Regional/Seasonal Biases in Aquarius SSS

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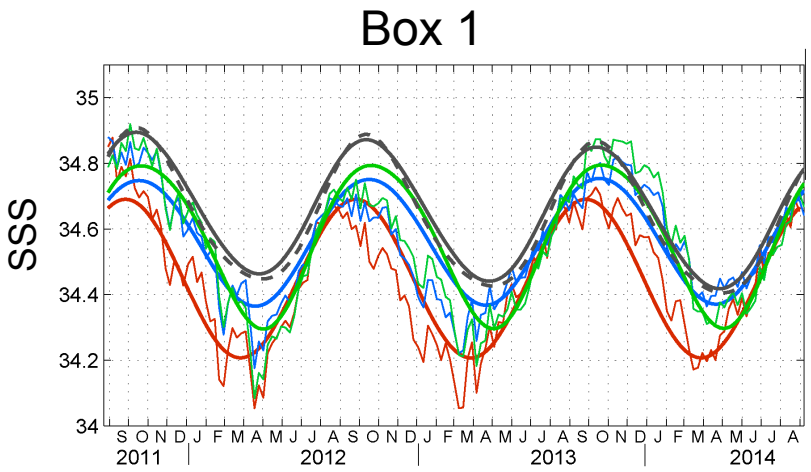
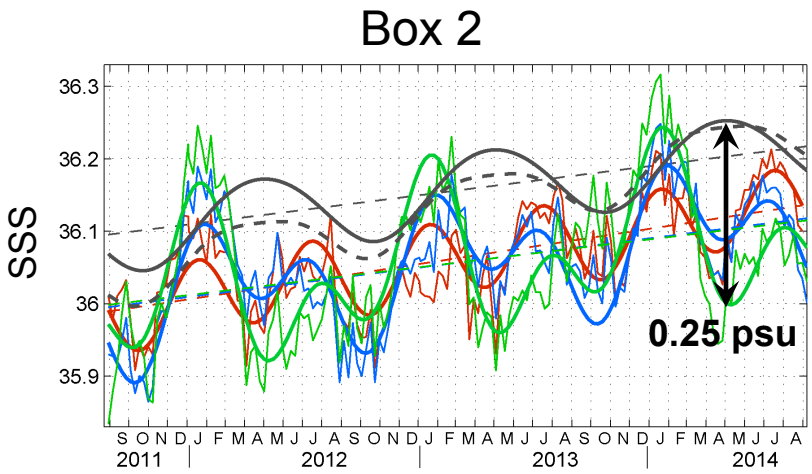
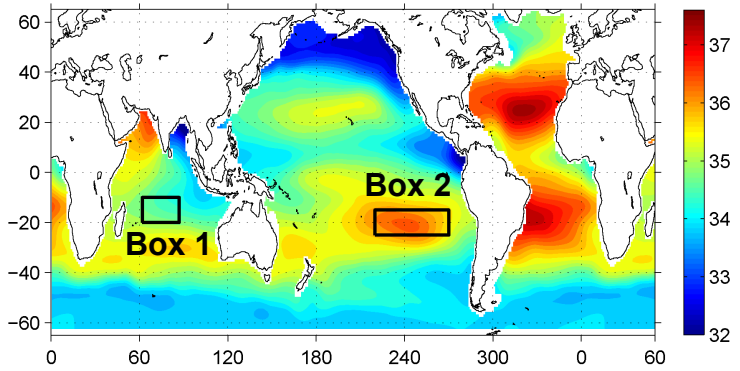
Box analysis: $S(t) = A_{12}\cos(\omega_{12}t + \varphi_{12}) + A_6\cos(\omega_6 t + \varphi_6)$







