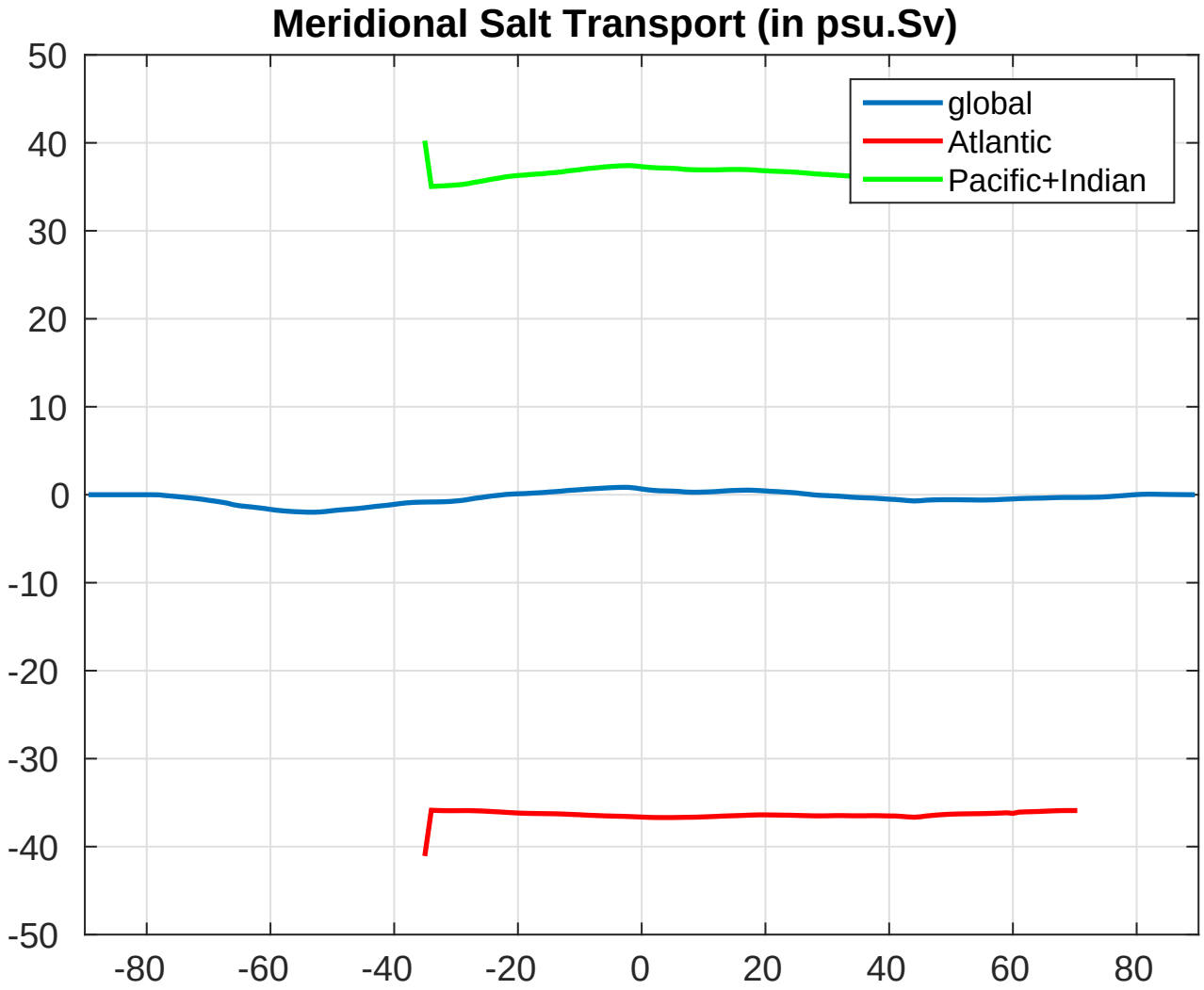

Figure : 1992-2017 mean – meridional salt transport (psu.Sv)

meridional salt transport

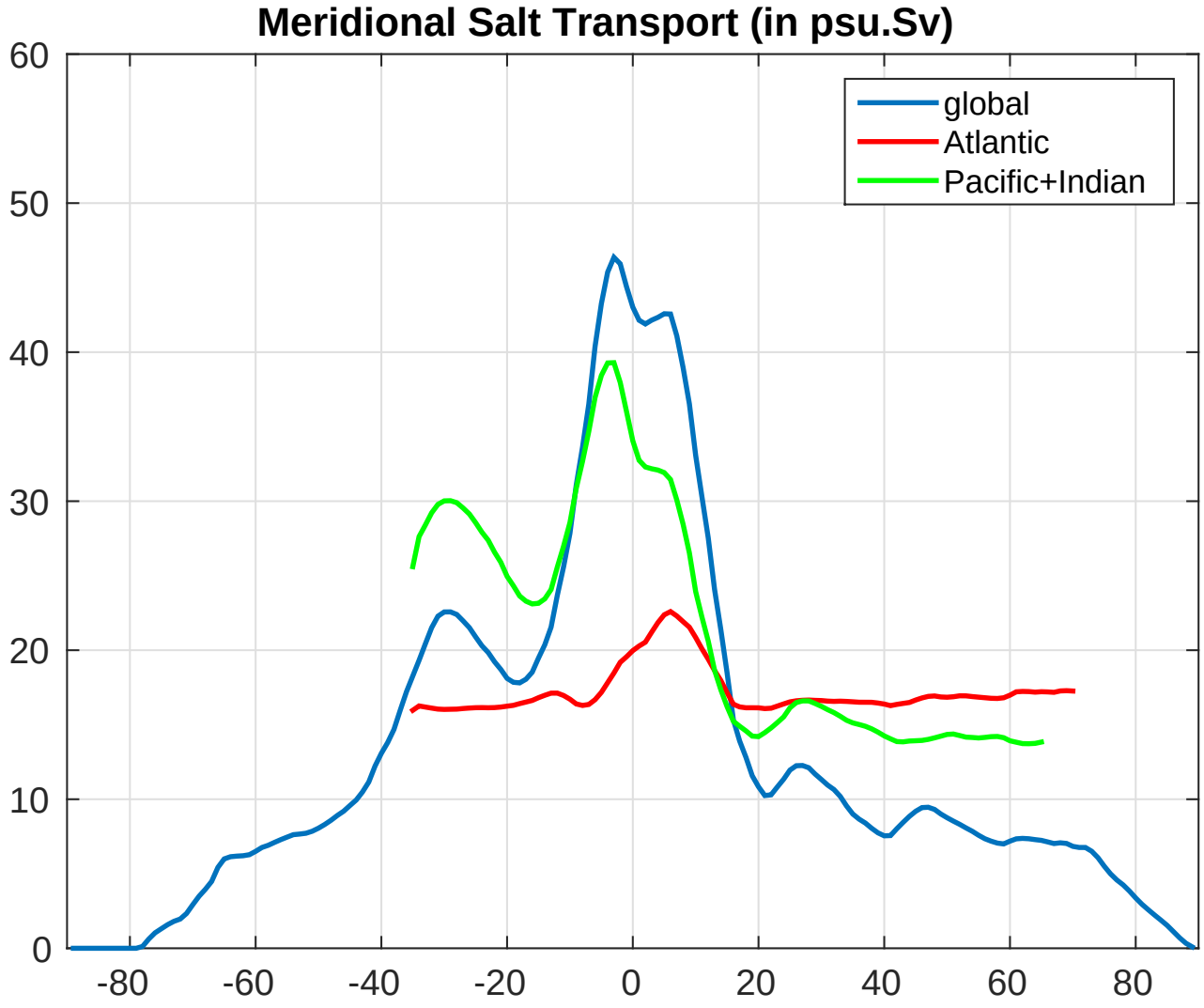

Figure : 1992-2017 standard deviation – meridional salt transport (psu.Sv)

meridional transports (time series)

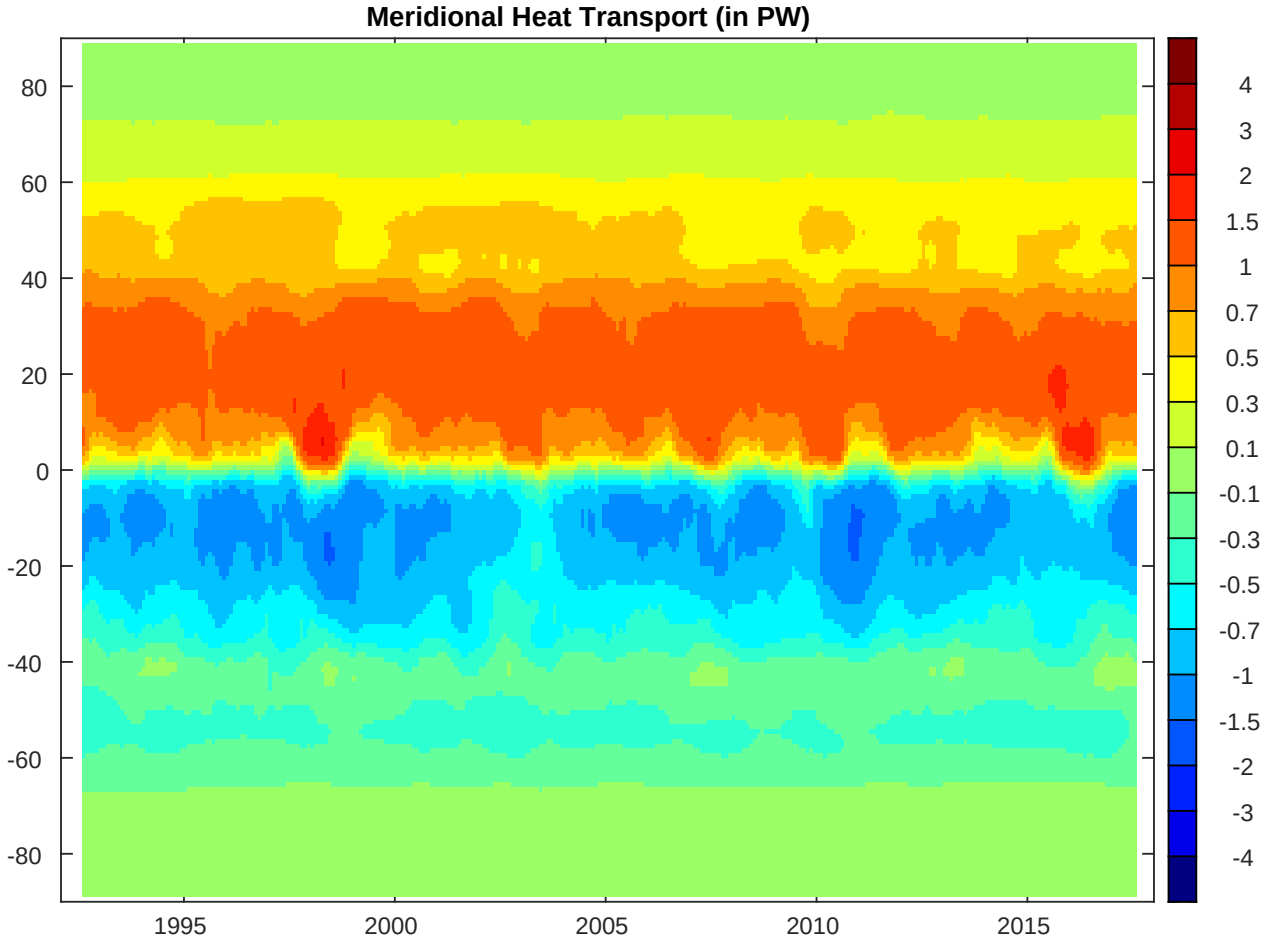

Figure : meridional heat transport (PW, annual mean)

meridional transports (time series)

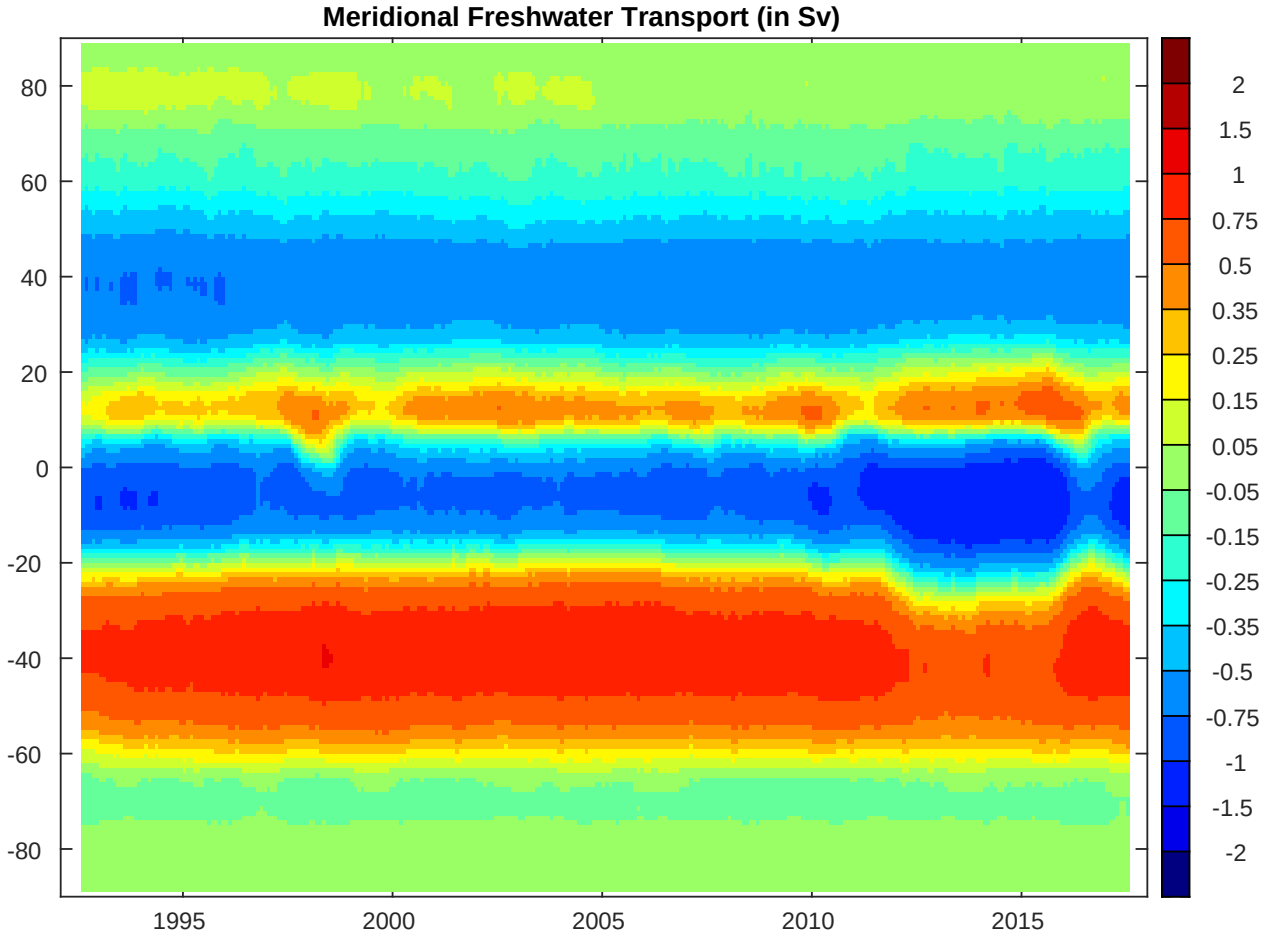

Figure : meridional freshwater transport (Sv, annual mean)

meridional transports (time series)

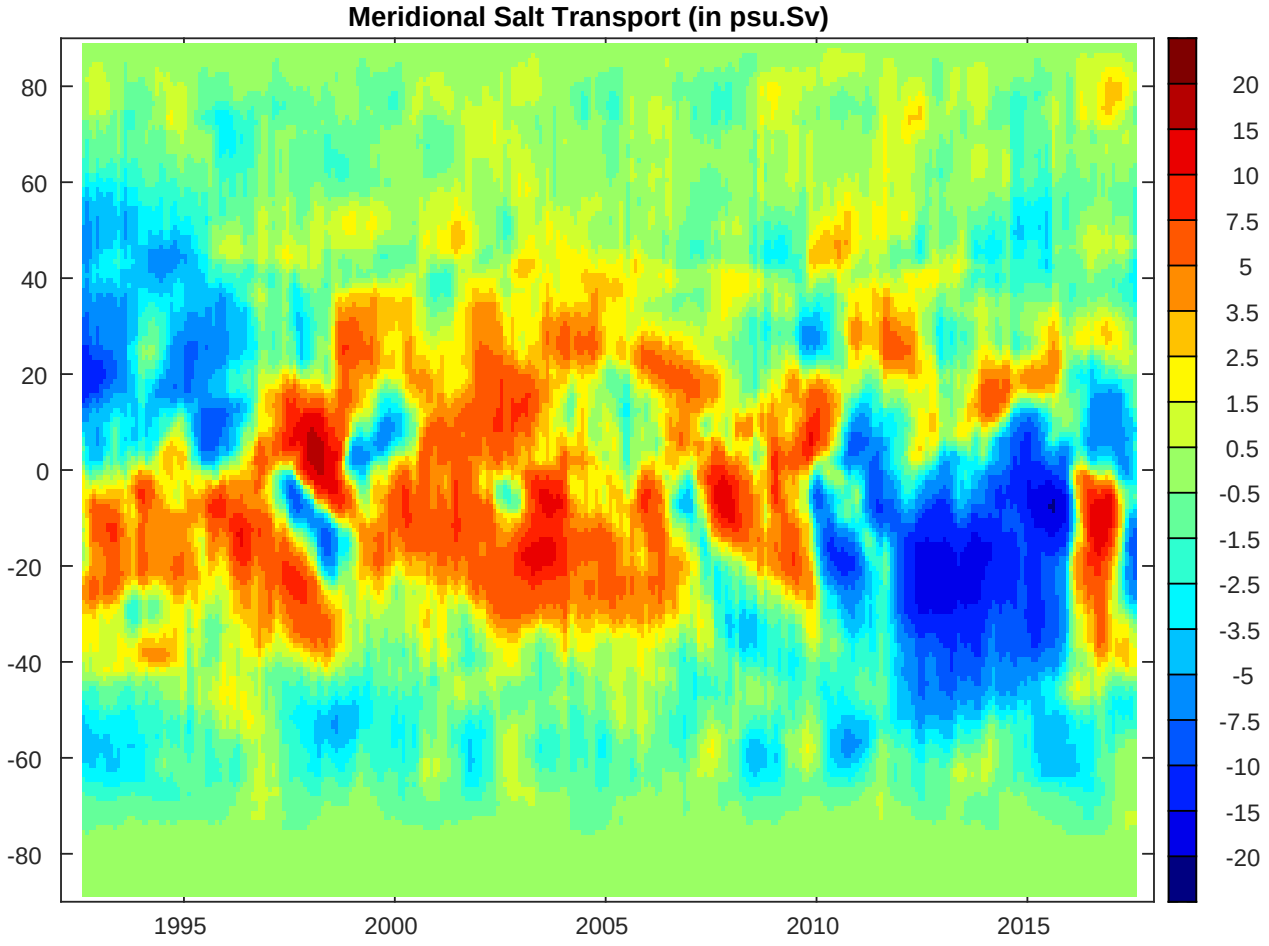

Figure : meridional salt transport (psu.Sv, annual mean)

transects transport

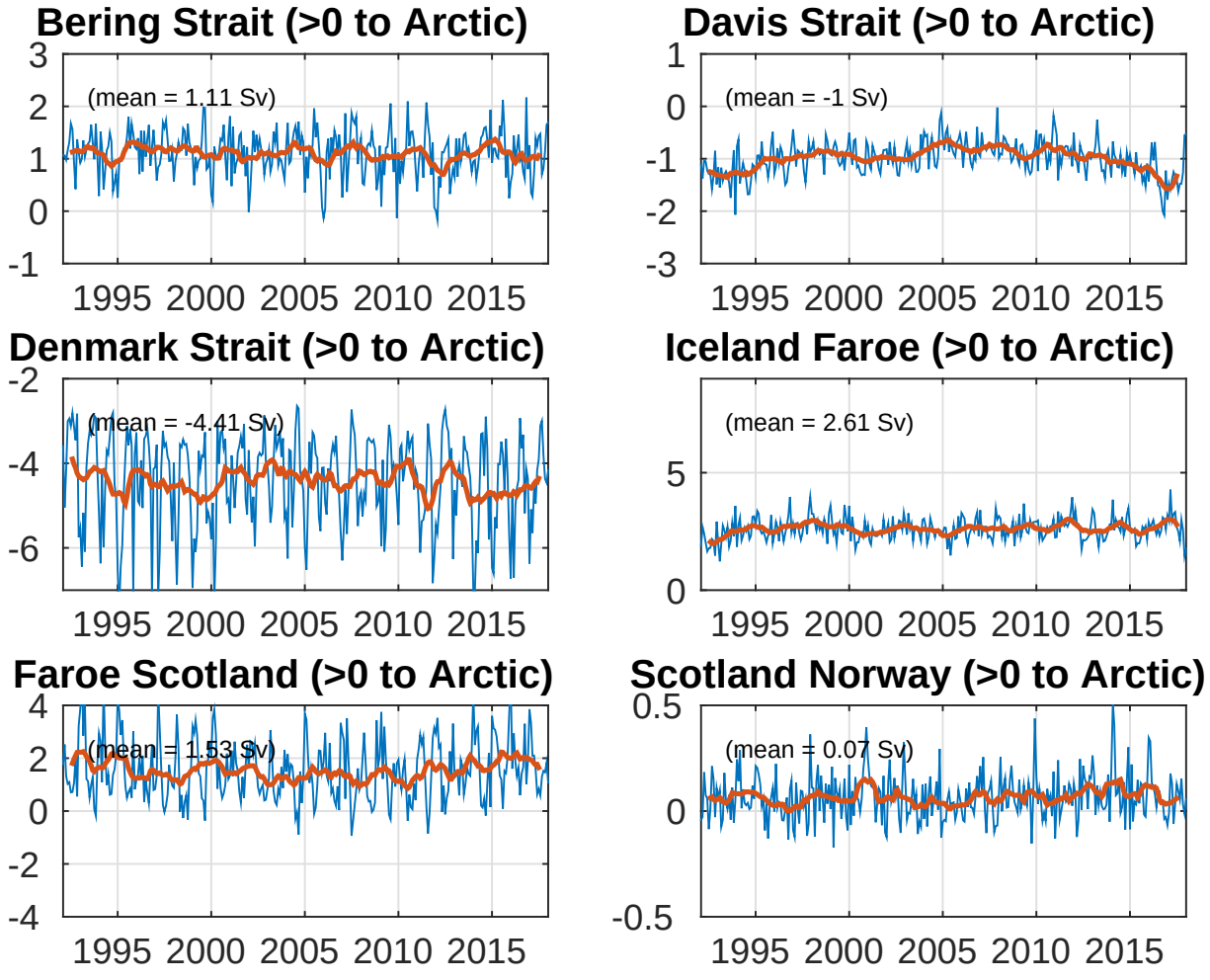

Figure : volume transports entering the Arctic (Sv, annual mean)

transects transport

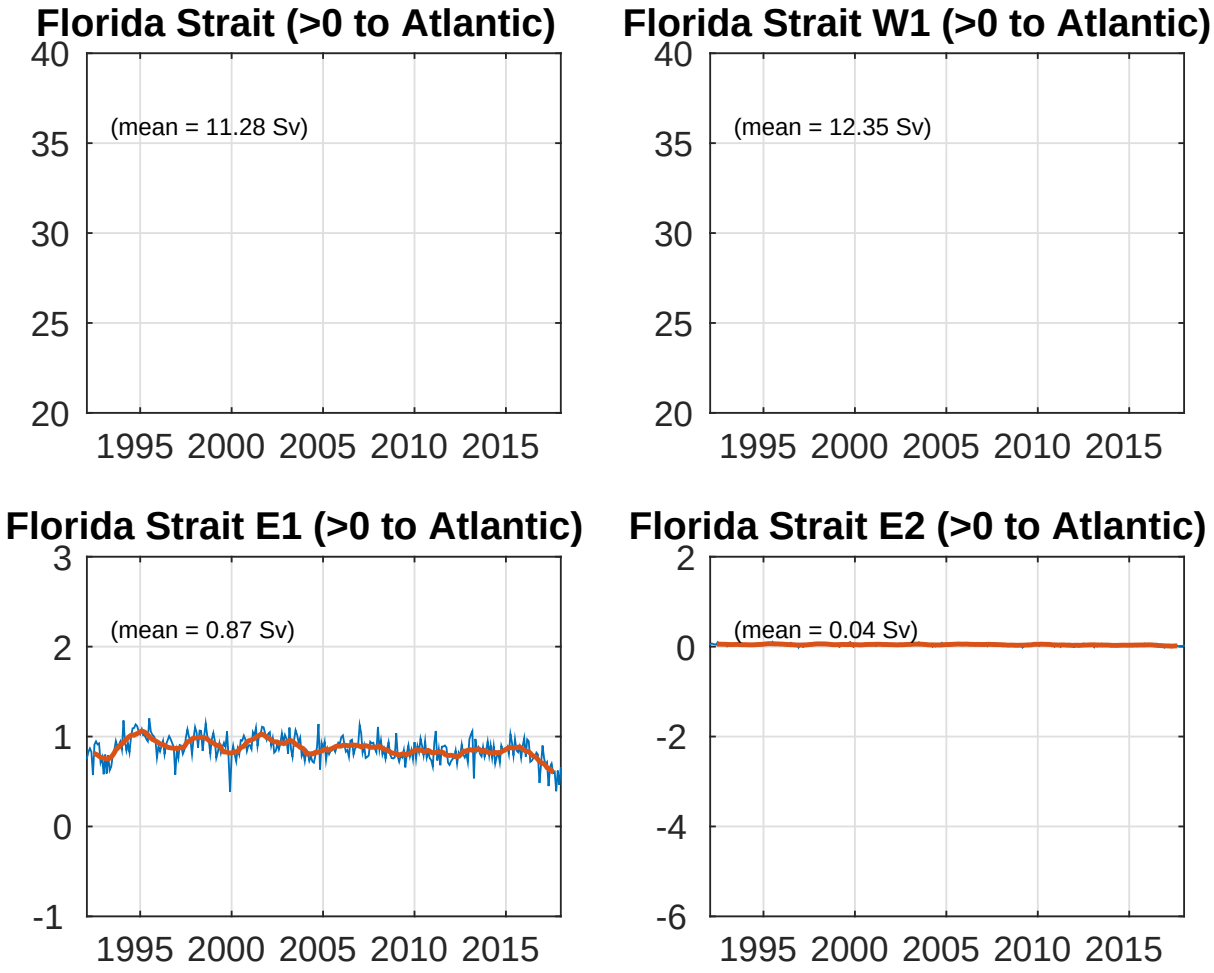

Figure : volume transports entering the Atlantic (Sv, annual mean)

transects transport

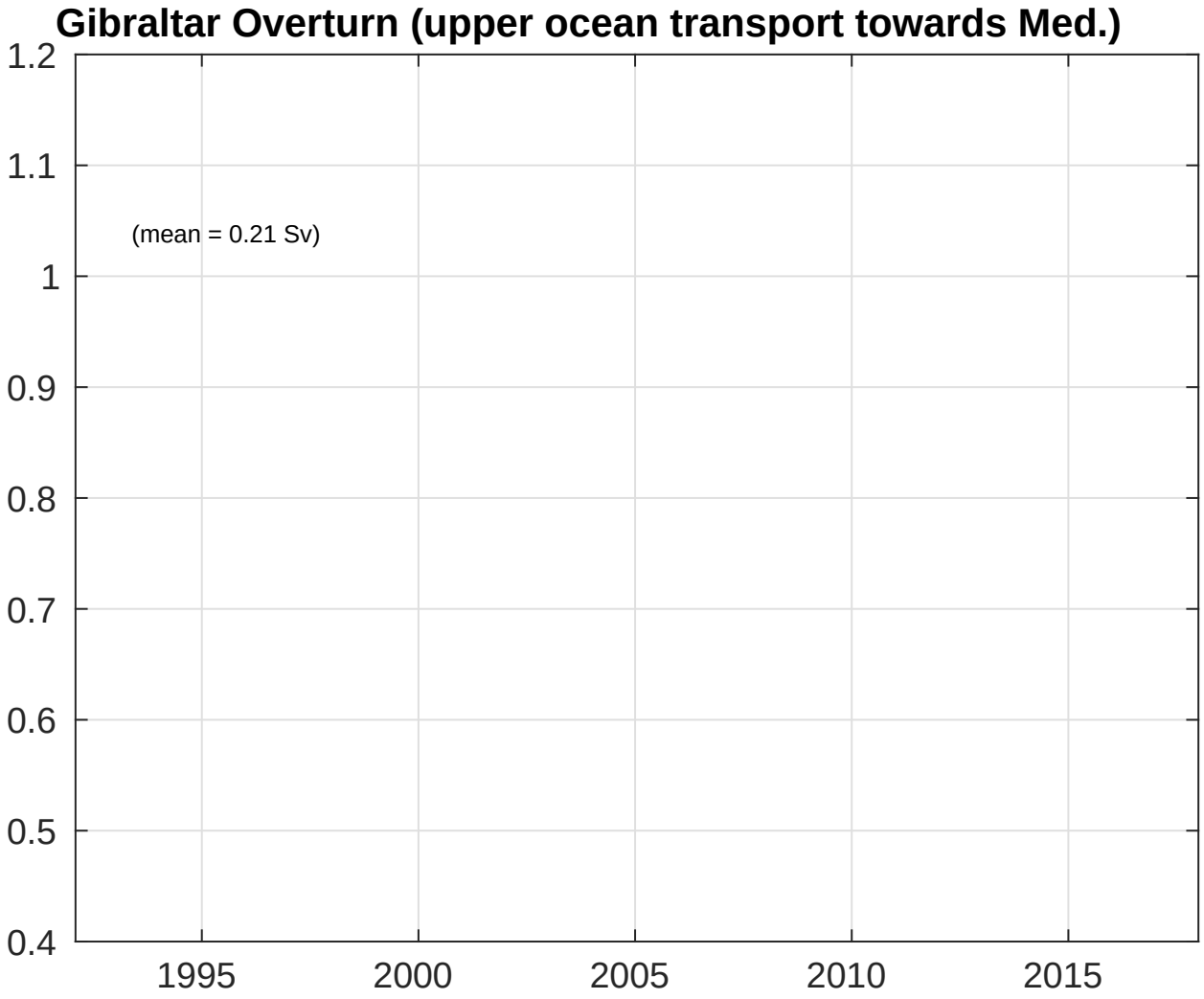

Figure : Gibraltar Overturn (Sv, annual mean)

transects transport

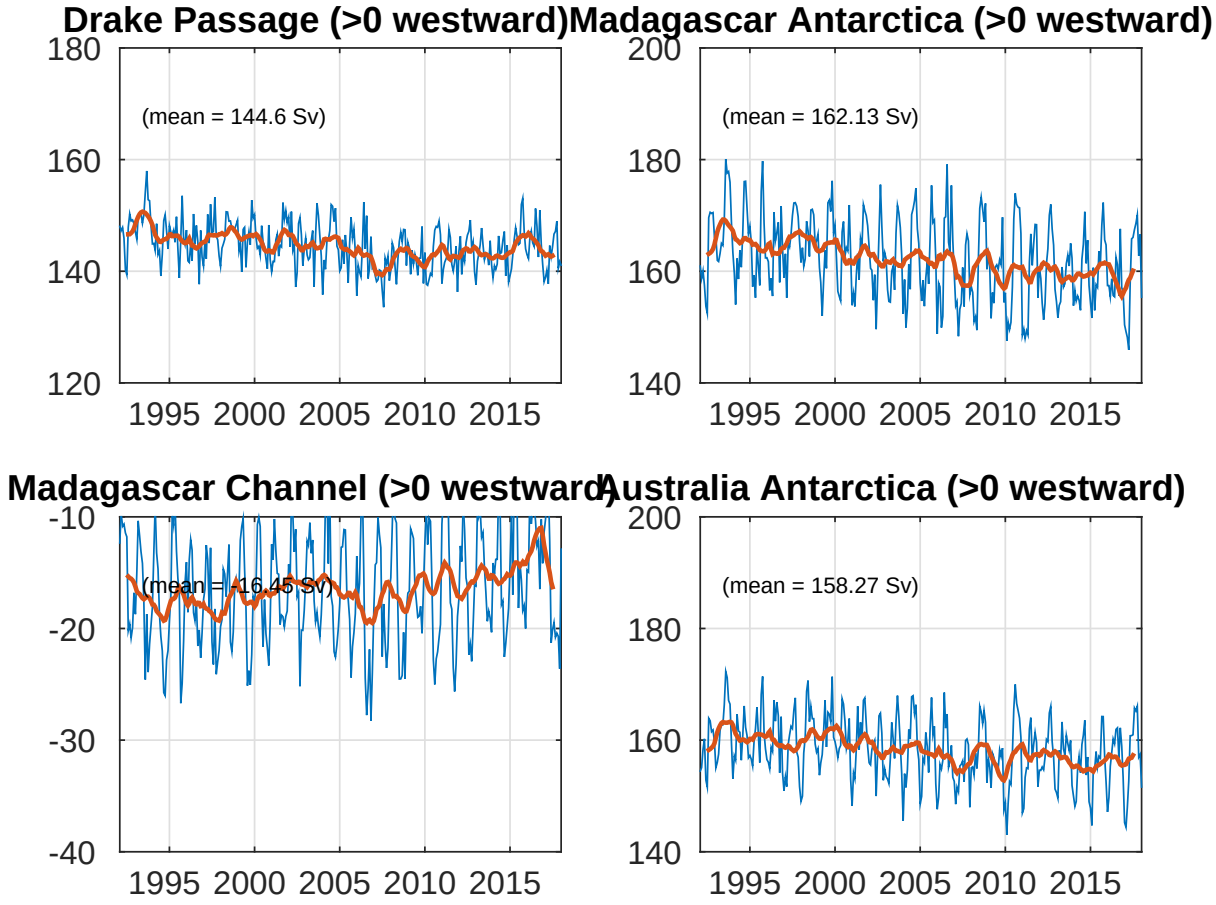

Figure : ACC volume transports (Sv, annual mean)

transects transport

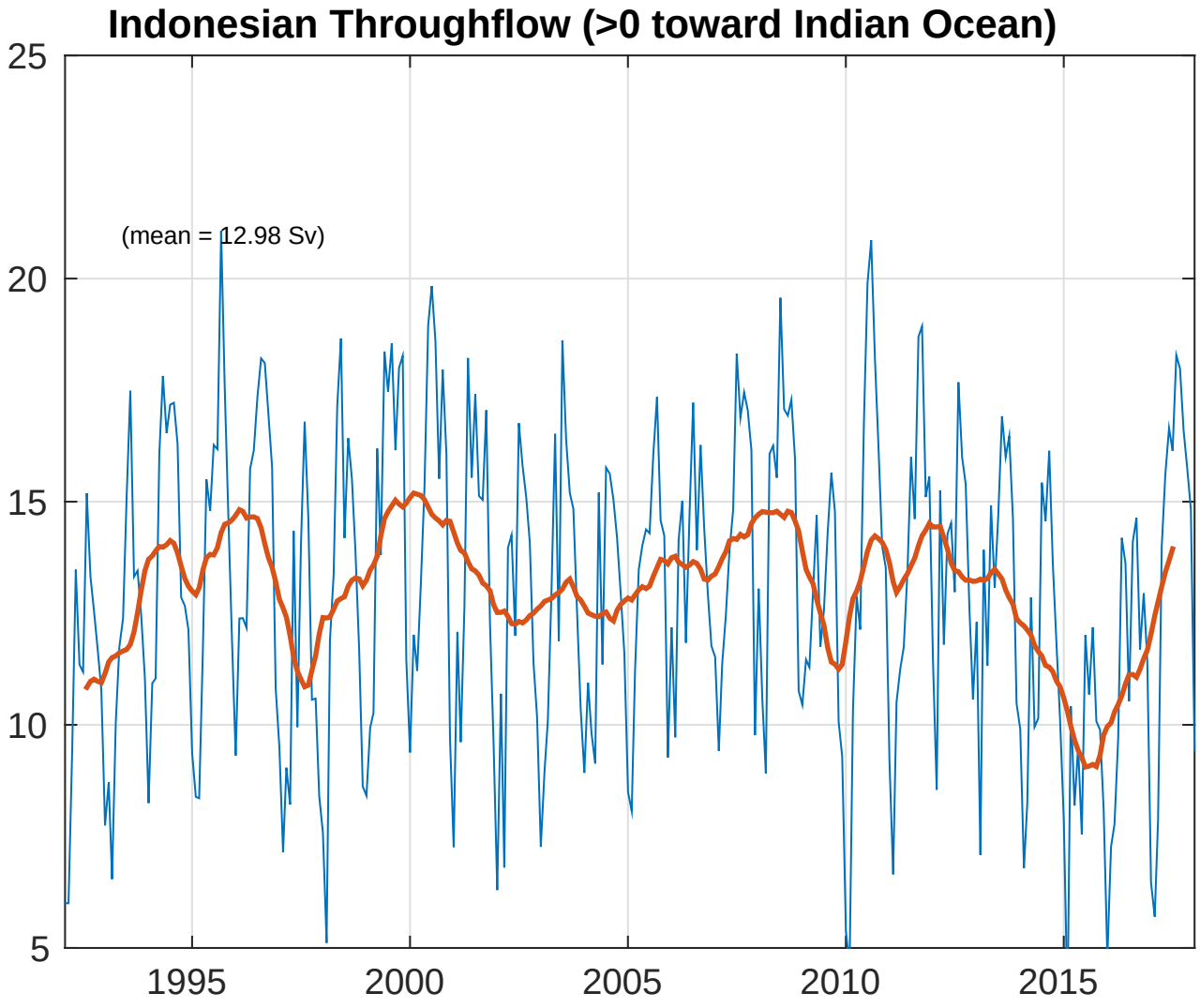

Figure : Indonesian Throughflow (Sv, annual mean)

sea surface height

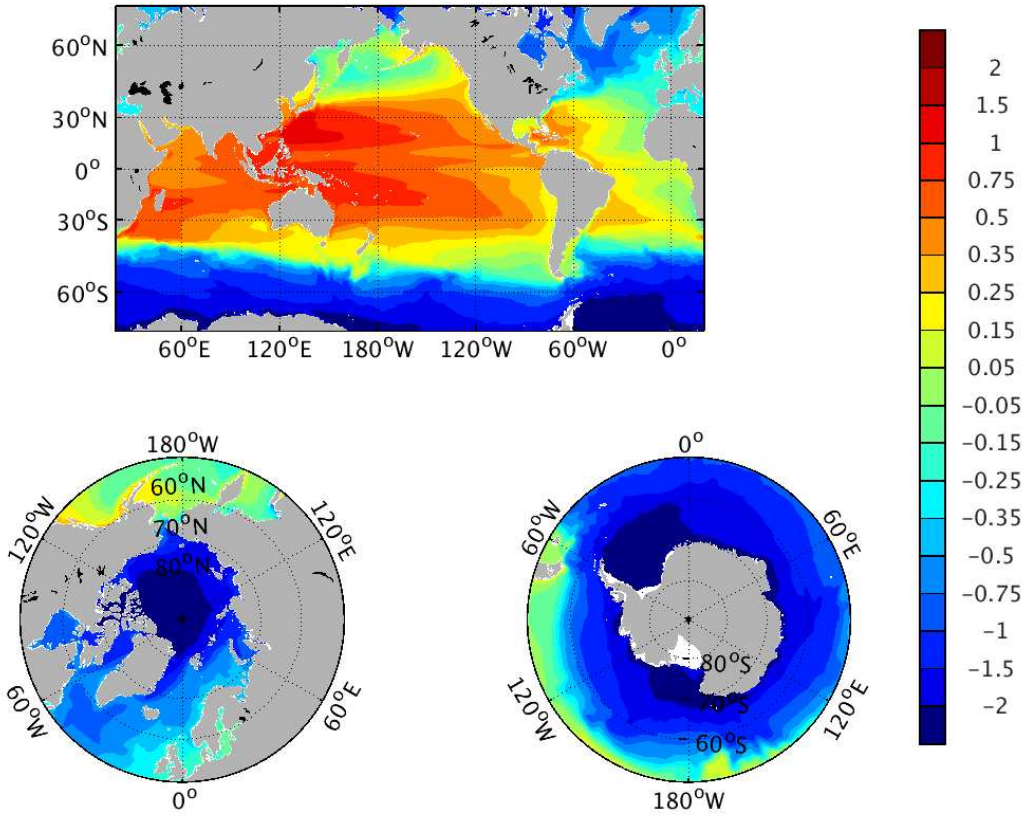

Figure : 1992-2017 mean – sea surface height (EXCLUDING ice, in m)

sea surface height

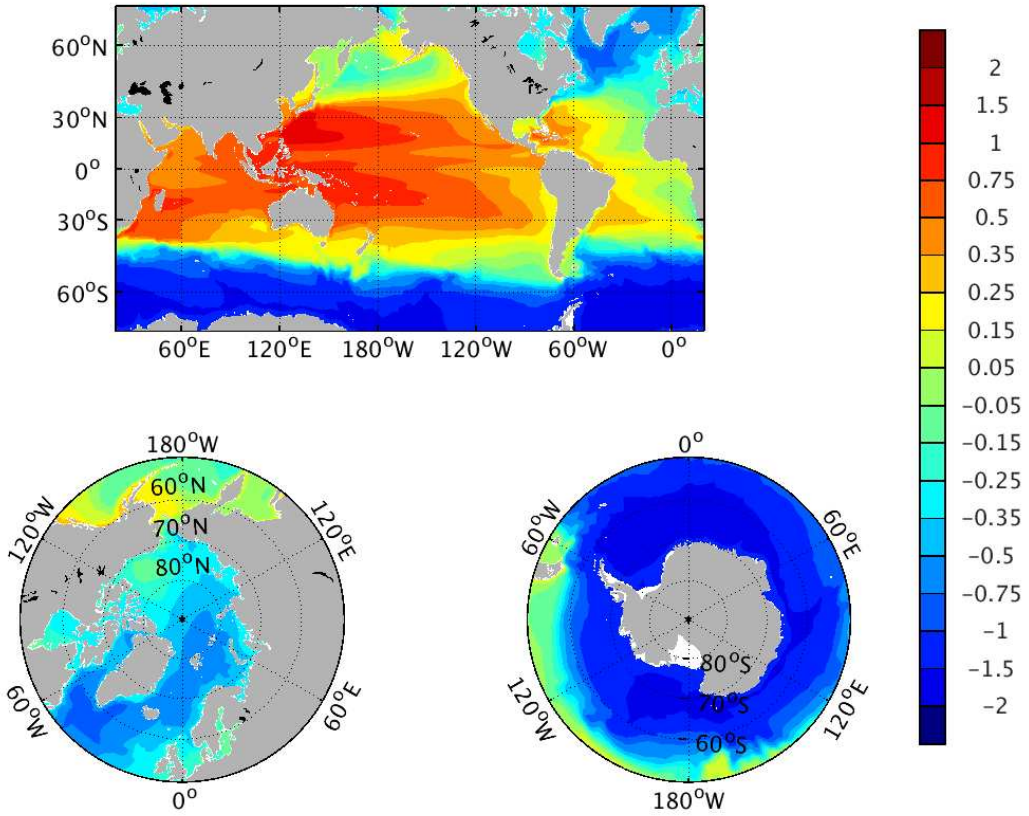

Figure : 1992-2017 mean – sea surface height (INCLUDING ice, in m)

sea surface height

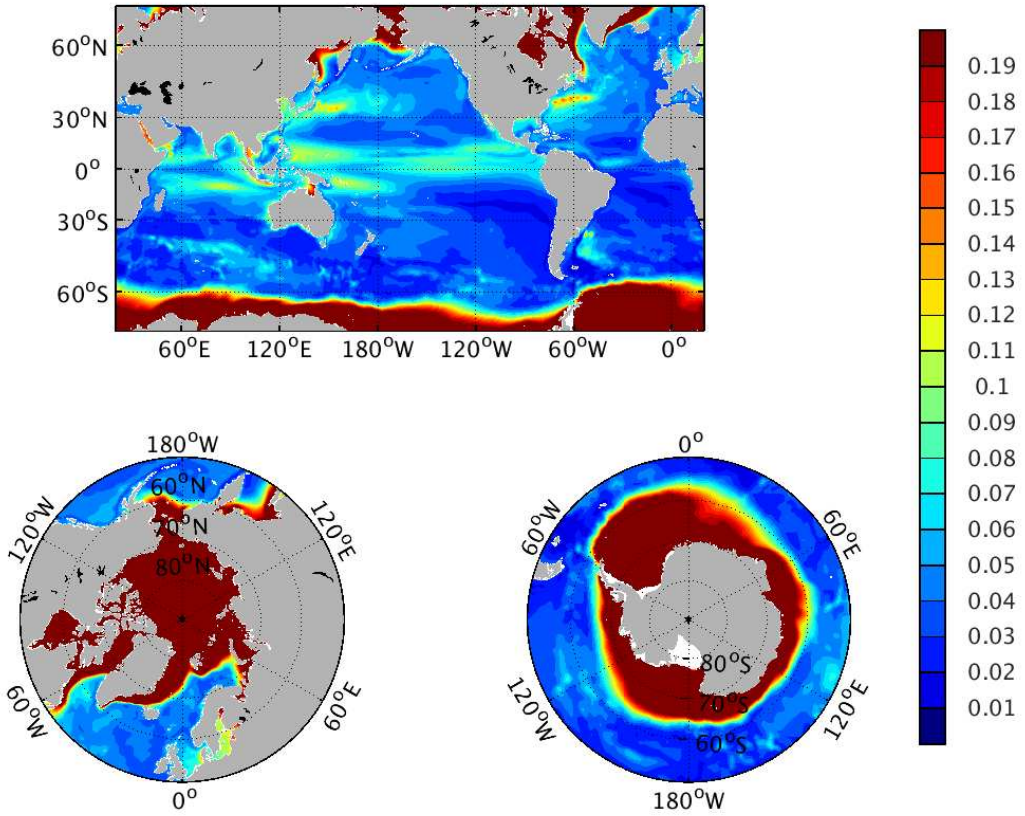

Figure : 1992-2017 standard deviation – sea surface height (EXCLUDING ice, in m)

sea surface height

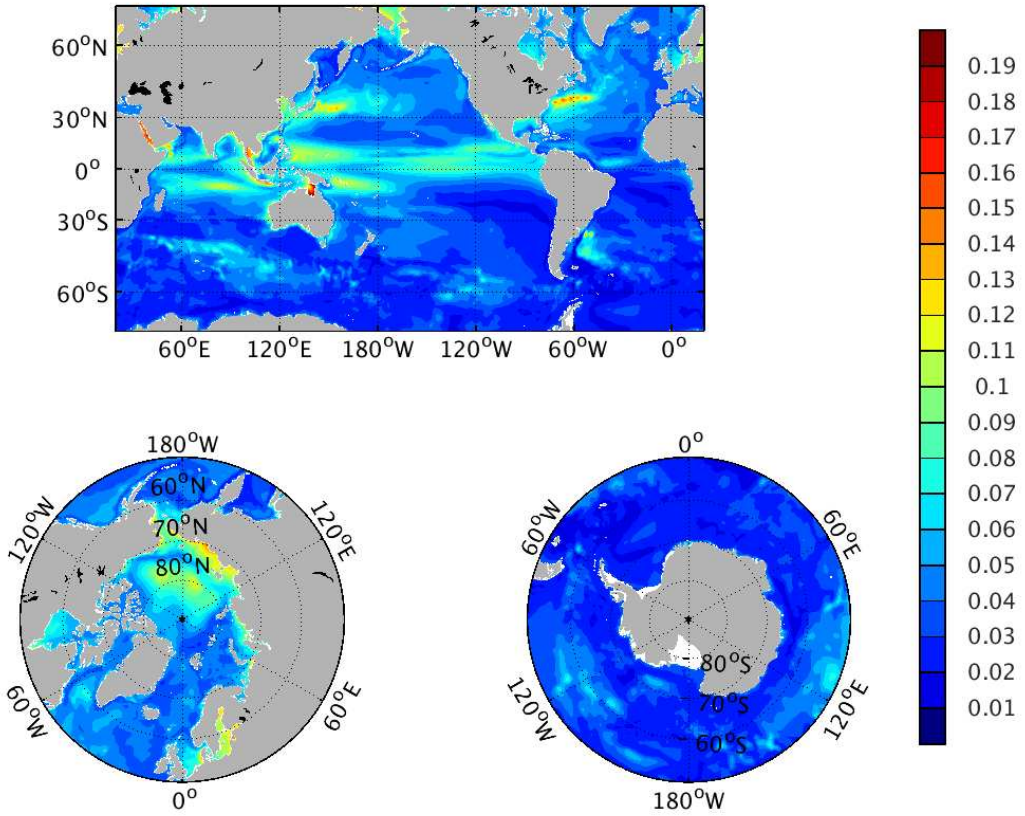

Figure : 1992-2017 standard deviation – sea surface height (INCLUDING ice, in m)

