

Controls of mean state

Jan Harlaß, Mojib Latif, Hui Ding

GEOMAR

GA PREFACE, Casablanca
29th Oct 2014



PART I

SST bias

Equatorial SST

SST variability

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Part I

- ▶ Impact of enhanced vertical and/or horizontal resolution on model systematic errors
- ▶ WP 6.3, 7.1

Part II

- ▶ Impact of reducing the SST bias on the skill of hindcasts in the Equatorial Atlantic
- ▶ WP 7.2

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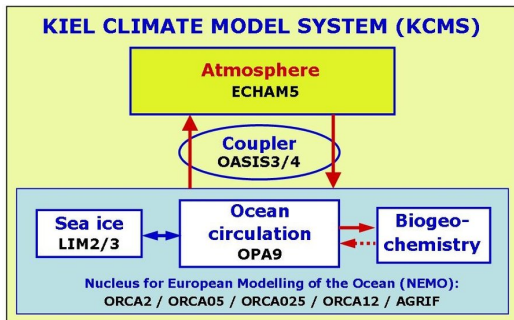
Impact of enhanced vertical and/or horizontal resolution on model systematic errors

Fully coupled Kiel Climate Model (KCM)

ECHAM5.4 - ORCA2

T42 (2.8°) - L31 / L62

T159 (0.75°) - L31 / L62



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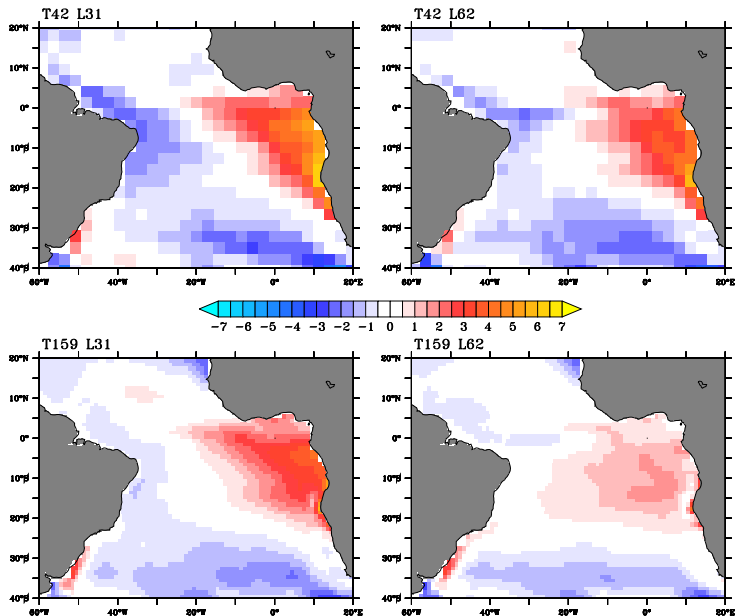
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SST bias w.r.t. HadISST [JAS]

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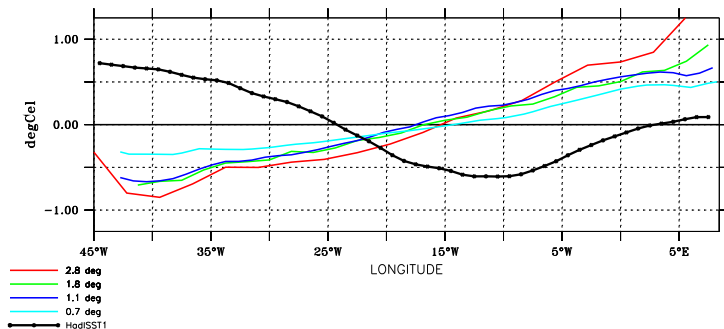
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SST gradient along equator, 5°S-5°N