V3.0 standard

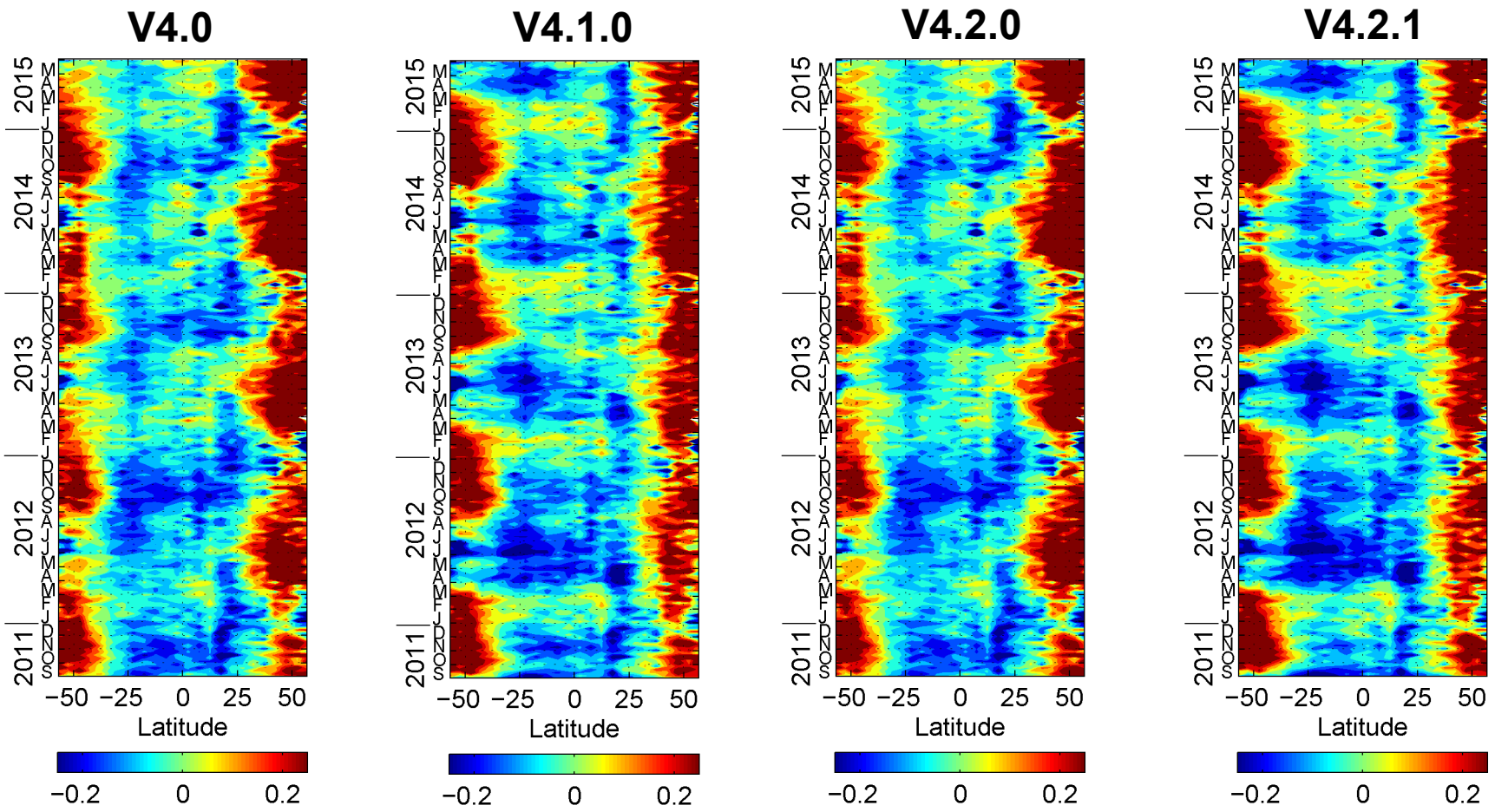
V4.0

V4.1.0

Argo APDRC

Argo profiles

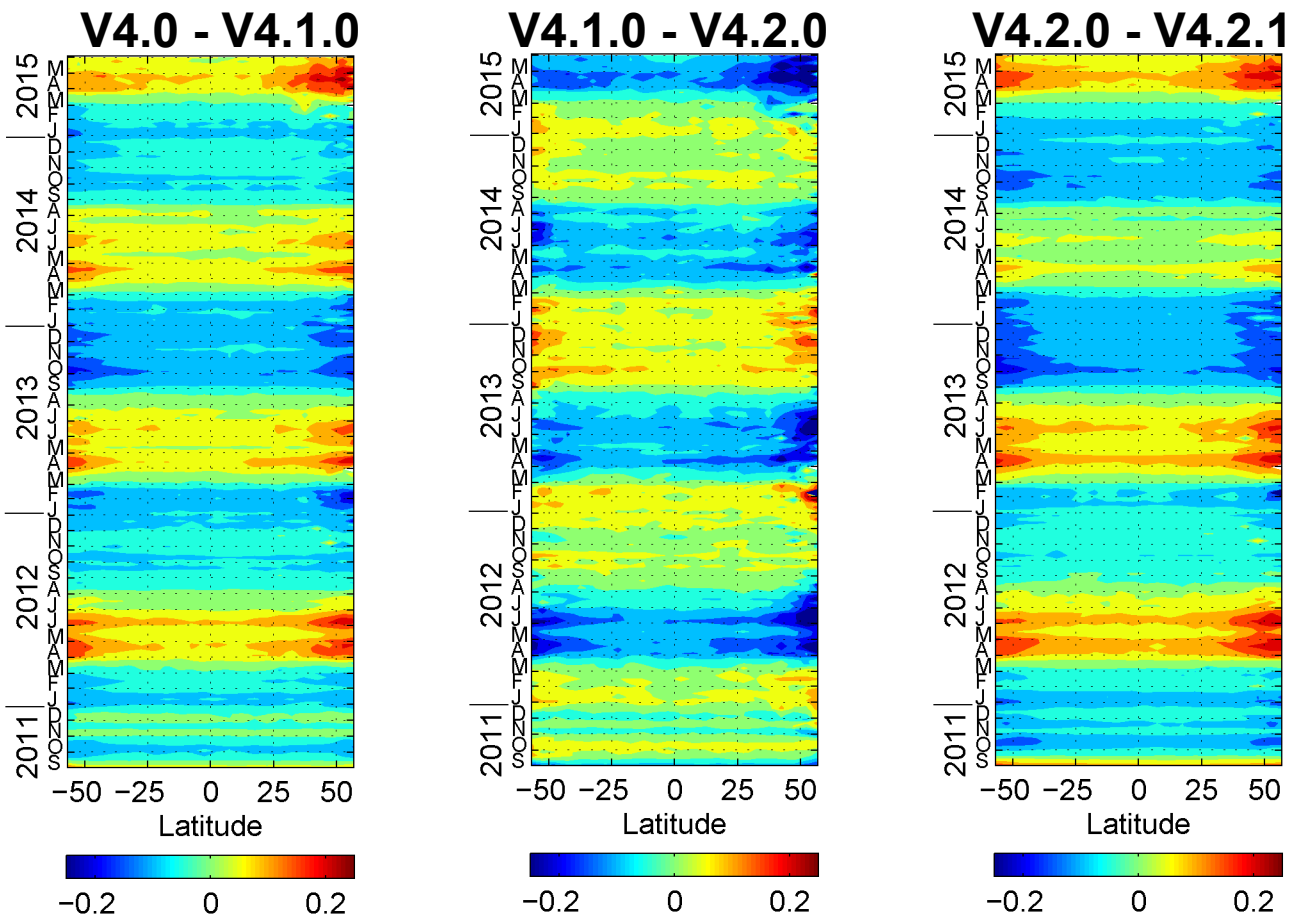
Latitude-time distributions of the zonally averaged differences between weekly SSS maps and the corresponding Argo buoy data



The error statistics are calculated by comparing Argo buoy measurements (z<6m) for a given week with SSS values at the same locations obtained by interpolating the corresponding Aquarius L3 SSS maps.