3D state variables

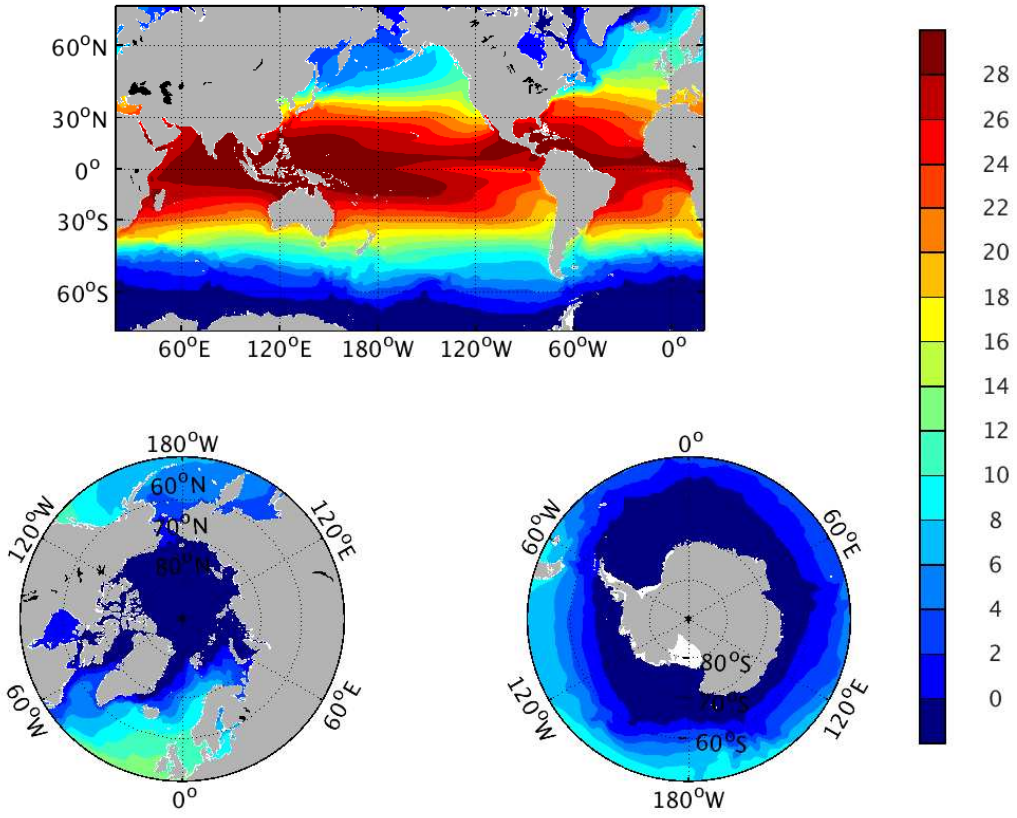

Figure : 1992-2017 mean – temperature (in degC) at 5m

3D state variables

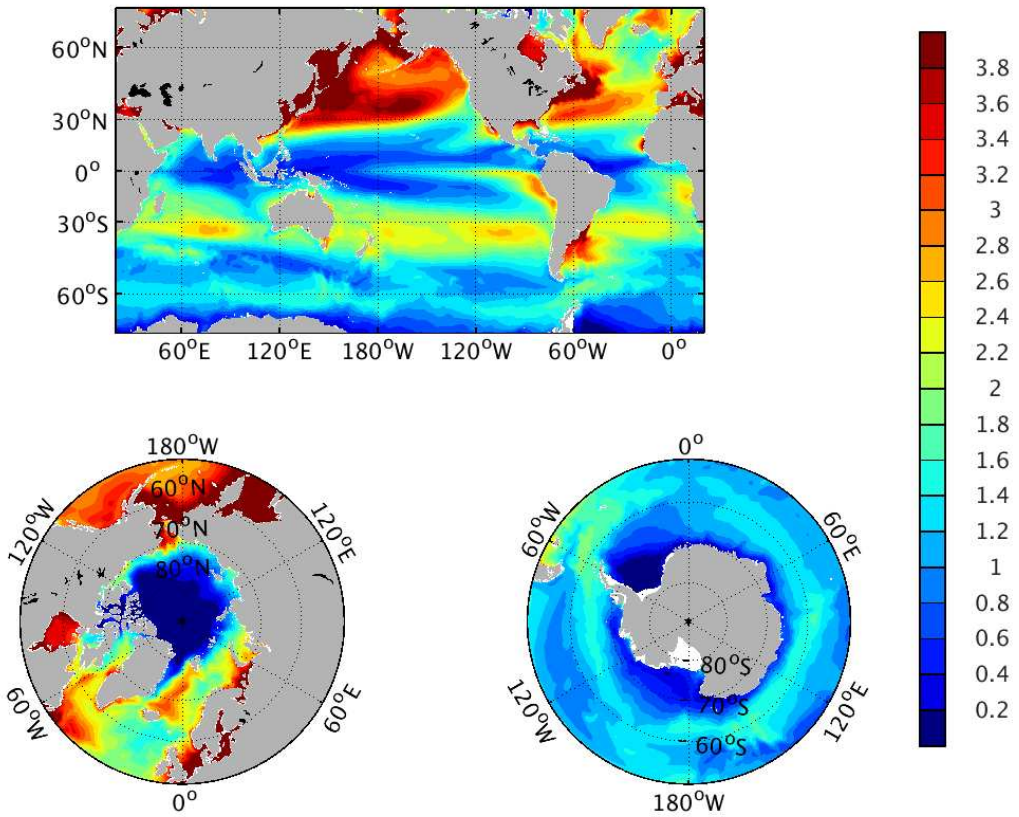

Figure : 1992-2017 standard deviation – temperature (in degC) at 5m

3D state variables

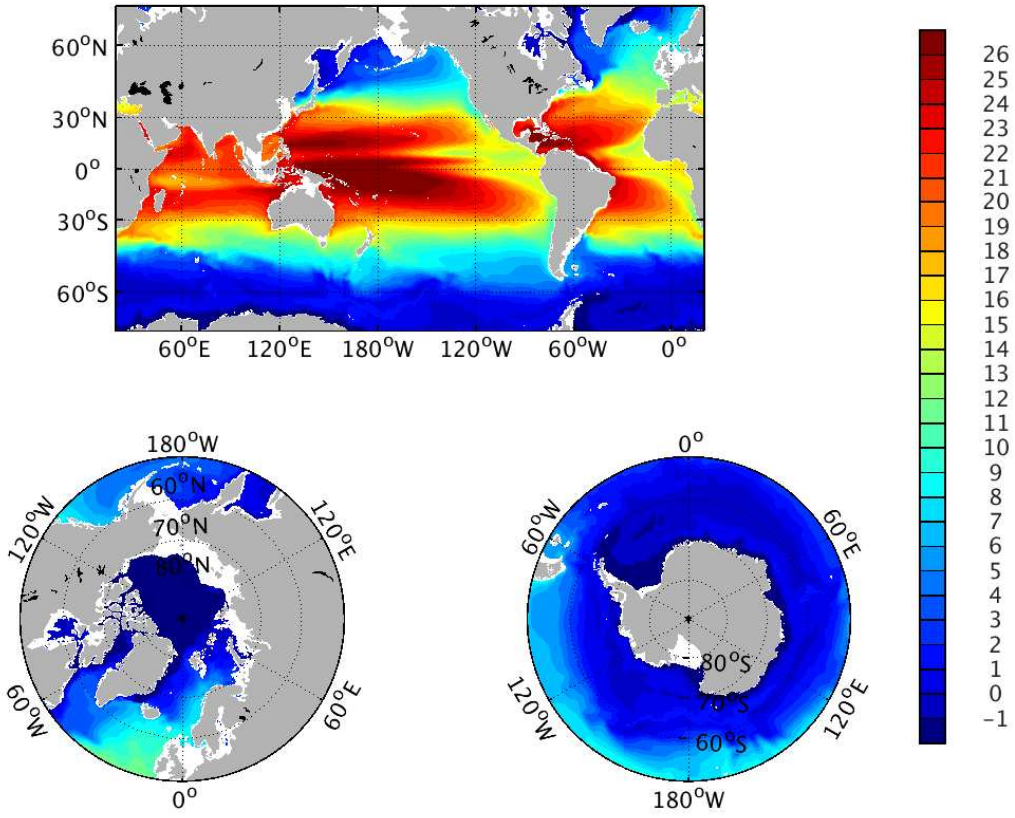

Figure : 1992-2017 mean – temperature (in degC) at 105m

3D state variables

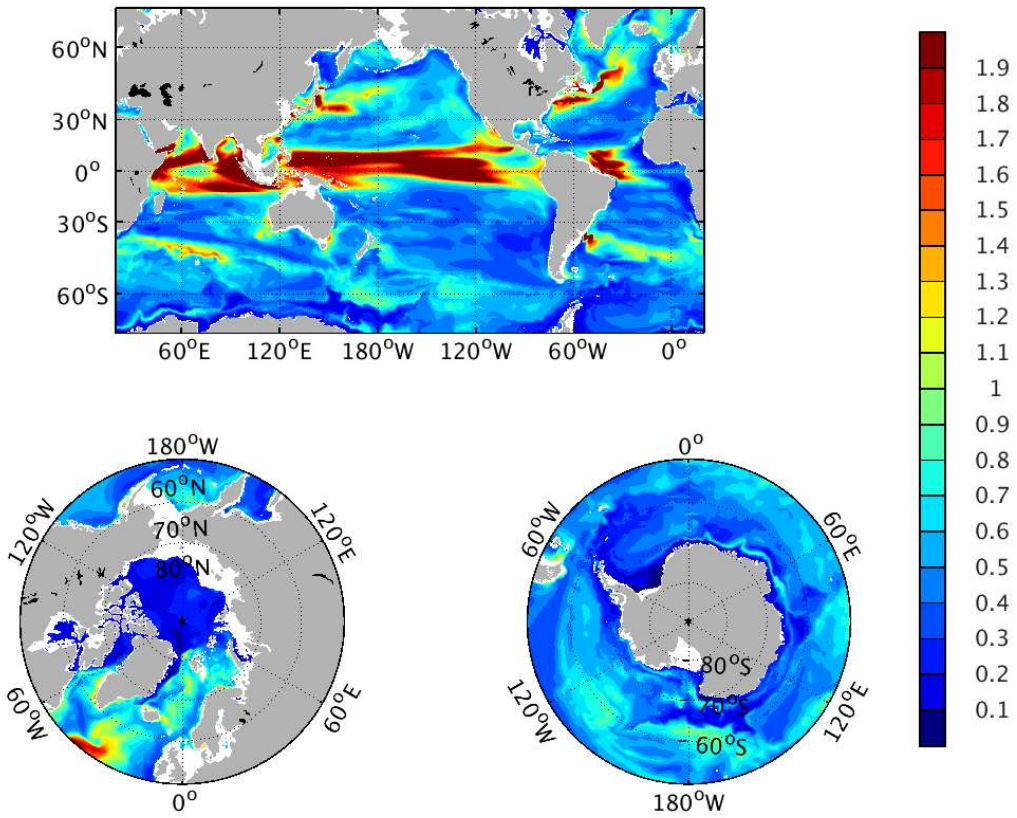

Figure : 1992-2017 standard deviation – temperature (in degC) at 105m

3D state variables

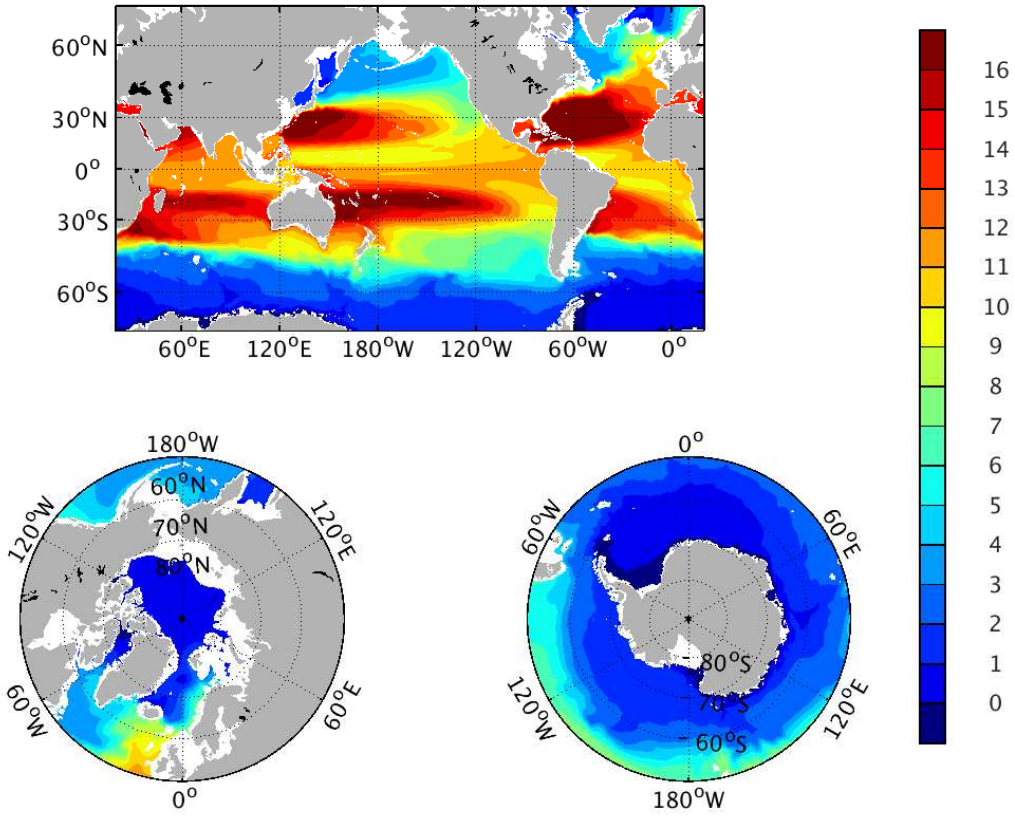

Figure : 1992-2017 mean – temperature (in degC) at 300m

3D state variables

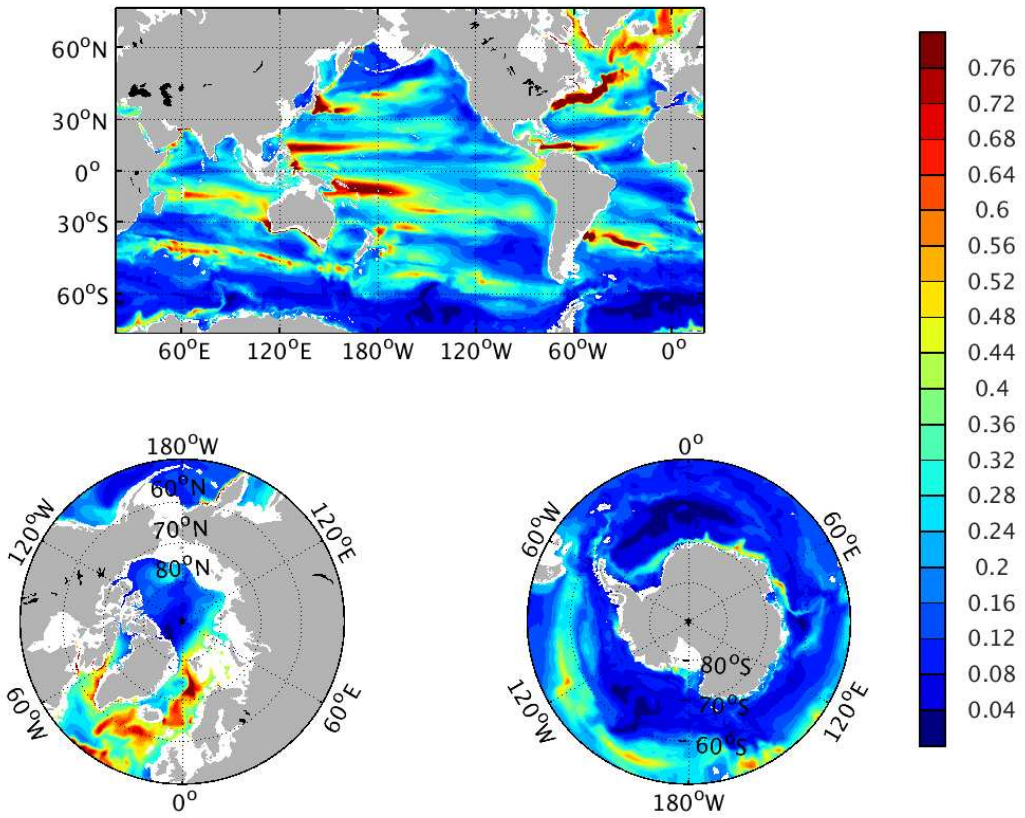

Figure : 1992-2017 standard deviation – temperature (in degC) at 300m

3D state variables

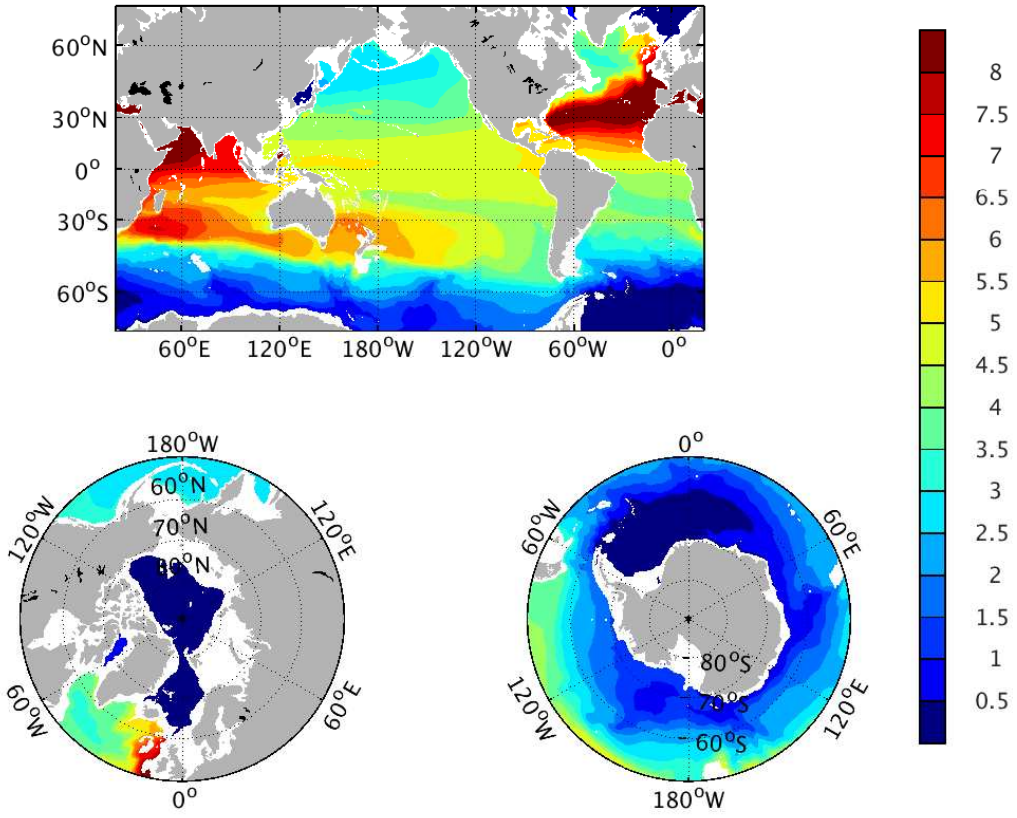

Figure : 1992-2017 mean – temperature (in degC) at 910m

3D state variables

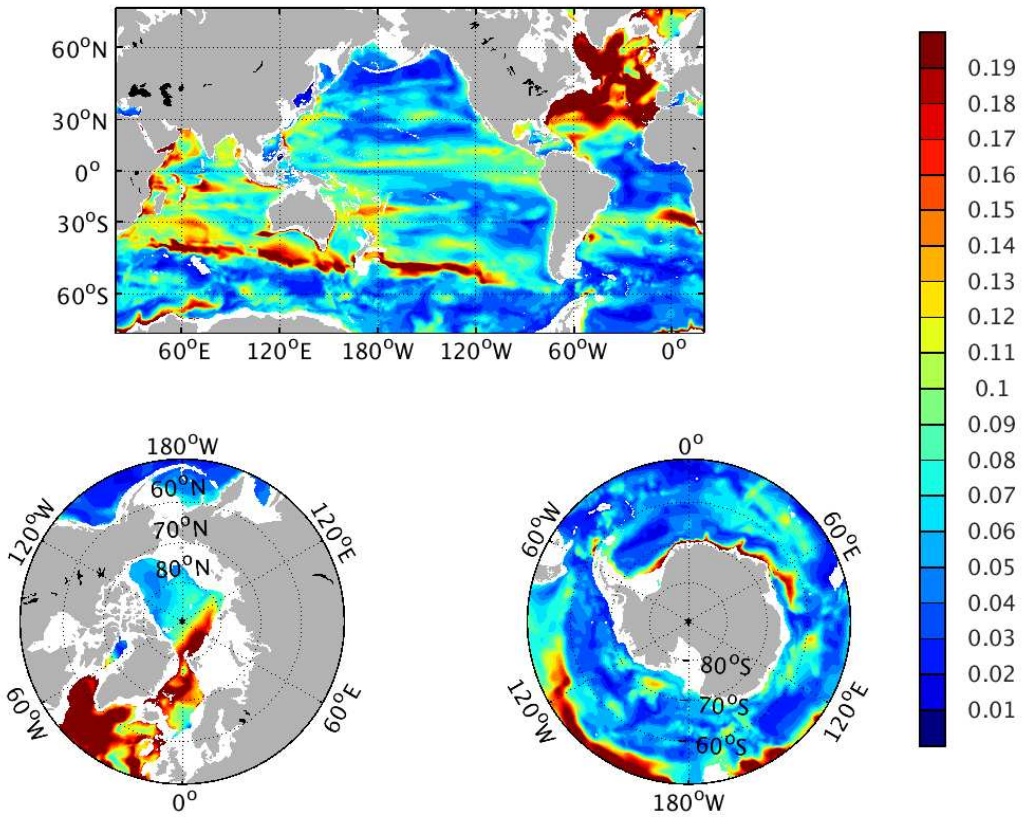

Figure : 1992-2017 standard deviation – temperature (in degC) at 910m

3D state variables

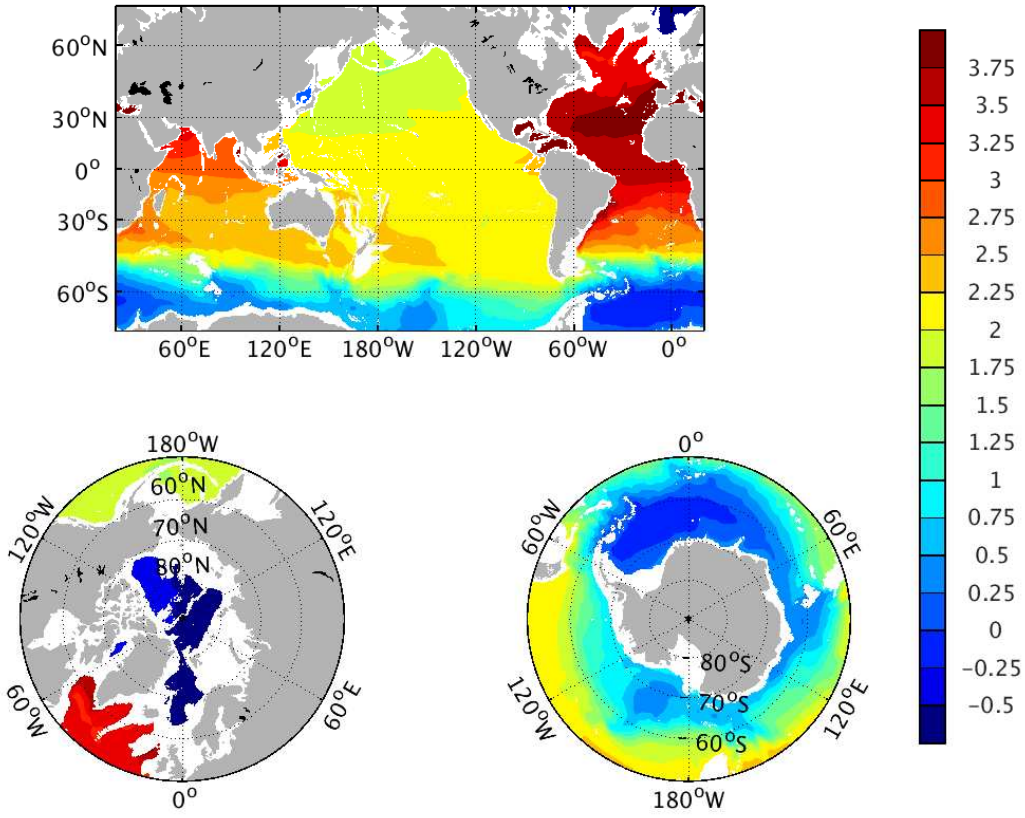

Figure : 1992-2017 mean – temperature (in degC) at 1914m

3D state variables

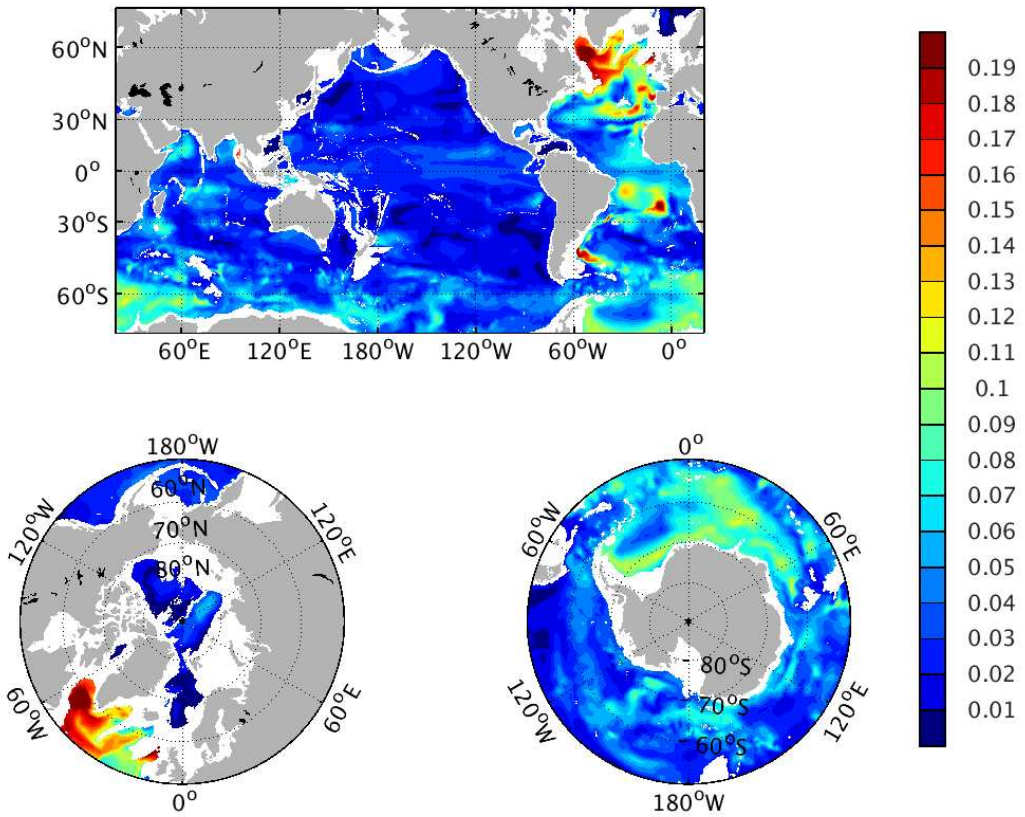

Figure : 1992-2017 standard deviation – temperature (in degC) at 1914m

3D state variables

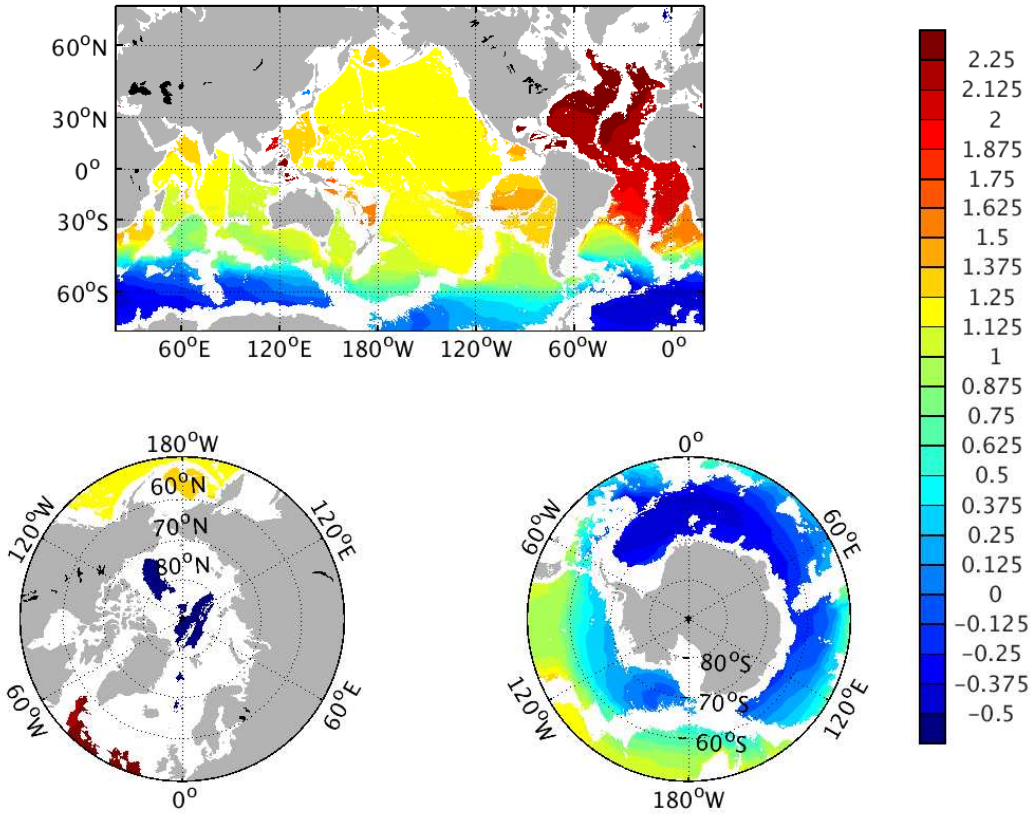

Figure : 1992-2017 mean – temperature (in degC) at 3581m

3D state variables

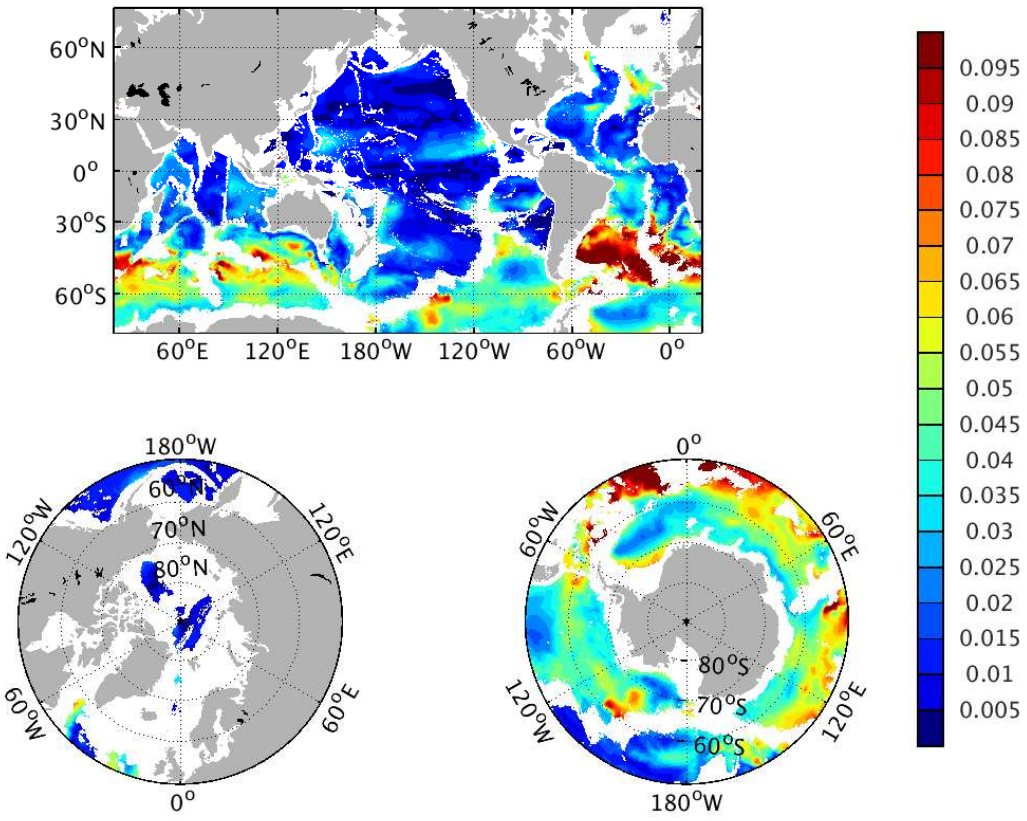

Figure : 1992-2017 standard deviation – temperature (in degC) at 3581m

3D state variables

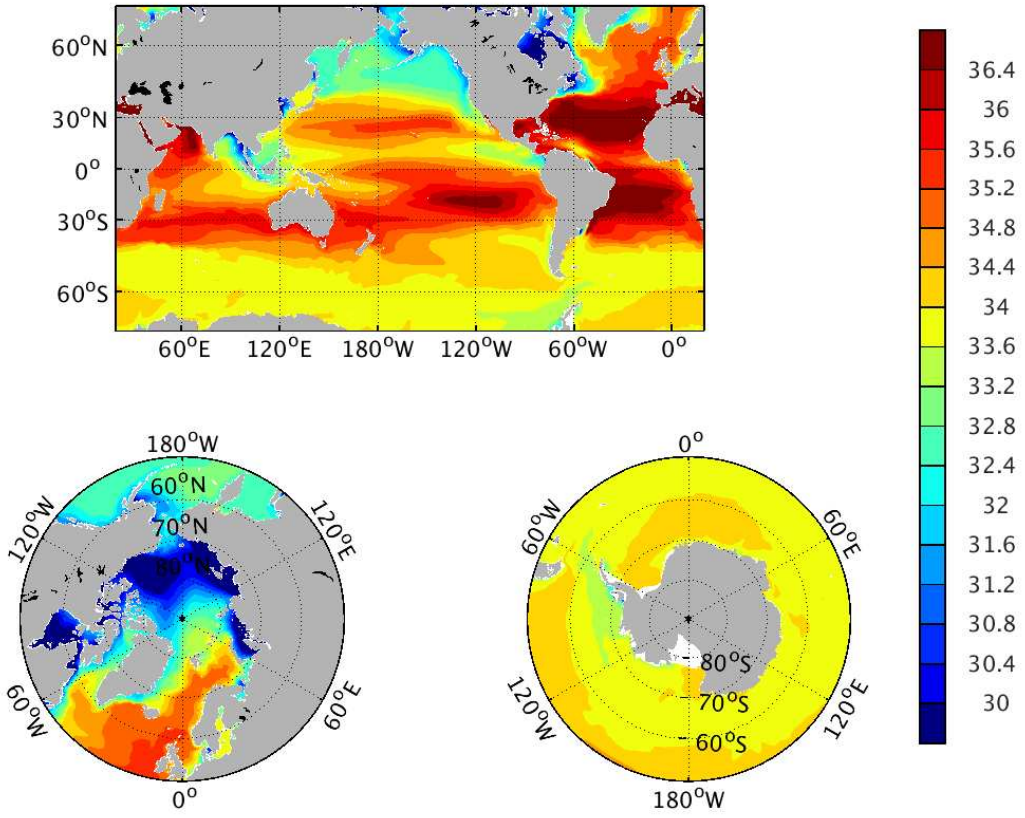

Figure : 1992-2017 mean – salinity (in psu) at 5m

3D state variables

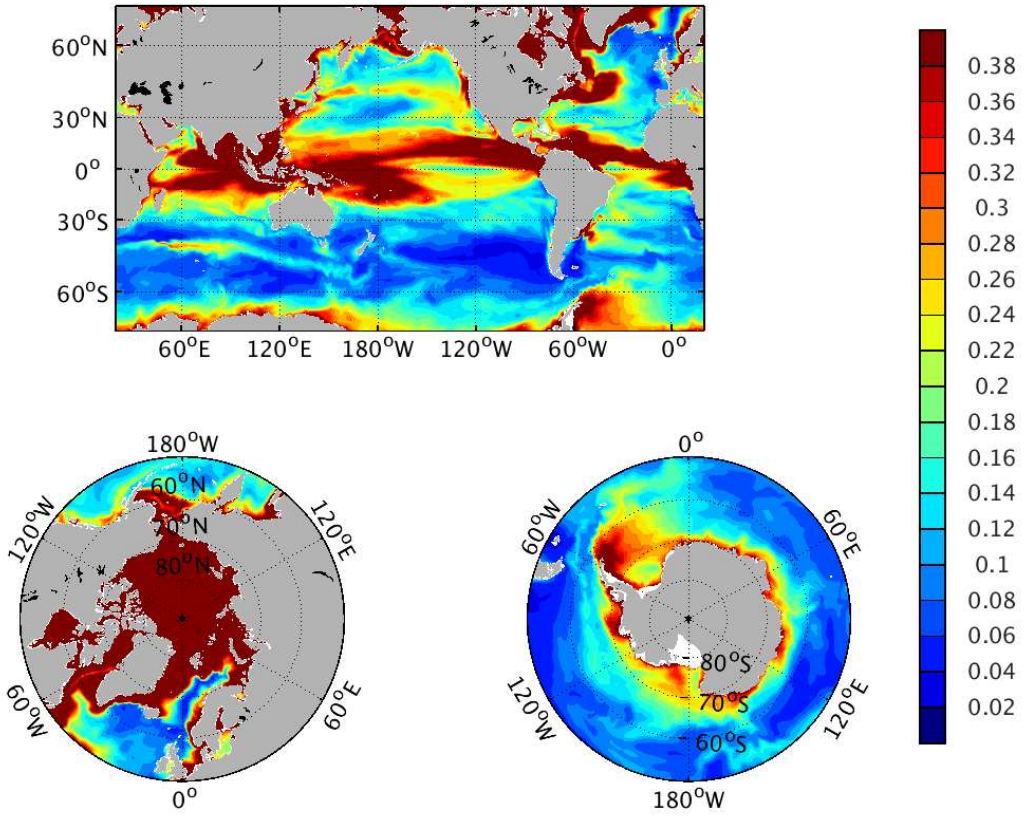

Figure : 1992-2017 standard deviation – salinity (in psu) at 5m

3D state variables

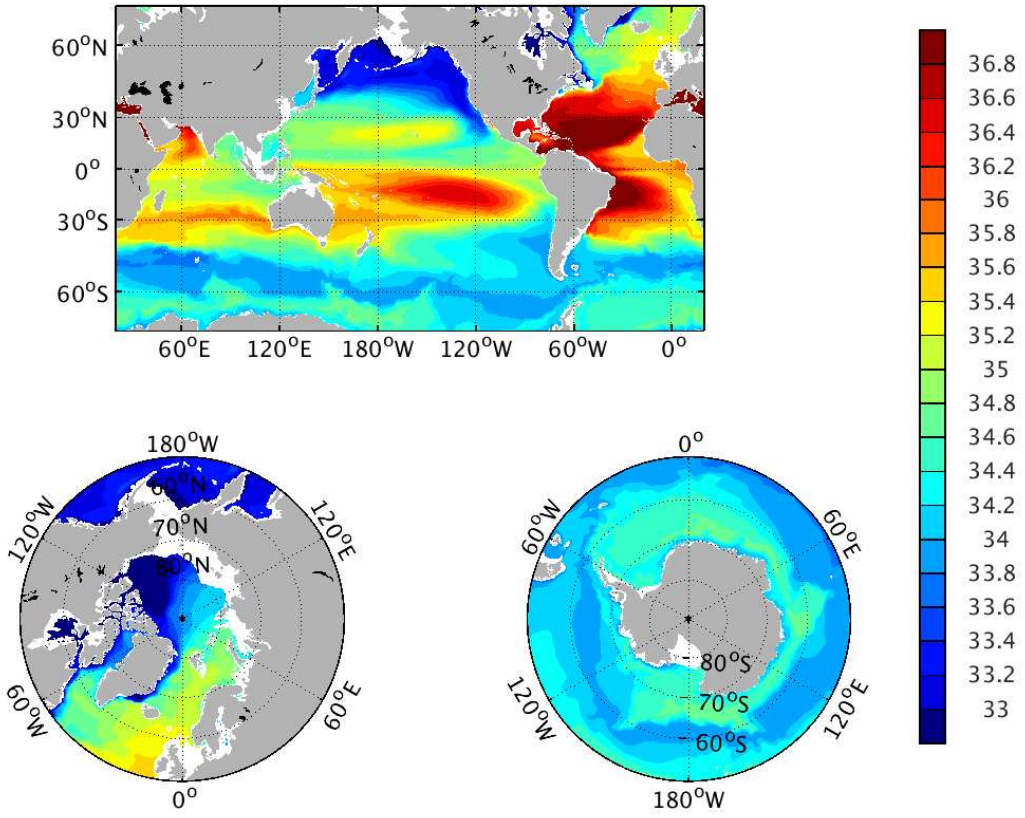

Figure : 1992-2017 mean – salinity (in psu) at 105m

3D state variables

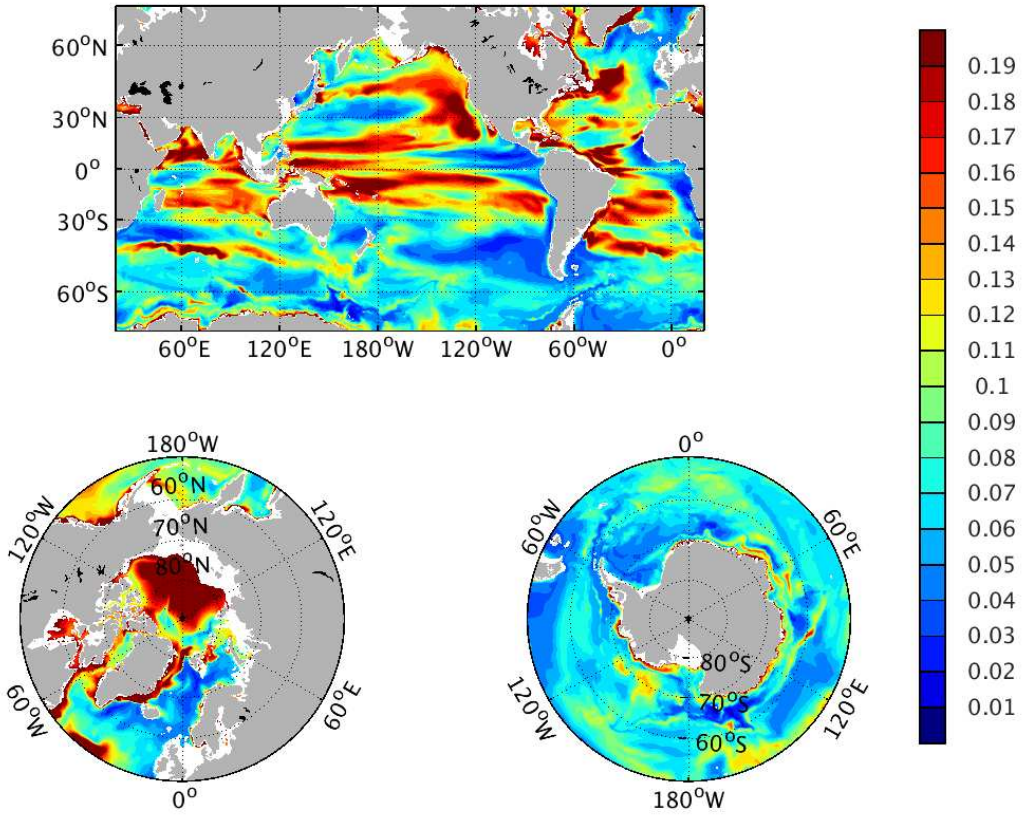

Figure : 1992-2017 standard deviation – salinity (in psu) at 105m

3D state variables

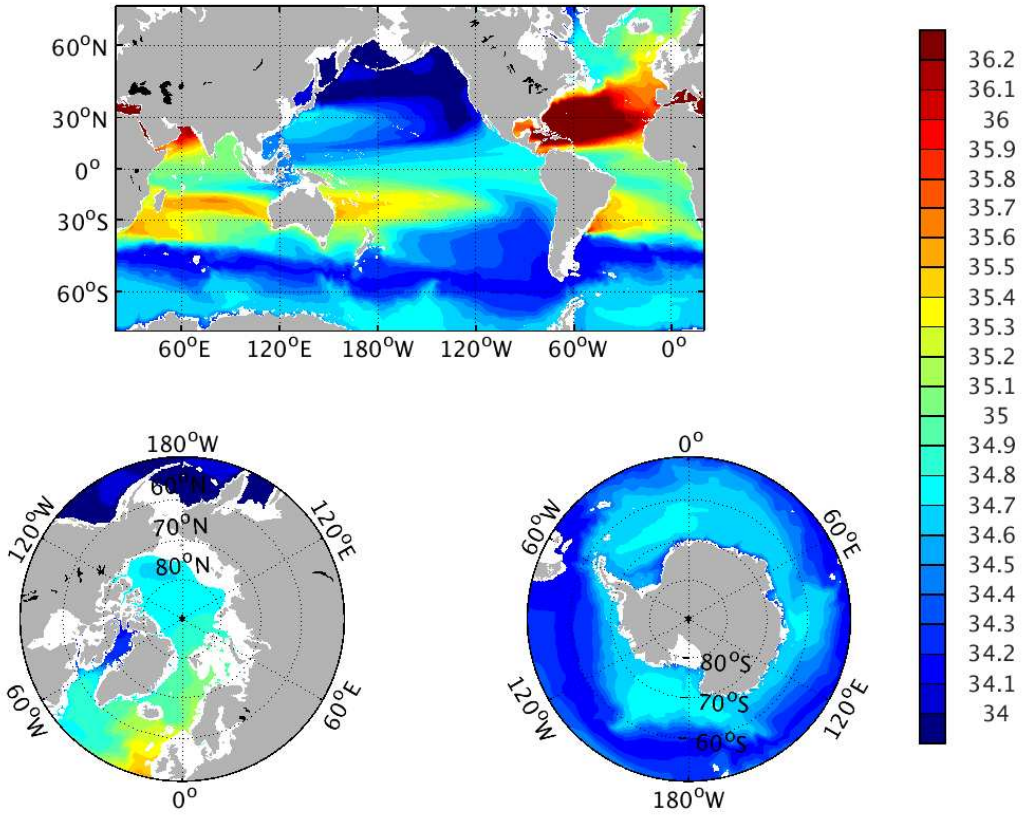

Figure : 1992-2017 mean – salinity (in psu) at 300m

3D state variables

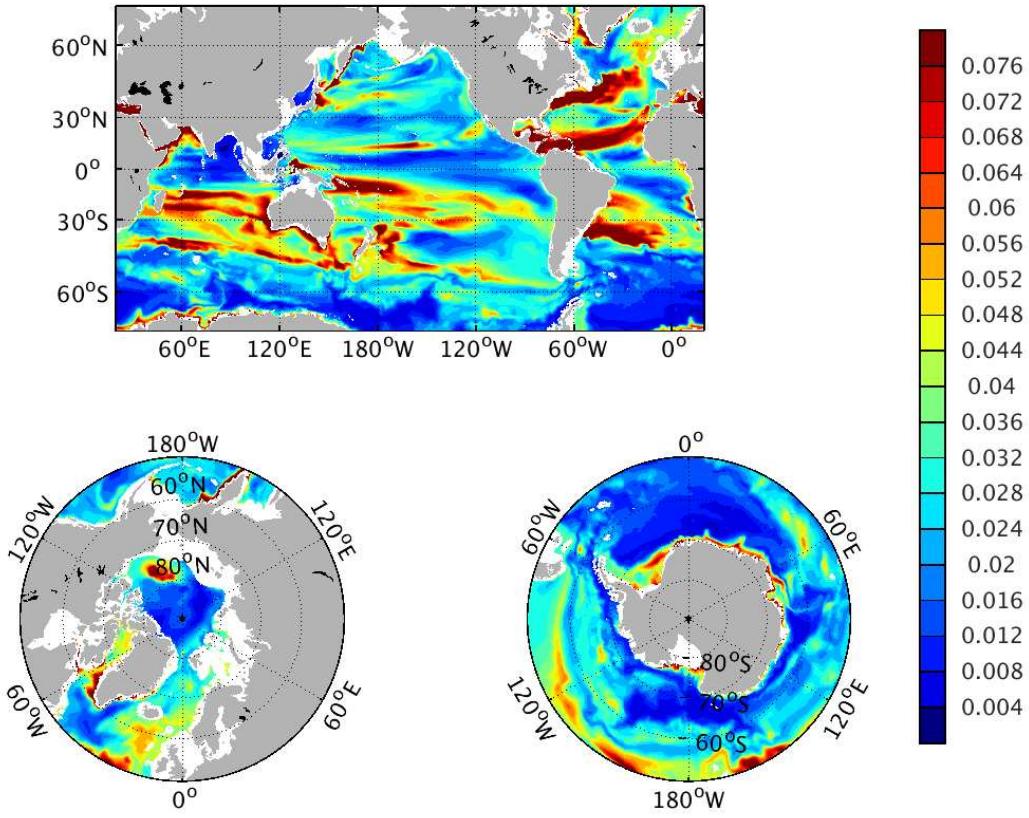

Figure : 1992-2017 standard deviation – salinity (in psu) at 300m

3D state variables

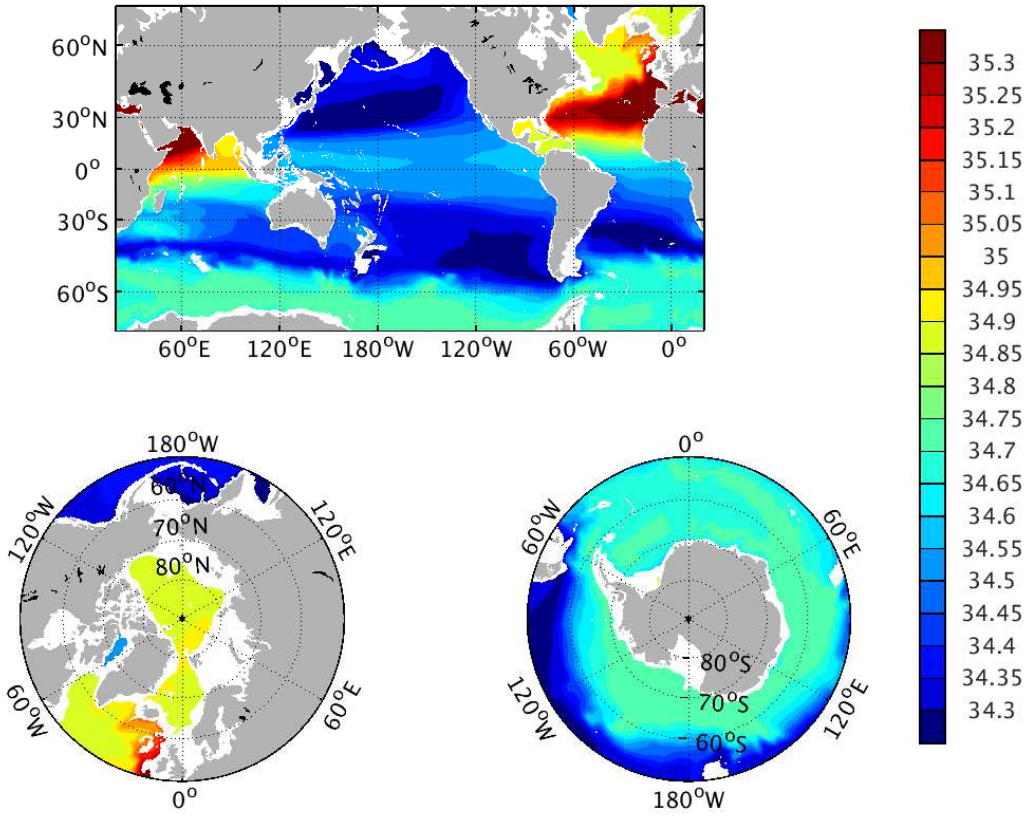

Figure : 1992-2017 mean – salinity (in psu) at 910m

3D state variables

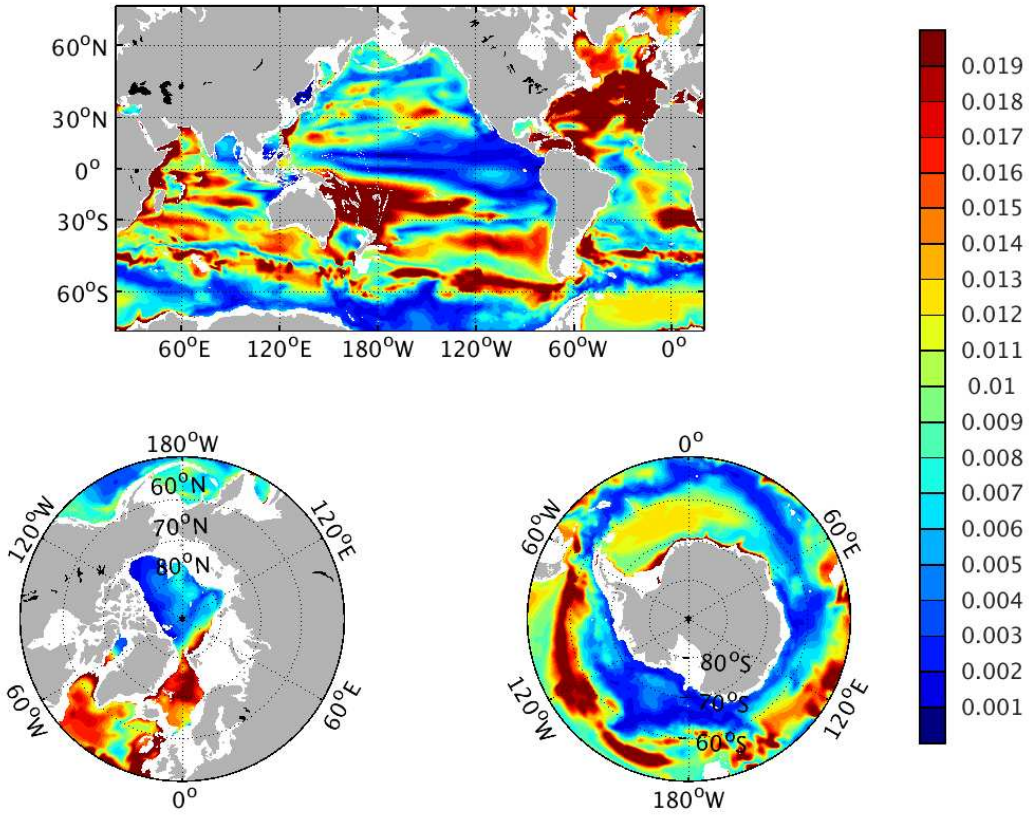

Figure : 1992-2017 standard deviation – salinity (in psu) at 910m

3D state variables

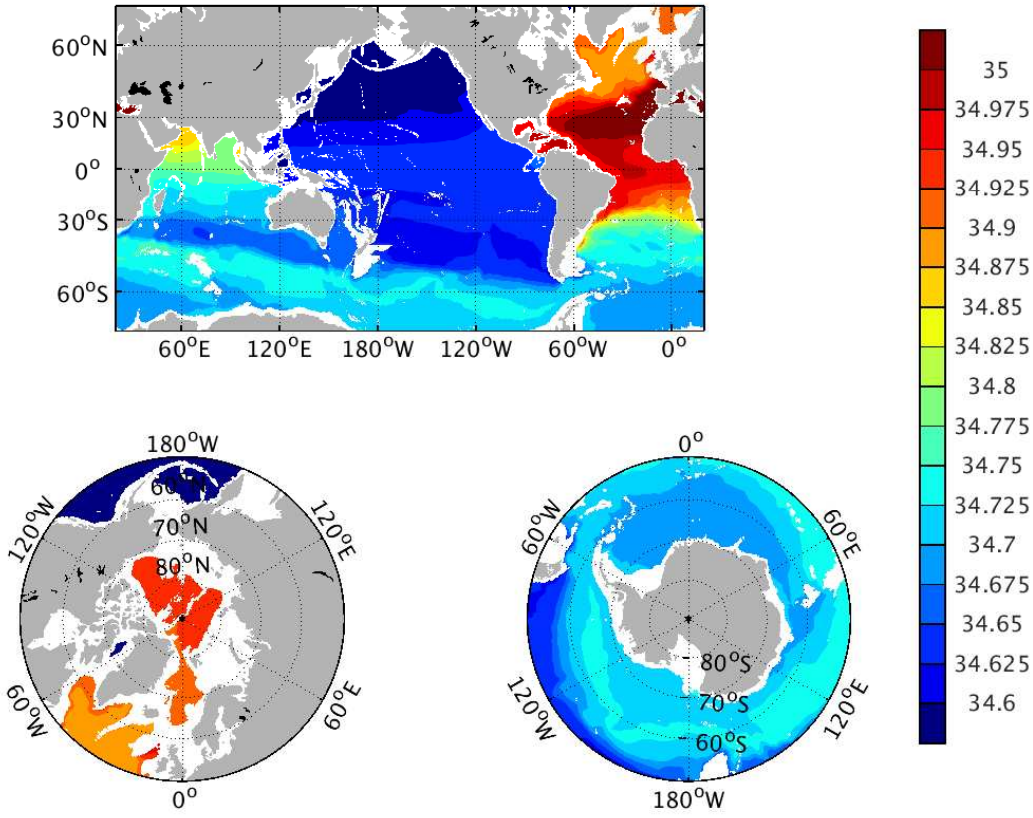

Figure : 1992-2017 mean – salinity (in psu) at 1914m

3D state variables

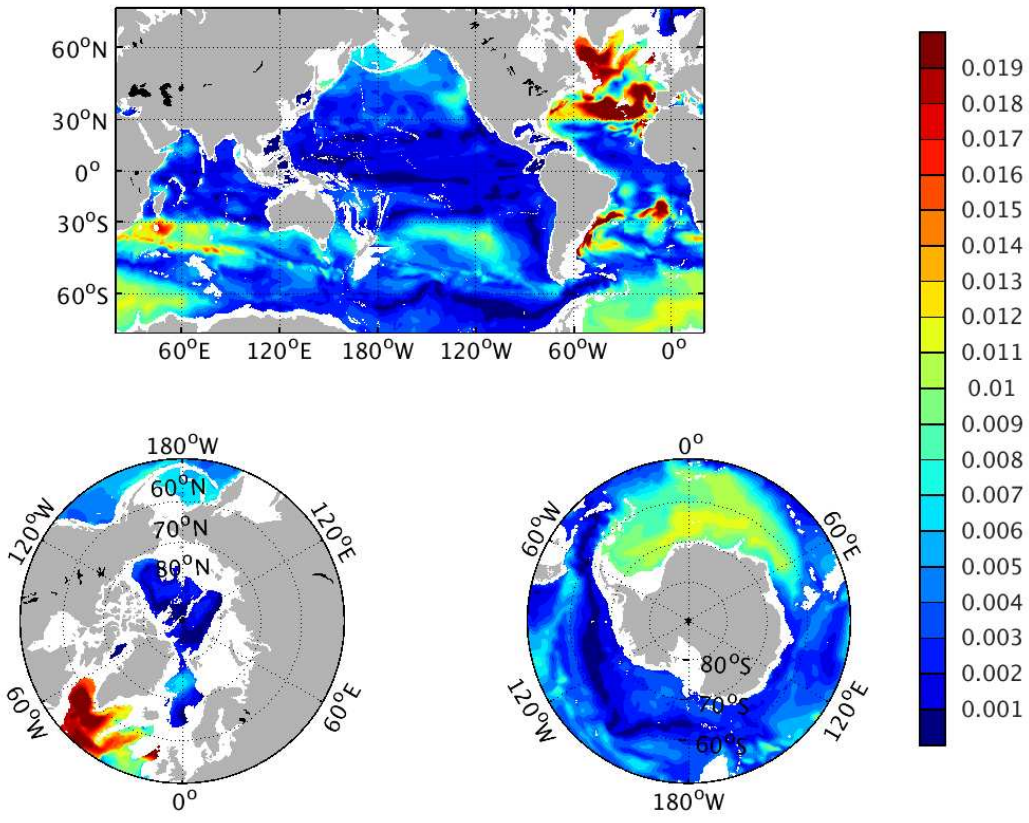

Figure : 1992-2017 standard deviation – salinity (in psu) at 1914m

3D state variables

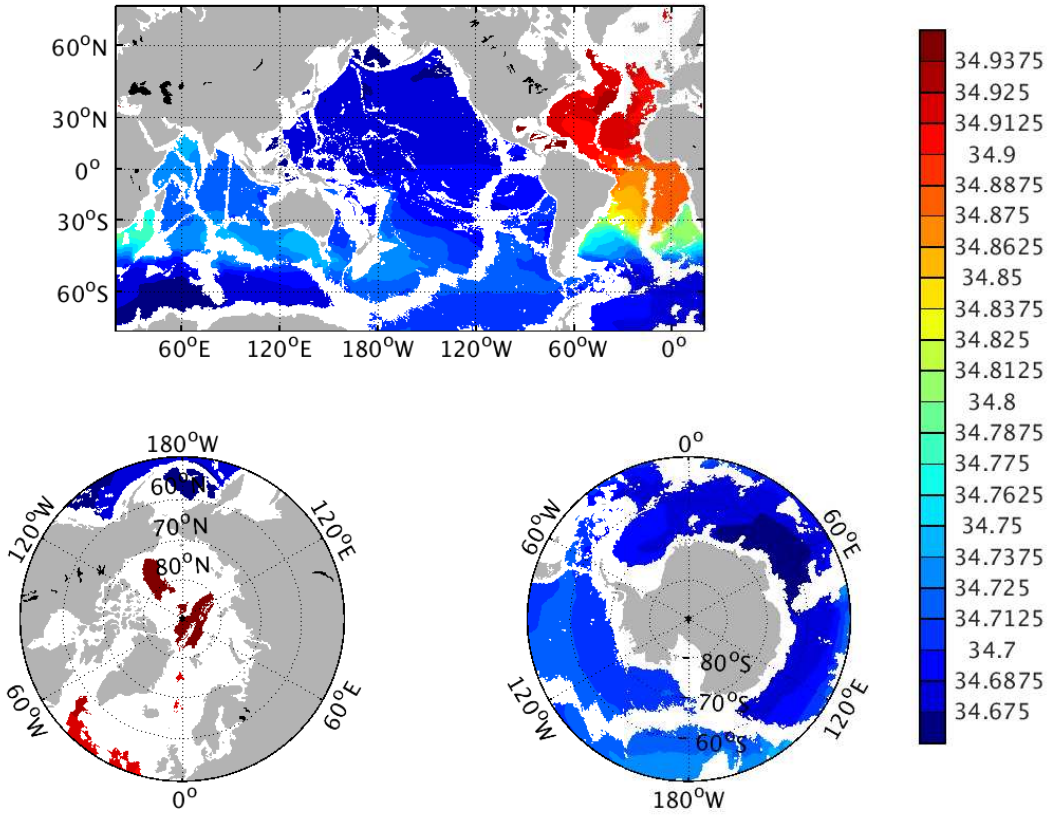

Figure : 1992-2017 mean – salinity (in psu) at 3581m

3D state variables

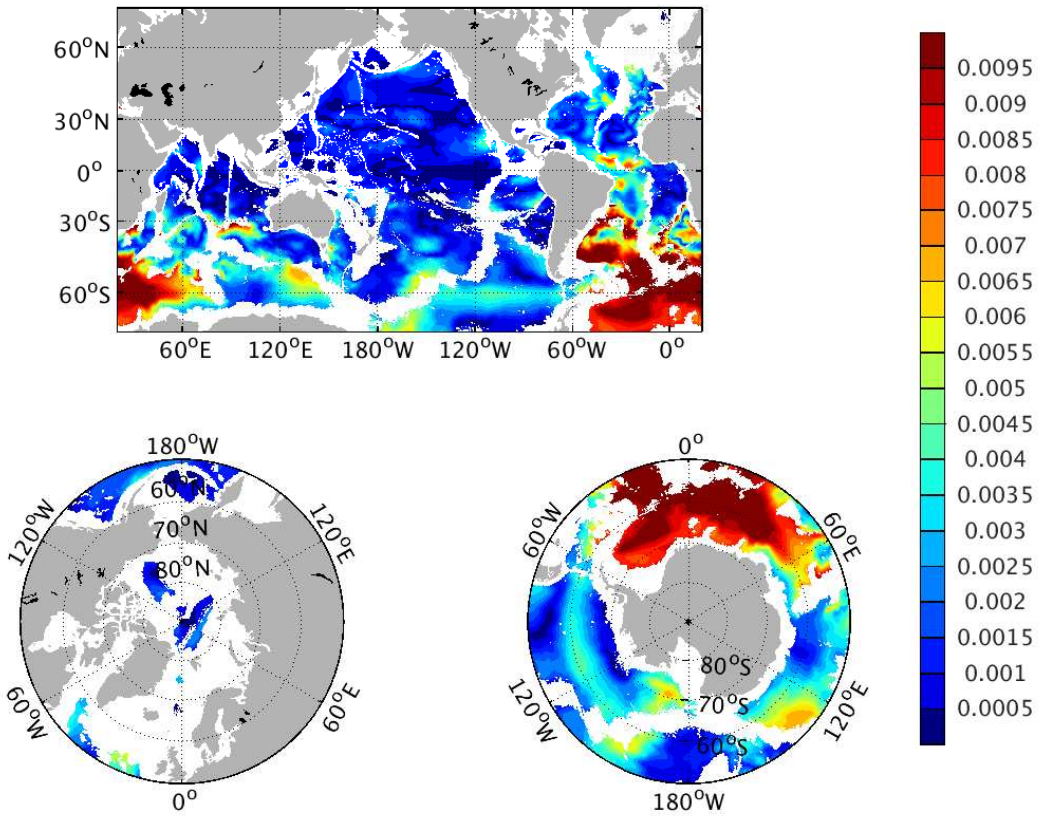

Figure : 1992-2017 standard deviation – salinity (in psu) at 3581m

3D state variables

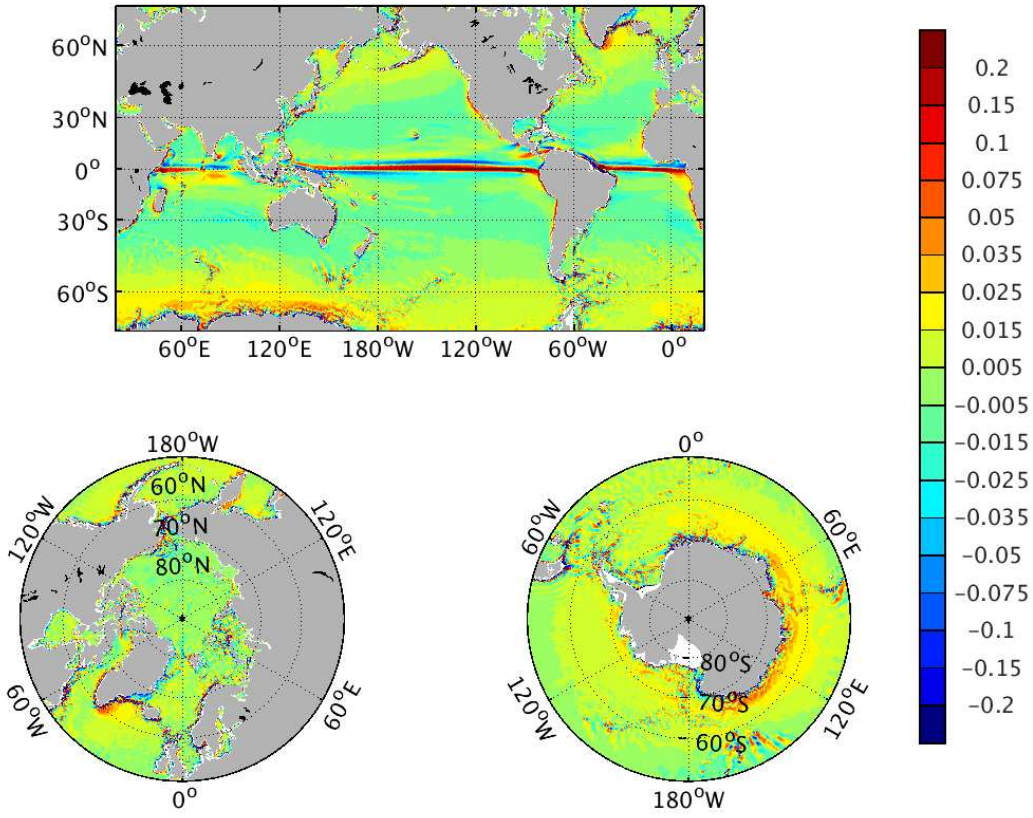

Figure : 1992-2017 mean – vertical velocity (in mm/year) at 15m

3D state variables

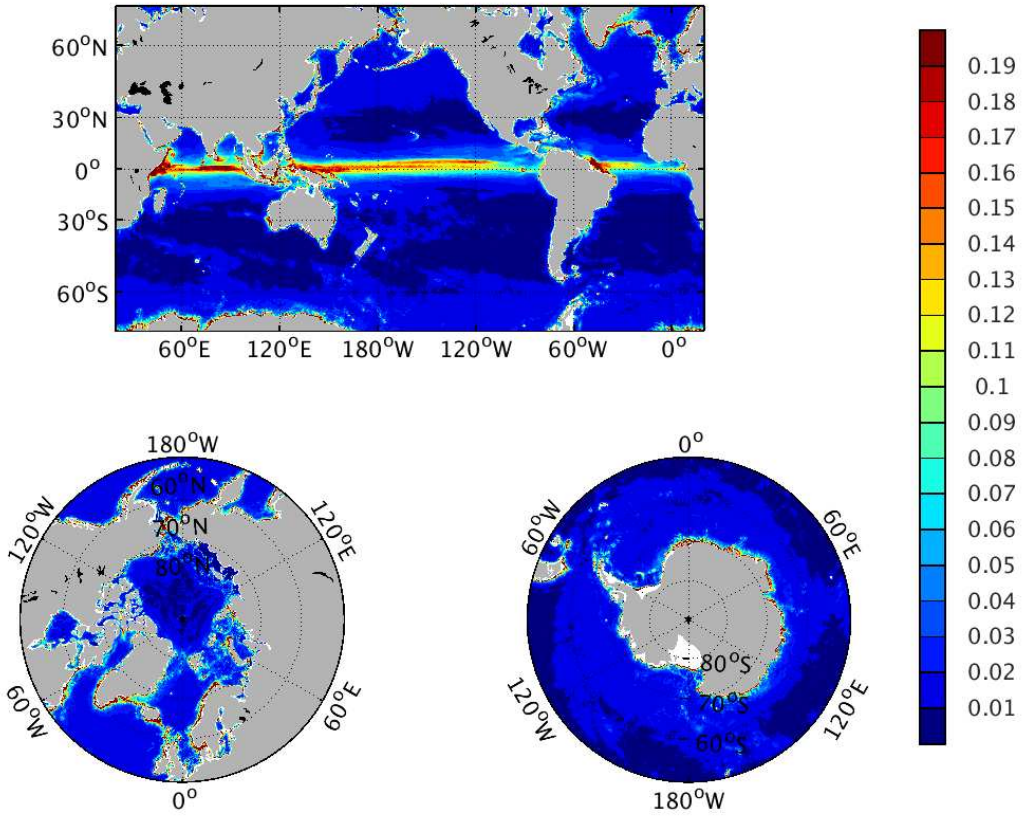

Figure : 1992-2017 standard deviation – vertical velocity (in mm/year) at 15m

3D state variables

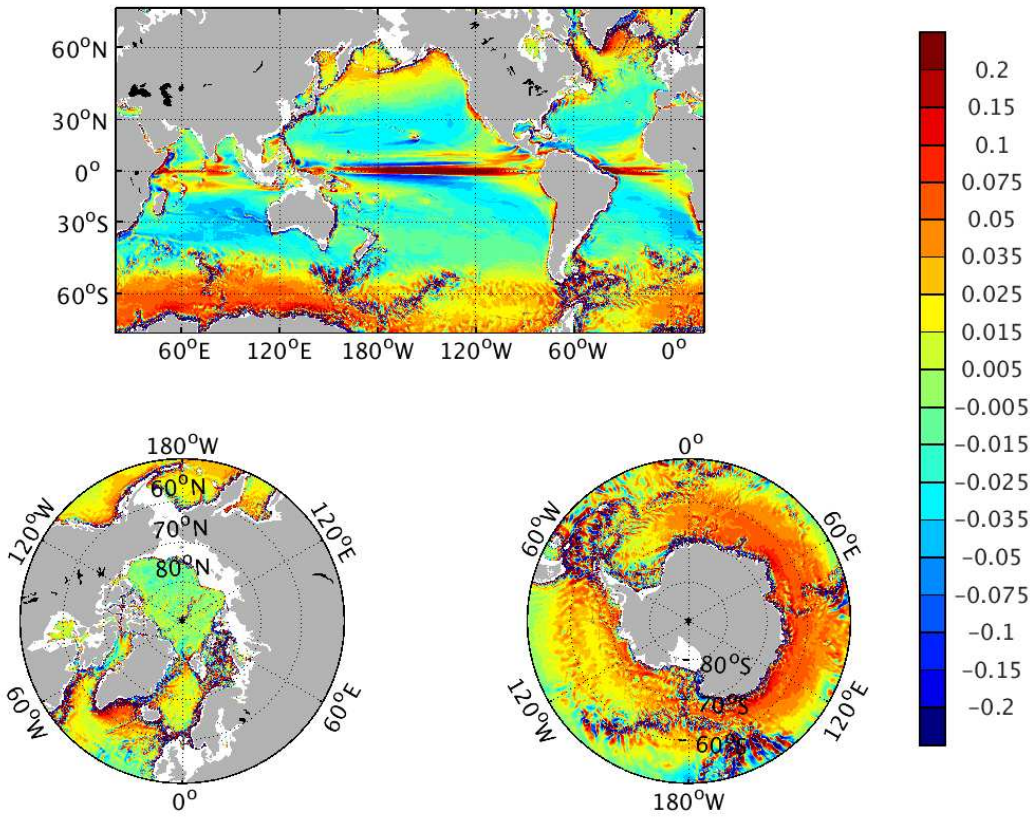

Figure : 1992-2017 mean – vertical velocity (in mm/year) at 105m

3D state variables

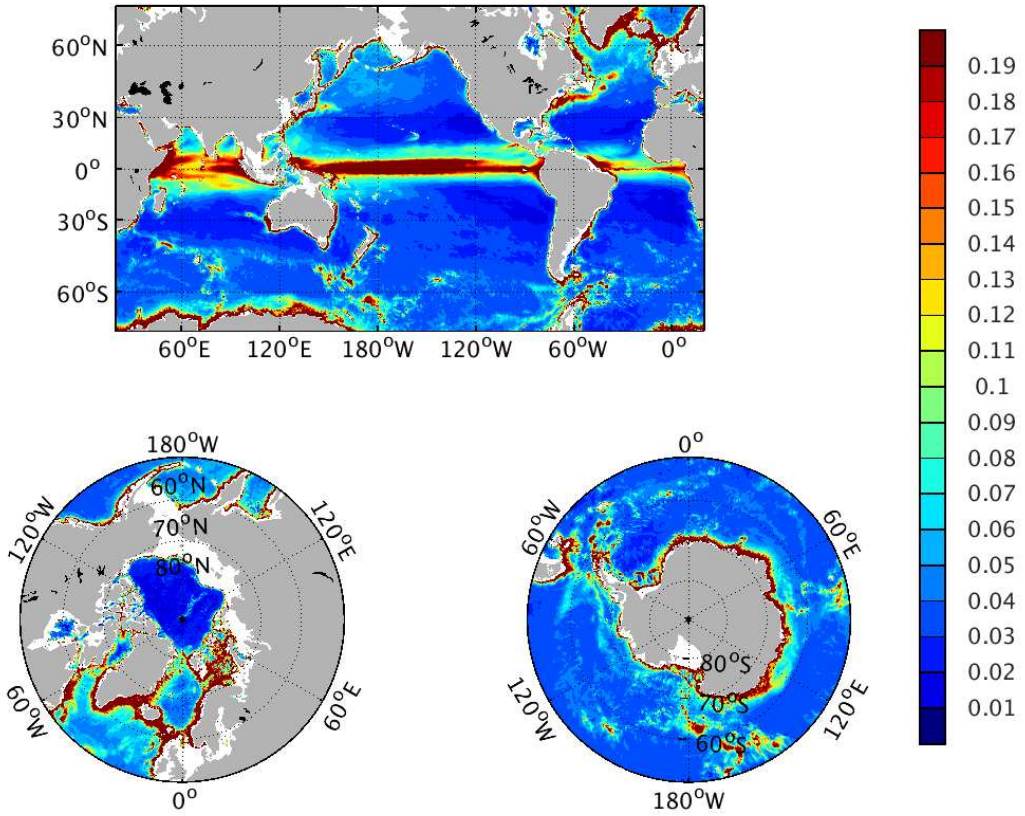

Figure : 1992-2017 standard deviation – vertical velocity (in mm/year) at 105m

3D state variables

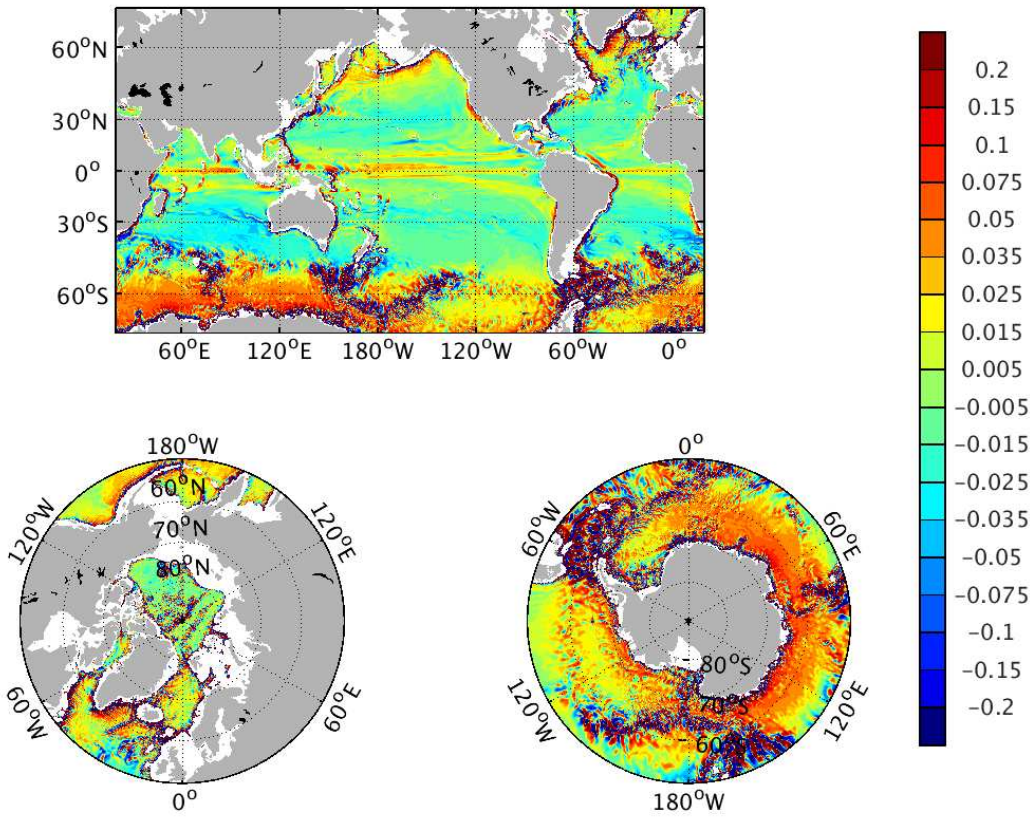

Figure : 1992-2017 mean – vertical velocity (in mm/year) at 300m

3D state variables

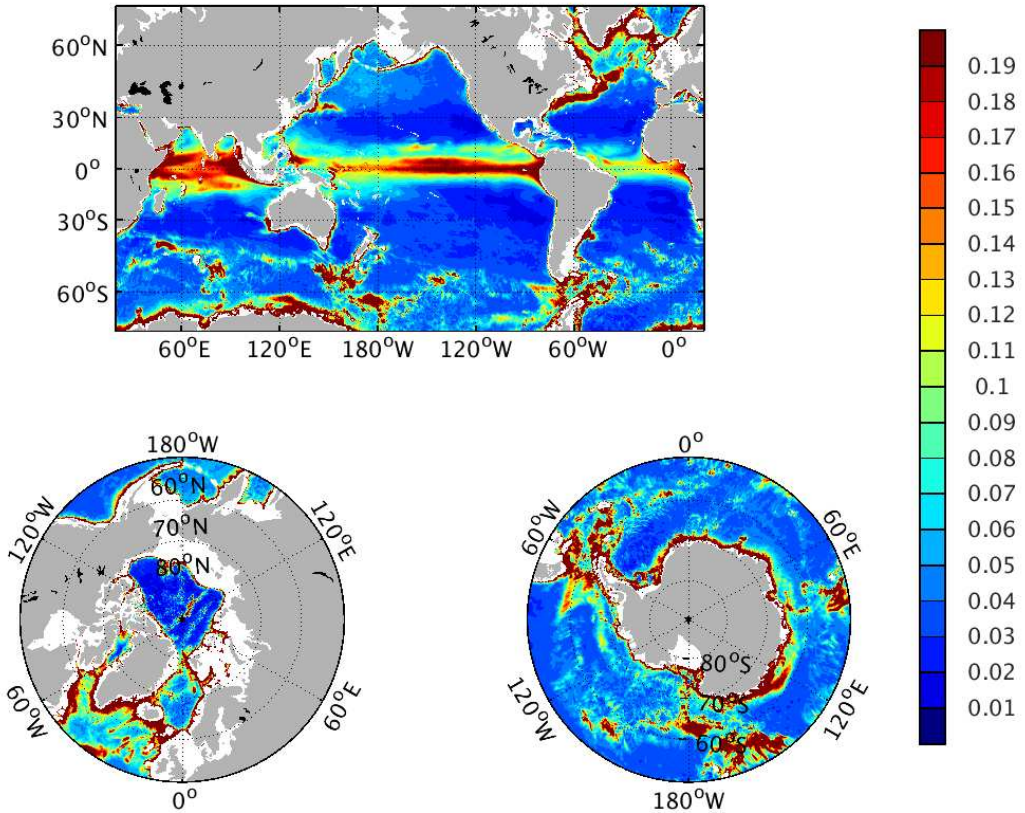

Figure : 1992-2017 standard deviation – vertical velocity (in mm/year) at 300m

3D state variables

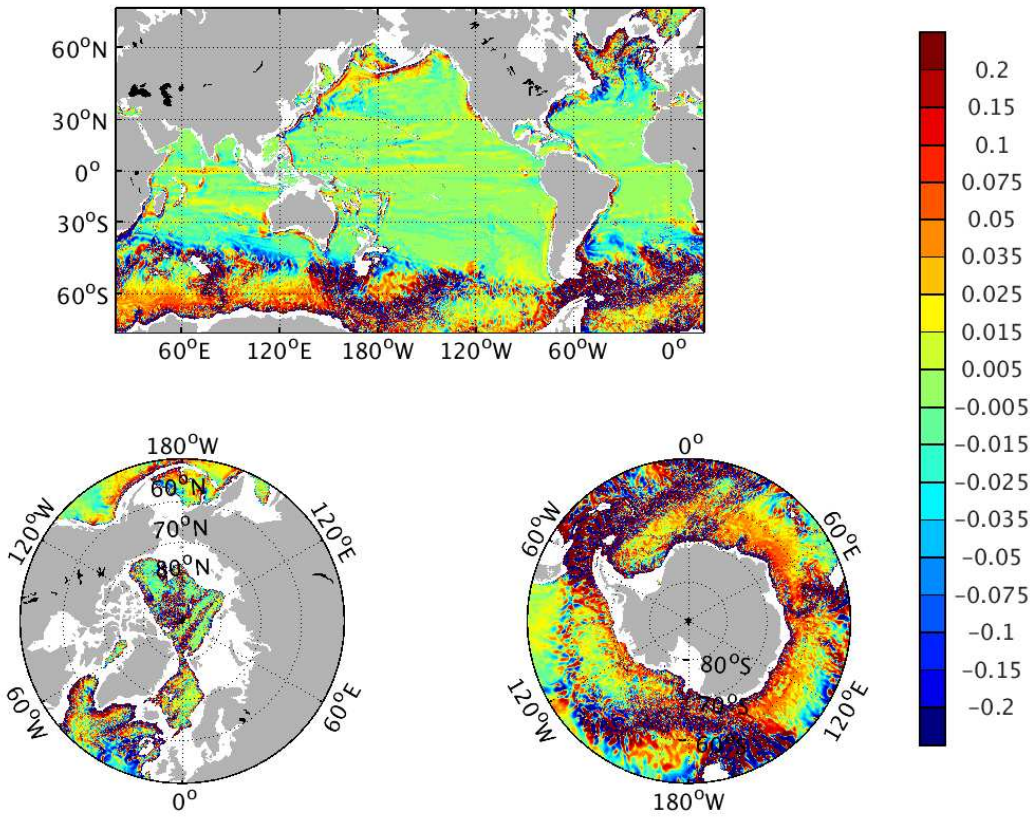

Figure : 1992-2017 mean – vertical velocity (in mm/year) at 910m

3D state variables

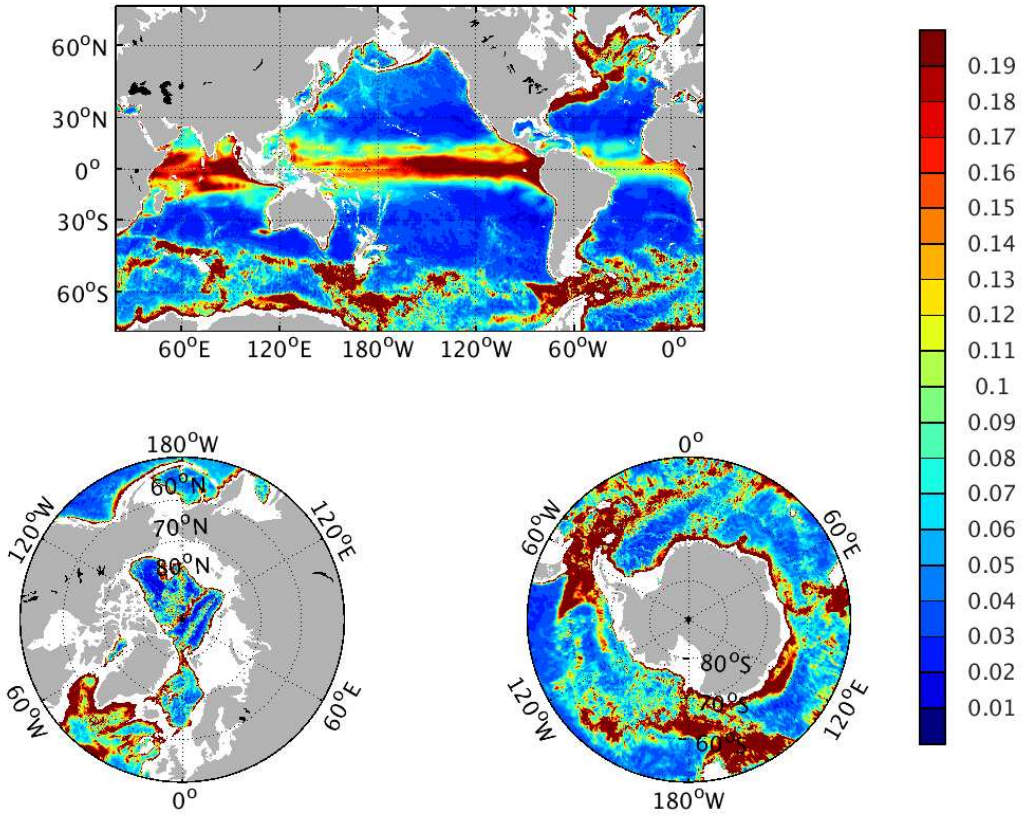

Figure : 1992-2017 standard deviation – vertical velocity (in mm/year) at 910m

3D state variables

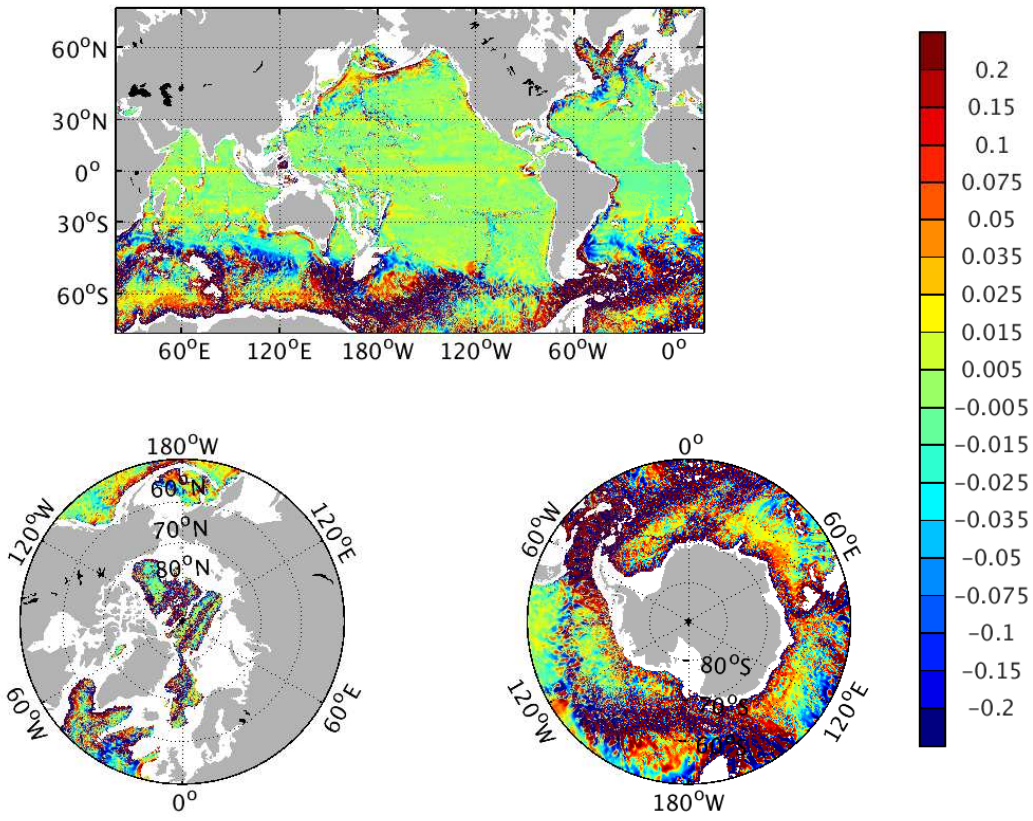

Figure : 1992-2017 mean – vertical velocity (in mm/year) at 1914m

3D state variables

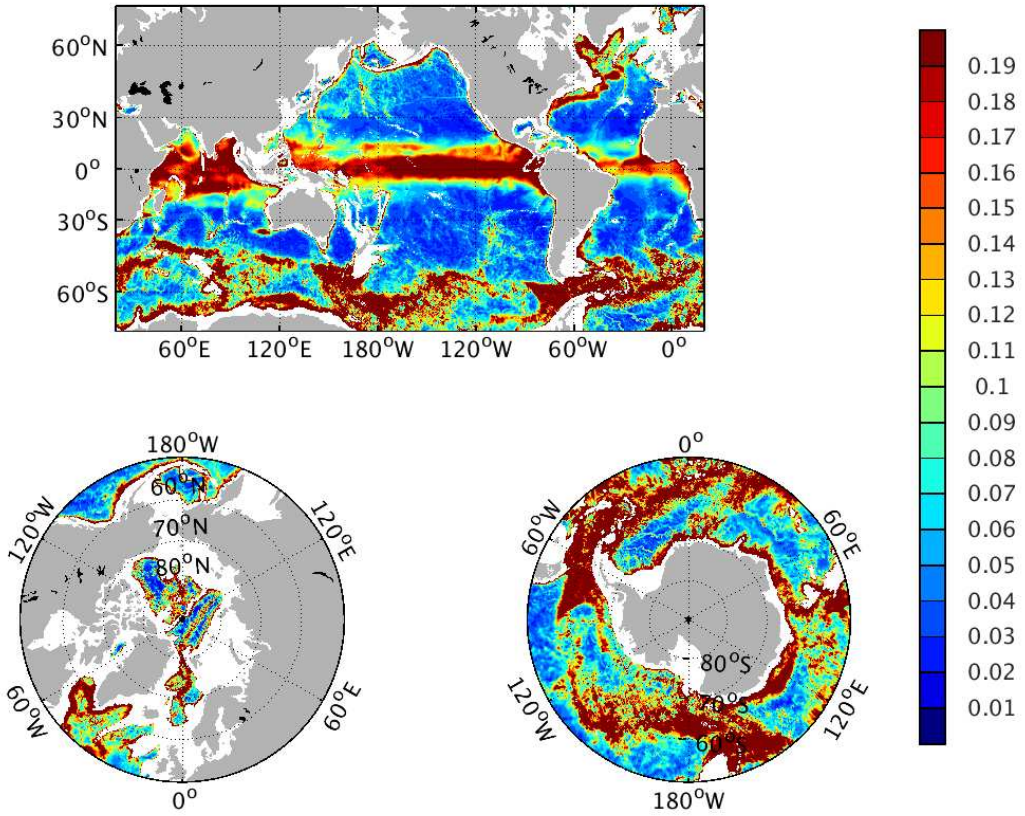