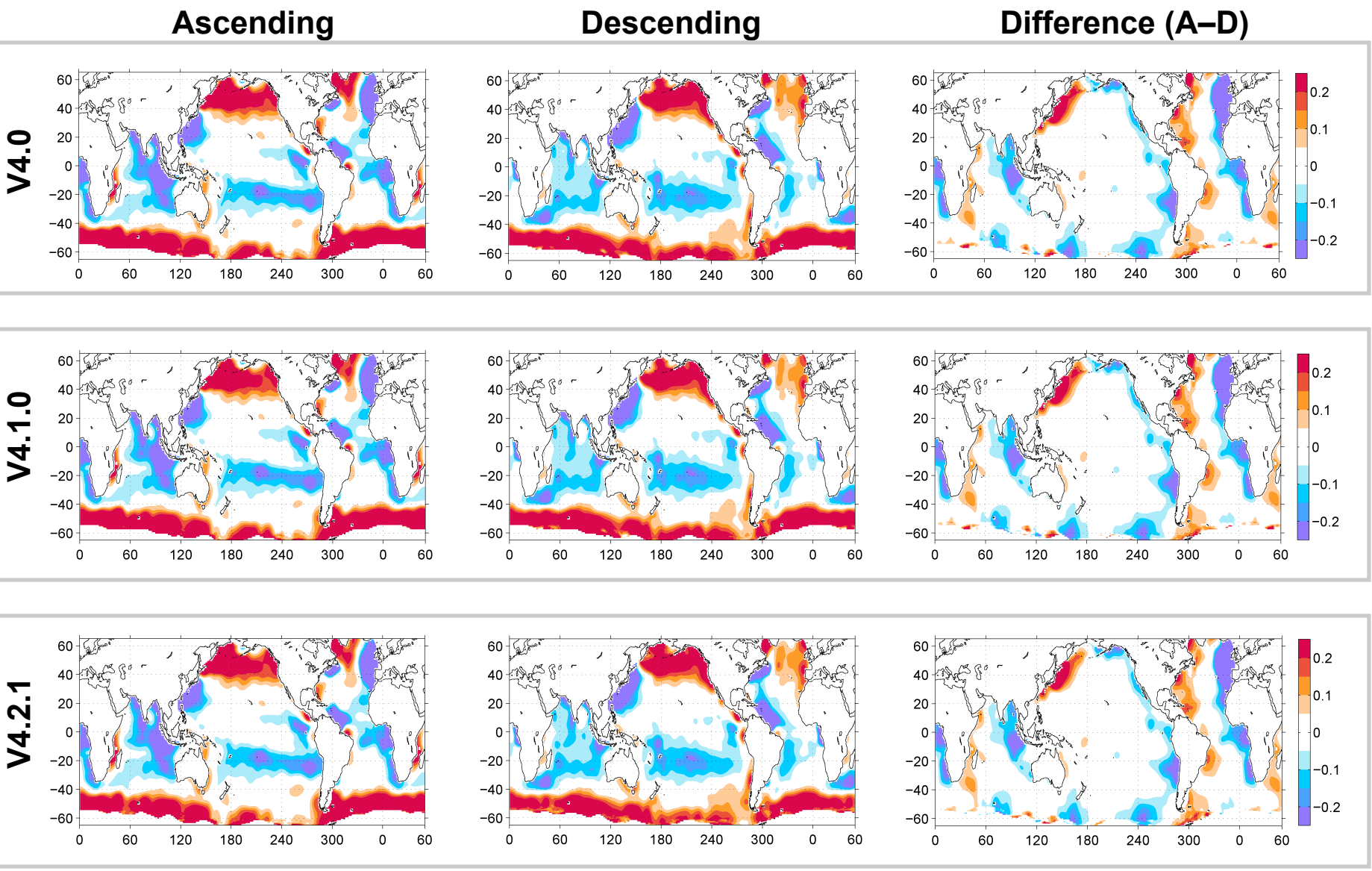
Latitude-time distributions of the zonally averaged differences between weekly SSS maps and the corresponding Argo buoy data

Differences between data versions (from previous slide)



The error statistics are calculated by comparing Argo buoy measurements (z<6m) for a given week with SSS values at the same locations obtained by interpolating the corresponding Aquarius L3 SSS maps.

Static bias (3-year mean) with respect to Argo (APDRC)



Apparently, no changes from version to version

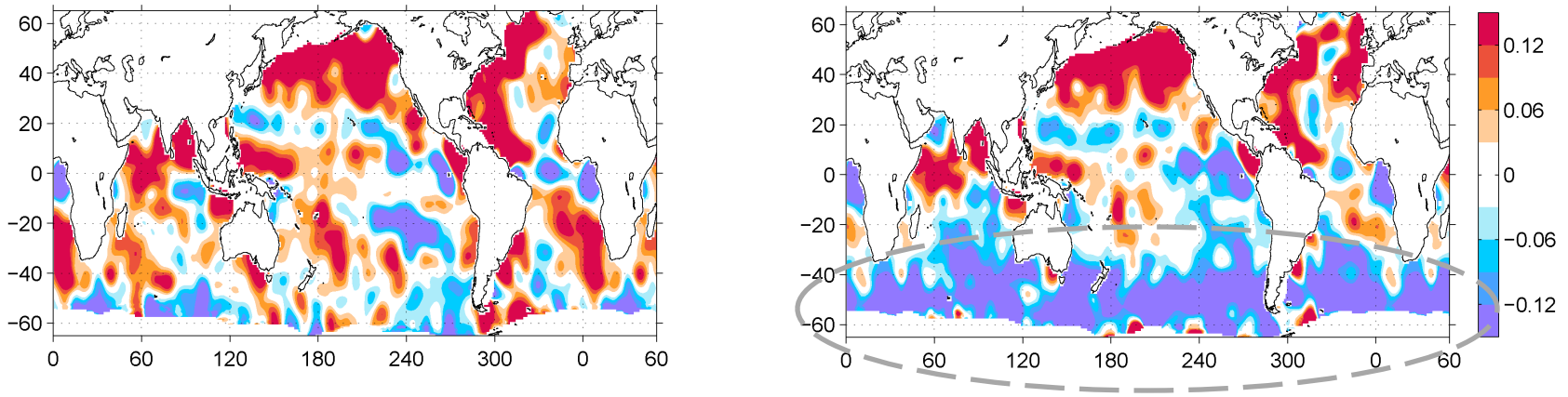
Bias maps are computed from monthly fields using 6 x 6 degree boxes on a 3-degree grid.

Time-varying bias (example V4.0 for April and September 2013)

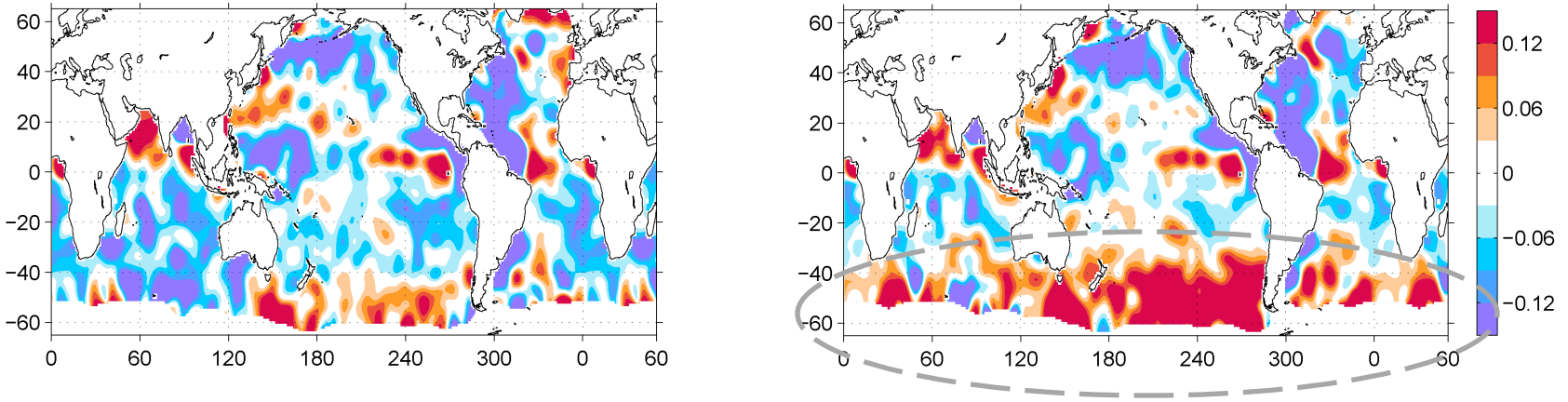
Ascending

Descending

April 2013



September 2013



Bias maps are computed from monthly fields using 6 x 6 degree boxes on a 3-degree grid.

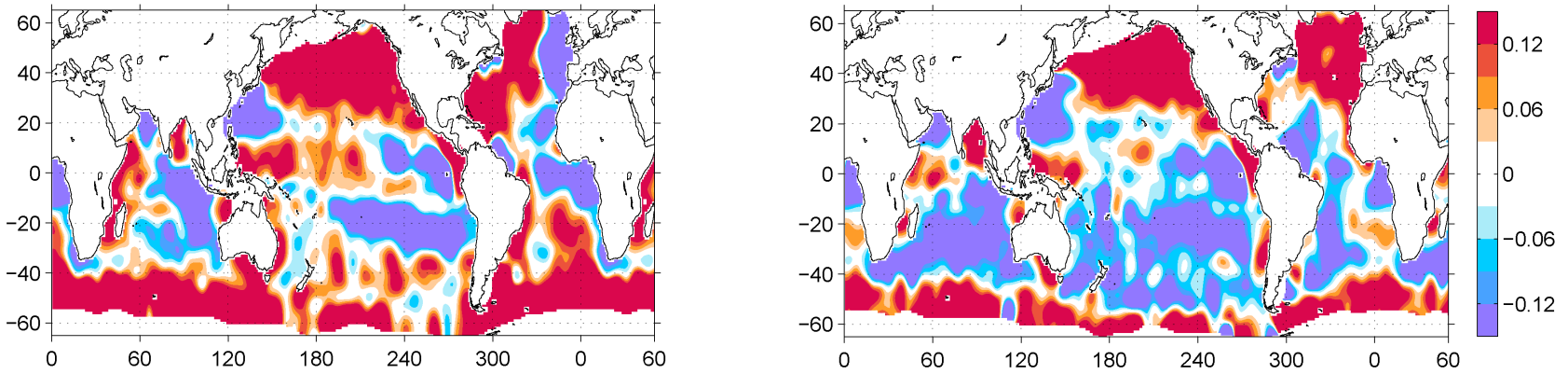
Total bias (example V4.0 for April and September 2013)

Static + time-varying

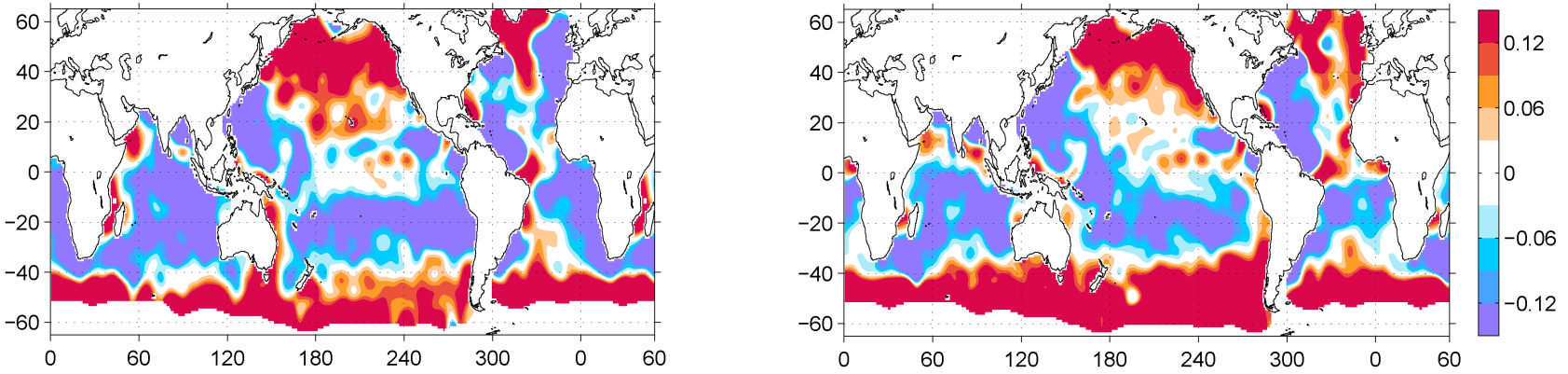
Ascending

Descending

April 2013



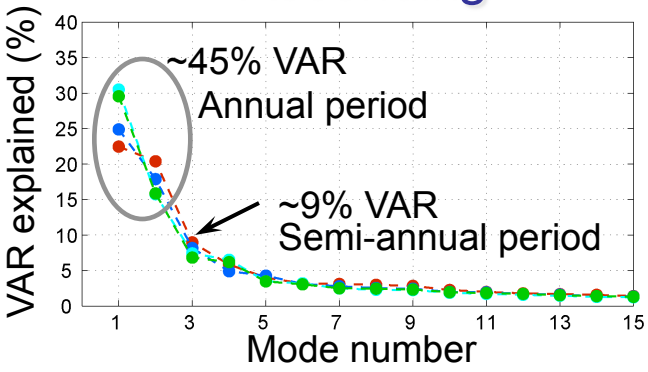
September 2013



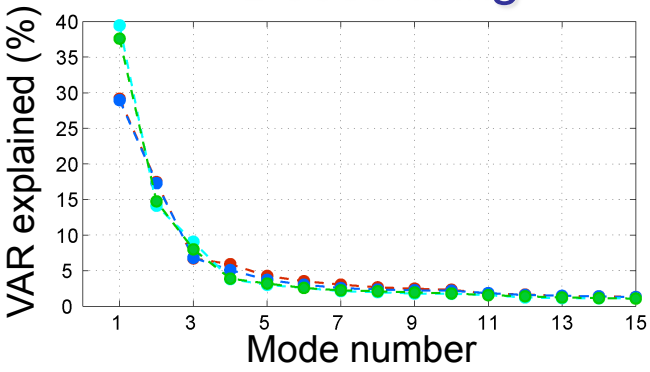
Bias maps are computed from monthly fields using 6 x 6 degree boxes on a 3-degree grid.