Figure : 1992-2017 standard deviation – vertical velocity (in mm/year) at 1914m

3D state variables

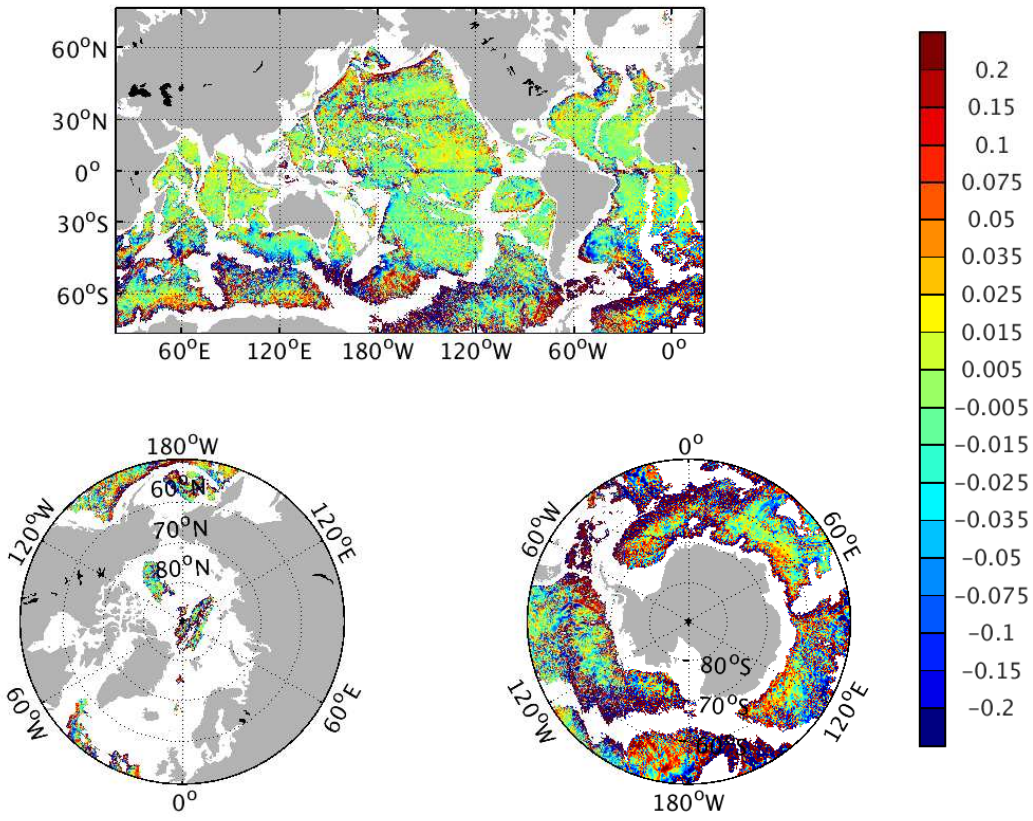

Figure : 1992-2017 mean – vertical velocity (in mm/year) at 3581m

3D state variables

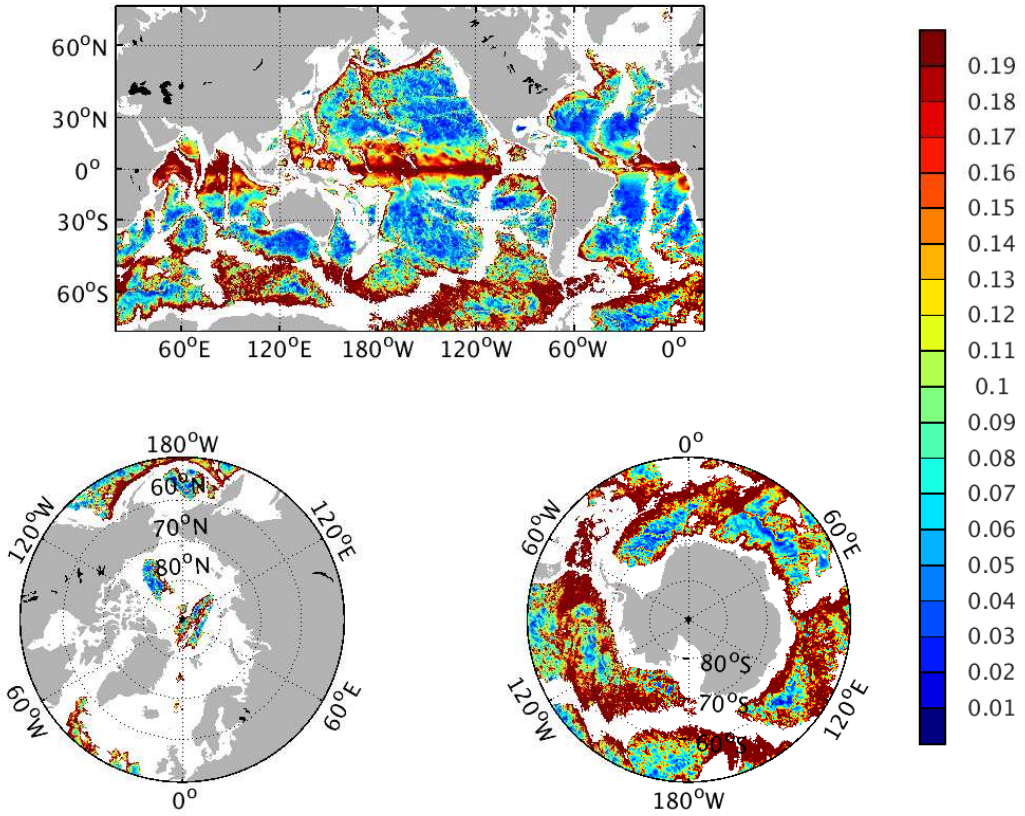

Figure : 1992-2017 standard deviation – vertical velocity (in mm/year) at 3581m

air-sea heat flux

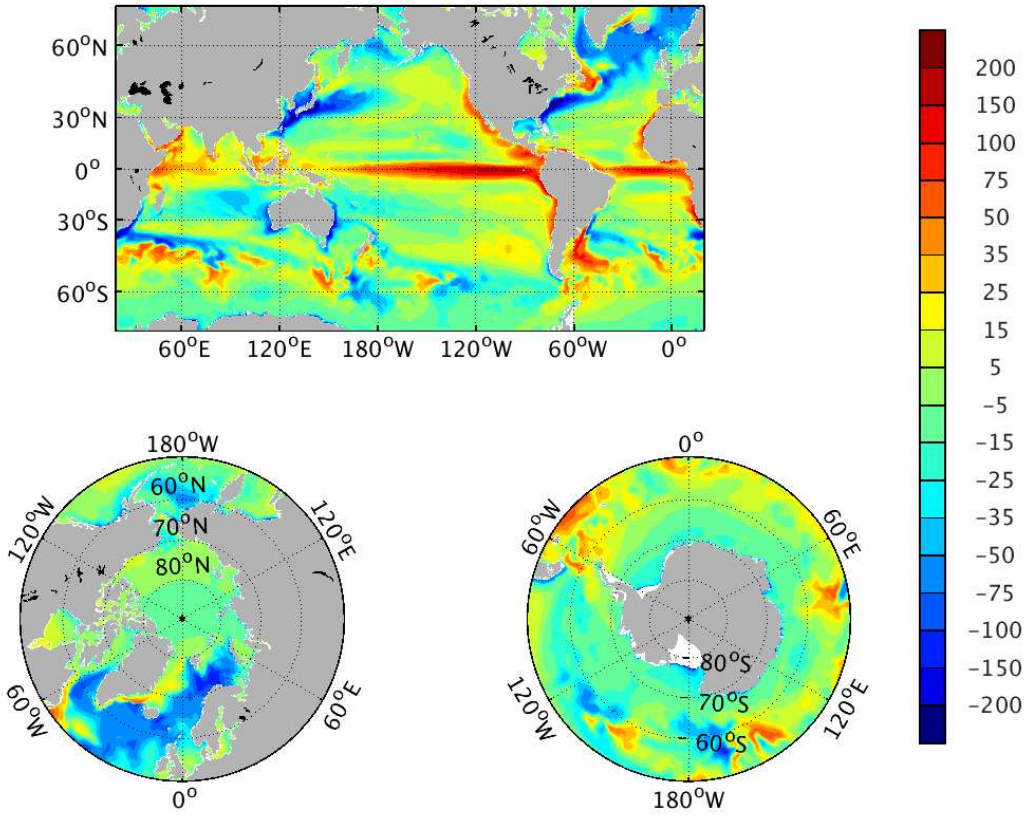

Figure : 1992-2017 mean – QNET to ocean+ice (W/m^2)

air-sea heat flux

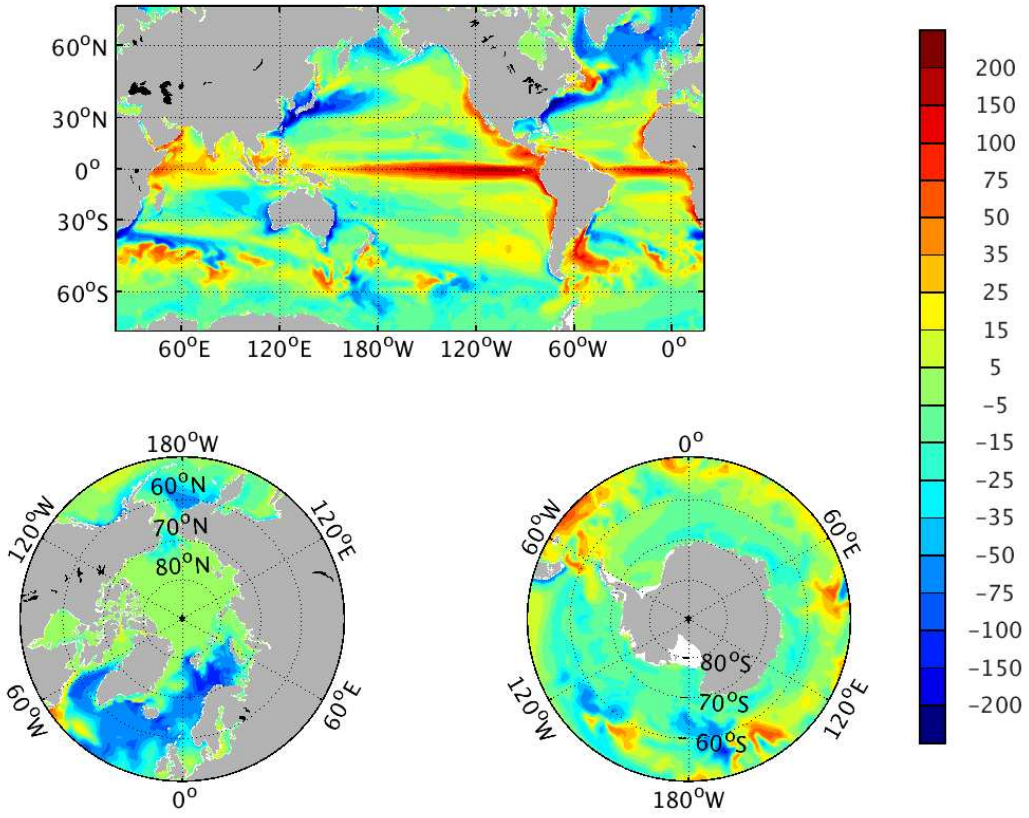

Figure : 1992-2017 mean – QNET to ocean (W/m^2)

air-sea heat flux

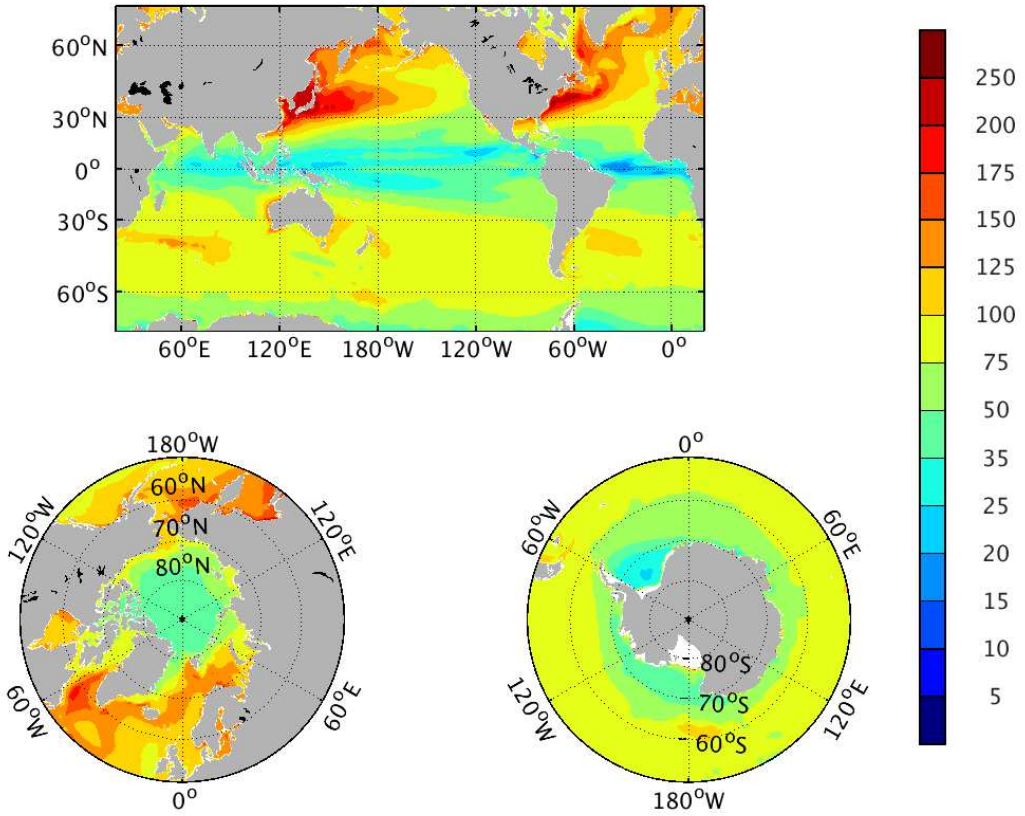

Figure : 1992-2017 standard deviation – QNET to ocean+ice (W/m^2)

air-sea heat flux

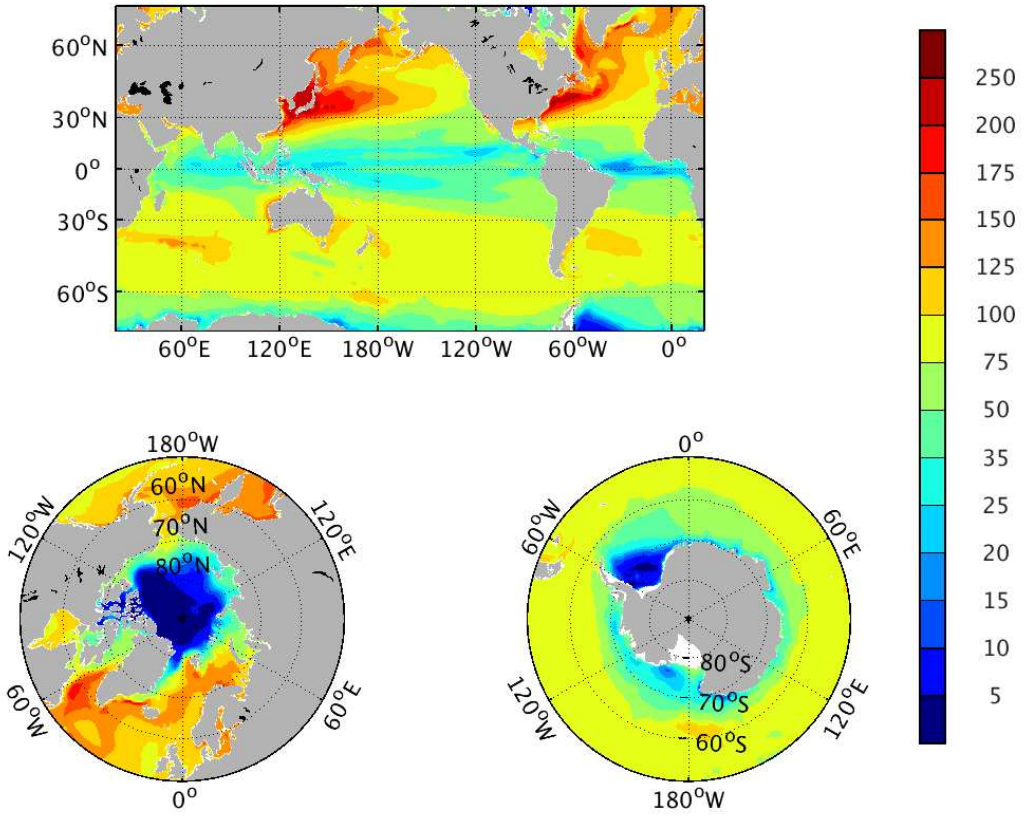

Figure : 1992-2017 standard deviation – QNET to ocean (W/m^2)

air-sea freshwater flux

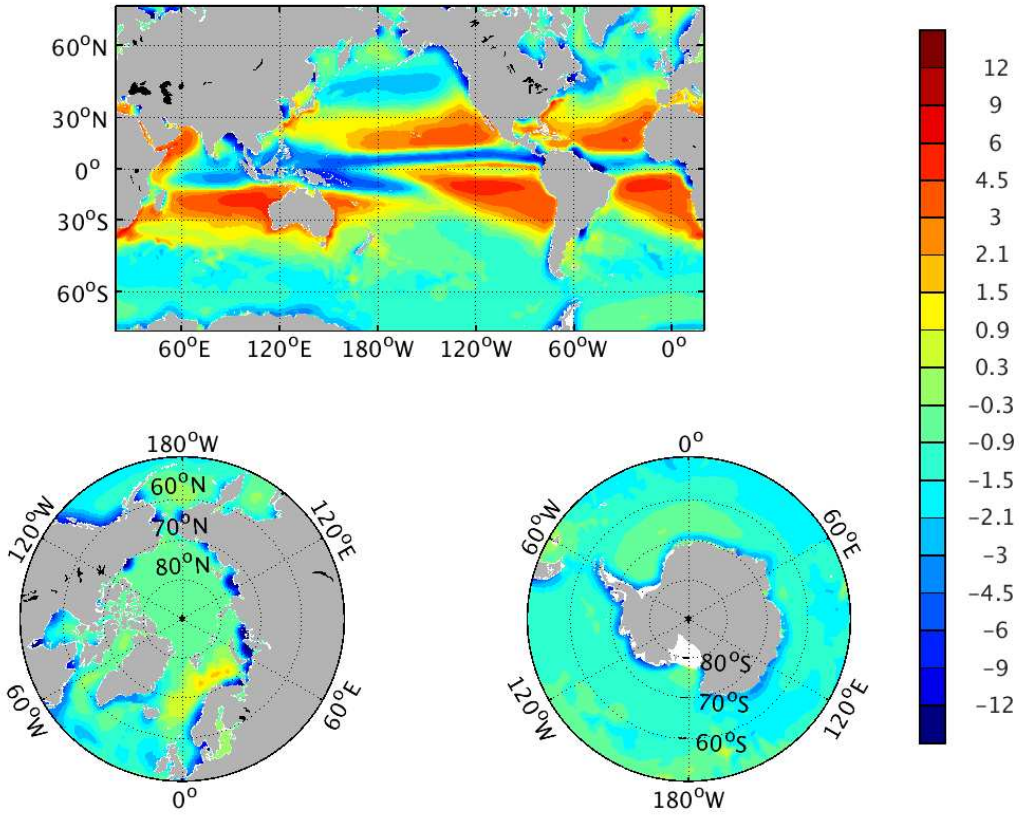

Figure : 1992-2017 mean – E-P-R from ocean+ice (mm/day)

air-sea freshwater flux

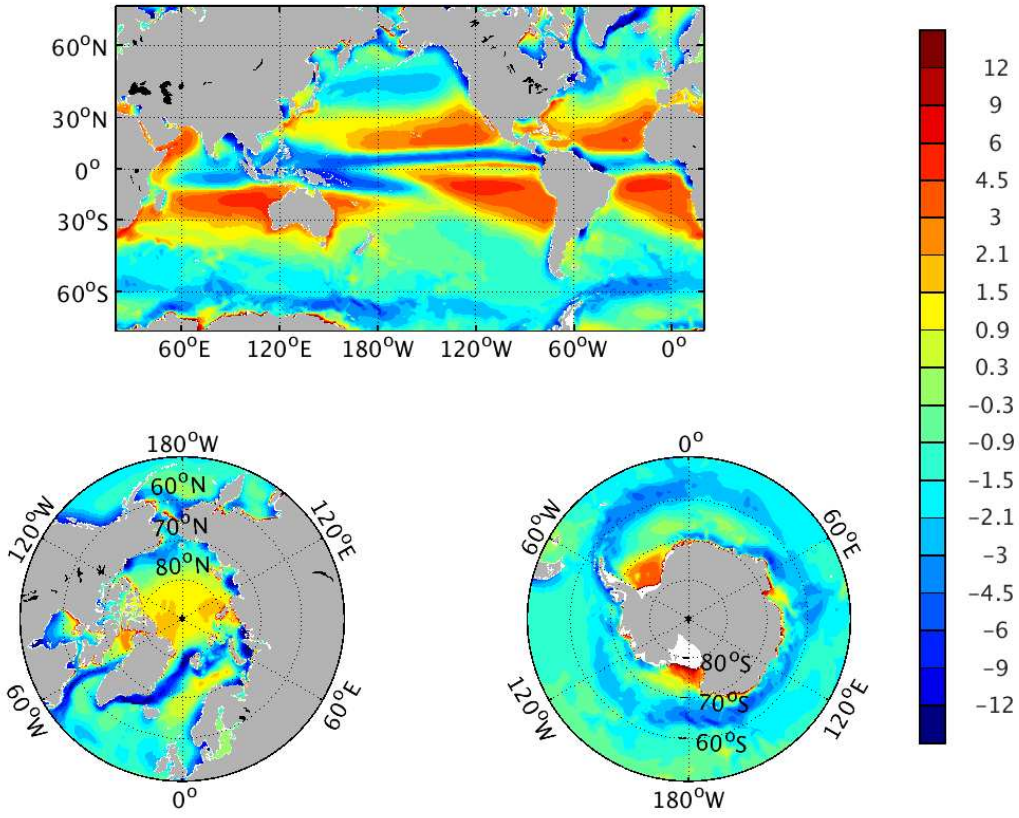

Figure : 1992-2017 mean – E-P-R from ocean (mm/day)

air-sea freshwater flux

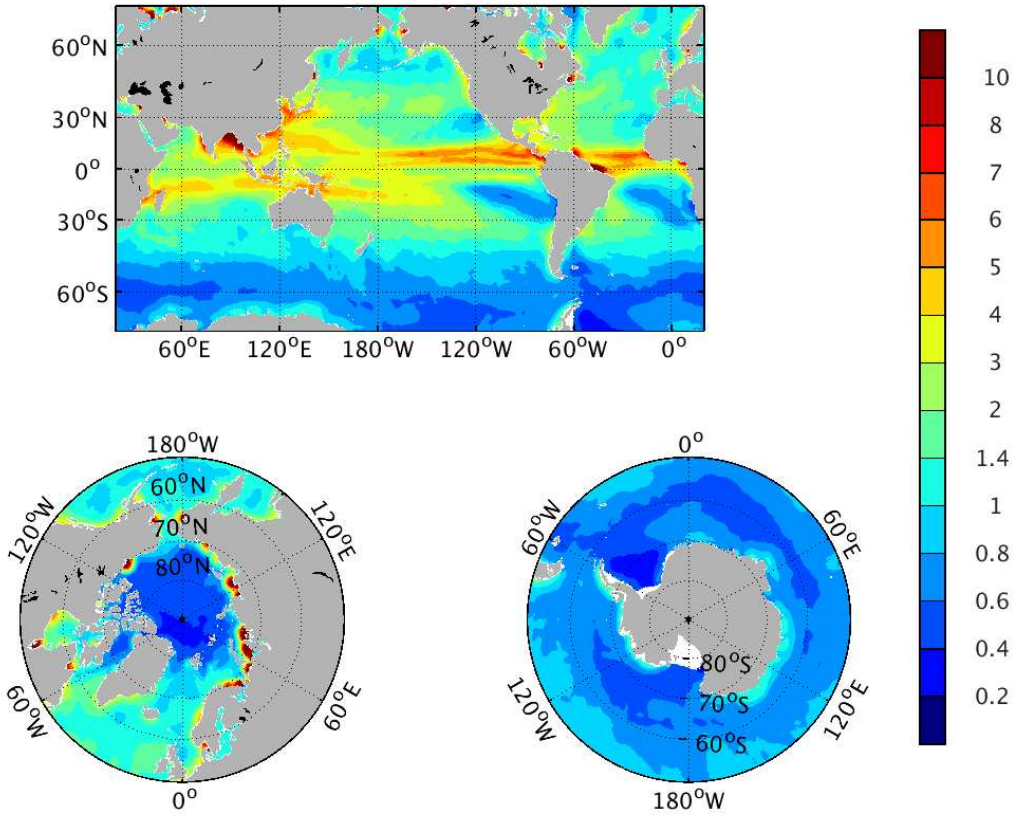

Figure : 1992-2017 standard deviation – E-P-R to ocean+ice (W/m^2)

air-sea freshwater flux

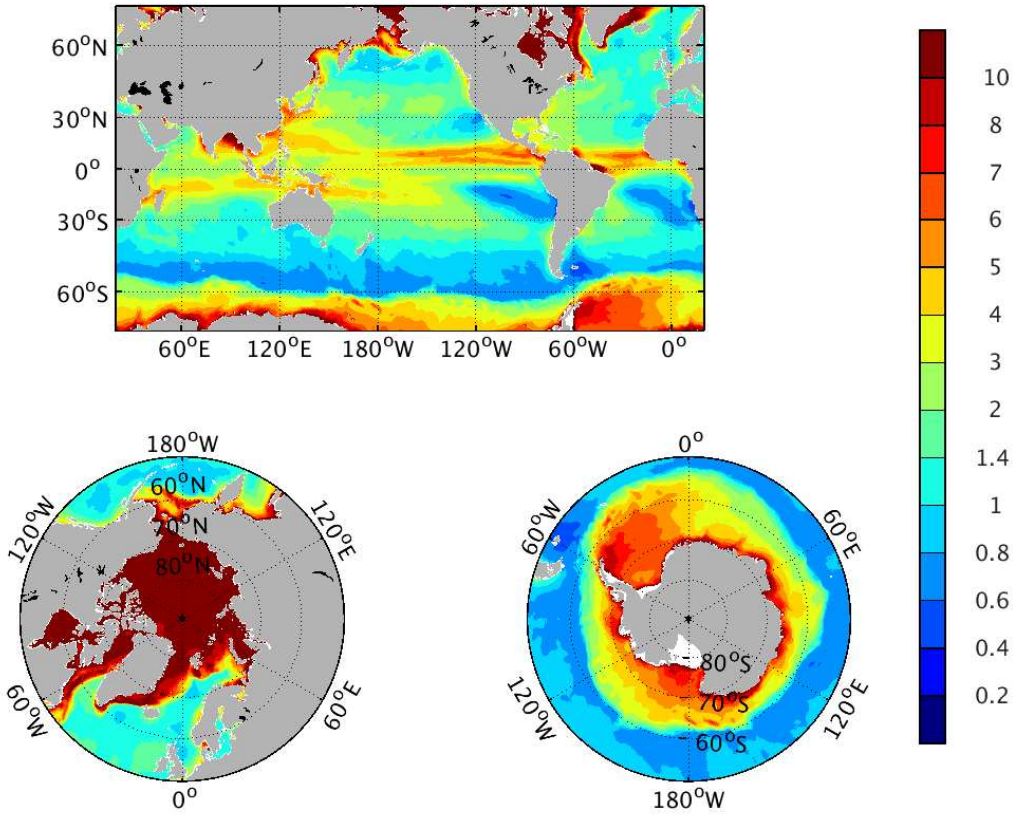

Figure : 1992-2017 standard deviation – E-P-R to ocean (W/m^2)

surface wind stress

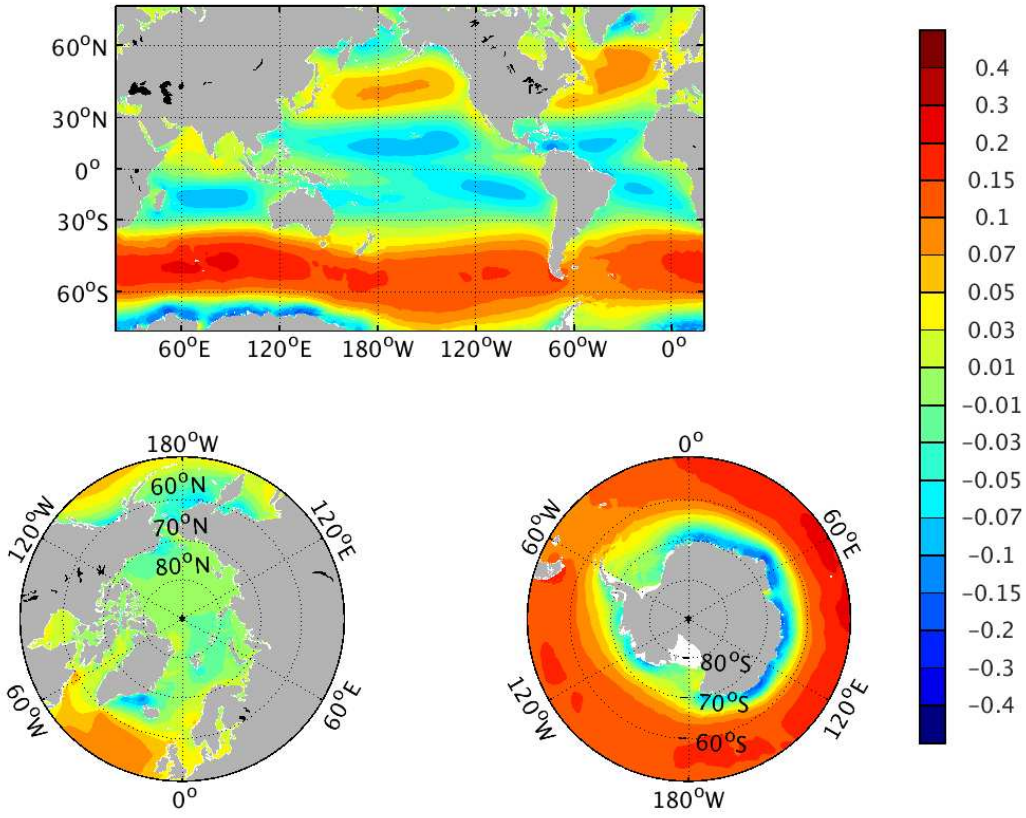

Figure : 1992-2017 mean – zonal wind stress (N/m^2)

surface wind stress

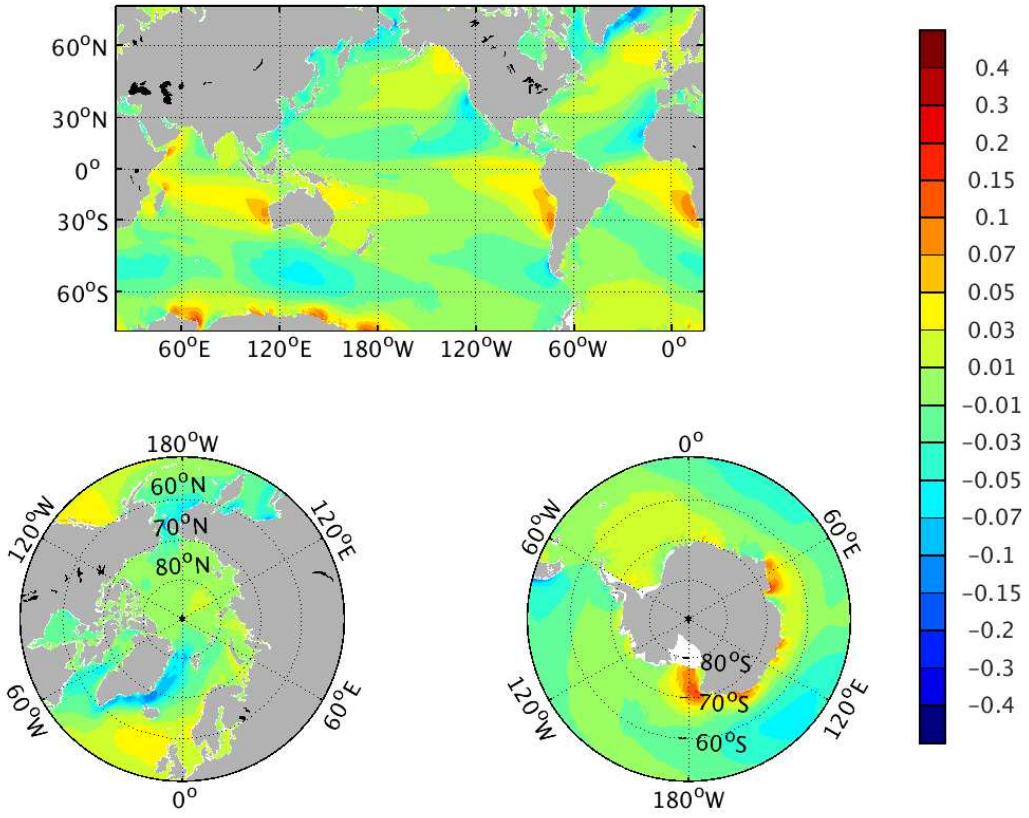

Figure : 1992-2017 mean – meridional wind stress (N/m^2)

surface wind stress

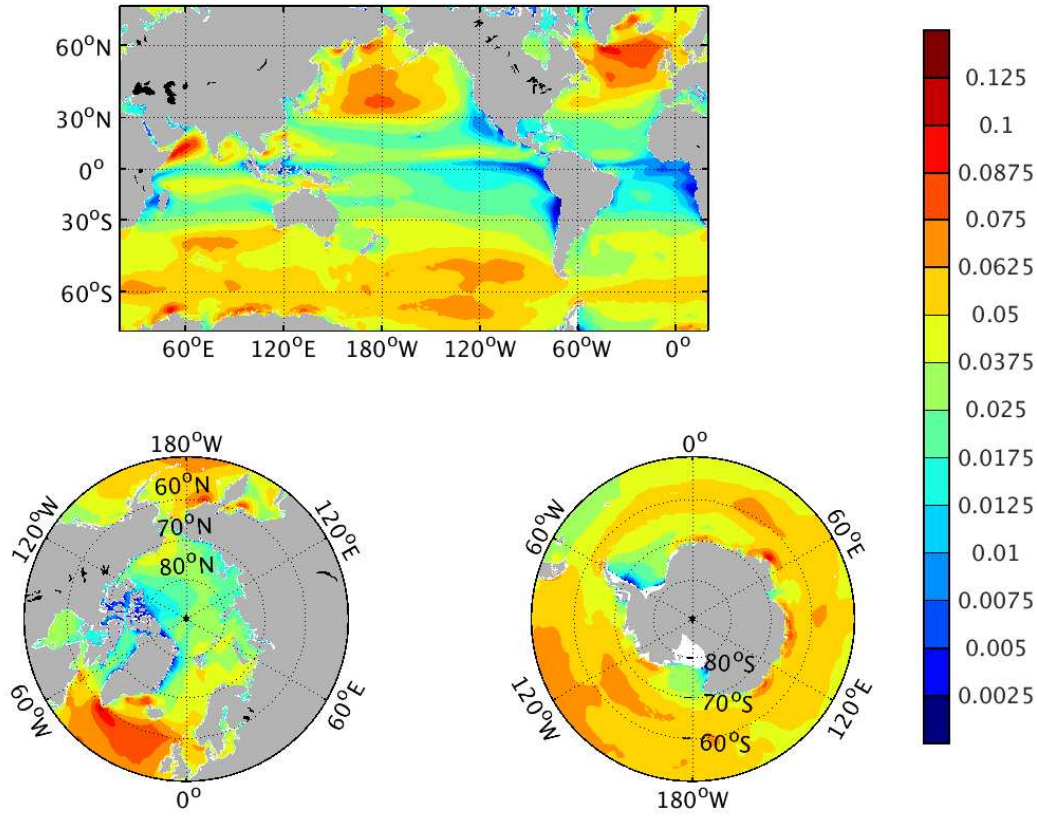

Figure : 1992-2017 standard deviation – tauZ (W/m^2)

surface wind stress

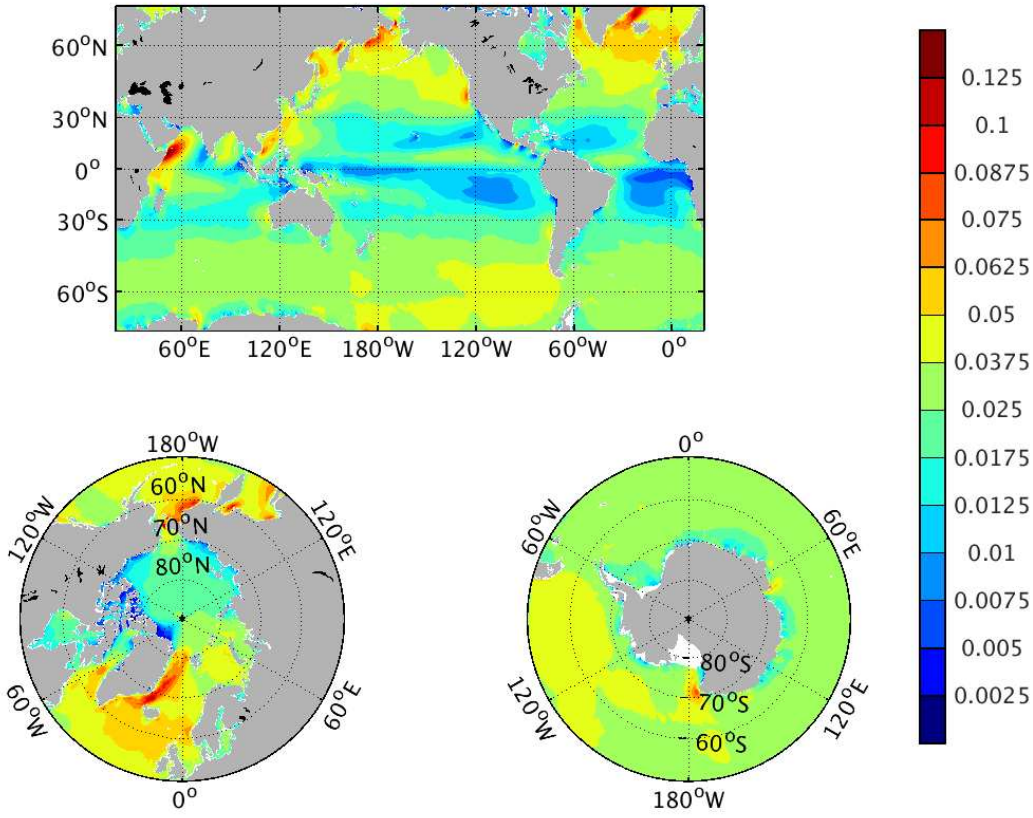

Figure : 1992-2017 standard deviation – tauM (W/m^2)

zonal mean tendencies

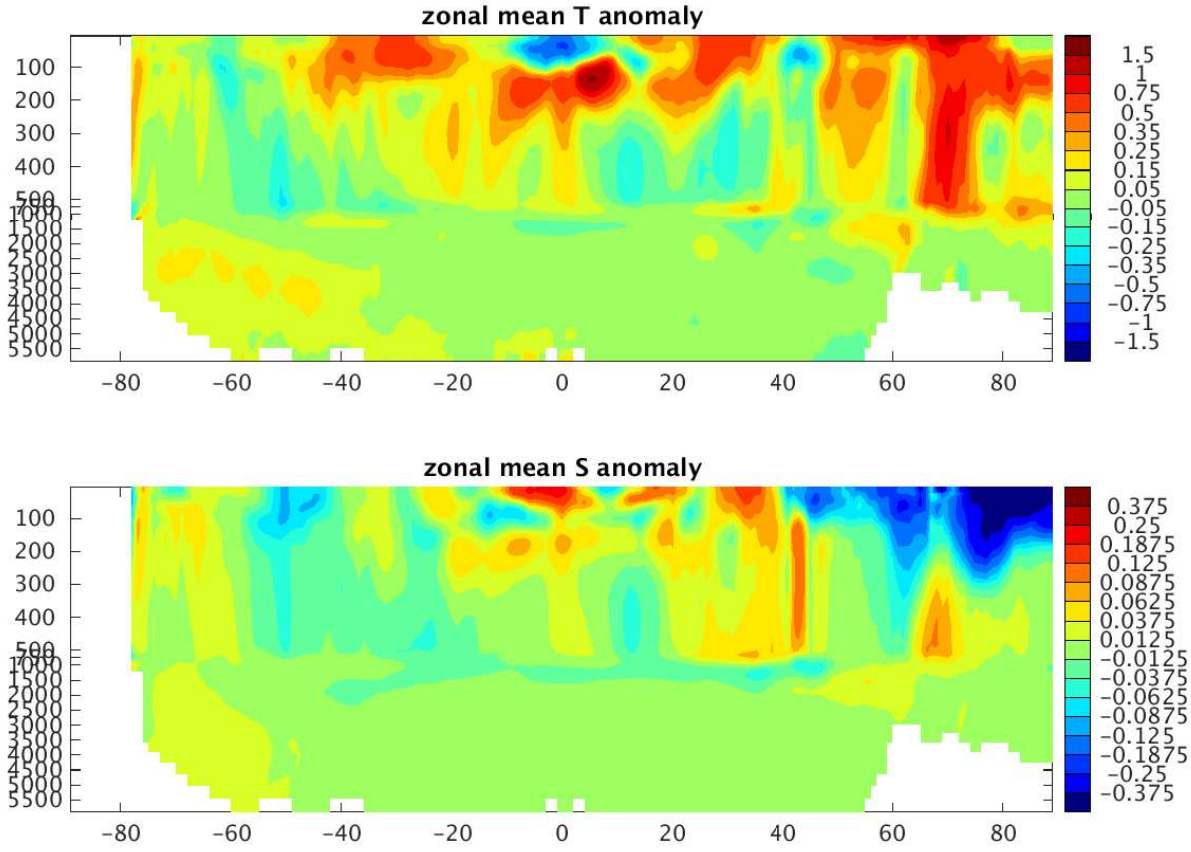

Figure : 1992-2017 , last year minus first year – zonal mean temperature (degC; top) and salinity (psu; bottom)

equatorial sections

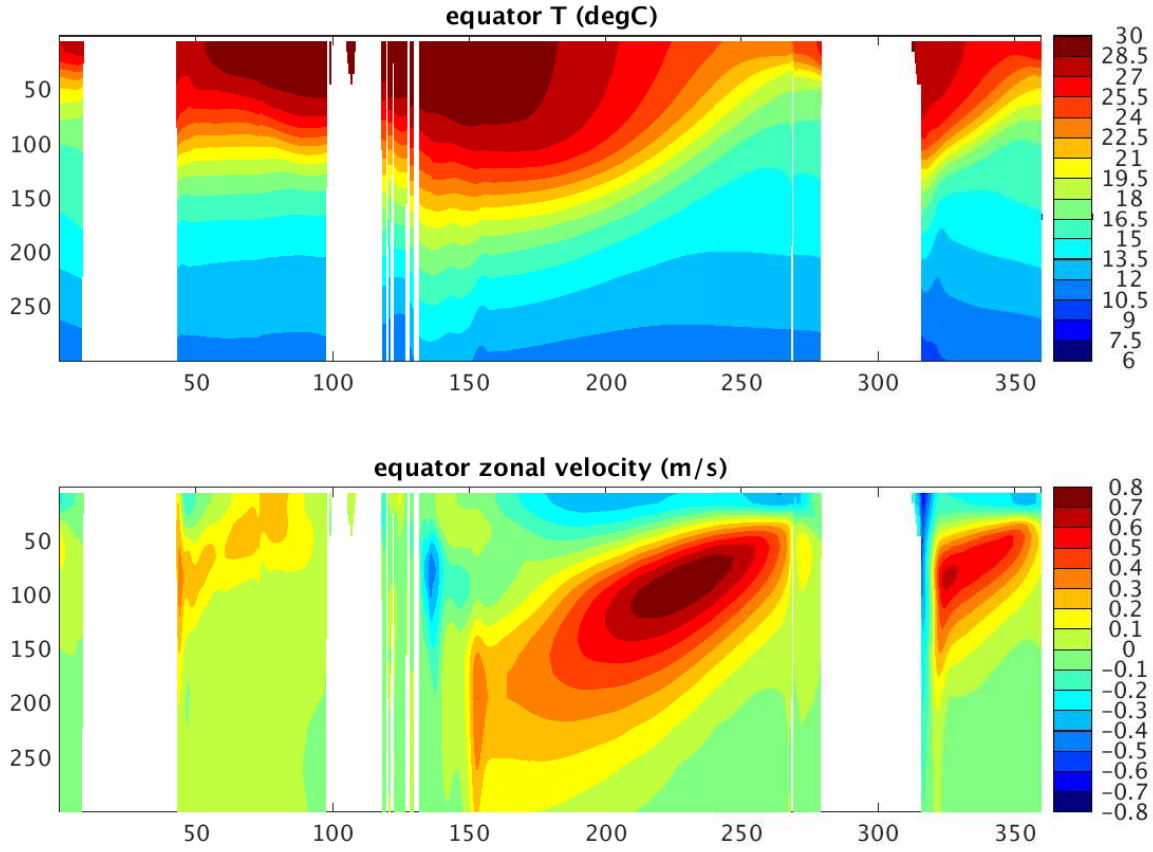

Figure : 1992-2017 mean – equator temperature (degC;top) and zonal velocity (m/s;bottom)

global mean properties

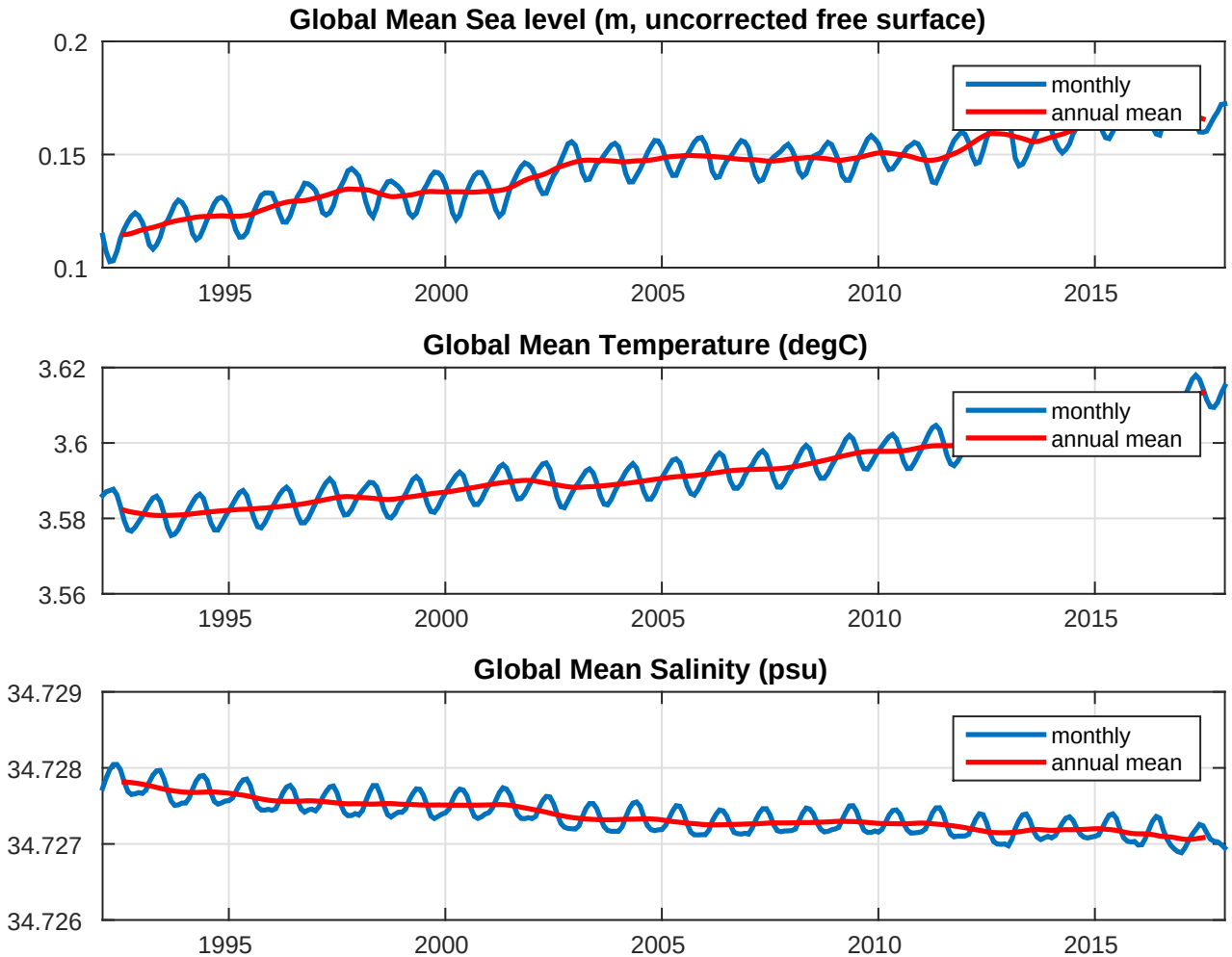

Figure : global mean T (degC; top) and S (psu; bottom)

global mean properties

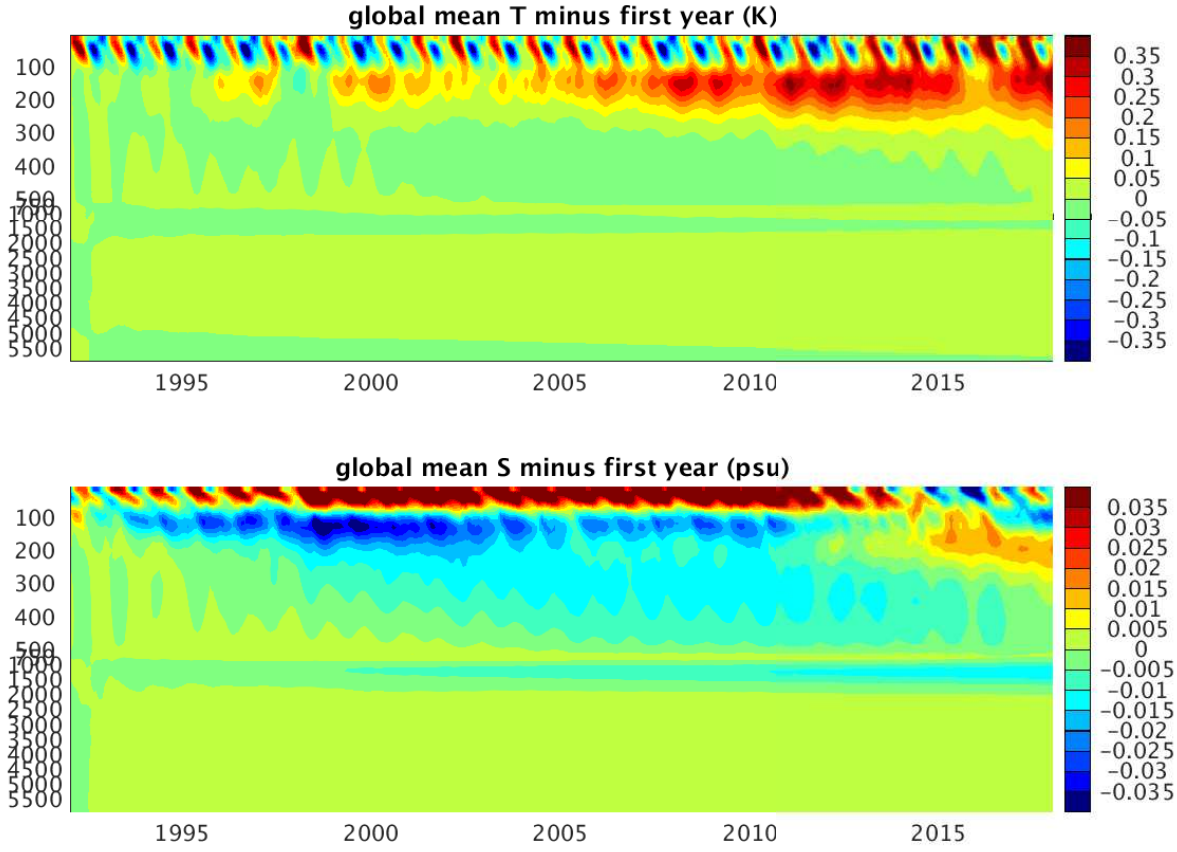

Figure : global mean temperature (K; top) and salinity (psu; bottom) minus first year

zonal mean properties

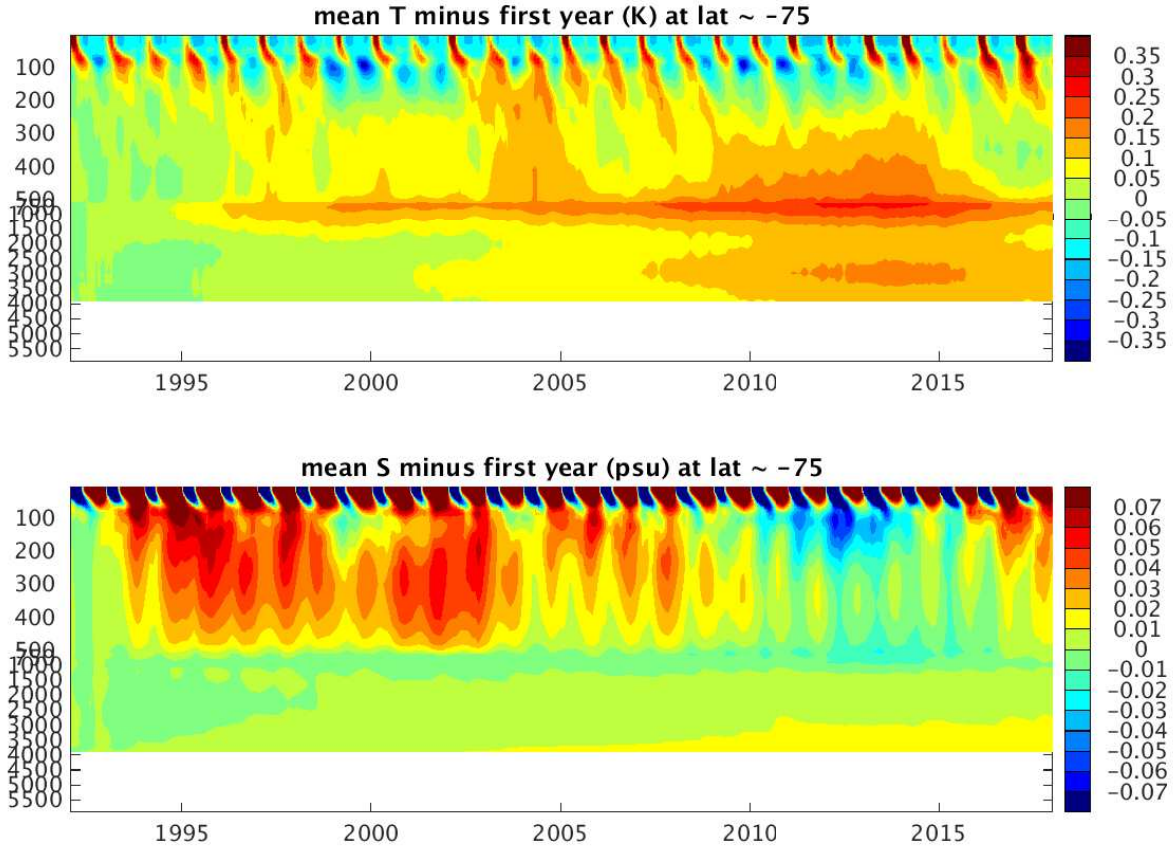

Figure : mean temperature (top; K) and salinity (bottom; psu) minus first year at lat $\approx$ -75

zonal mean properties

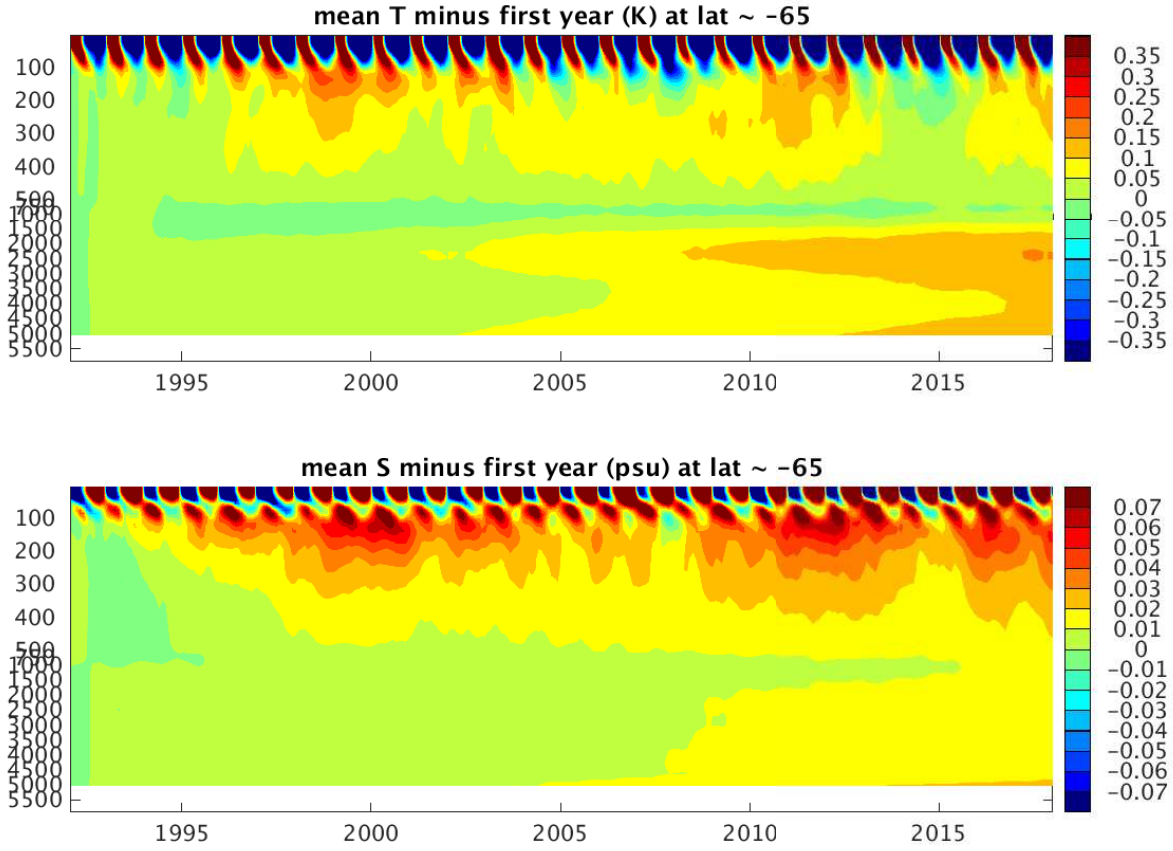

Figure : mean temperature (top; K) and salinity (bottom; psu) minus first year at lat $\approx$ -65

zonal mean properties

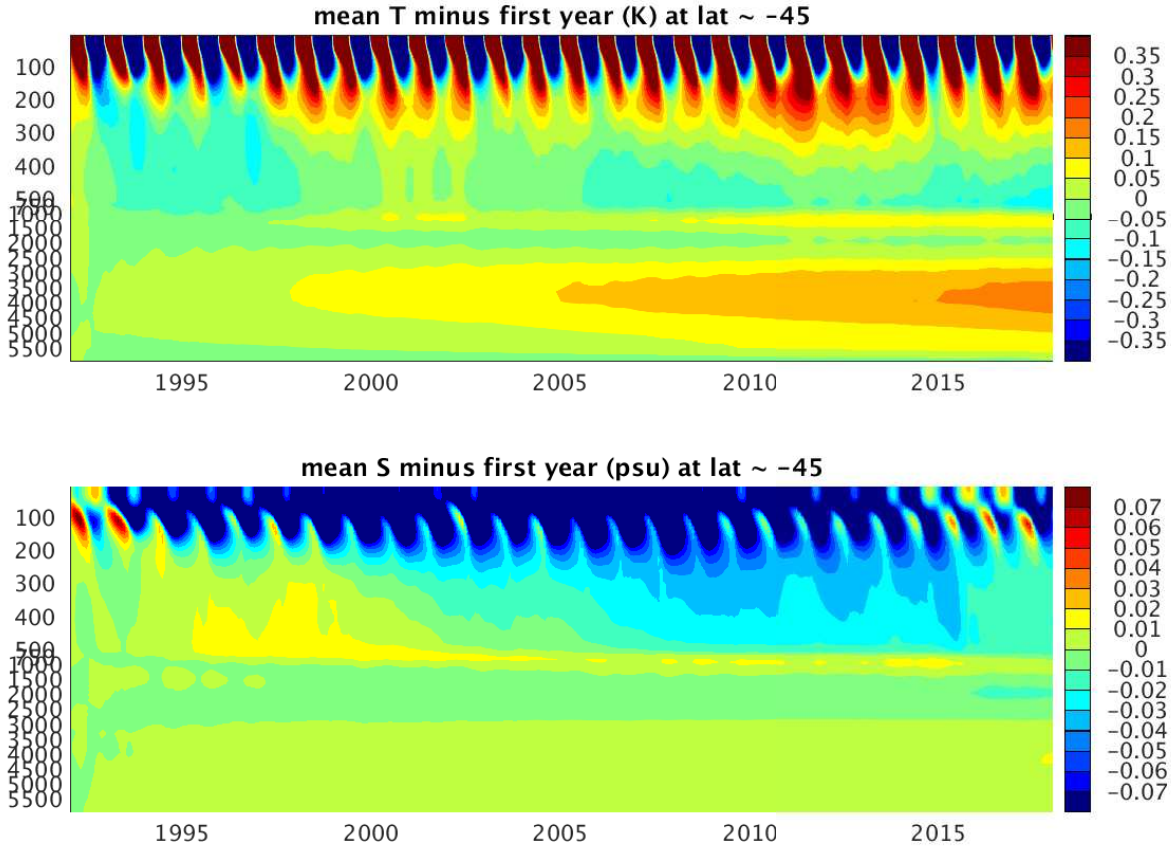

Figure : mean temperature (top; K) and salinity (bottom; psu) minus first year at lat $\approx$ -45

zonal mean properties

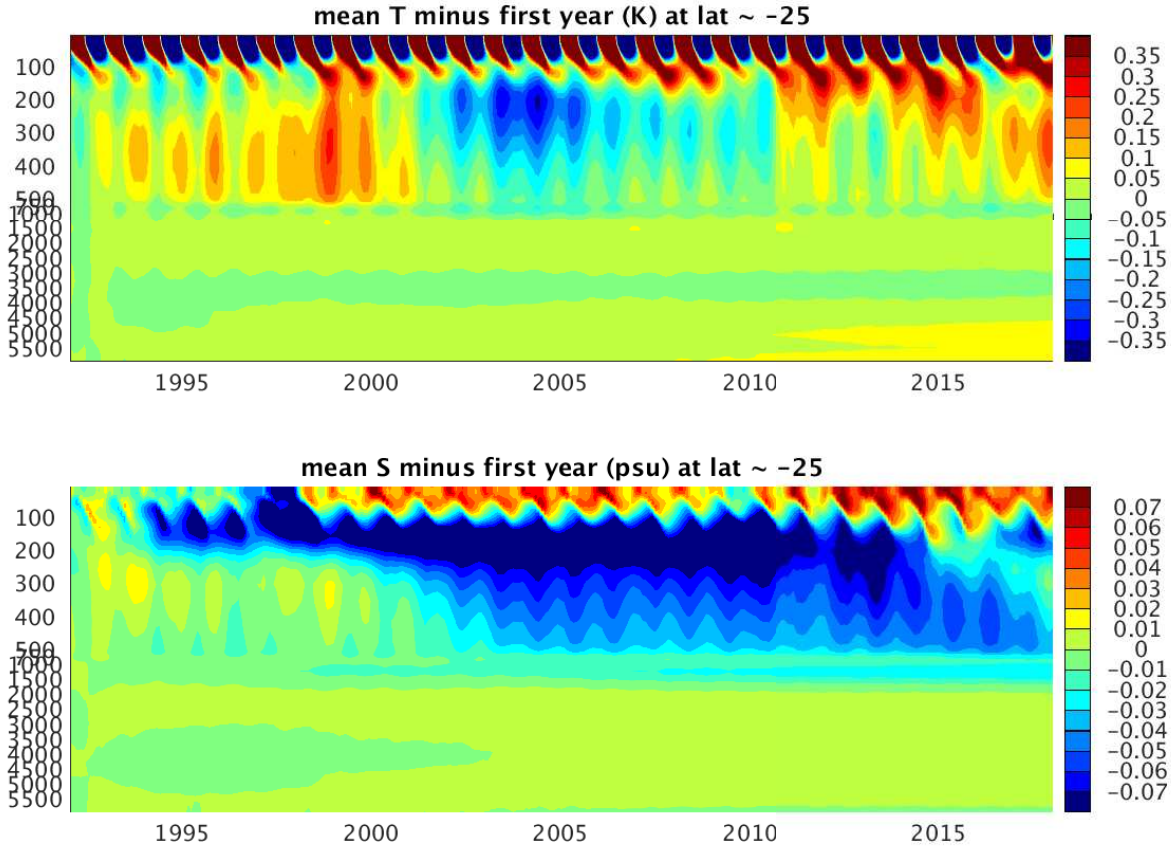

Figure : mean temperature (top; K) and salinity (bottom; psu) minus first year at lat $\approx$ -25

zonal mean properties

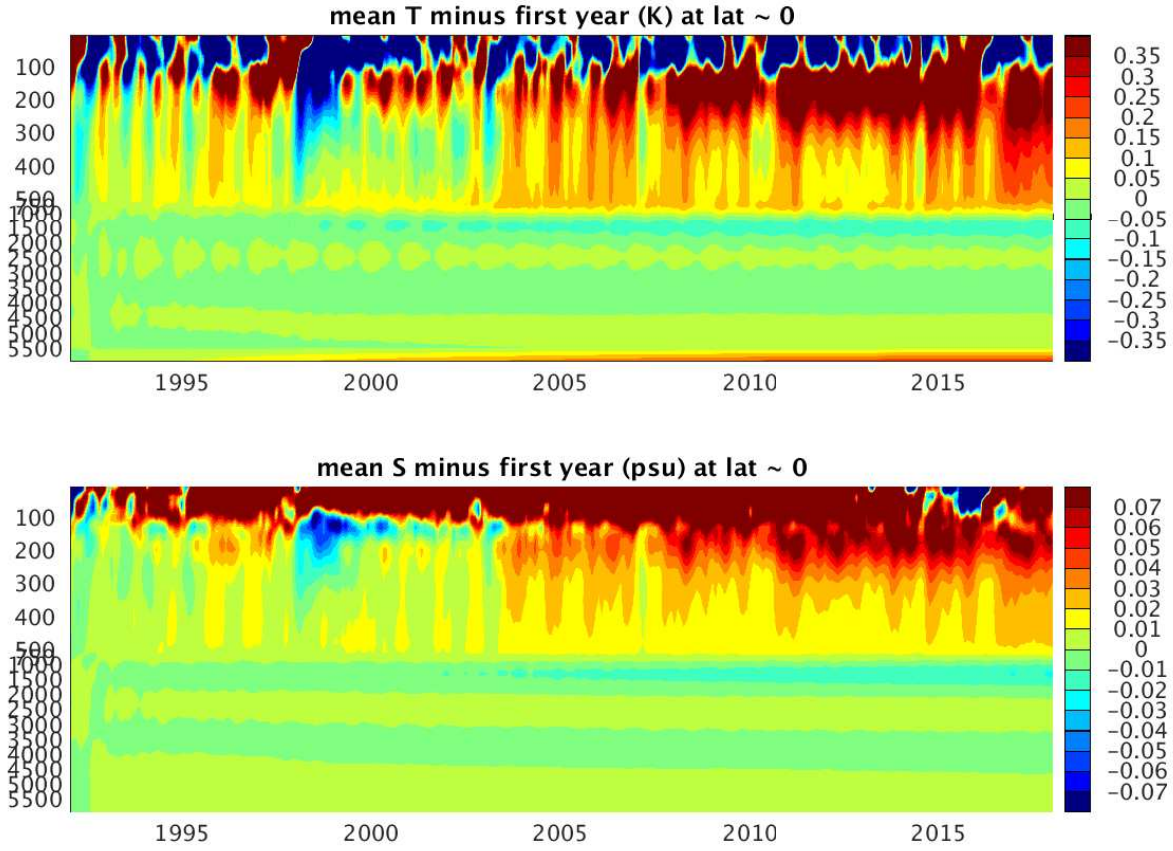

Figure : mean temperature (top; K) and salinity (bottom; psu) minus first year at lat ≈ 0

zonal mean properties

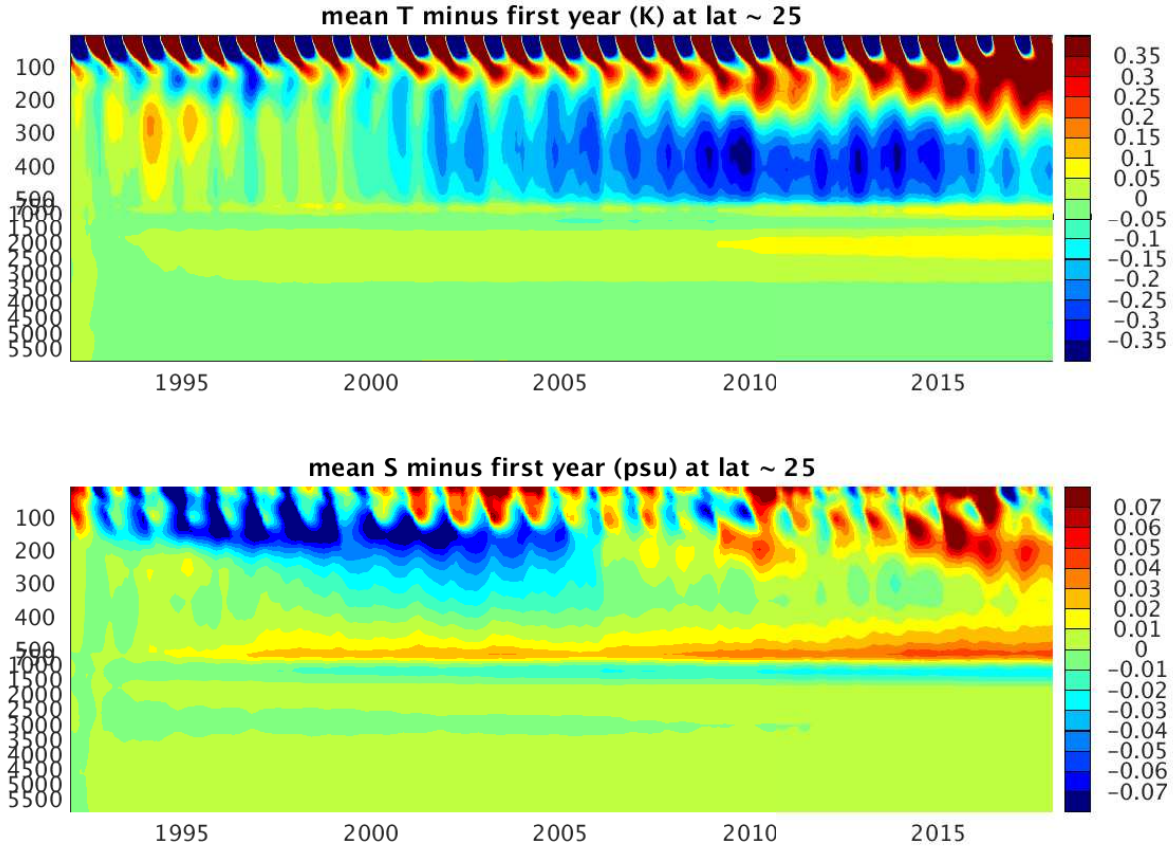

Figure : mean temperature (top; K) and salinity (bottom; psu) minus first year at lat ≈ 25

zonal mean properties

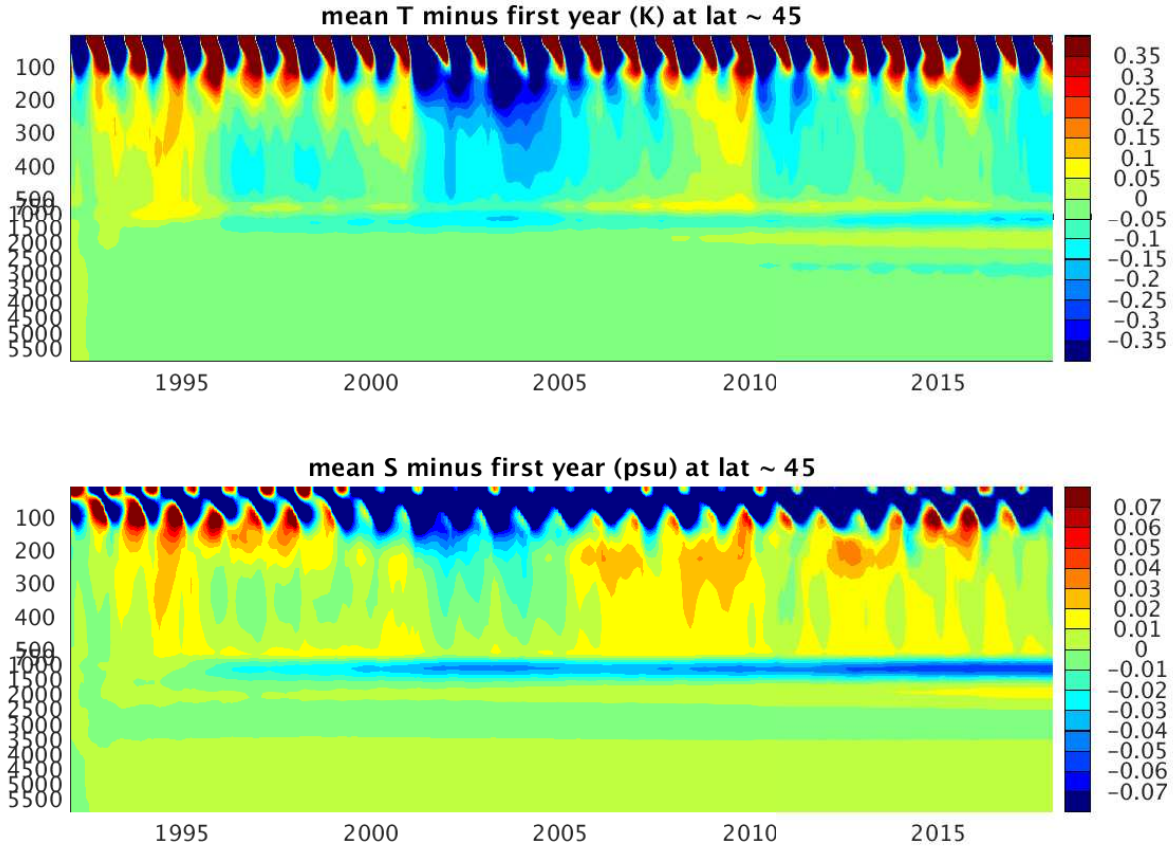

Figure : mean temperature (top; K) and salinity (bottom; psu) minus first year at lat ≈ 45

zonal mean properties

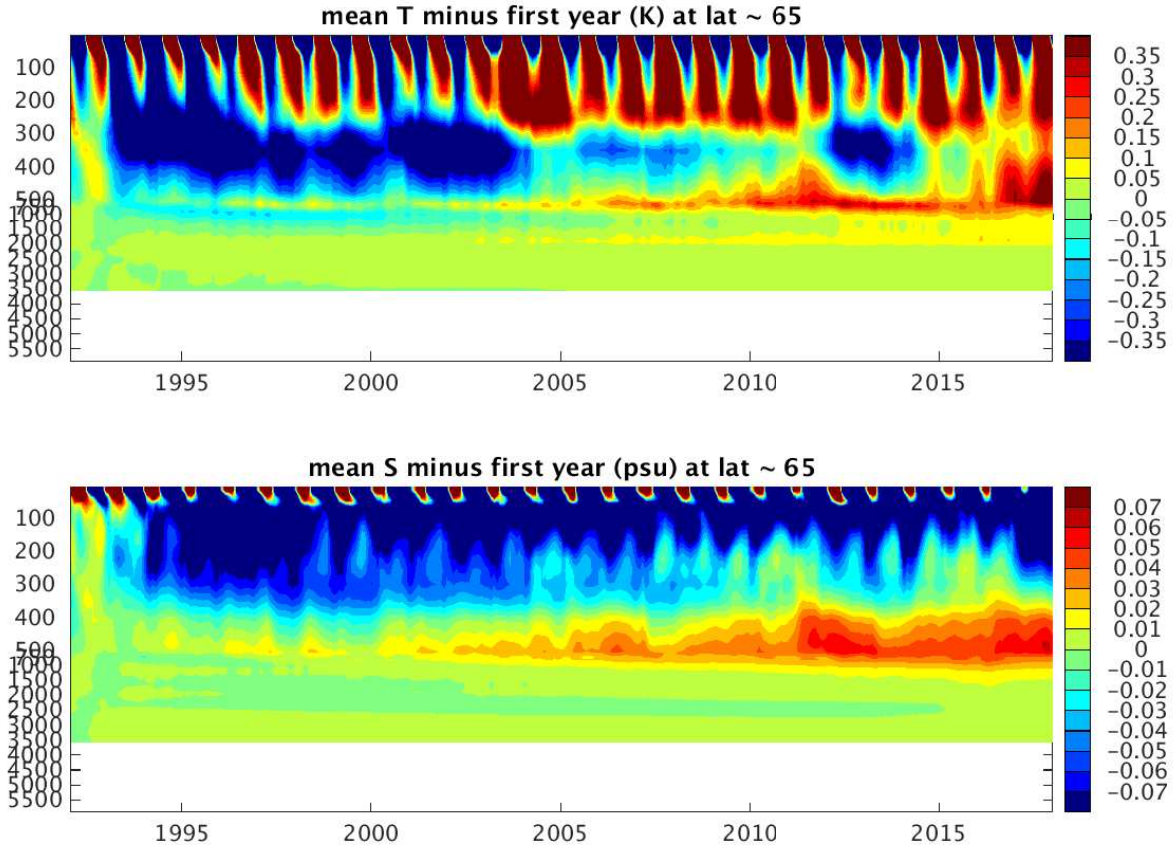

Figure : mean temperature (top; K) and salinity (bottom; psu) minus first year at lat $\approx$ 65

zonal mean properties

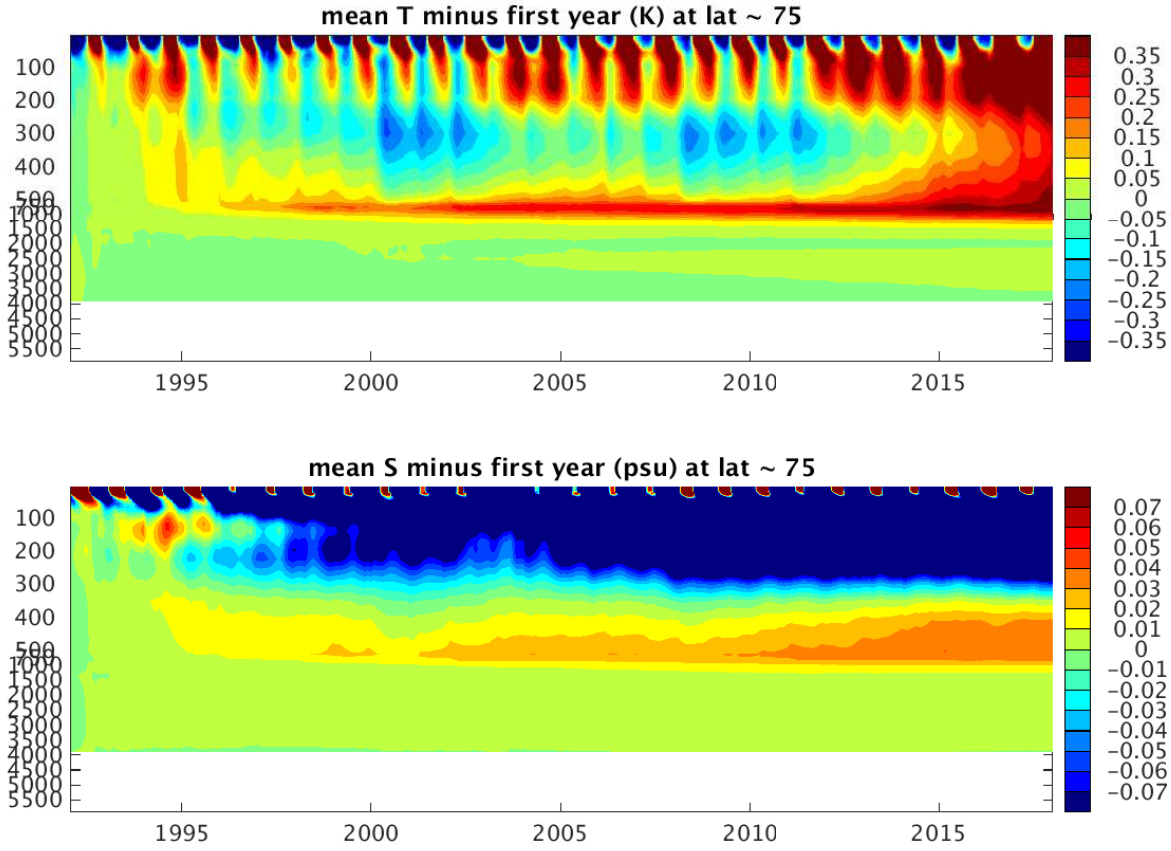

Figure : mean temperature (top; K) and salinity (bottom; psu) minus first year at lat $\approx$ 75

zonal mean properties (surface)

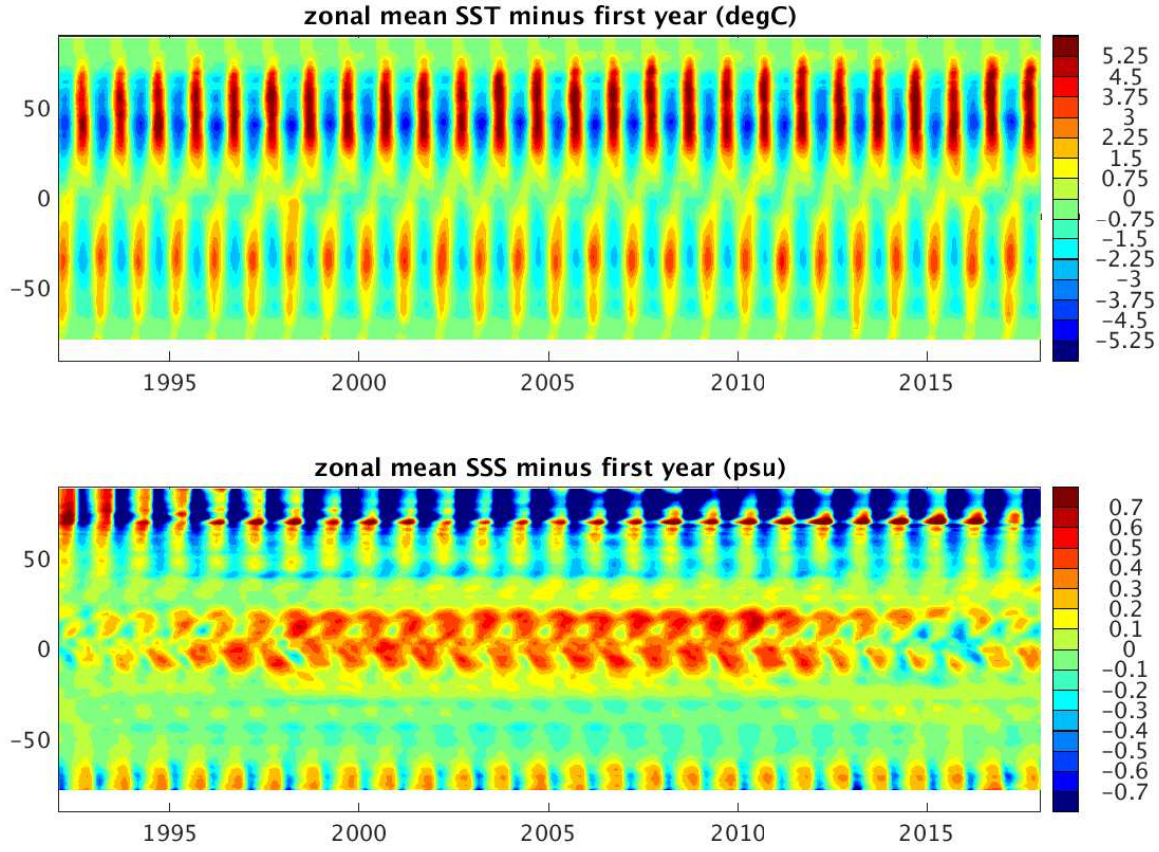

Figure : zonal mean temperature (degC; top) and salinity (psu; bottom) minus first year (psu) at 5m depth

zonal mean properties (surface)

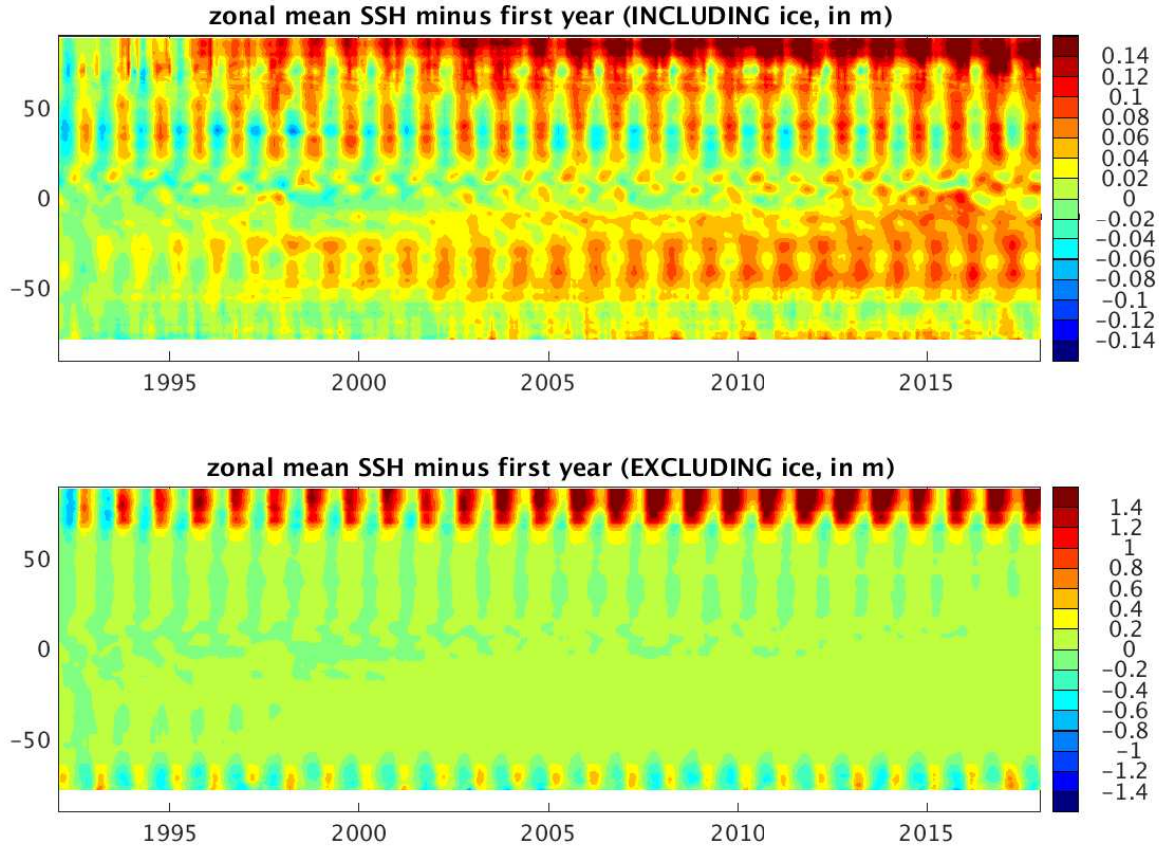

Figure : zonal mean SSH (m, uncorrected free surface) minus first year, including ice (top) and below ice (bottom)

zonal mean properties (surface)