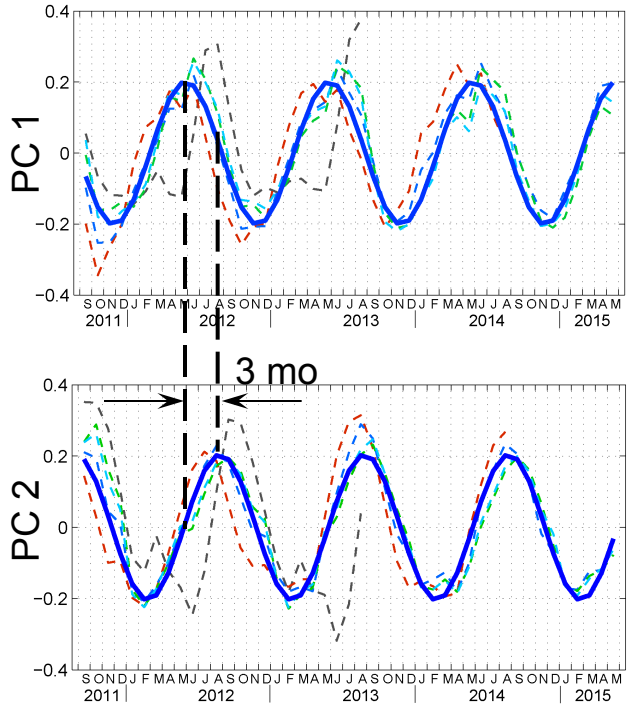
EOF decomposition of time-varying bias

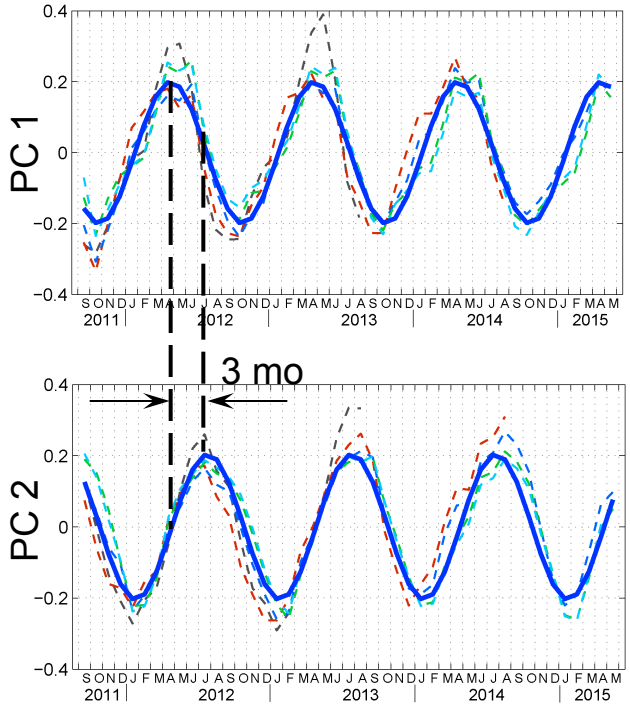
Ascending



Descending

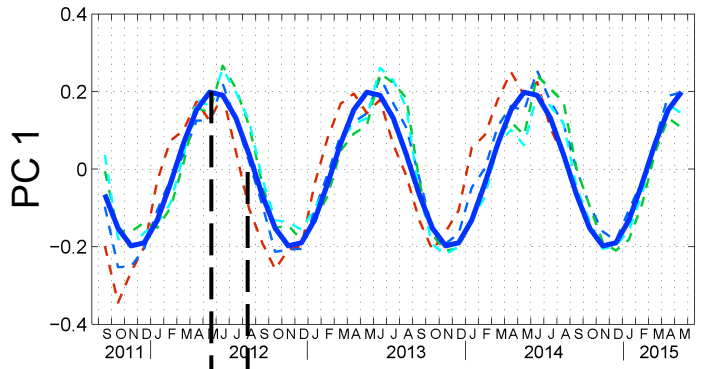


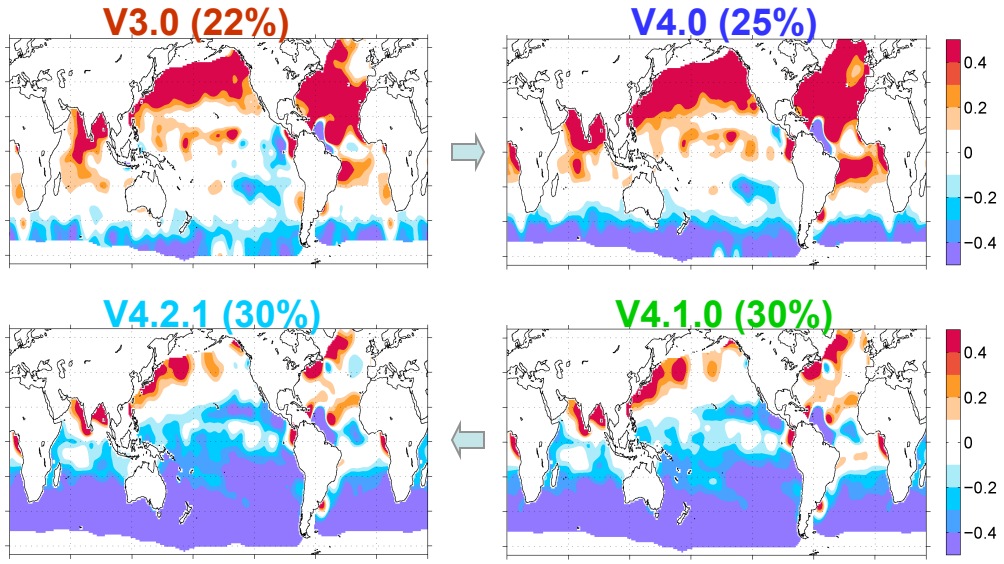


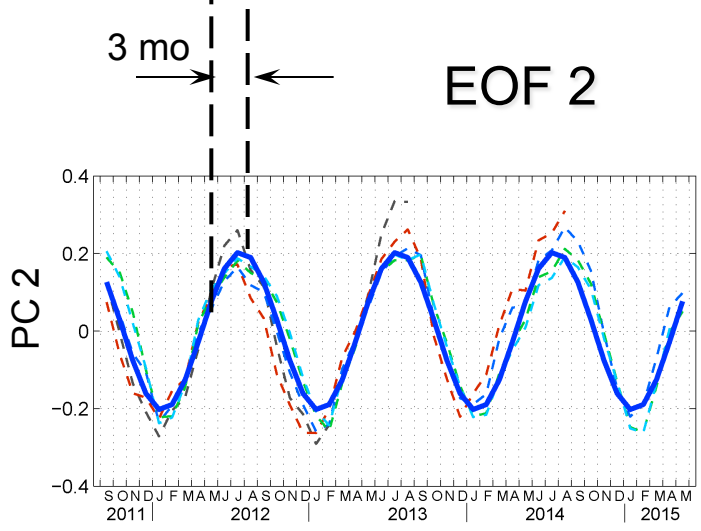


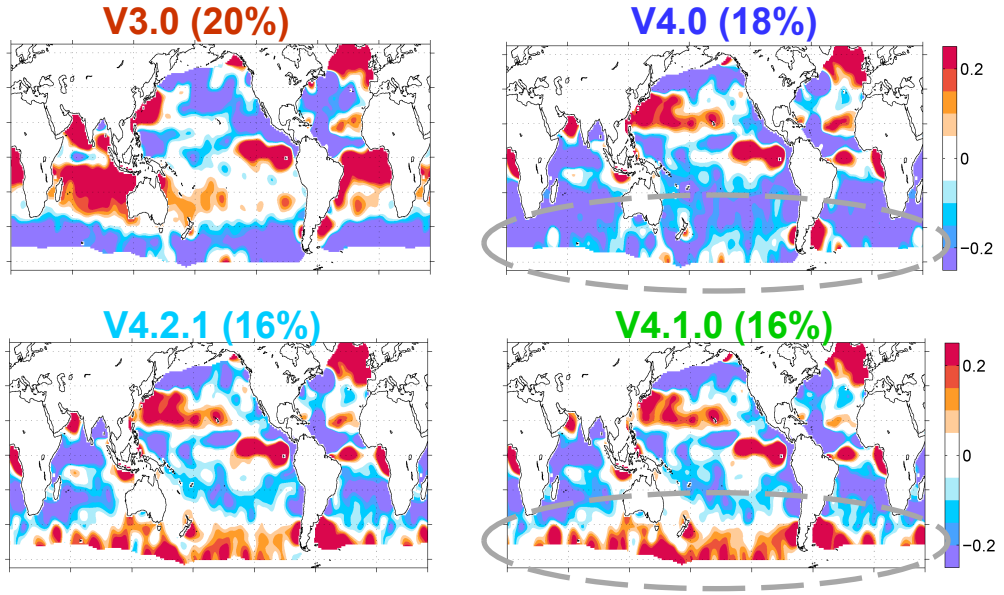