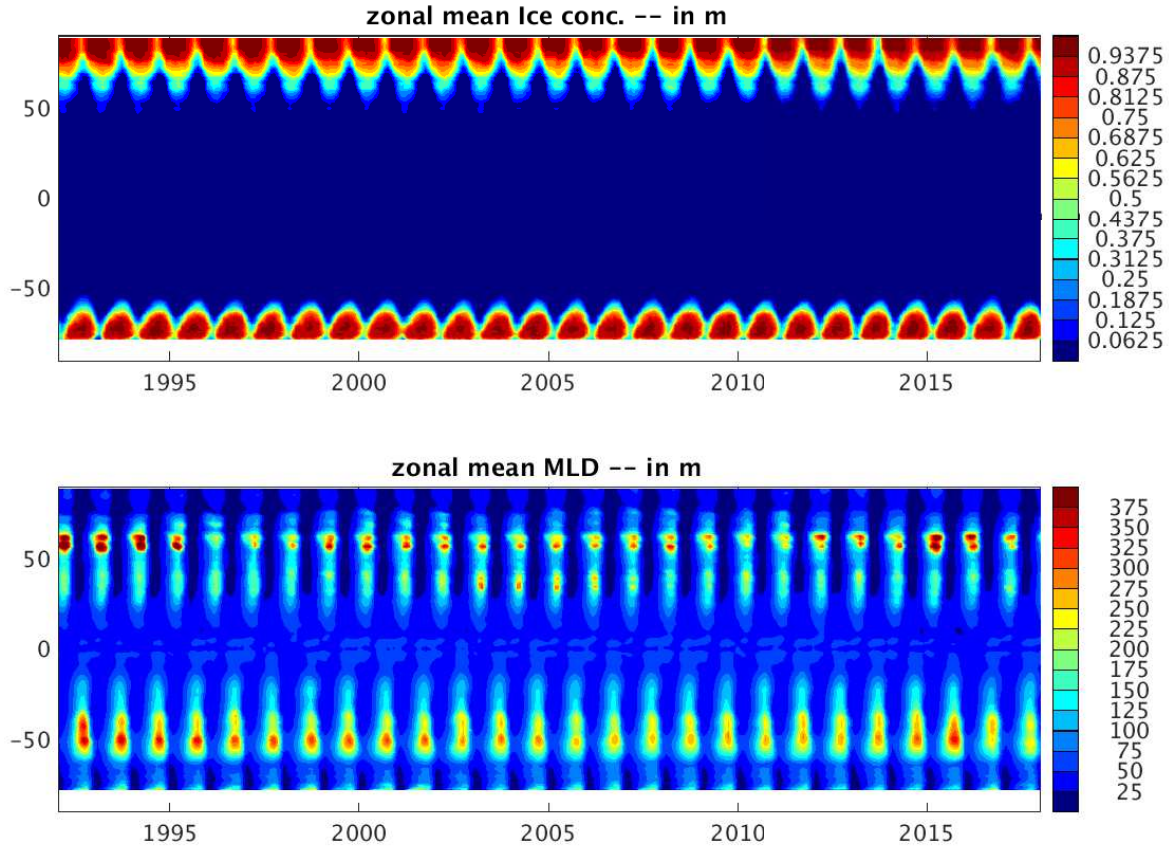

Figure : zonal mean ice concentration (no units) and mixed layer depth (m)

seaice time series

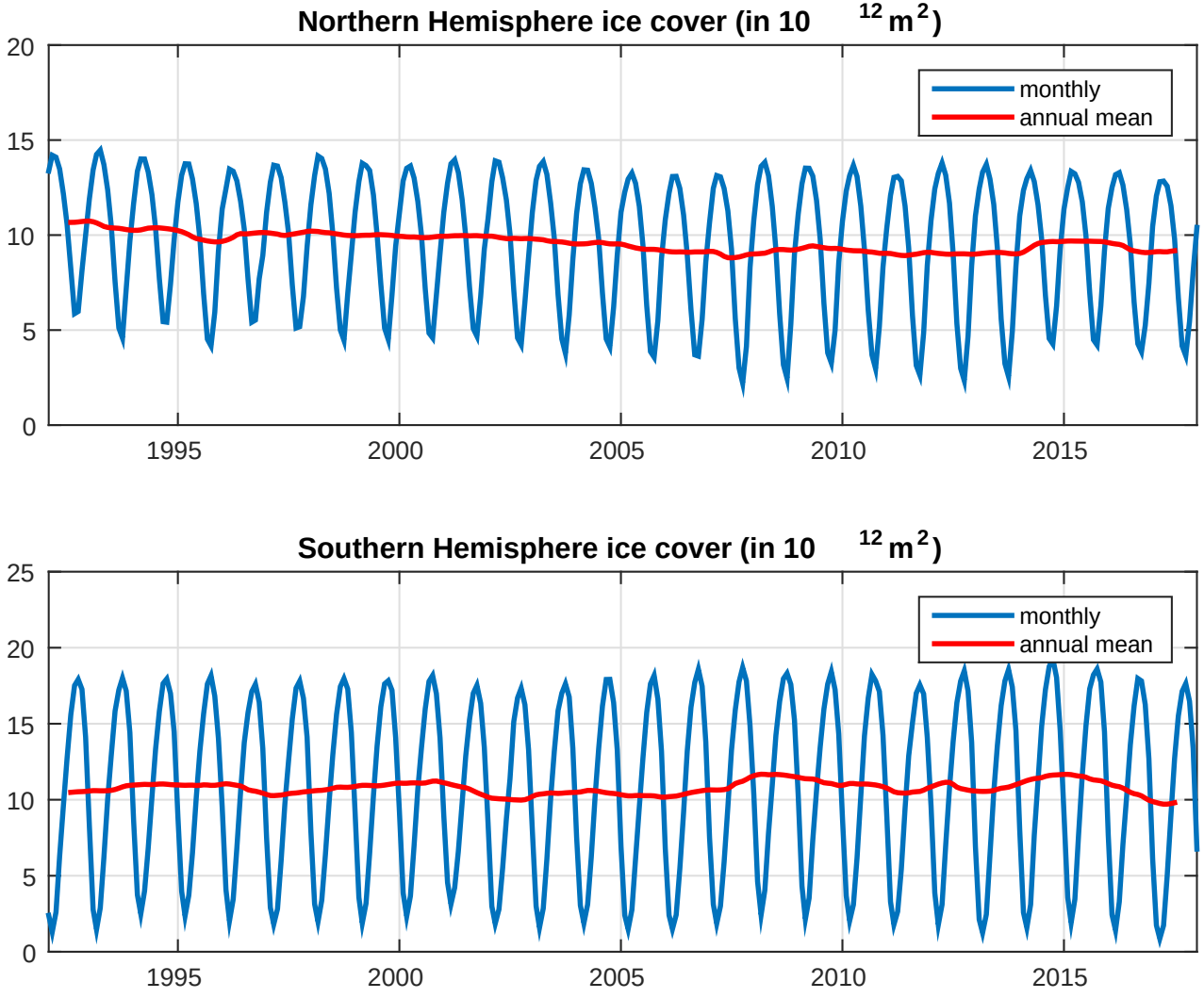

Figure : sea ice cover (in $10^{12} m^2$) in northern (top) and southern (bottom) hemisphere

seaice time series

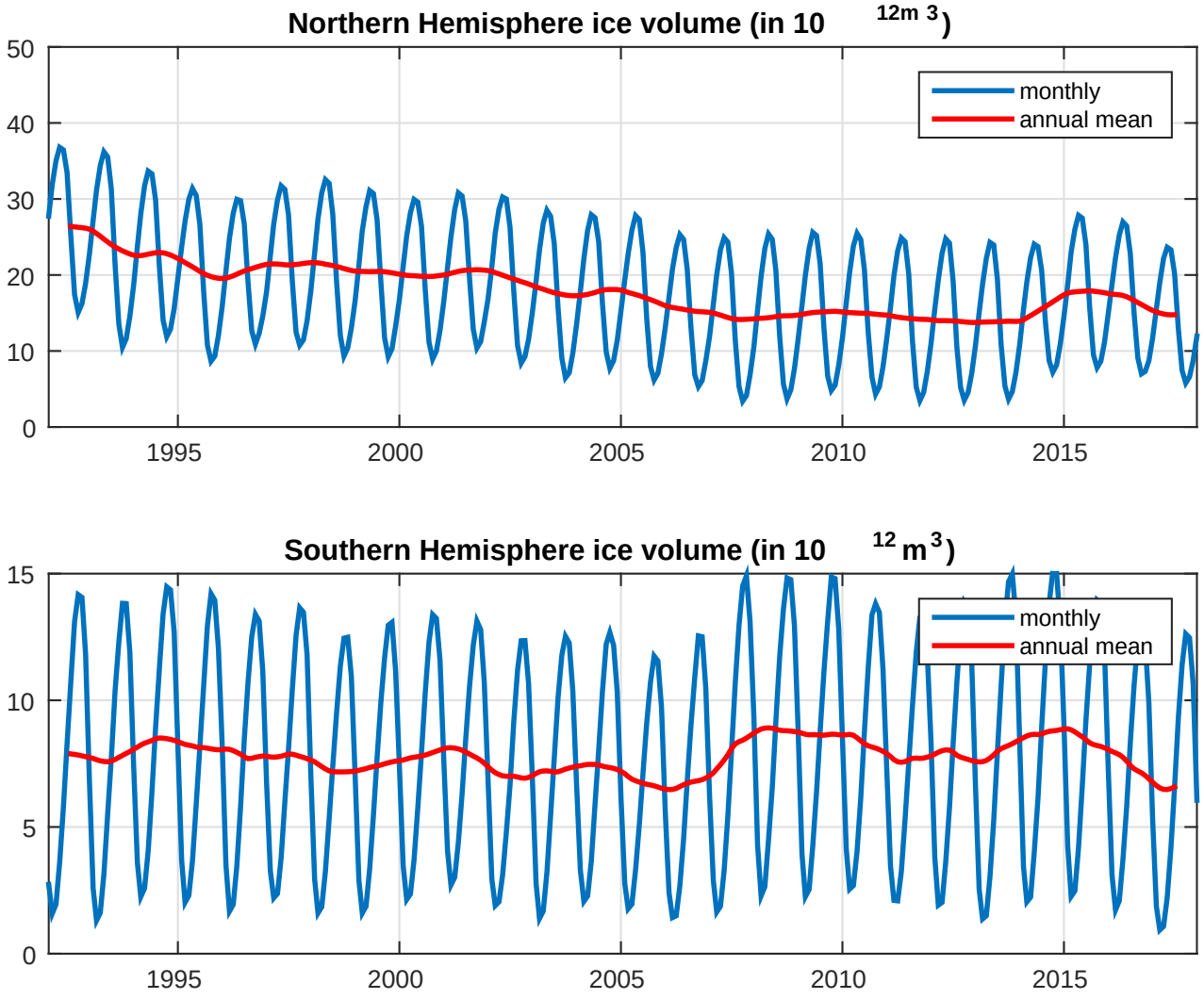

Figure : sea ice volume (in $10^{12} m^3$) in northern (top) and southern (bottom) hemisphere

seaice time series

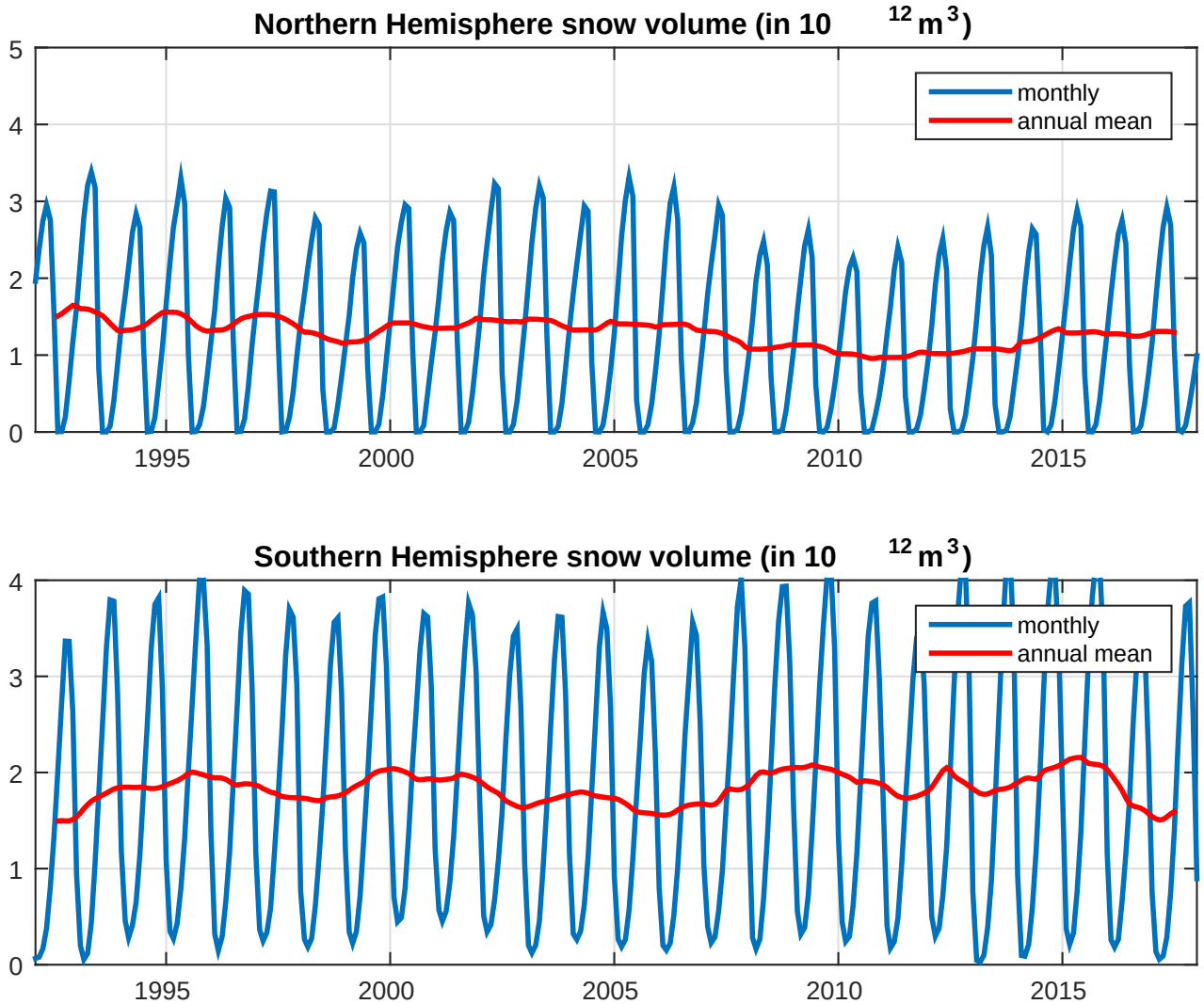

Figure : snow volume (in $10^{12} m^3$) in northern (top) and southern (bottom) hemisphere

seaice time series

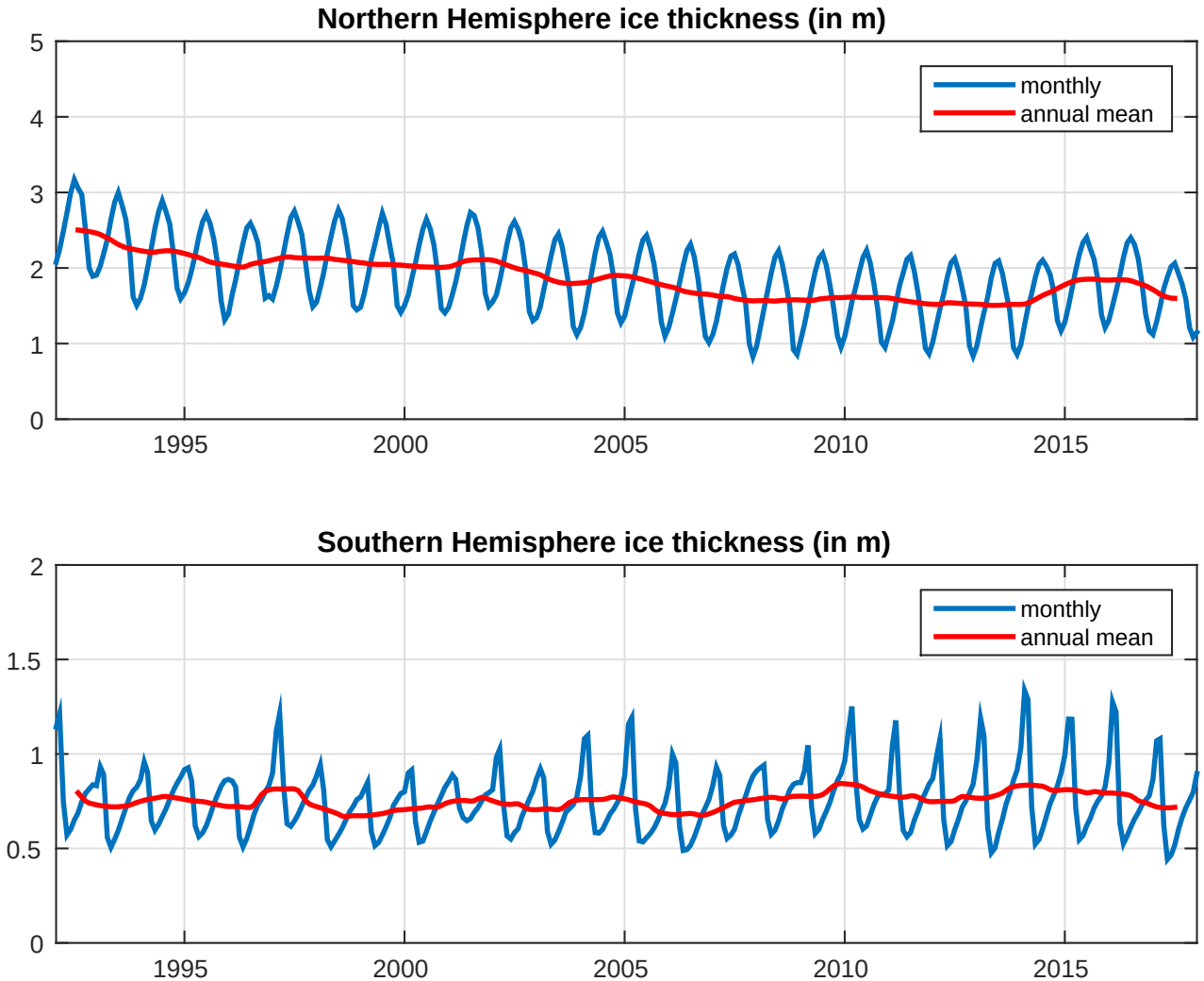

Figure : sea ice thickness (in m) in northern (top) and southern (bottom) hemisphere

seaice time series

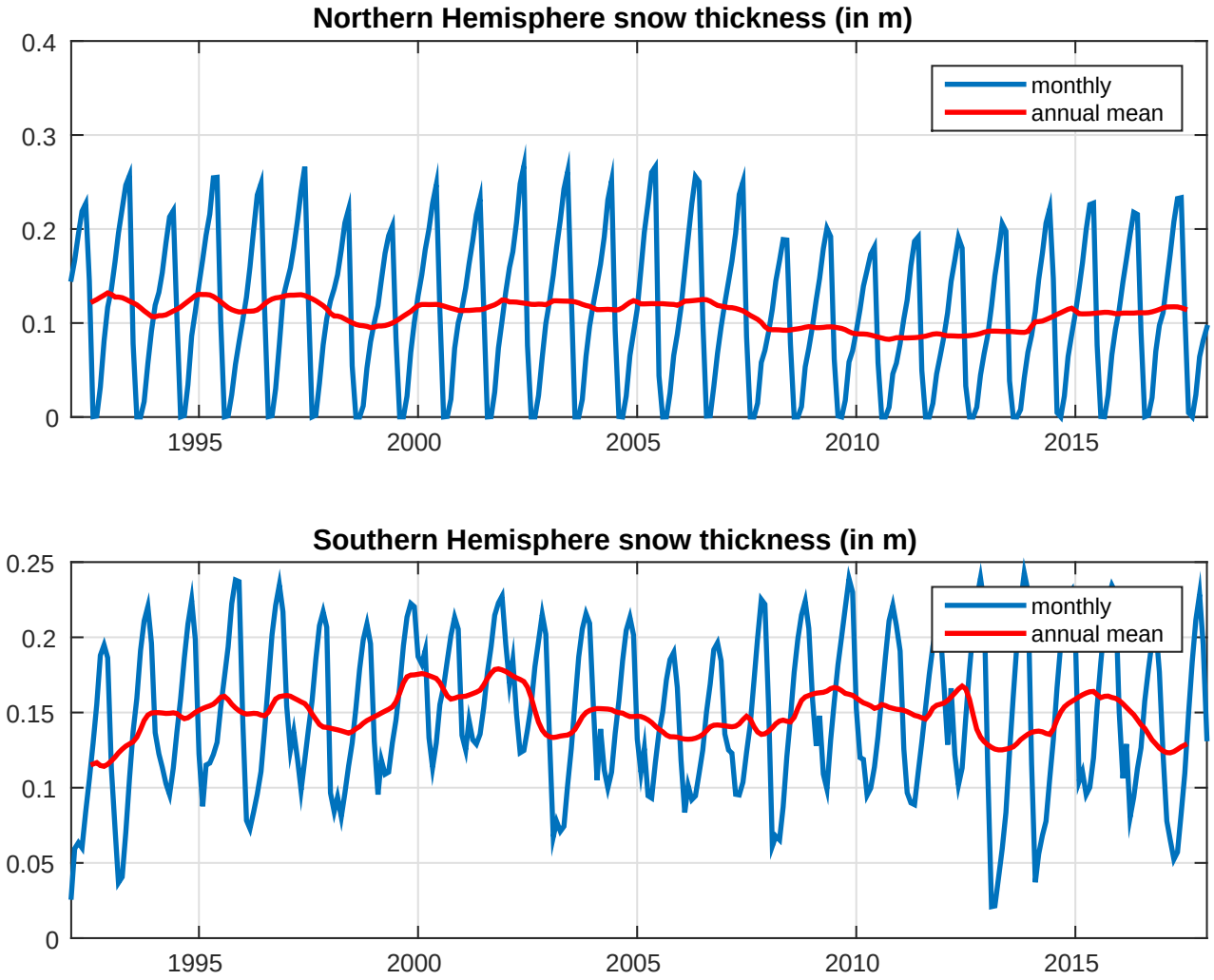

Figure : snow thickness (in m) in northern (top) and southern (bottom) hemisphere

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

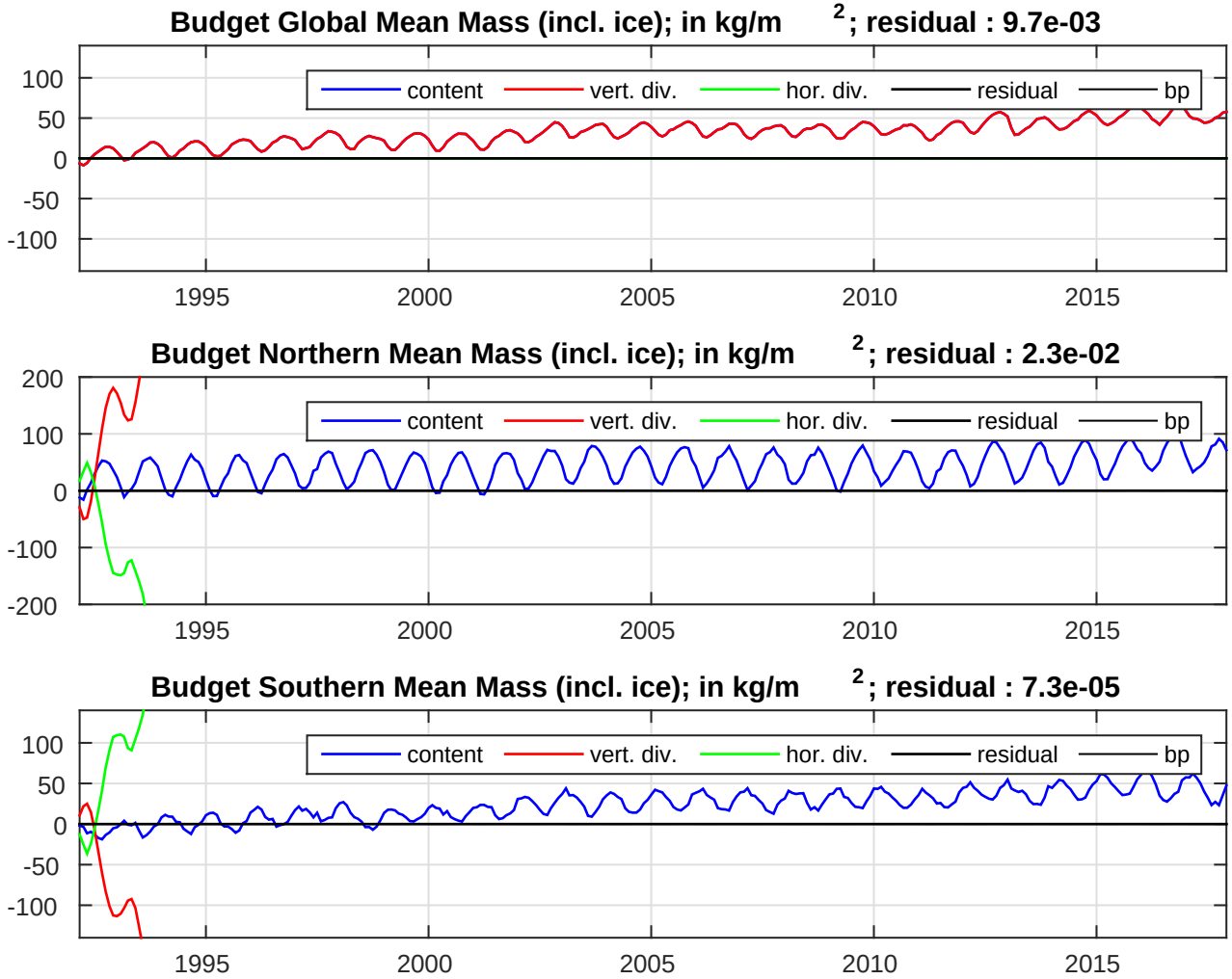

Figure : 1992-2017 global (upper) north (mid) and south (lower), mass budget (ocean+ice) in kg/m^2.

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

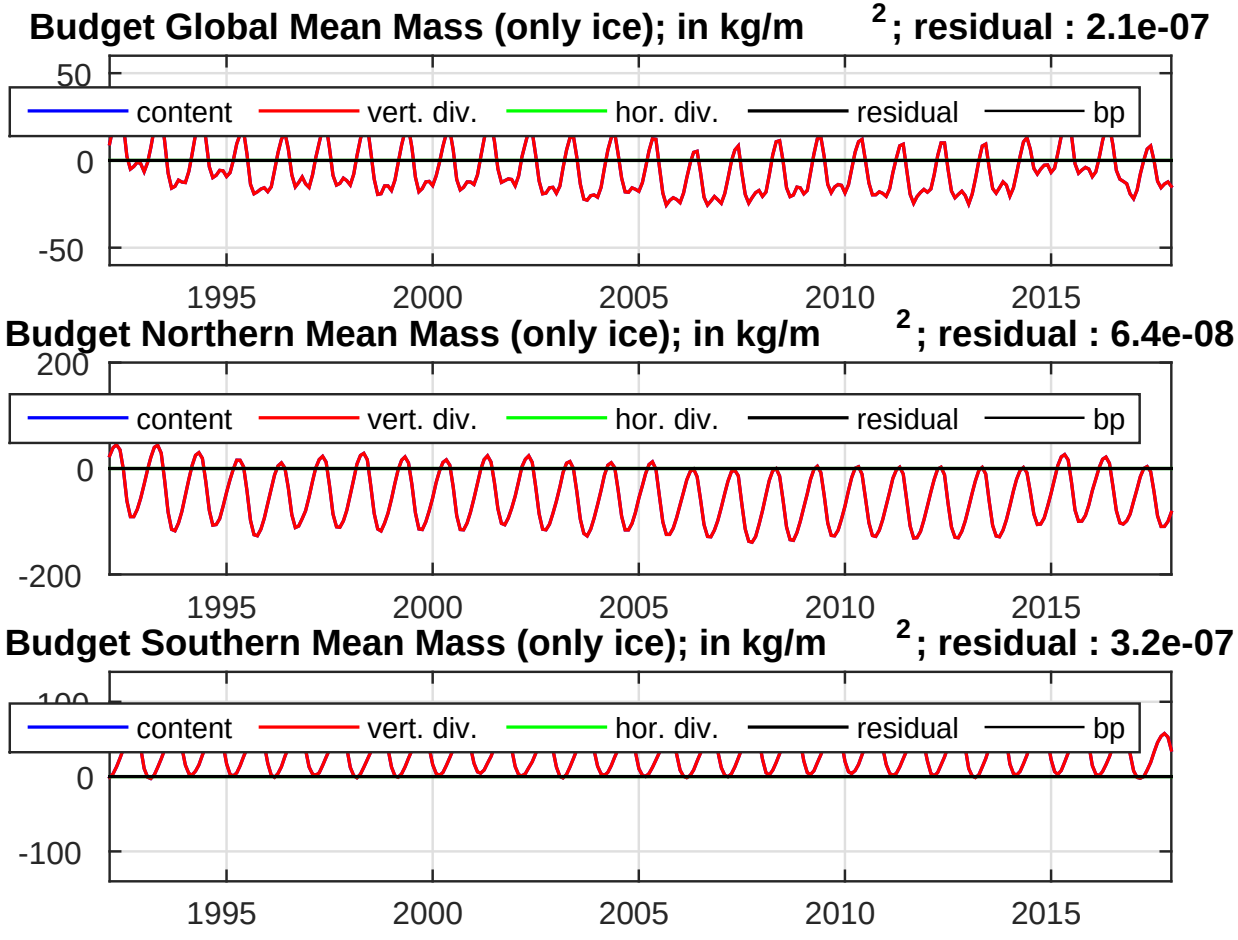

Figure : 1992-2017 global (upper) north (mid) and south (lower), mass budget (ice only) in kg/m^2.

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

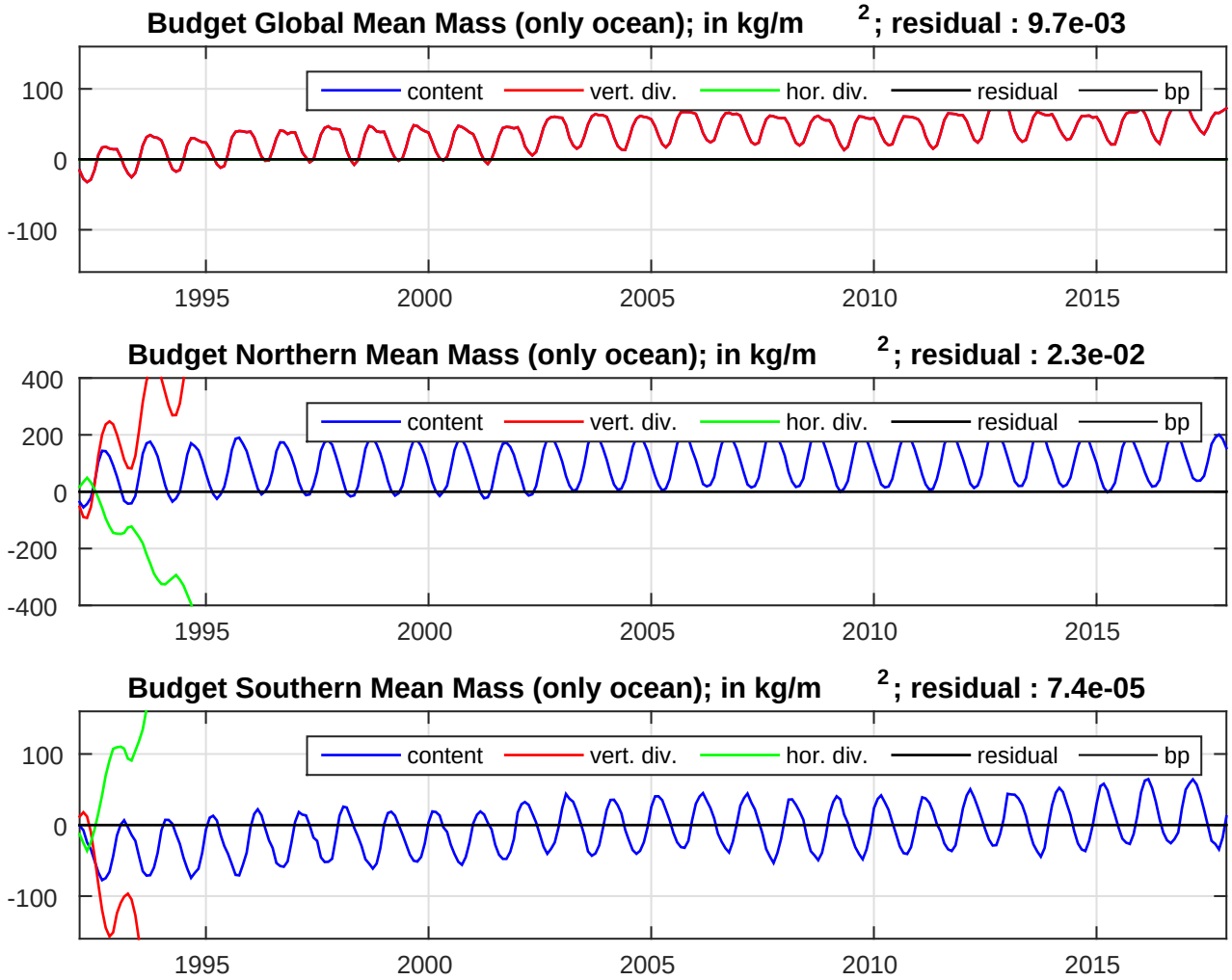

Figure : 1992-2017 global (upper) north (mid) and south (lower), mass budget (ocean only) in kg/m^2.

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

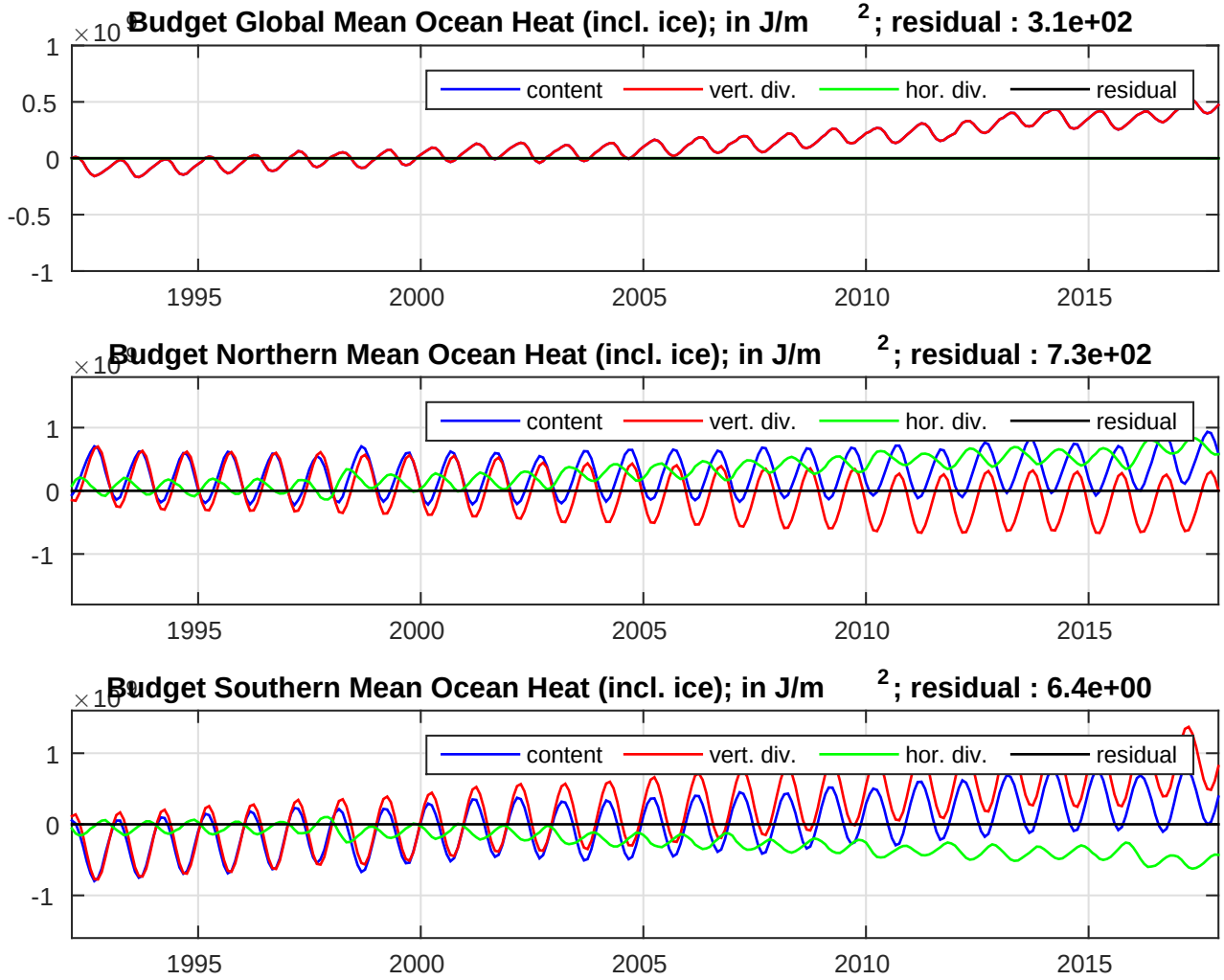

Figure : 1992-2017 global (upper) north (mid) and south (lower), heat budget (ocean+ice) in J/m^2.

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

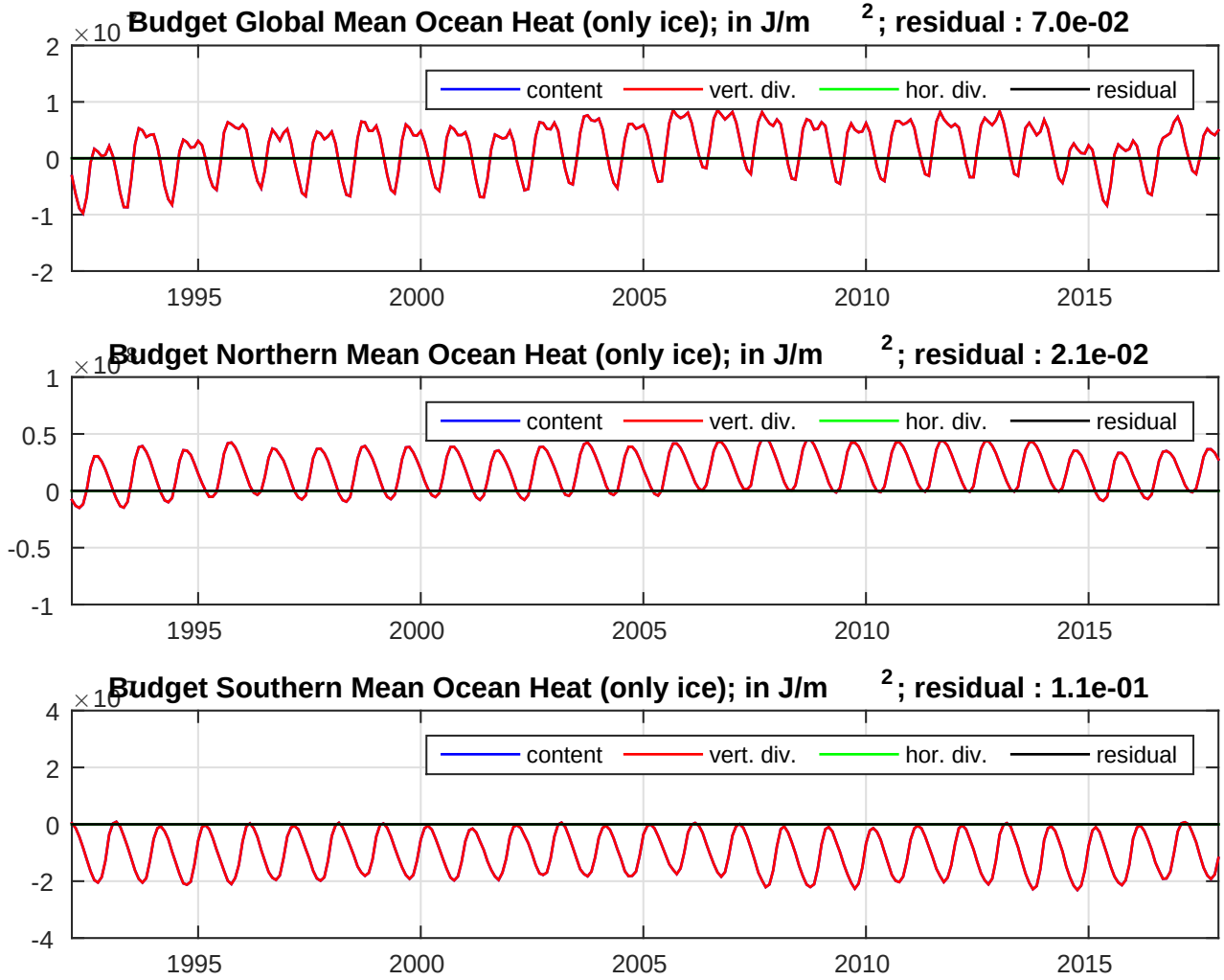

Figure : 1992-2017 global (upper) north (mid) and south (lower), heat budget (ice only) in J/m^2.

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

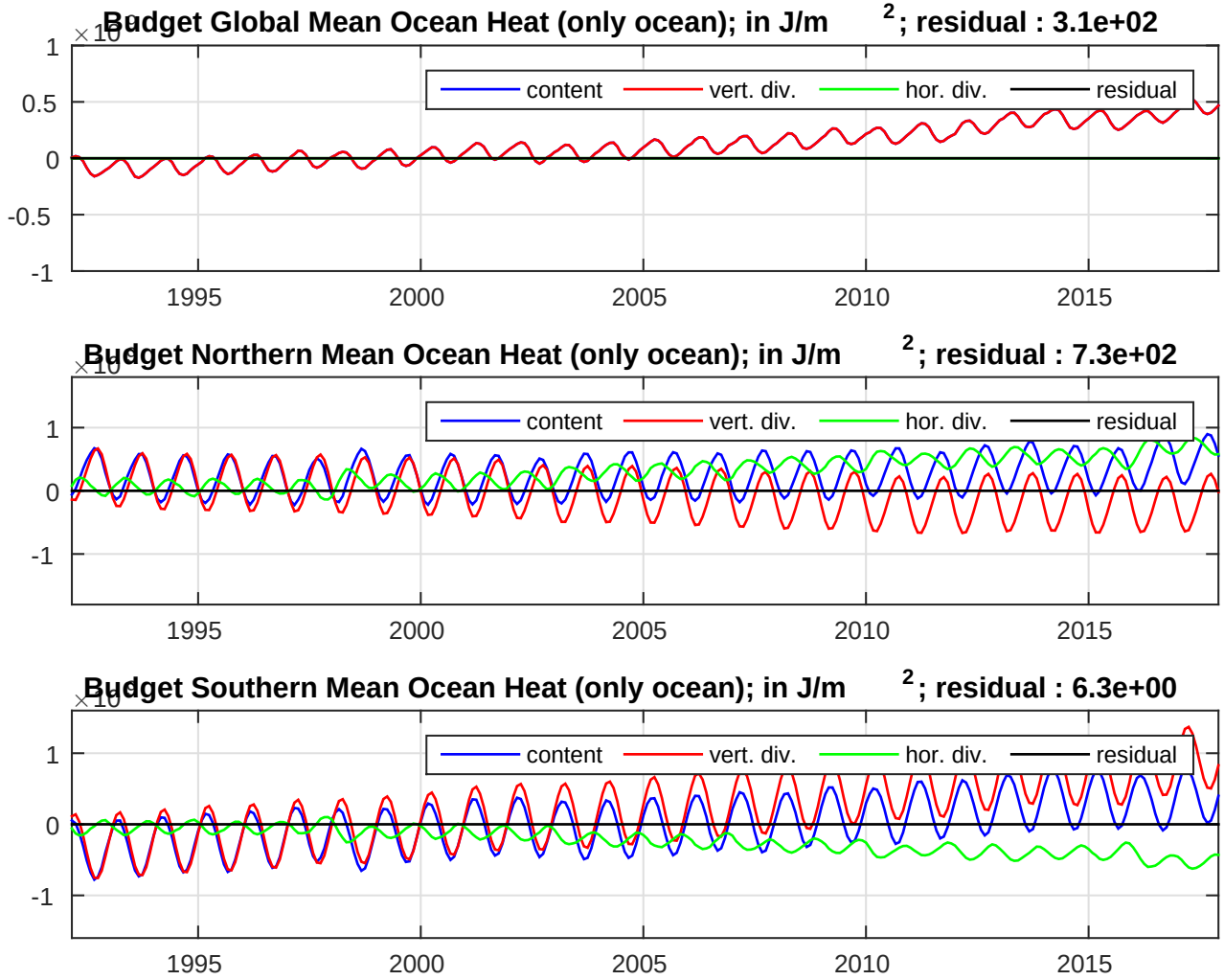

Figure : 1992-2017 global (upper) north (mid) and south (lower), heat budget (ocean only) in J/m^2.

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

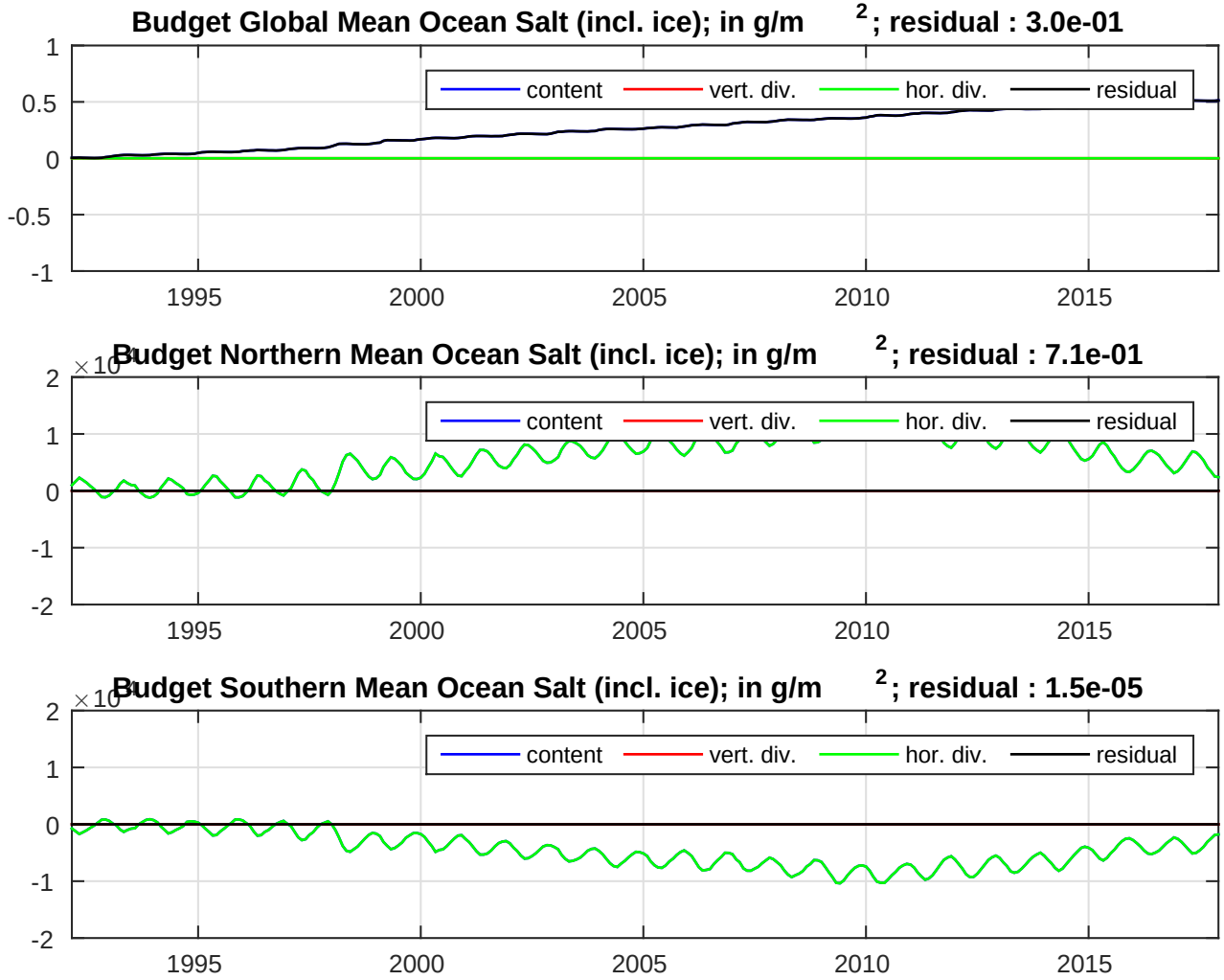

Figure : 1992-2017 global (upper) north (mid) and south (lower), salt budget (ocean+ice) in g/m^2.

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

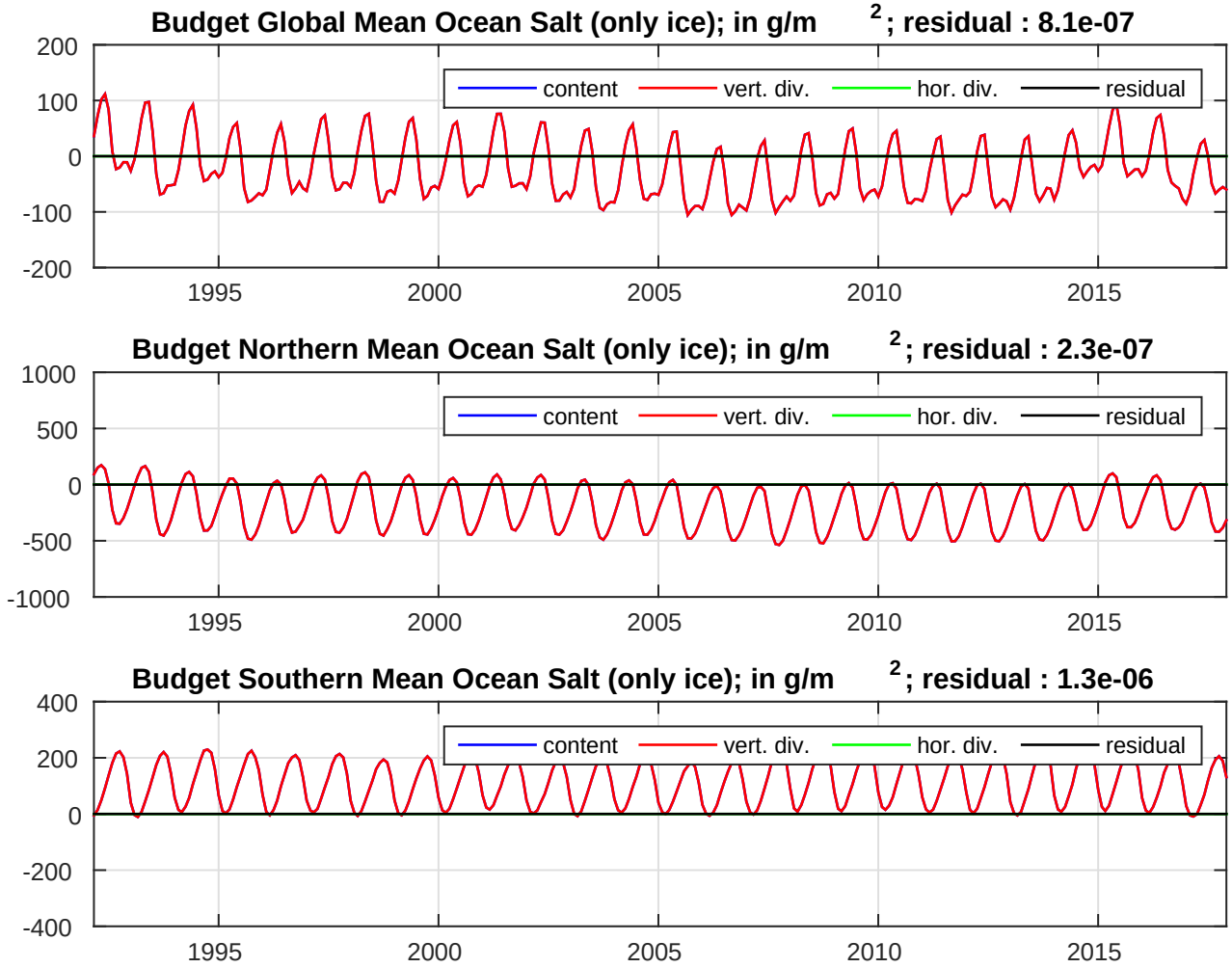

Figure : 1992-2017 global (upper) north (mid) and south (lower), salt budget (ice only) in g/m^2.