V2.0
V3.0
V4.0
V4.1.0
V4.2.1

Annual cycle in the bias fields (ascending)

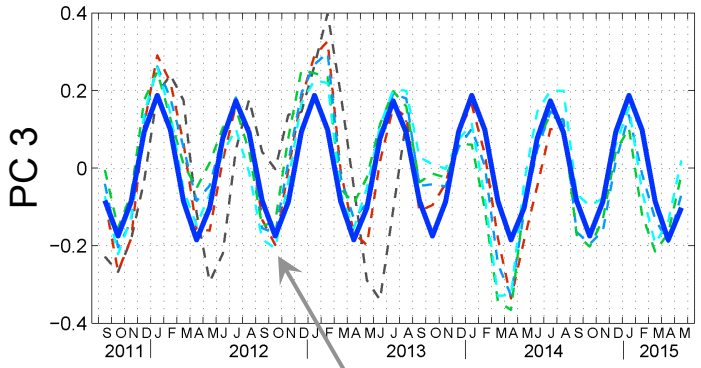


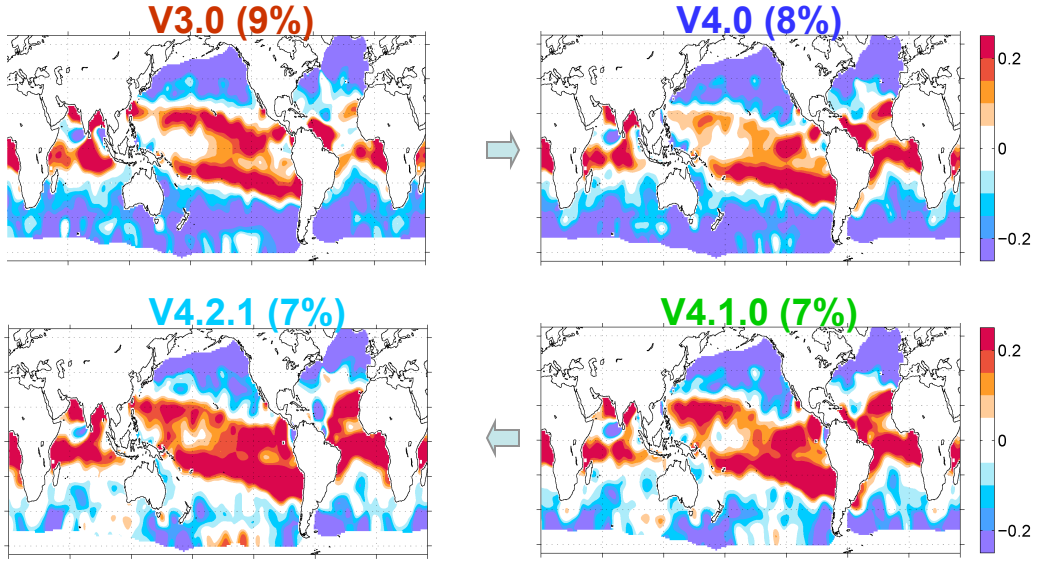


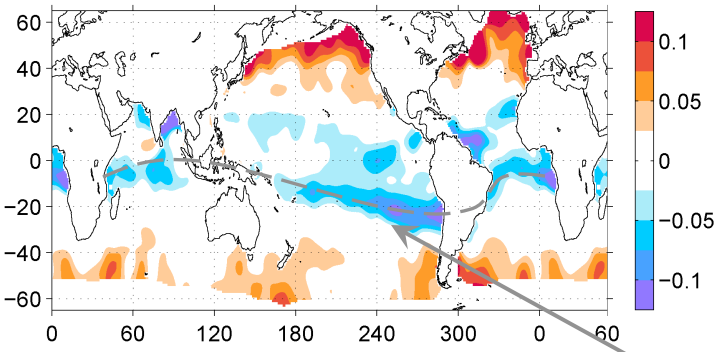


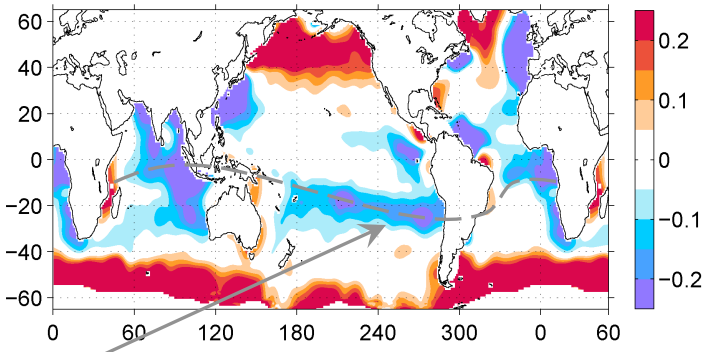


Semi-annual cycle in the bias fields (ascending)



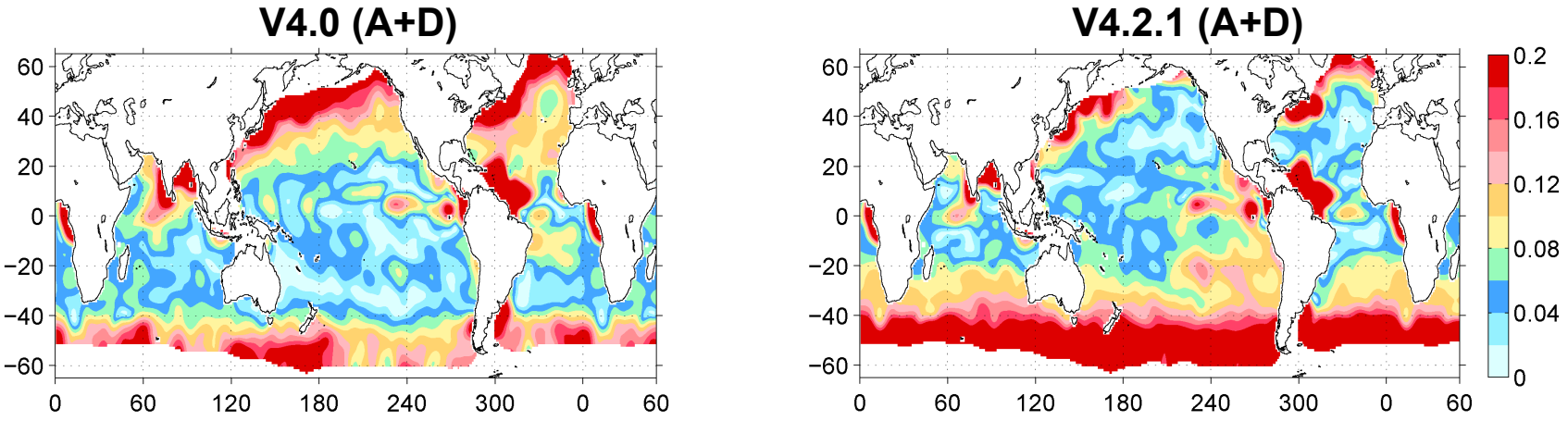




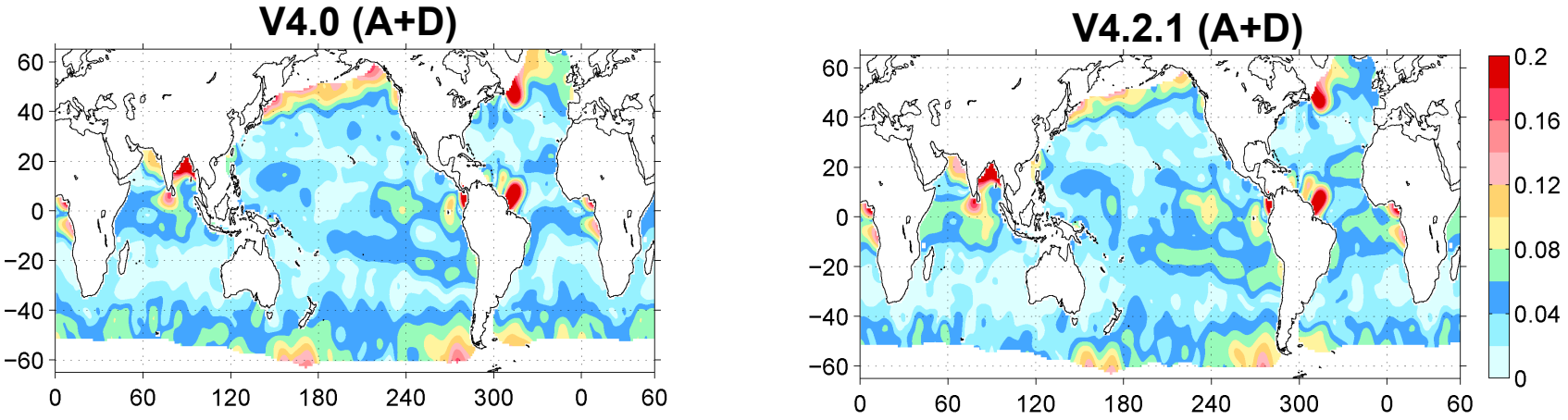


The same cause?

Amplitude of the annual cycle in the bias field



Amplitude of the semi-annual cycle in the bias field



Amplitudes of the annual and semiannual cycles in the bias are determined by harmonic analysis of the bias fields

$$Bias(x,y,t) = \boxed{A_{12}(x,y)}\cos(\omega_{12}t + \varphi_{12}(x,y)) + \boxed{A_6(x,y)}\cos(\omega_6 t + \varphi_6(x,y))$$

Comments

Static biases persist; no apparent reduction in V4+

Time-varying biases persist; no apparent reduction in V3+. The time varying biases consist of primarily annual (~45% of variance) and semi-annual (~8% of variance signals).

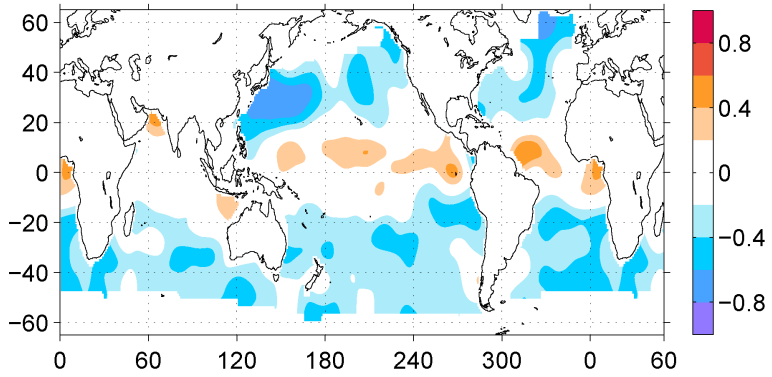
The amplitude of the spurious annual (semi-annual) signal can be a significant error compared to the Argo-derived annual (semi-annual) cycle regionally; thus, the biases need to be characterized and quantified (e.g., spatial maps of amplitude and phase) for science and applications users.