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

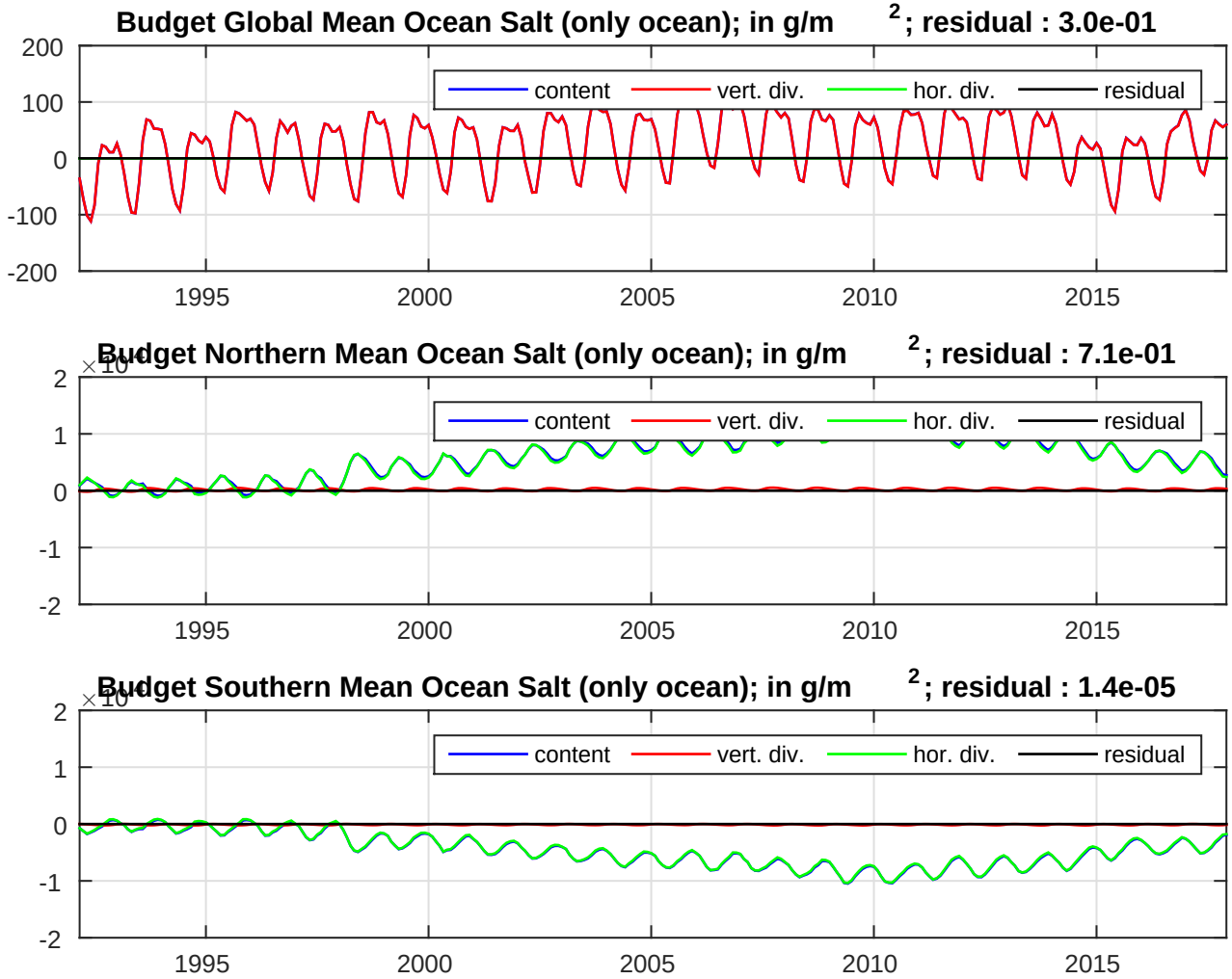

Figure : 1992-2017 global (upper) north (mid) and south (lower), salt budget (ocean only) in g/m^2.

budgets : volume. heat and salt (100m to bottom)

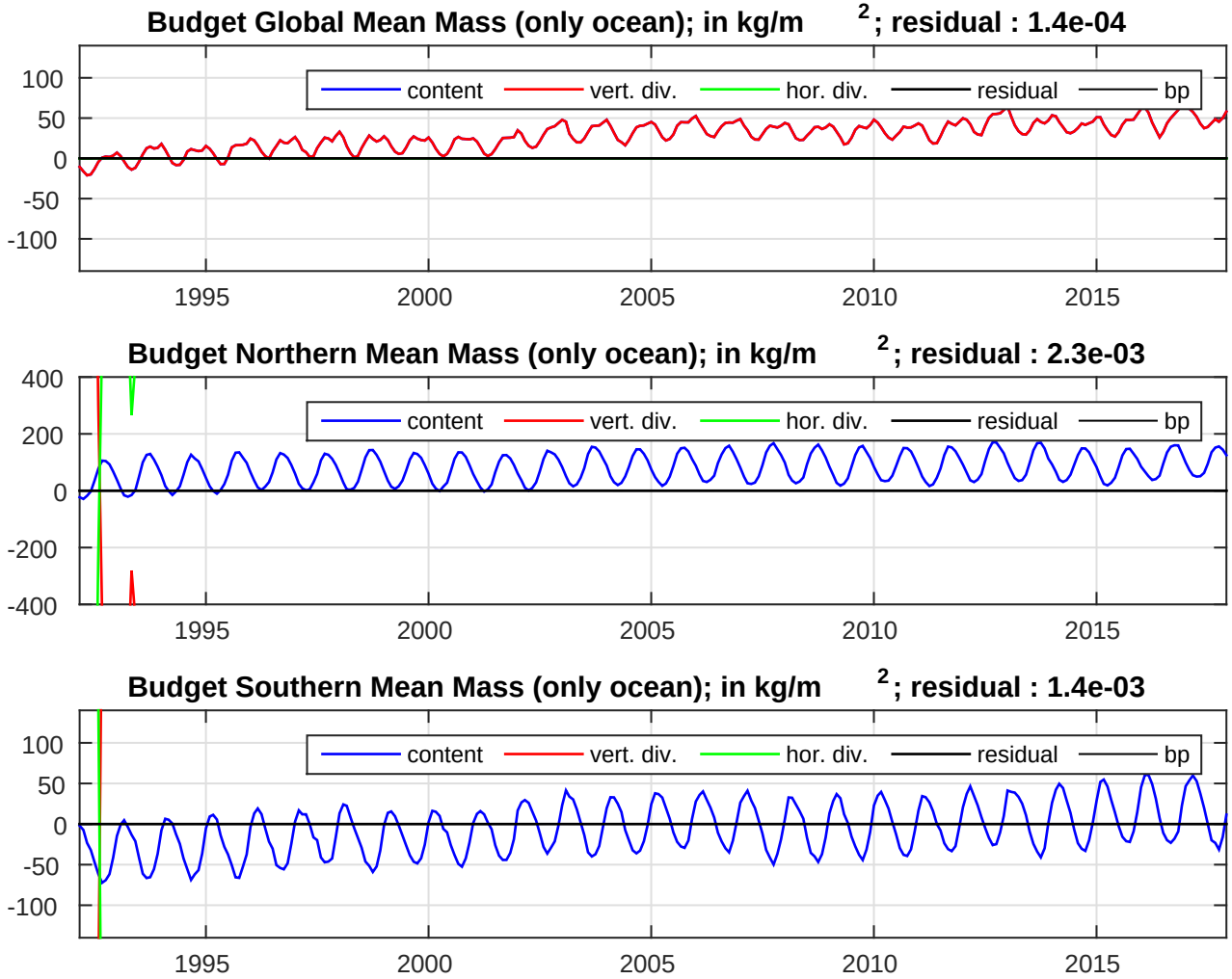

Figure : 1992-2017 global (upper) north (mid) and south (lower), mass budget (ocean only) in kg/m^2.

budgets : volume, heat and salt (100m to bottom)

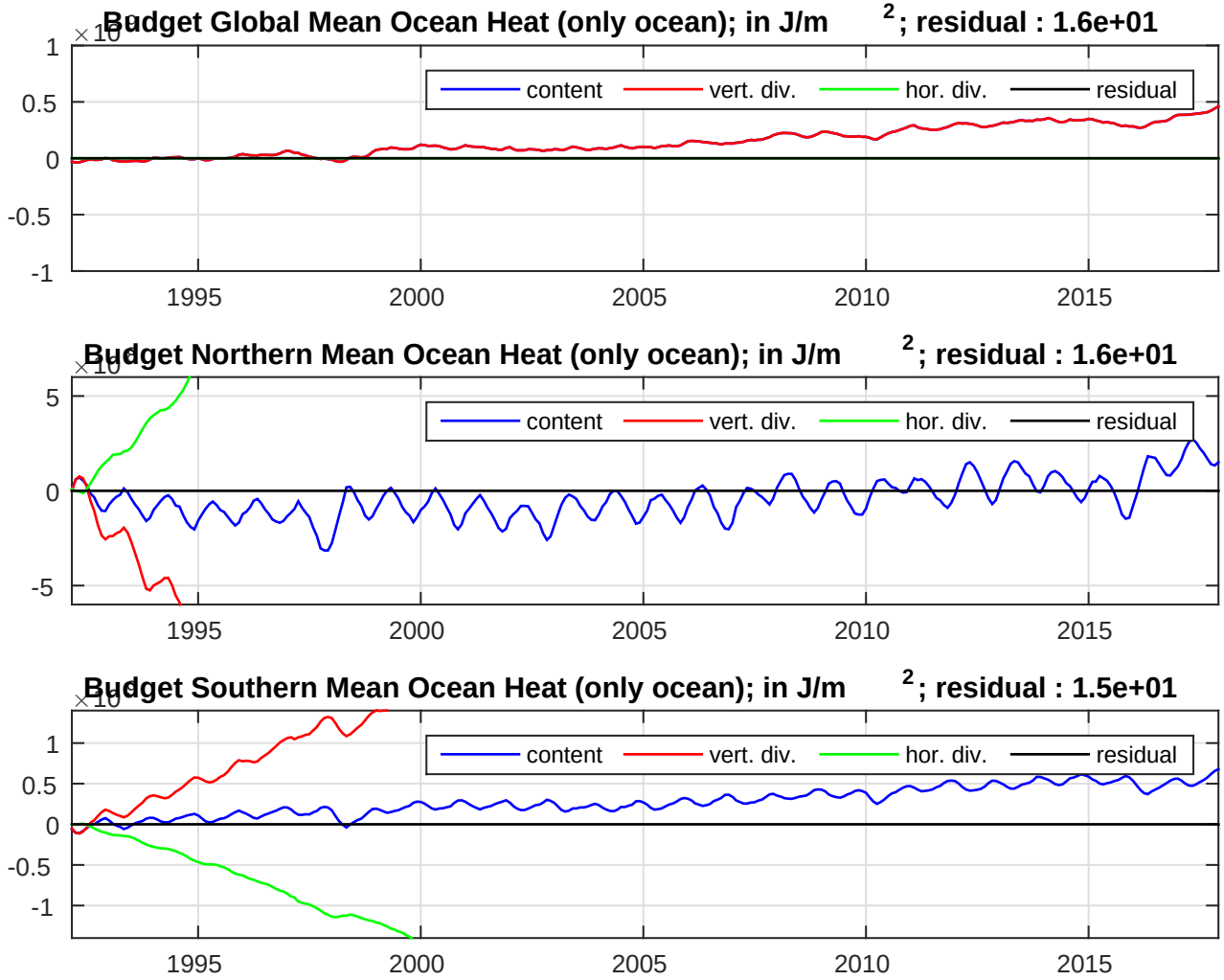

Figure : 1992-2017 global (upper) north (mid) and south (lower), heat budget (ocean only) in J/m^2.

budgets : volume, heat and salt (100m to bottom)

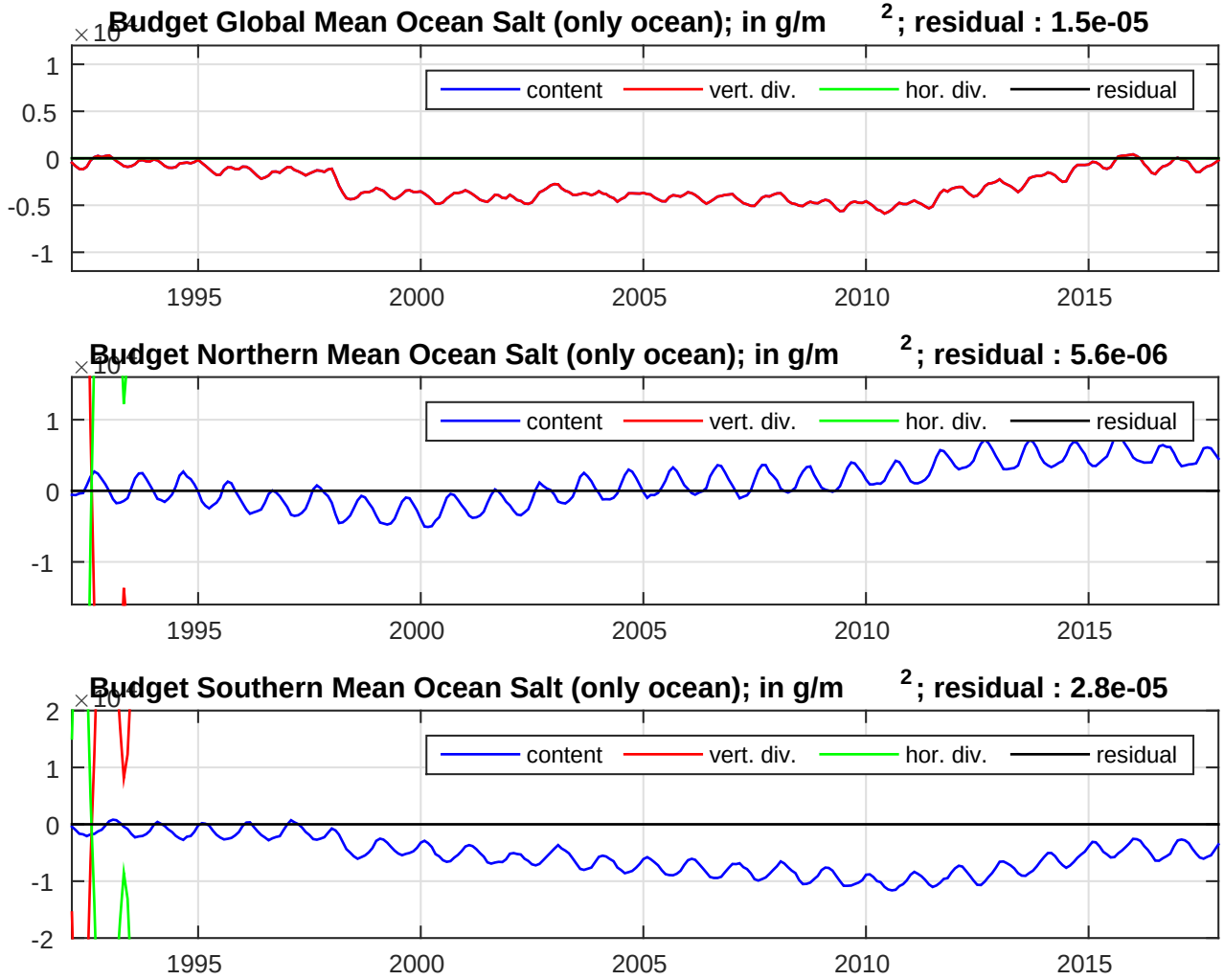

Figure : 1992-2017 global (upper) north (mid) and south (lower), salt budget (ocean only) in g/m^2.

mixed layer depth fields

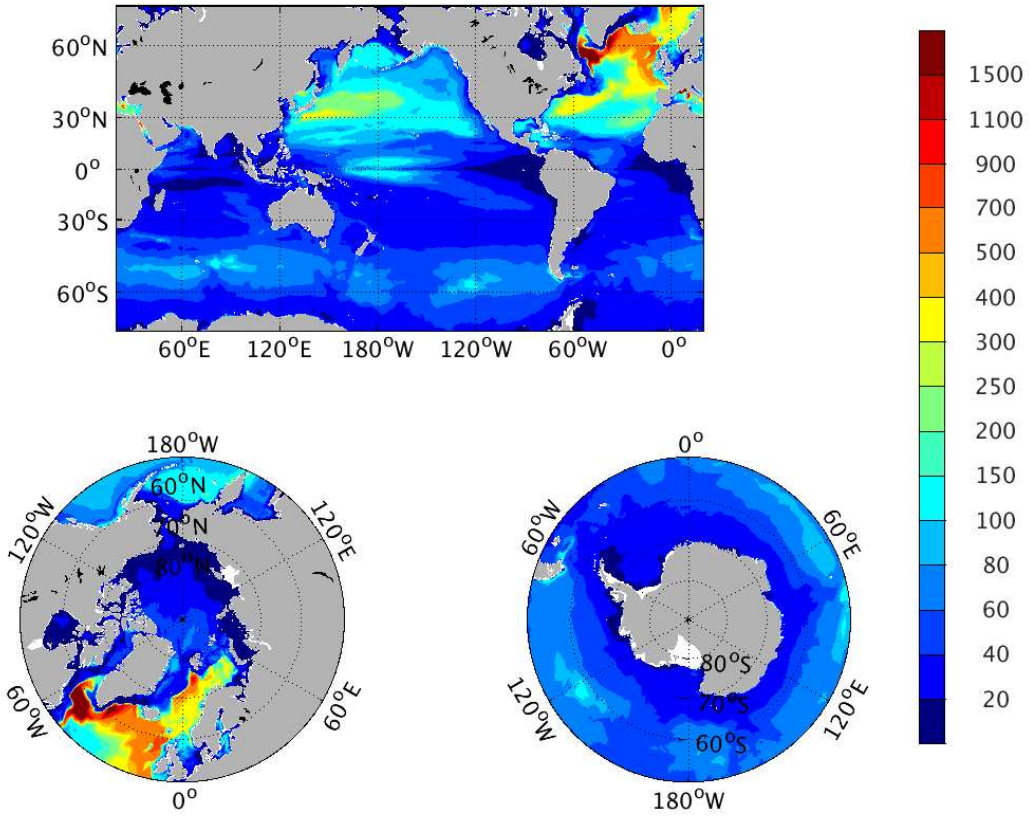

Figure : 1992-2017 March mean – mixed layer depth per Kara formula (m)

mixed layer depth fields

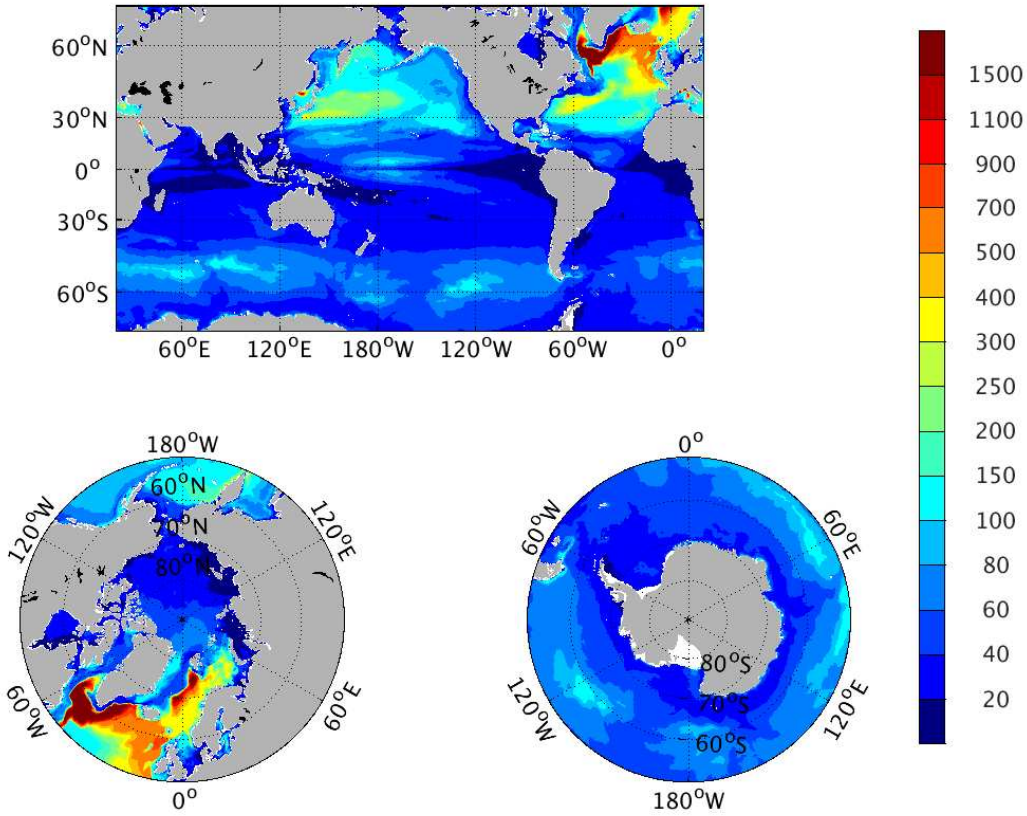

Figure : 1992-2017 March mean – mixed layer depth per Suga formula (m)

mixed layer depth fields

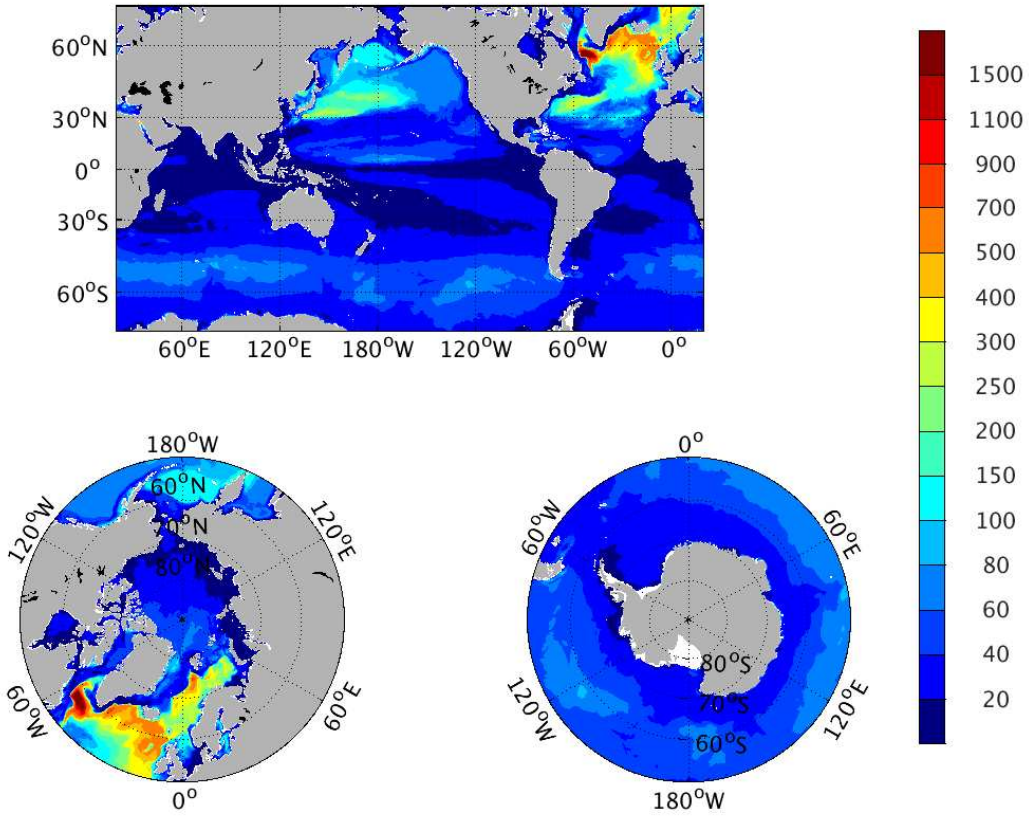

Figure : 1992-2017 March mean – mixed layer depth per Boyer M. formula (m)

mixed layer depth fields

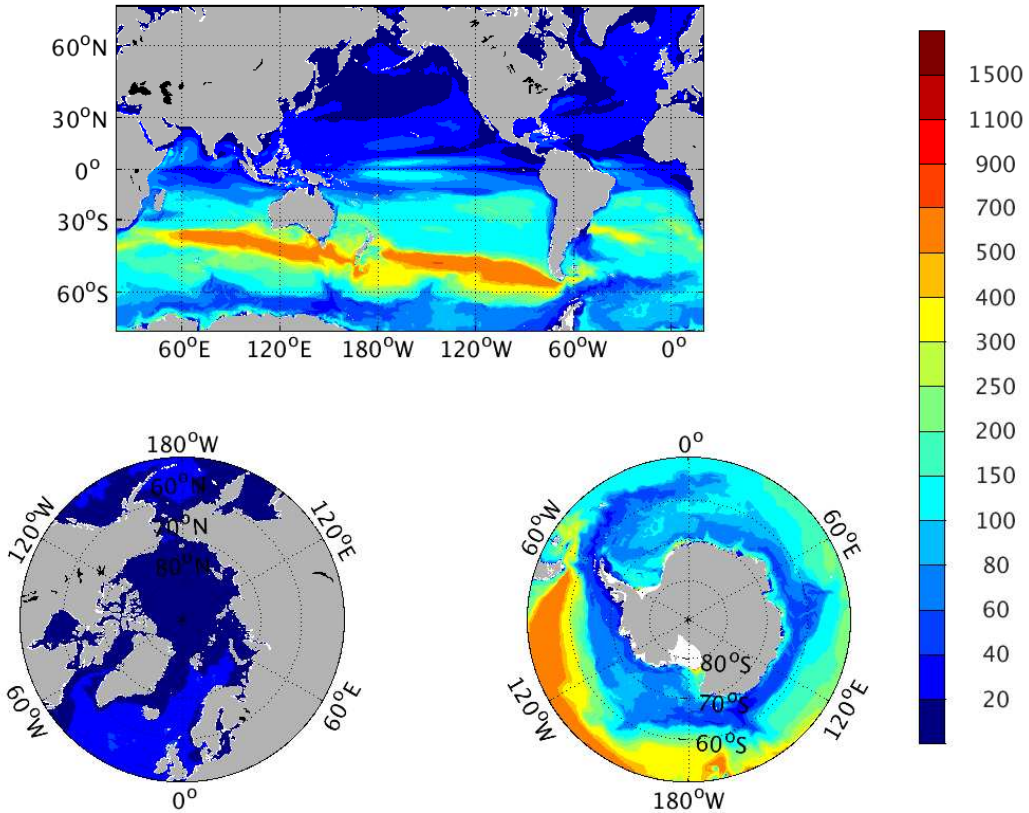

Figure : 1992-2017 September mean – mixed layer depth per Kara formula (m)

mixed layer depth fields

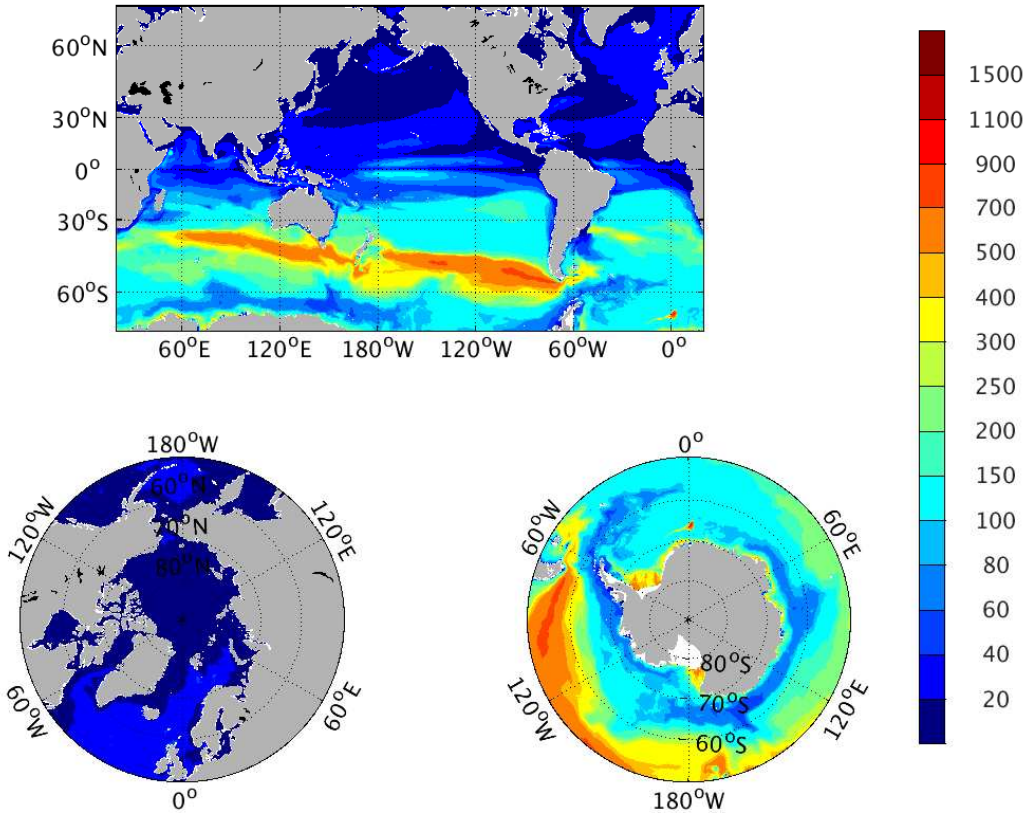

Figure : 1992-2017 September mean – mixed layer depth per Suga formula (m)

mixed layer depth fields

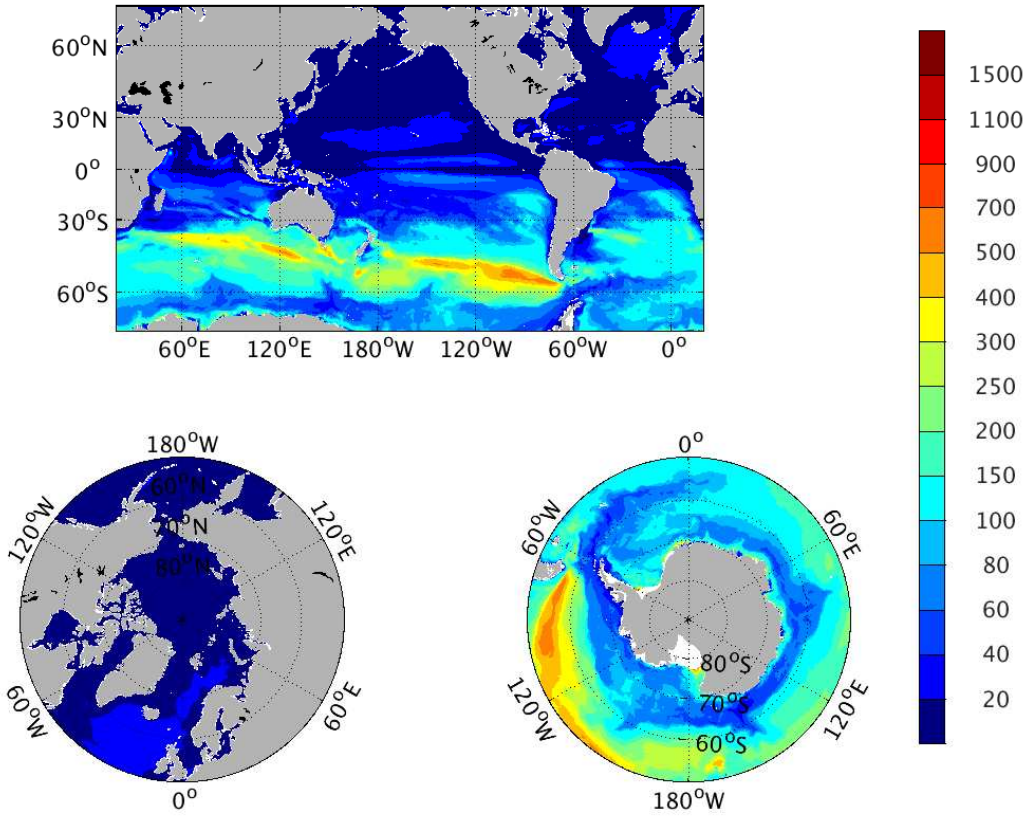

Figure : 1992-2017 September mean – mixed layer depth per Boyer M. formula (m)

Monthly Thickness Distribution

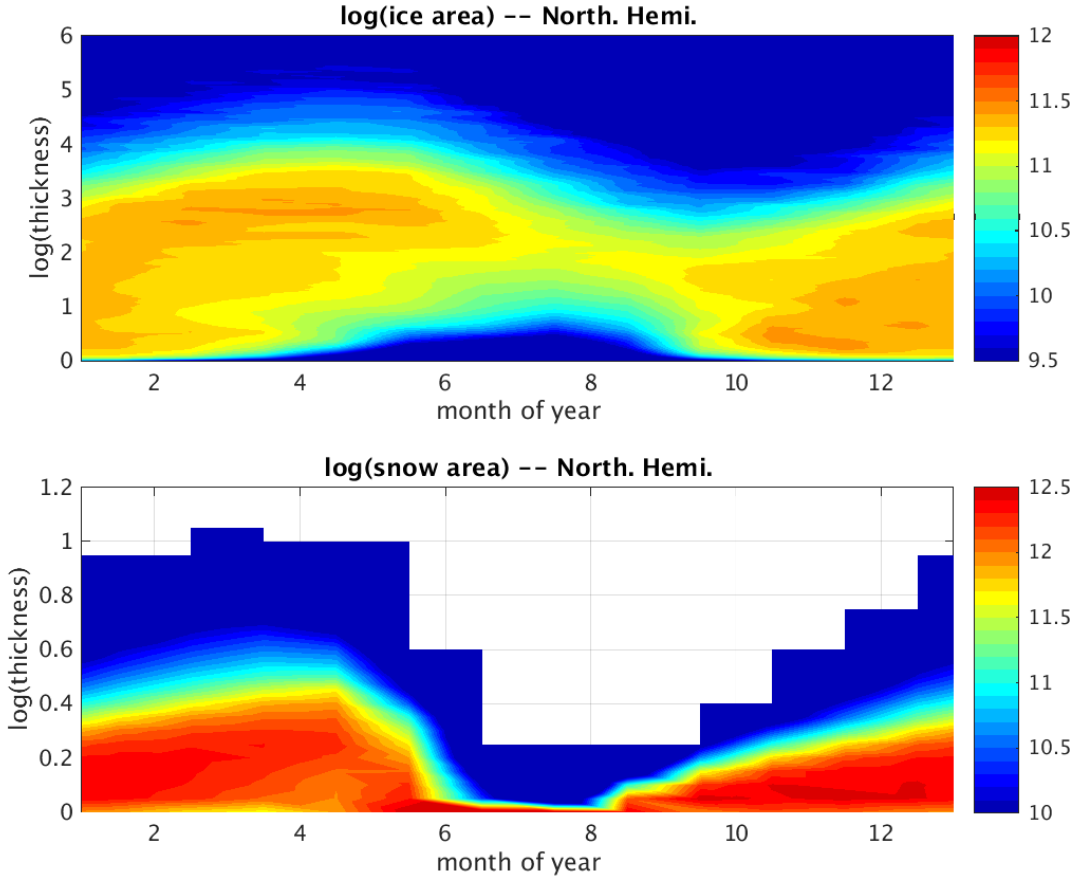

Figure : 1992-2017 Northern Hemisphere : monthly mean ice (top) and snow (bottom) thickness distribution (in $\log(m^2)$)

Monthly Thickness Distribution

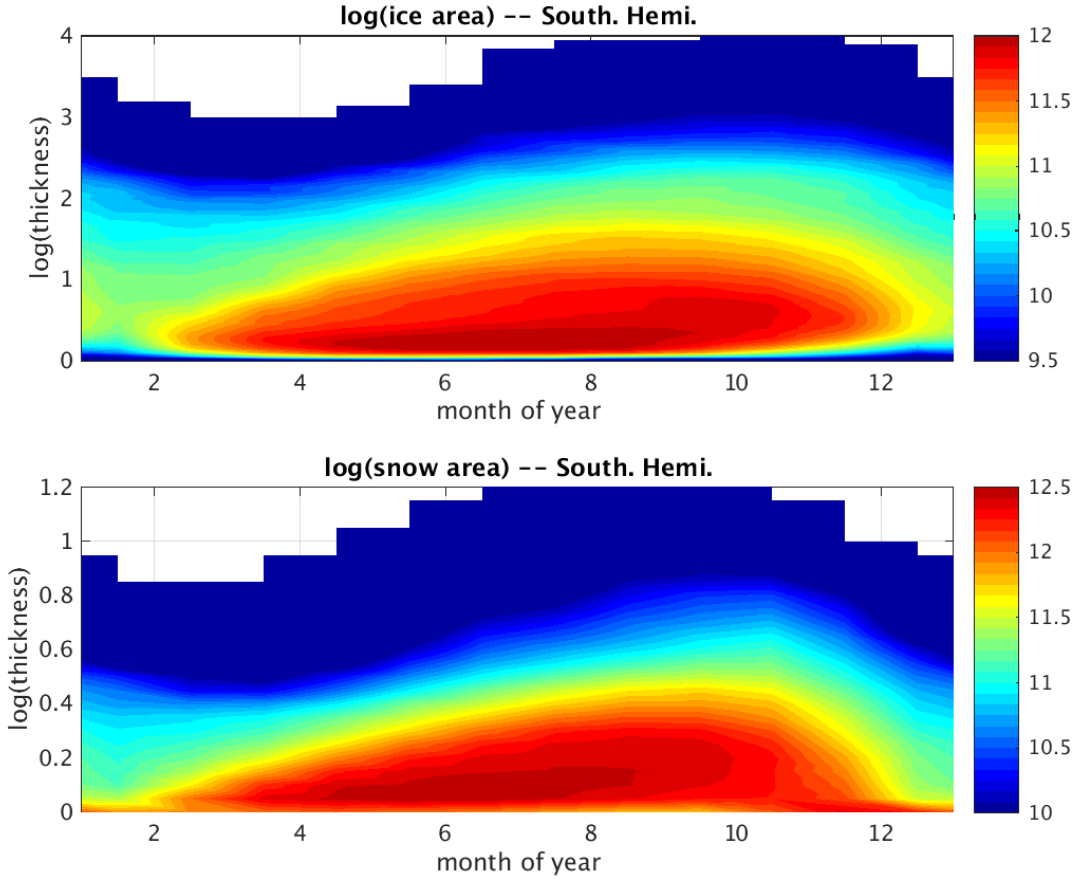

Figure : 1992-2017 Southern Hemisphere : monthly mean ice (top) and snow (bottom) thickness distribution (in log(m^2))

Northern Hem. in March

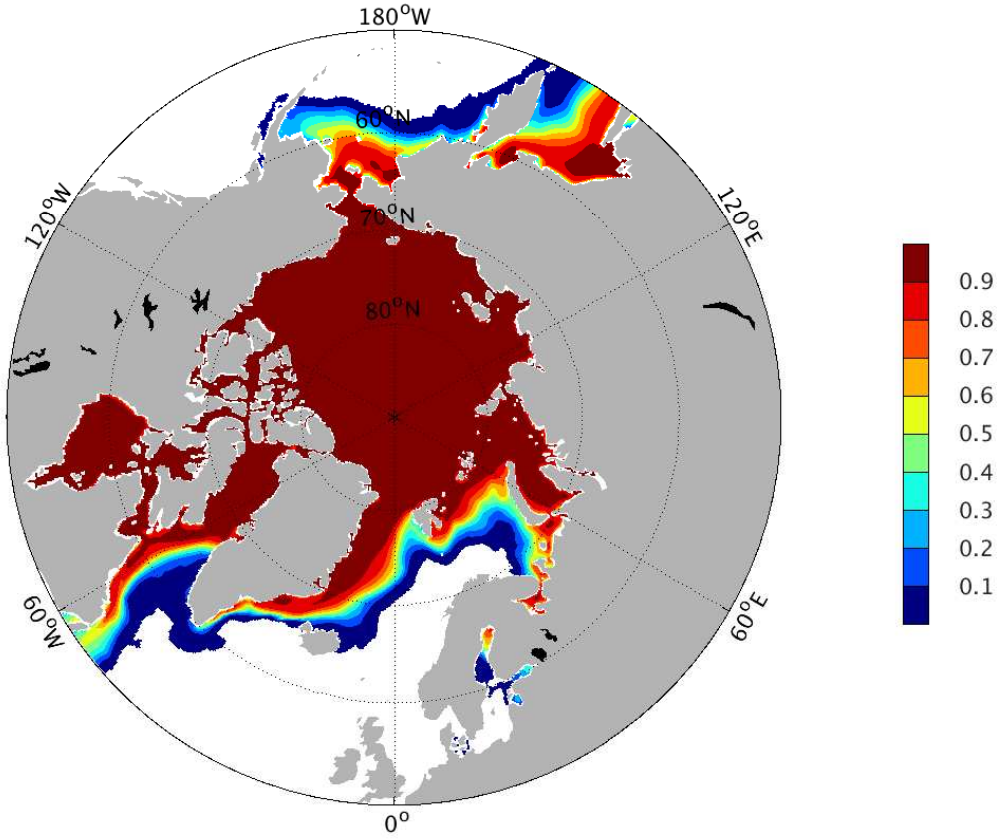

Figure : 1992-2017 March mean – ice concentration (unitless)

Northern Hem. in March

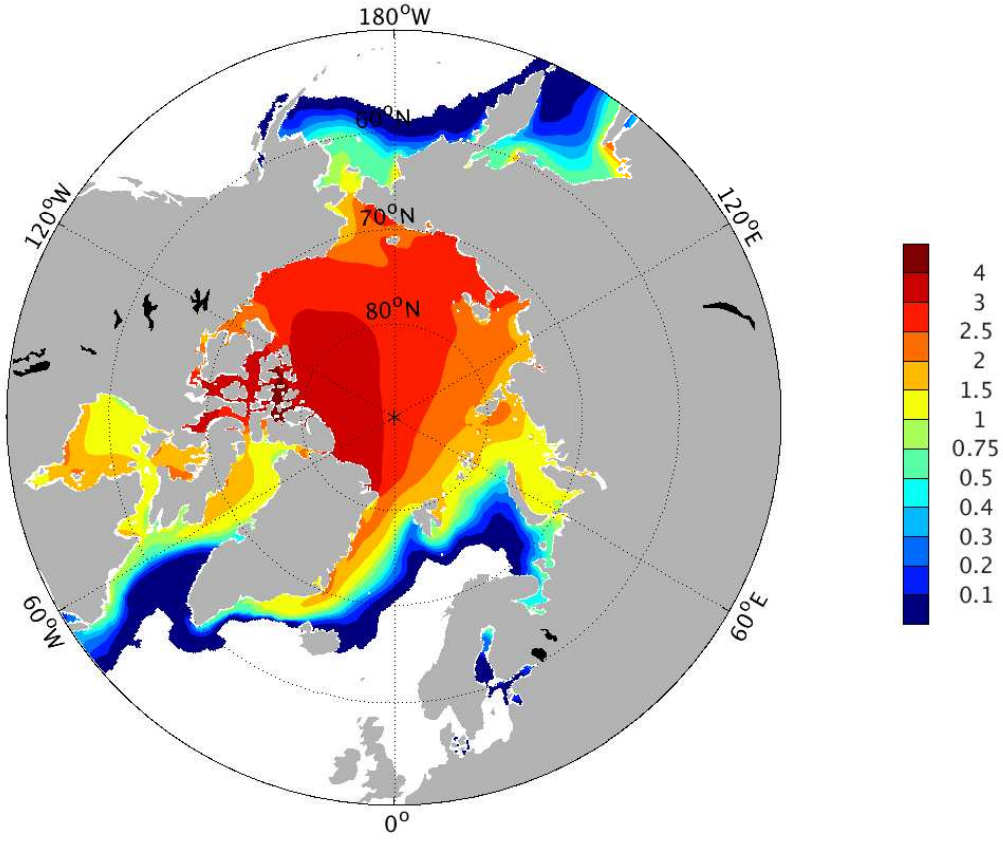

Figure : 1992-2017 March mean – ice thickness (m)

Northern Hem. in March

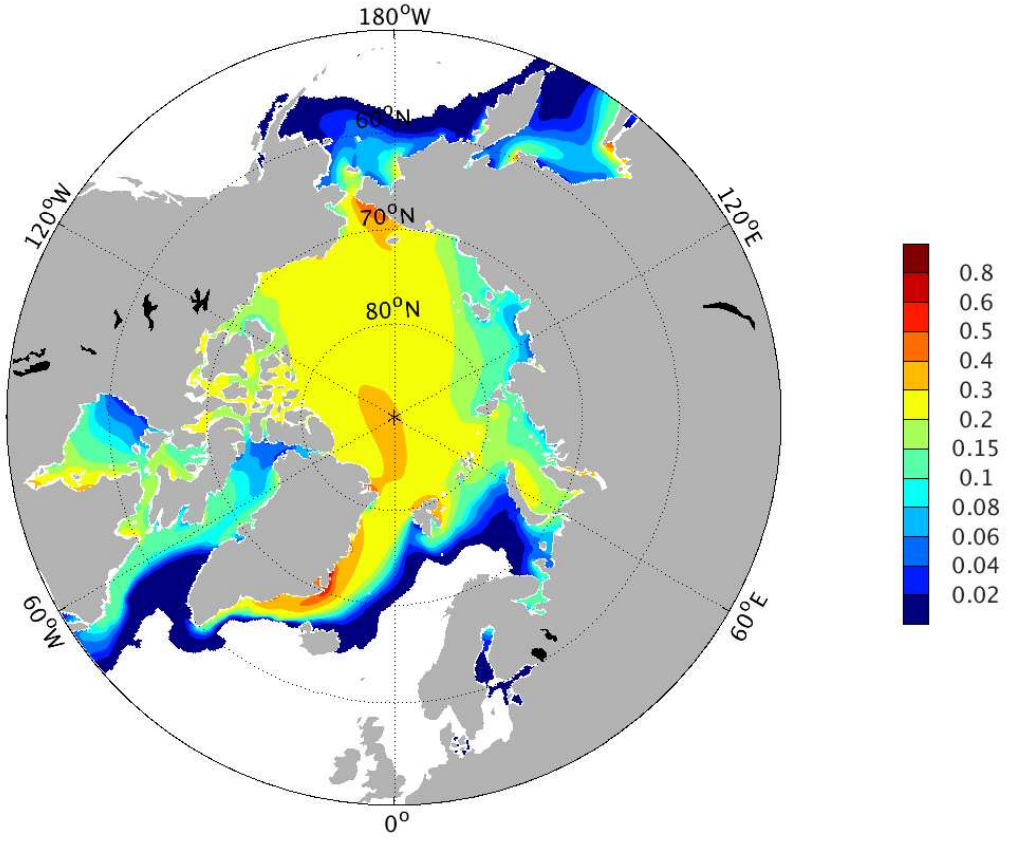

Figure : 1992-2017 March mean – snow thickness (m)

Northern Hem. in March

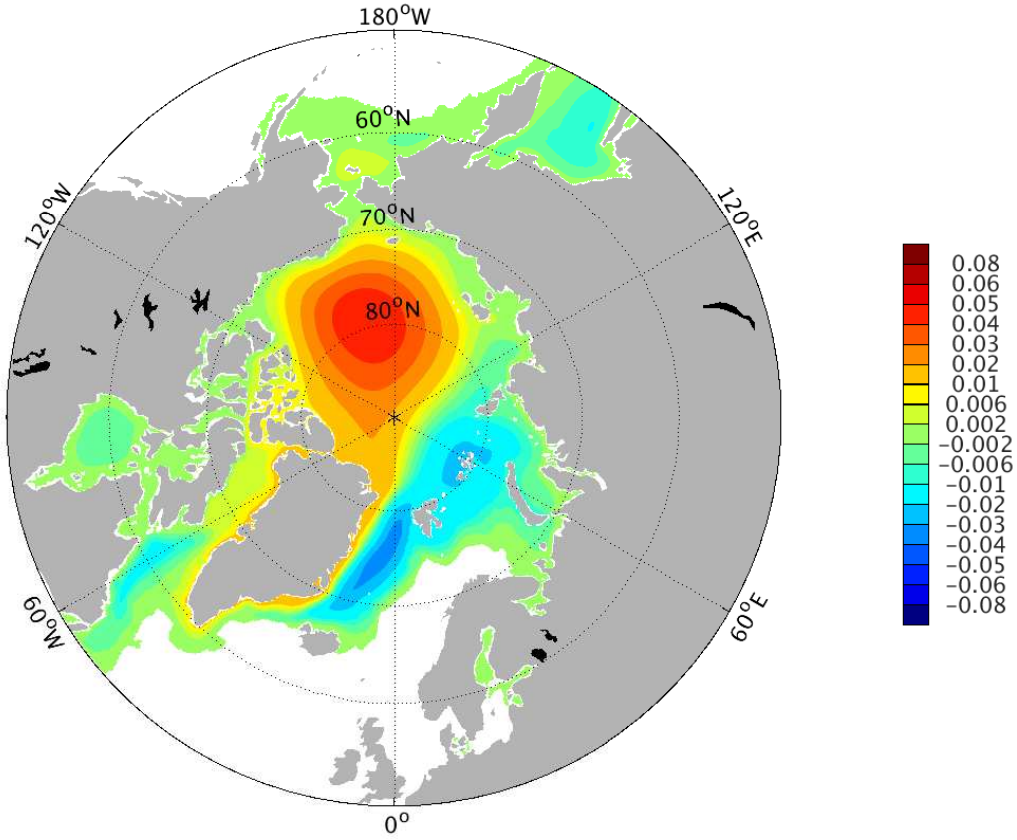

Figure : 1992-2017 March mean – ice+snow streamfunction (megaton/s)

Northern Hem. in March

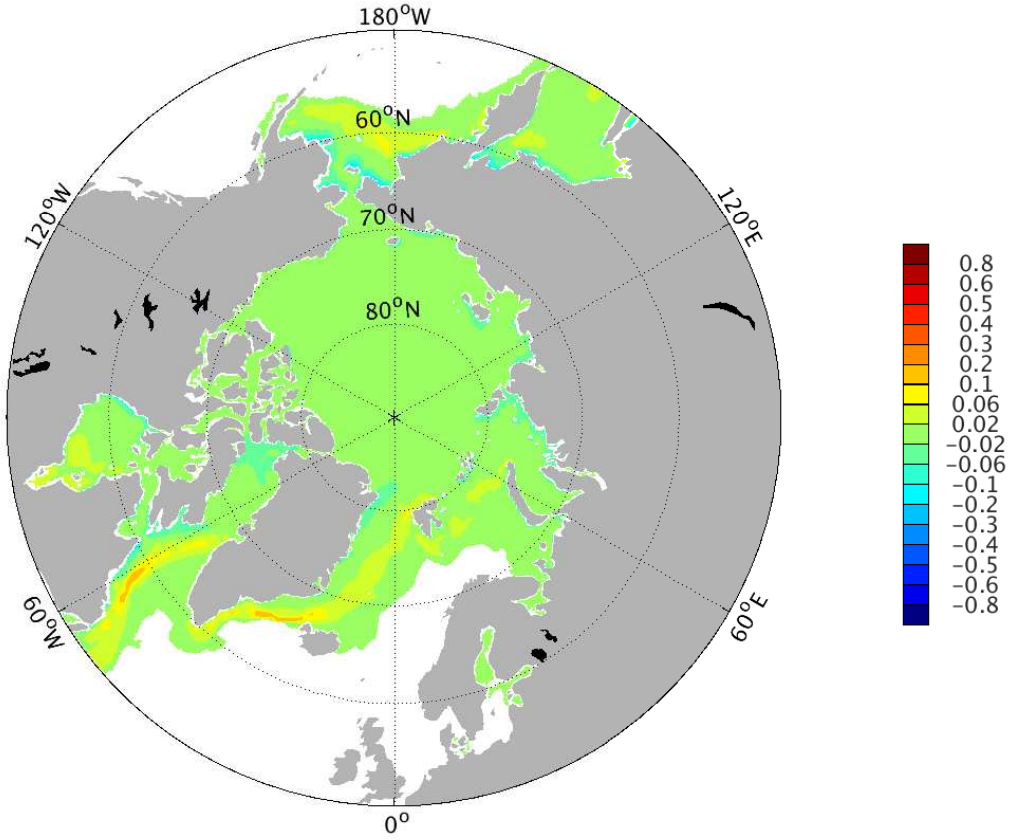

Figure : 1992-2017 March mean – ice+snow convergence (kiloton/s)

Northern Hem. in September

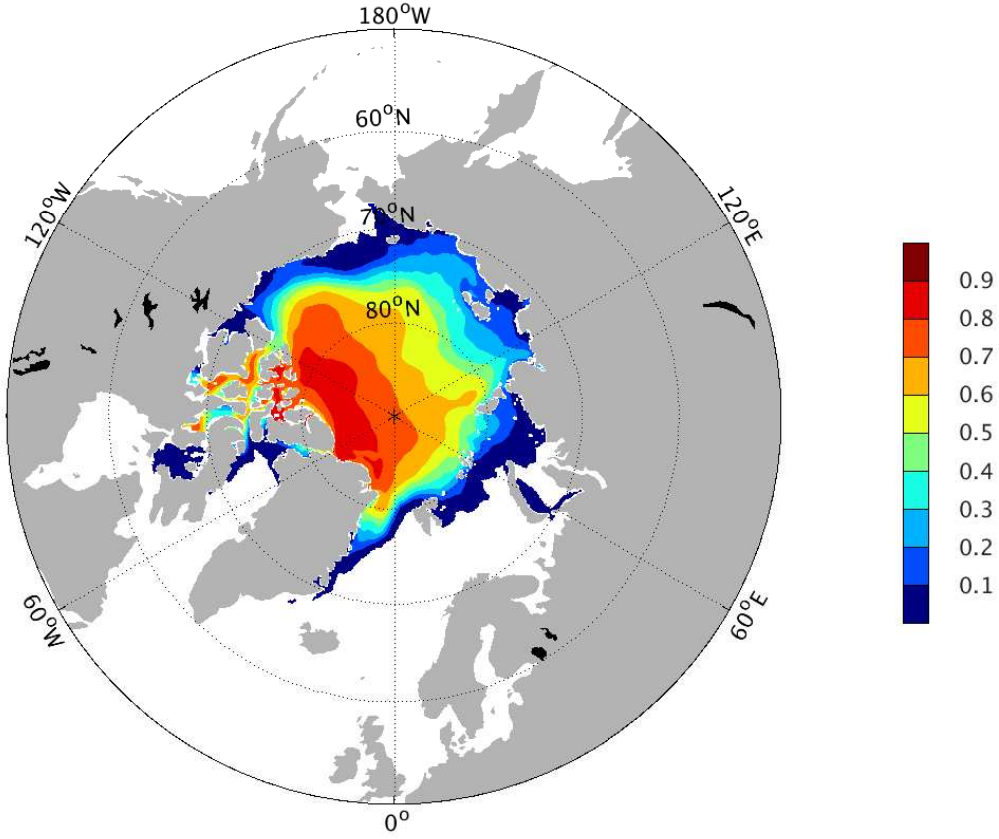

Figure : 1992-2017 September mean – ice concentration (unitless)

Northern Hem. in September

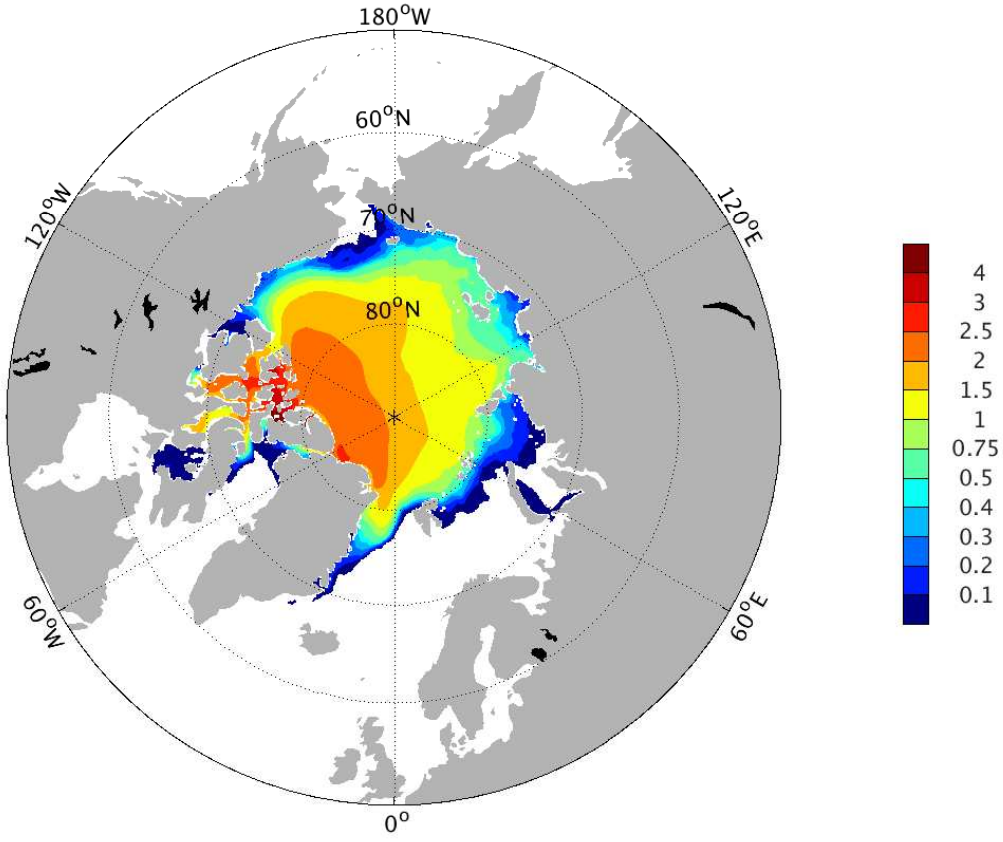

Figure : 1992-2017 September mean – ice thickness (m)

Northern Hem. in September

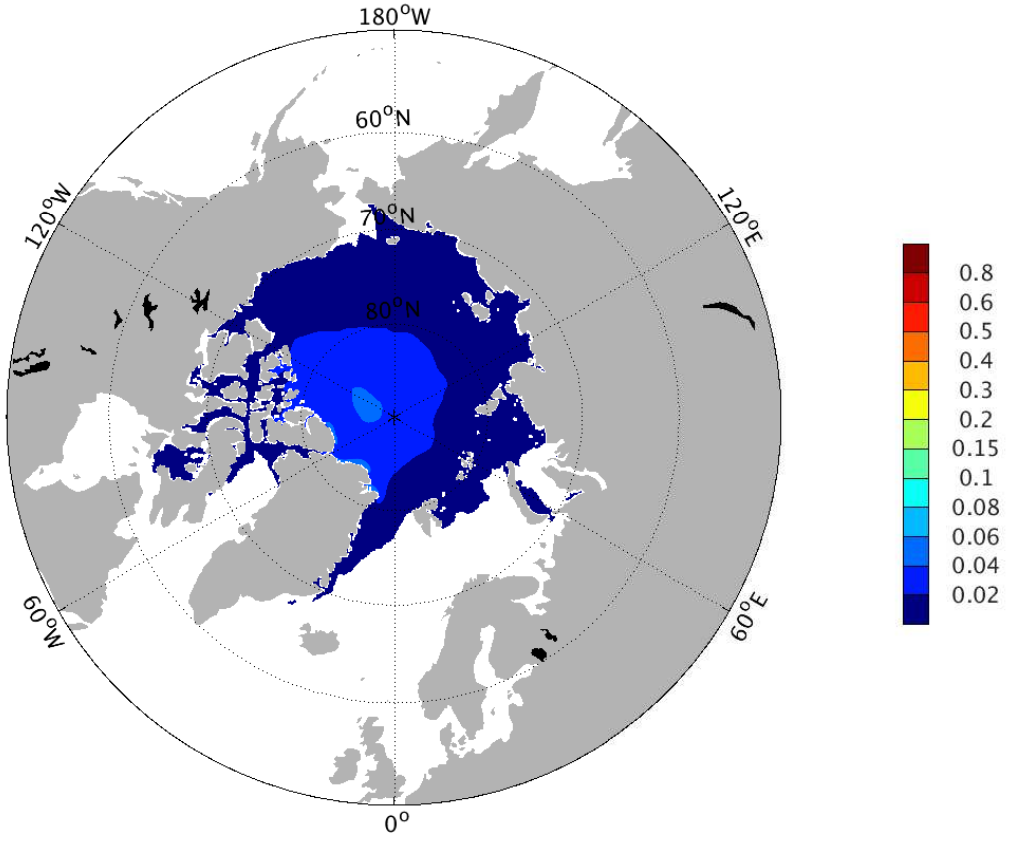

Figure : 1992-2017 September mean – snow thickness (m)

Northern Hem. in September

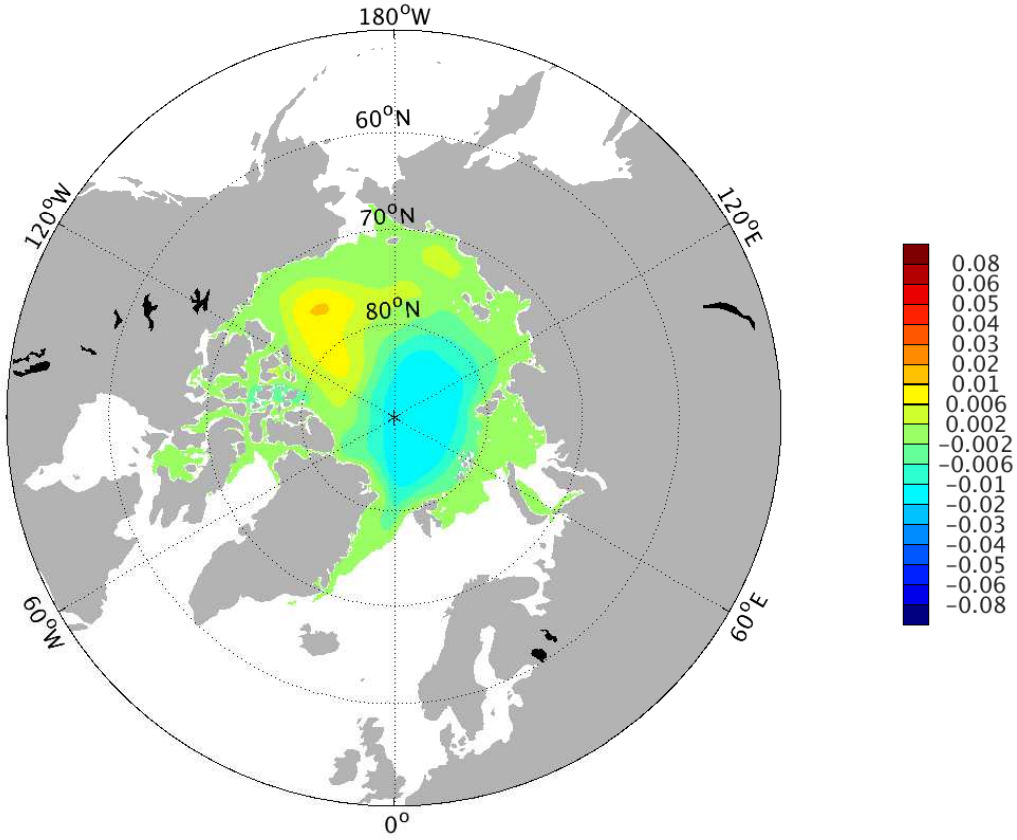

Figure : 1992-2017 September mean – ice+snow streamfunction (megaton/s)

Northern Hem. in September

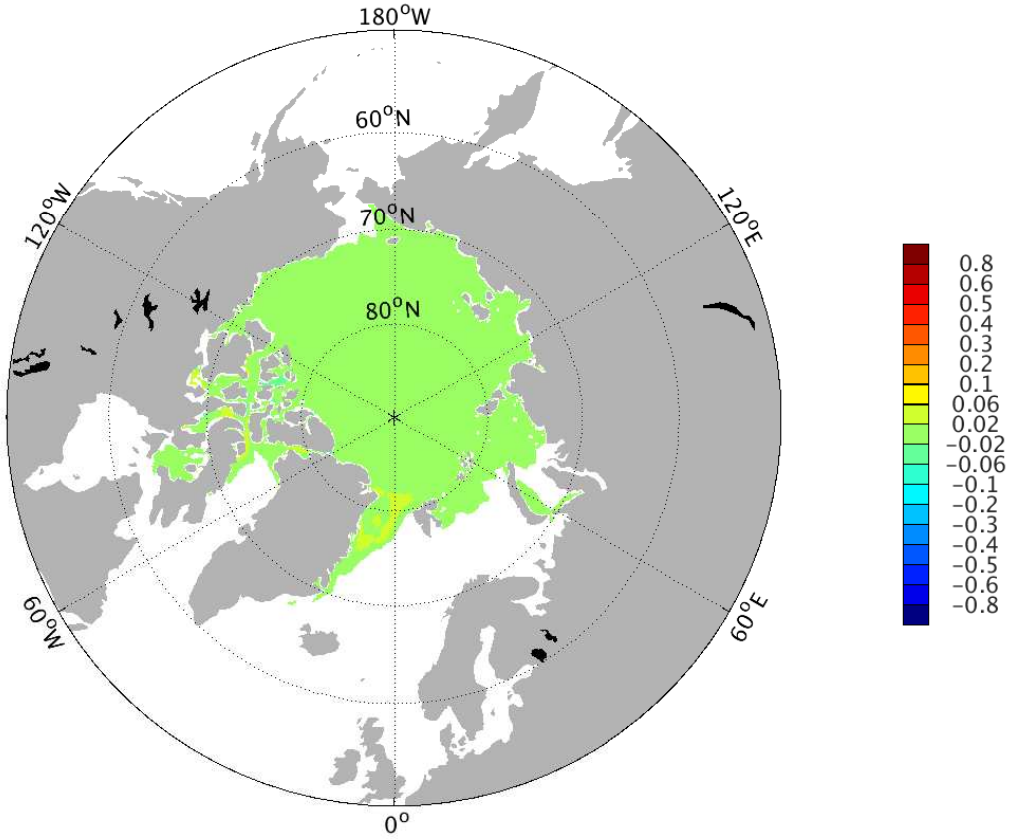

Figure : 1992-2017 September mean – ice+snow convergence (kiloton/s)

Southern Hem. in March

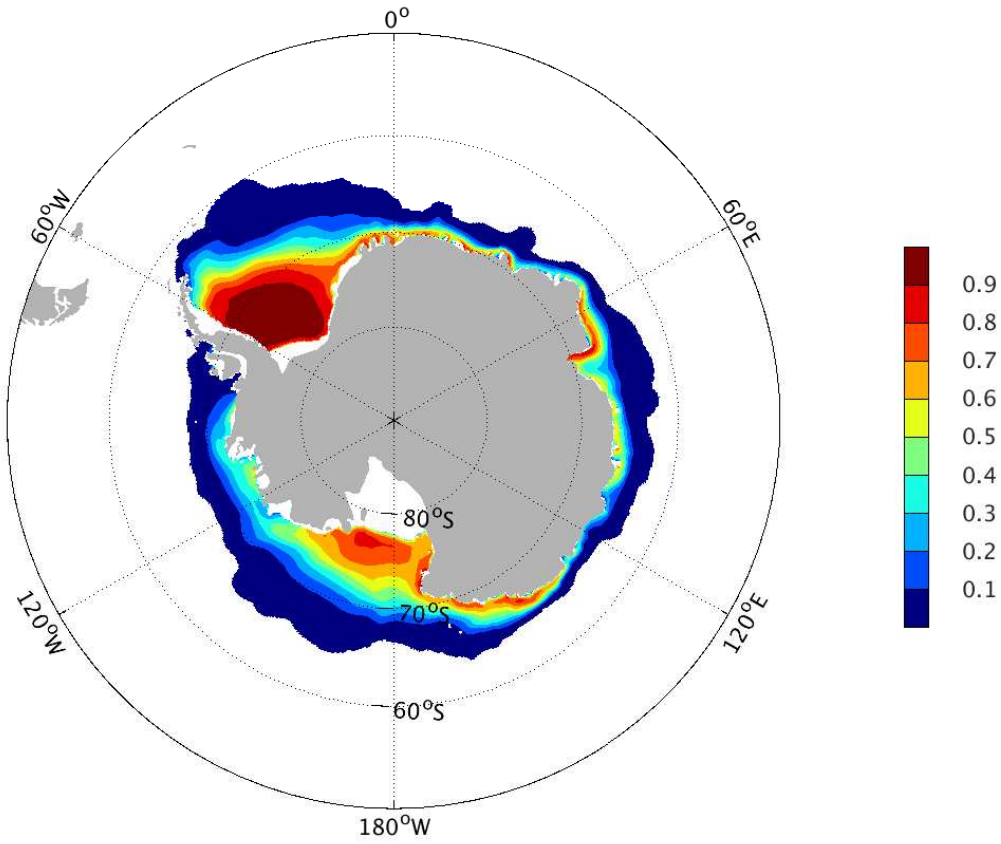

Figure : 1992-2017 March mean – ice concentration (unitless)

Southern Hem. in March

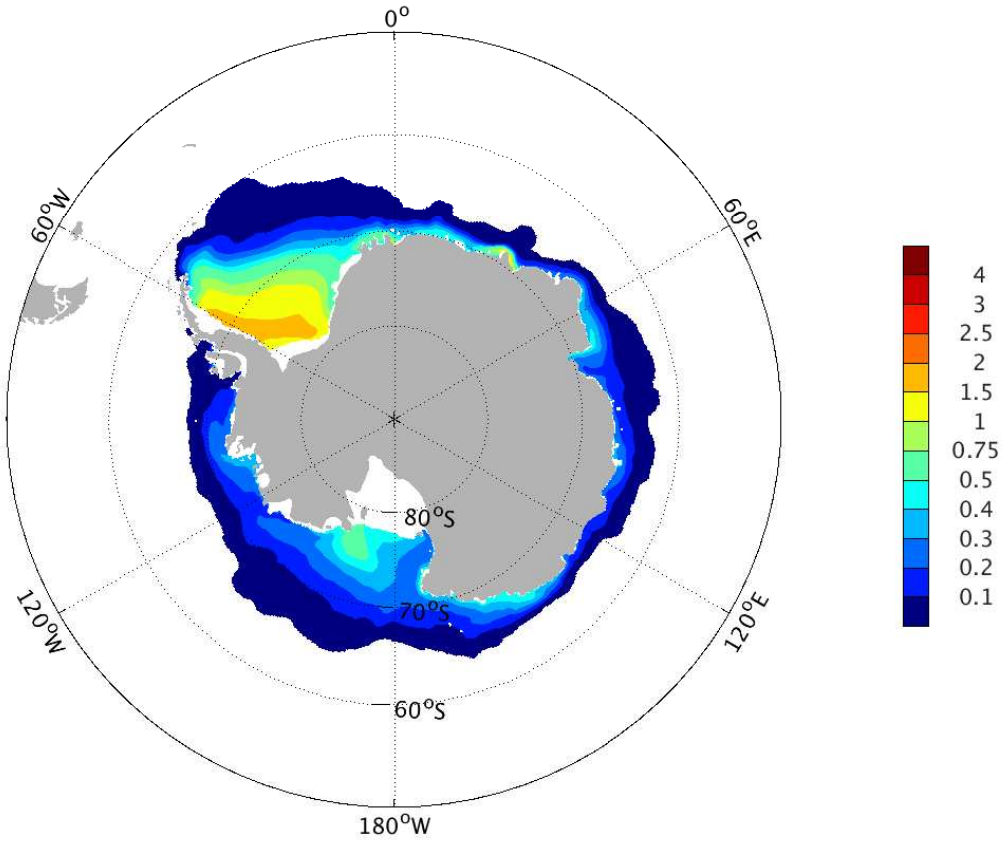

Figure : 1992-2017 March mean – ice thickness (m)

Southern Hem. in March

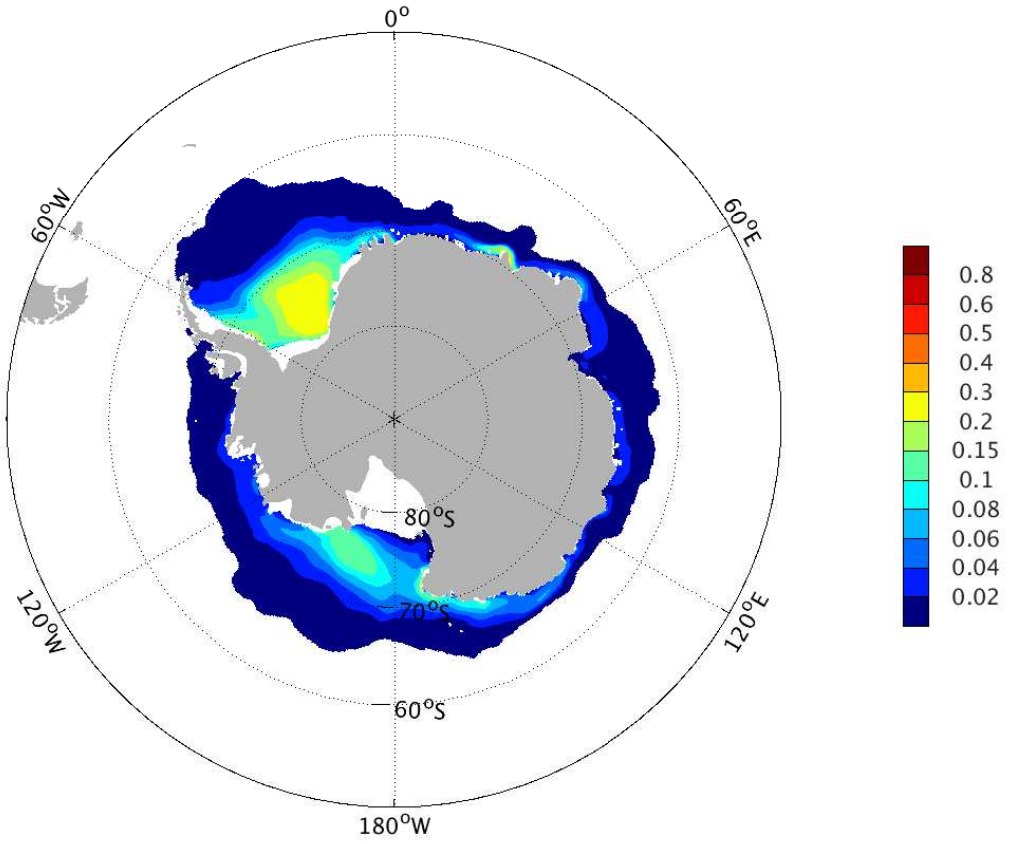

Figure : 1992-2017 March mean – snow thickness (m)

Southern Hem. in March

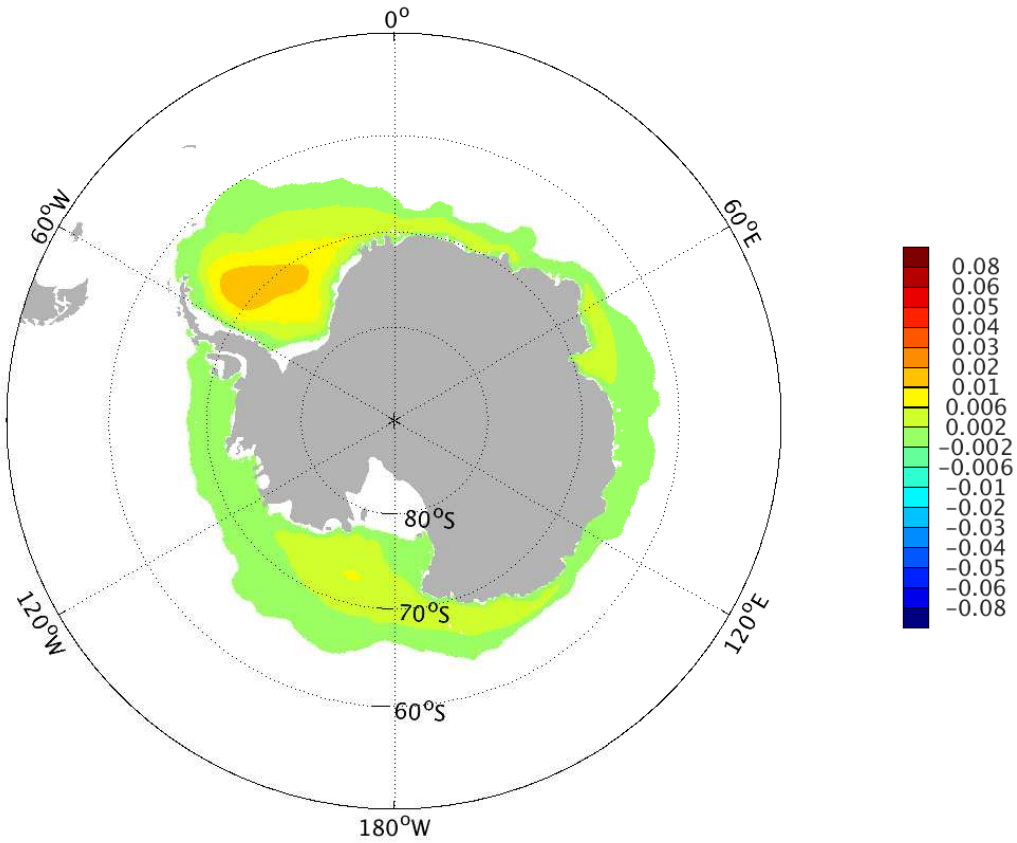

Figure : 1992-2017 March mean – ice+snow streamfunction (megaton/s)

Southern Hem. in March

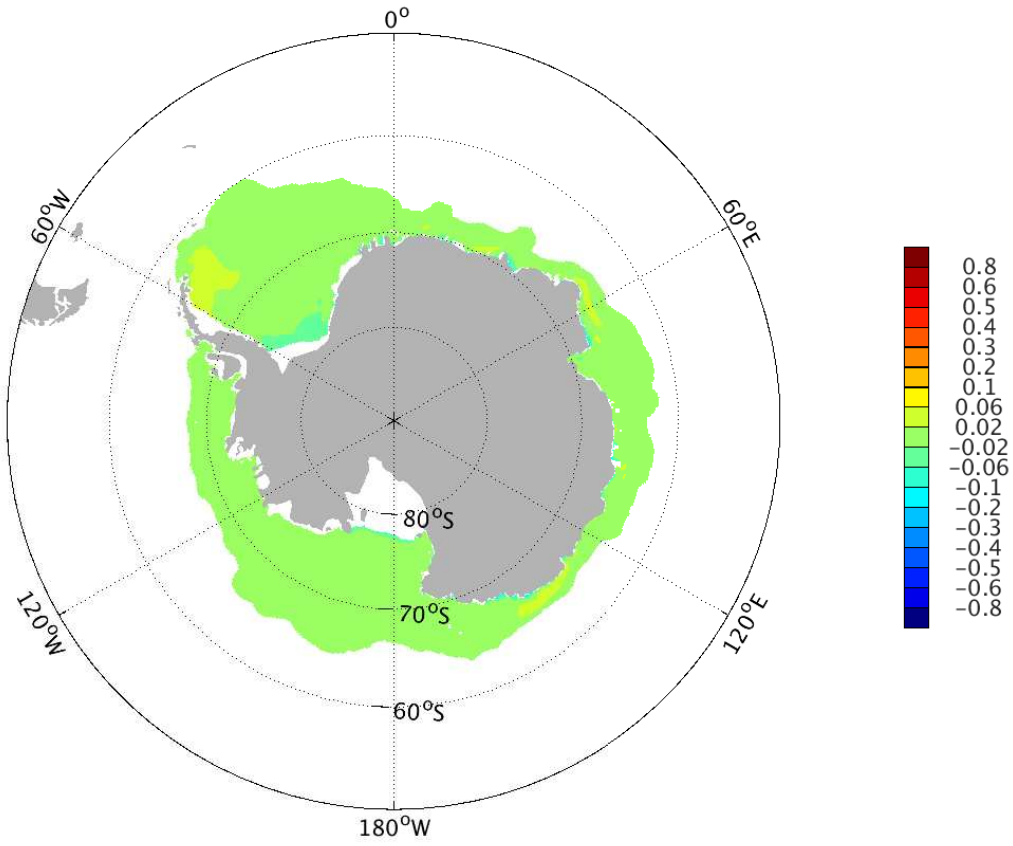

Figure : 1992-2017 March mean – ice+snow convergence (kiloton/s)

Southern Hem. in September

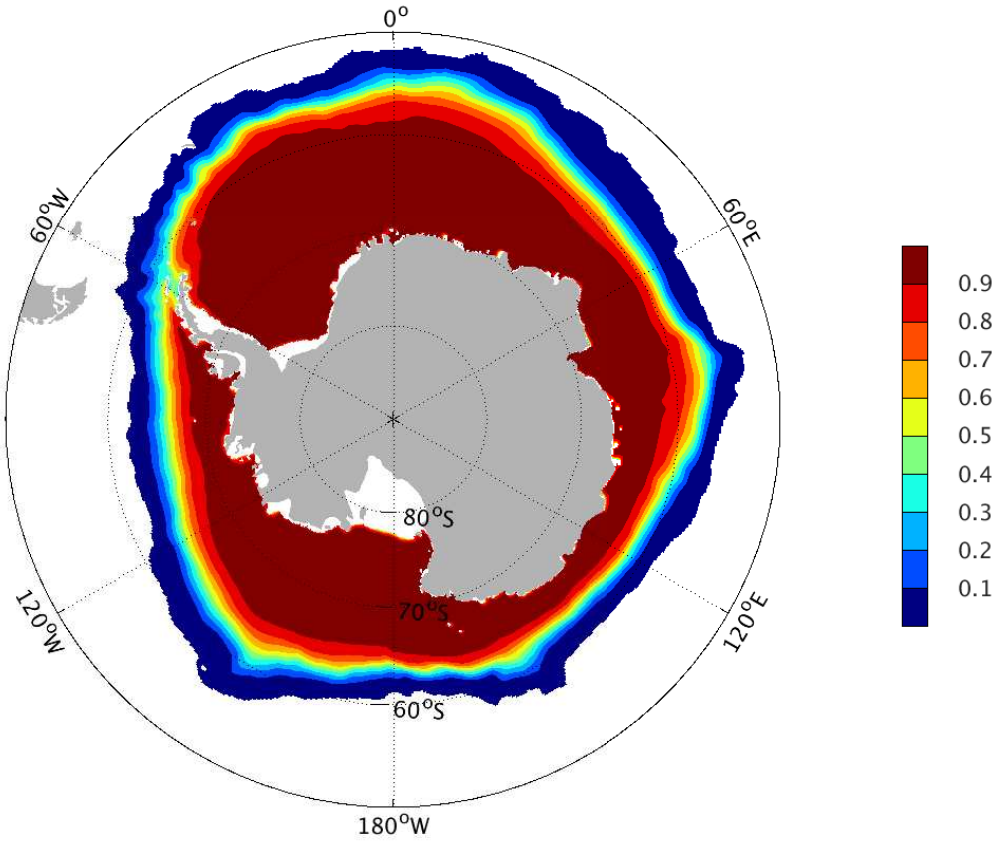

Figure : 1992-2017 September mean – ice concentration (unitless)

Southern Hem. in September

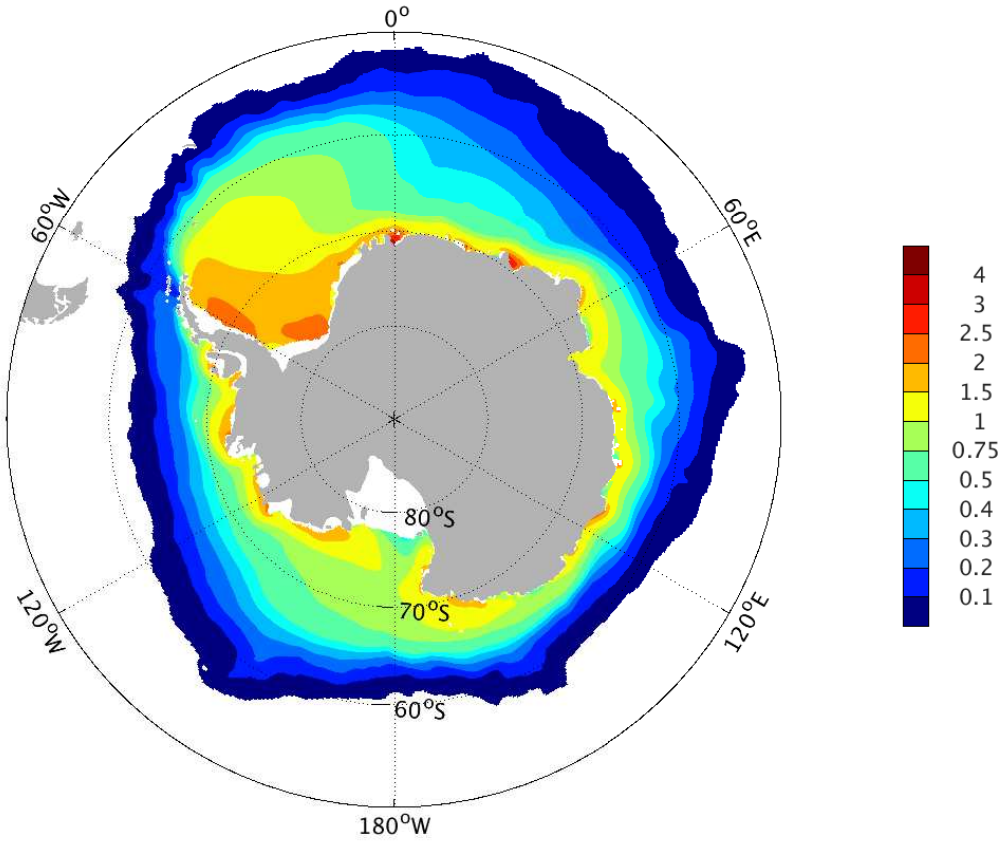

Figure : 1992-2017 September mean – ice thickness (m)

Southern Hem. in September

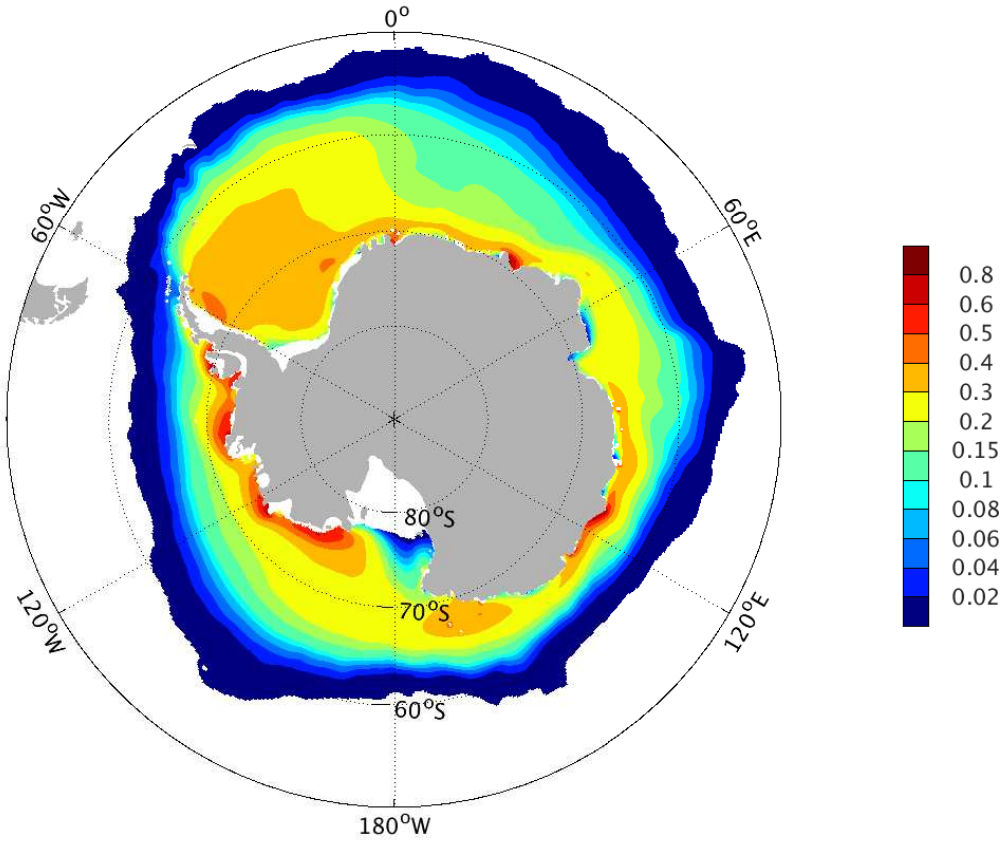

Figure : 1992-2017 September mean – snow thickness (m)

Southern Hem. in September

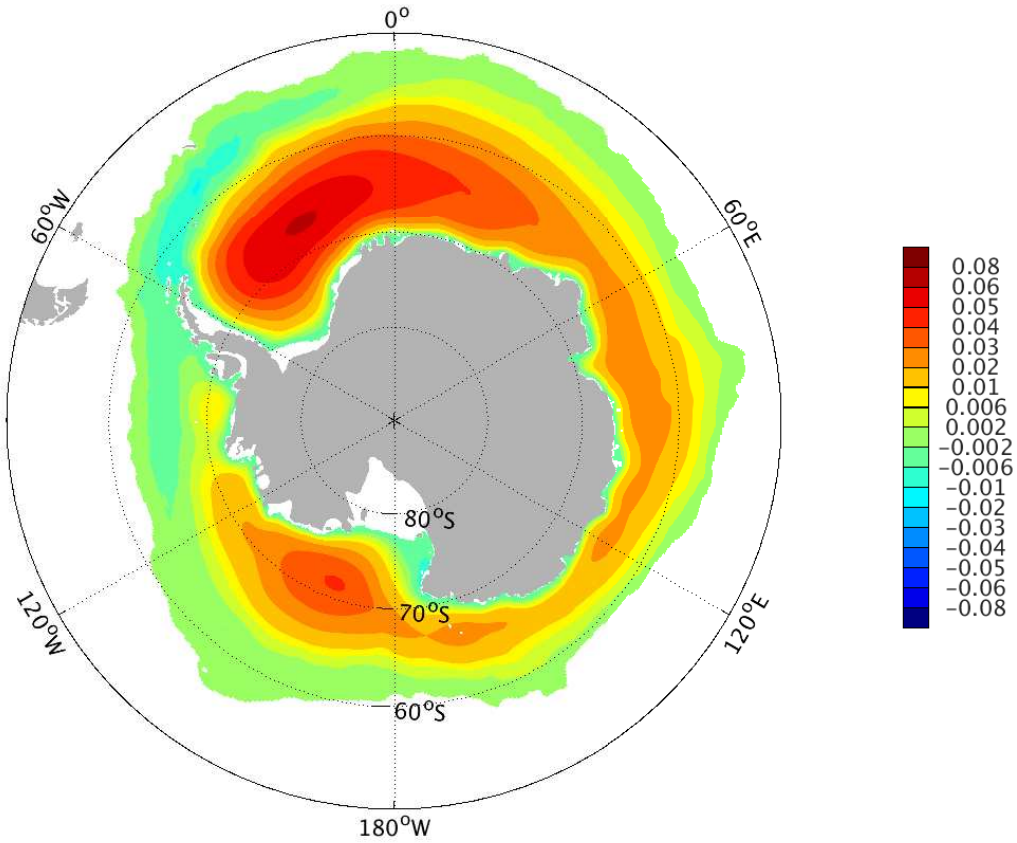

Figure : 1992-2017 September mean – ice+snow streamfunction (megaton/s)

Southern Hem. in September

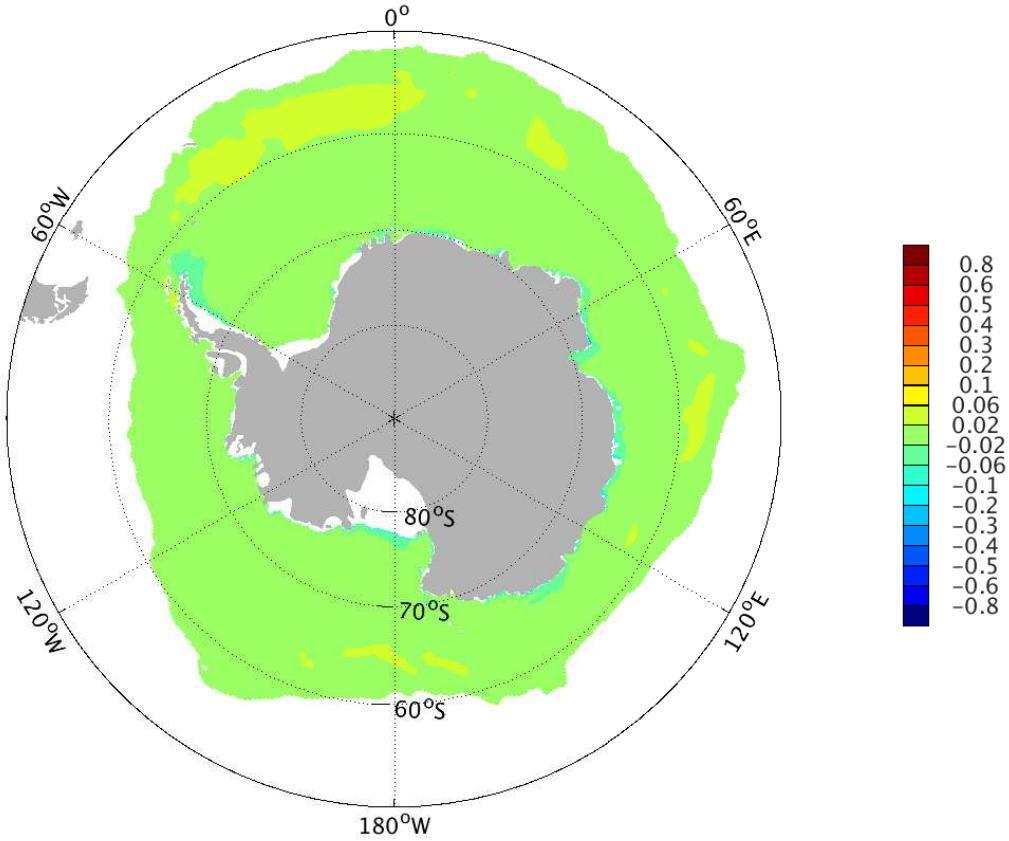

Figure : 1992-2017 September mean – ice+snow convergence (kiloton/s)