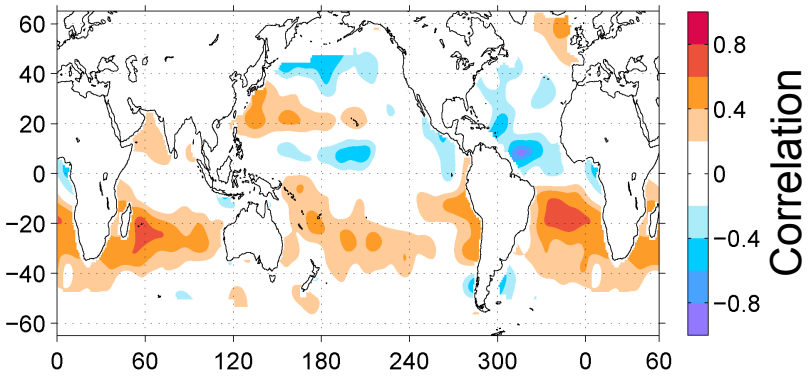
Correlations between SSS biases and geophysical parameters

Bias vs rad_hhh

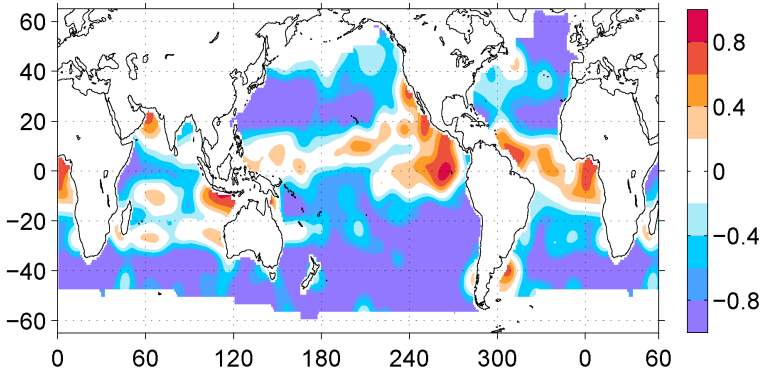
Bias vs anc_surface_temp

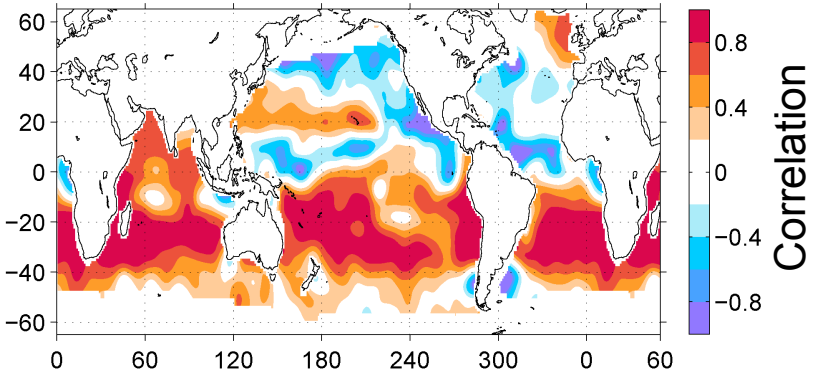
Total fields





Composed of EOF1+ EOF2 (annual cycle)





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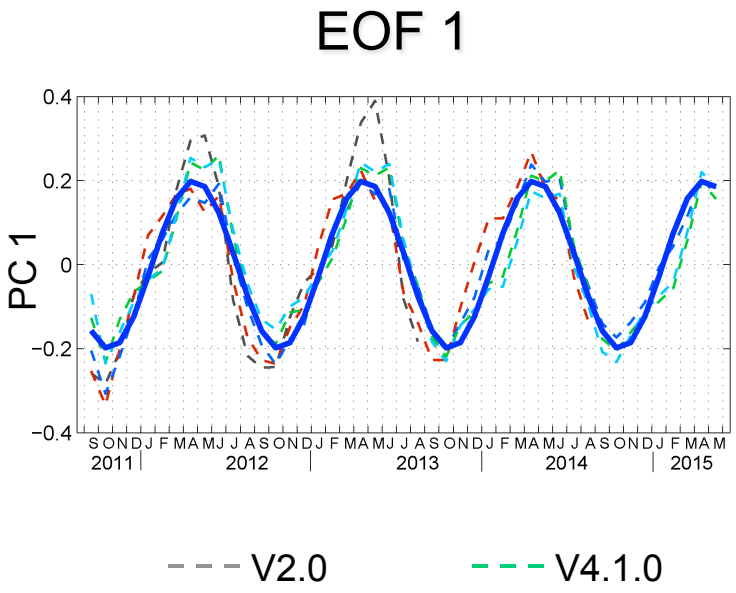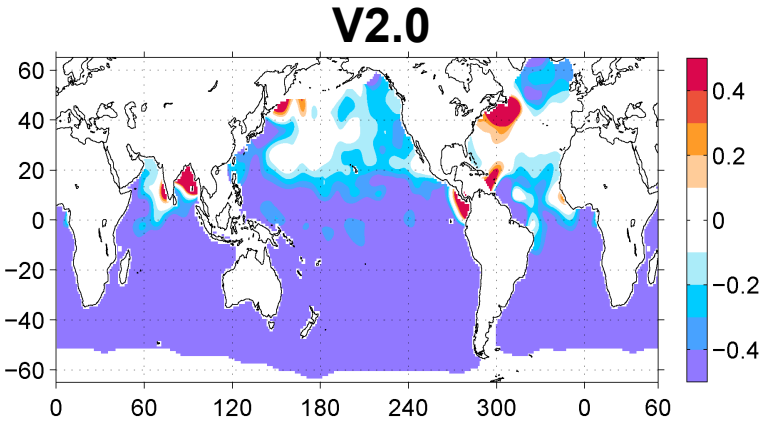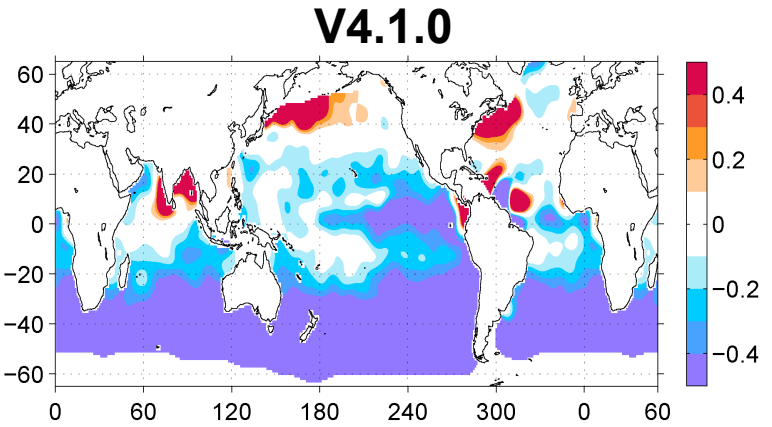
Descending