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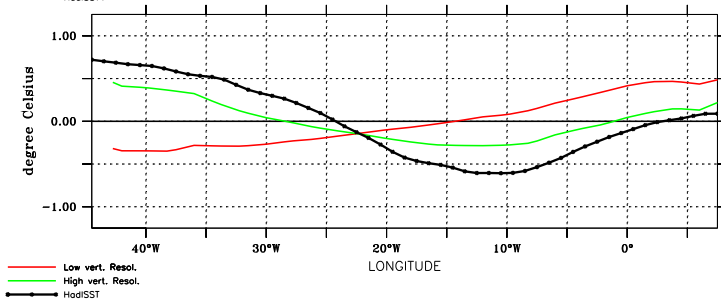
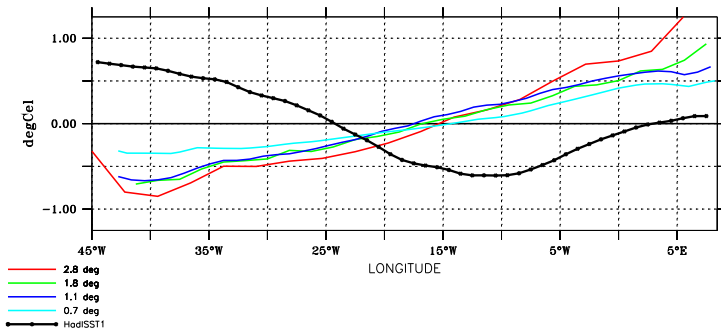
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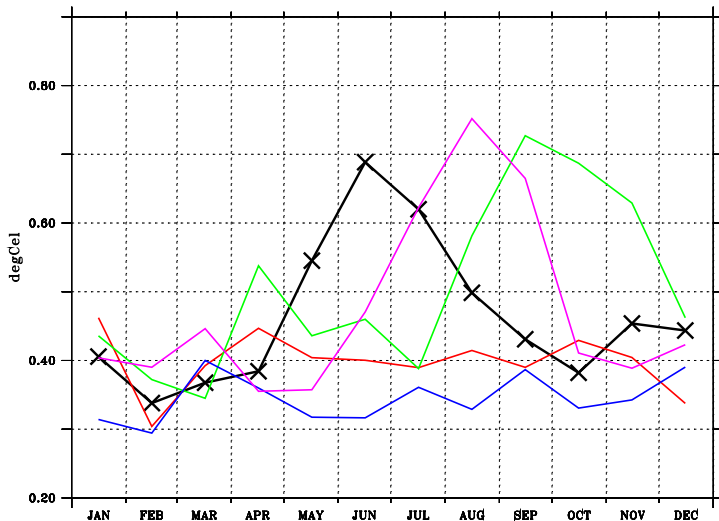
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STD SST ATL3

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— T42 L31
— T42 L62
— T159 L31
— T159 L62

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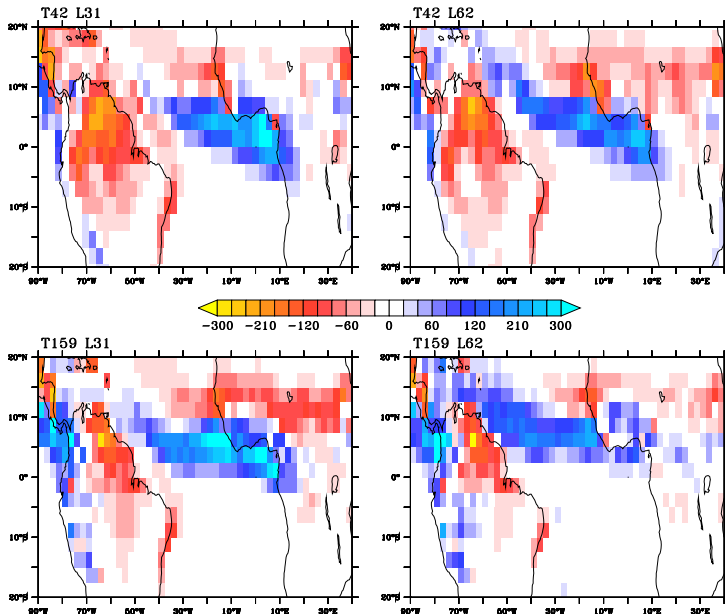
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Precipitation bias w.r.t. GPCP [JAS]

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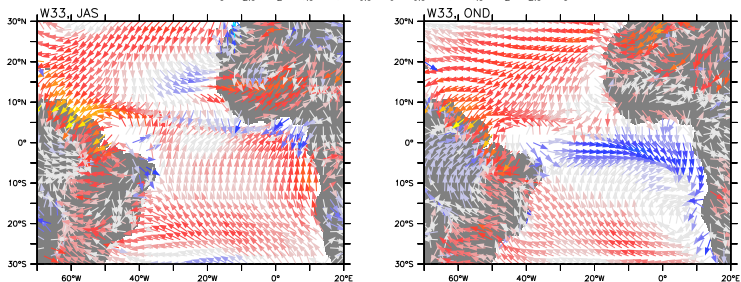
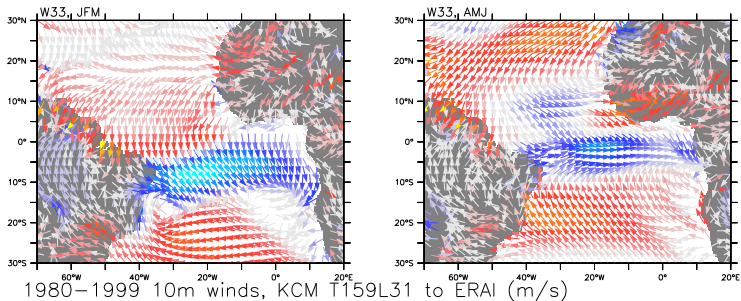
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10m wind bias, T159 L31

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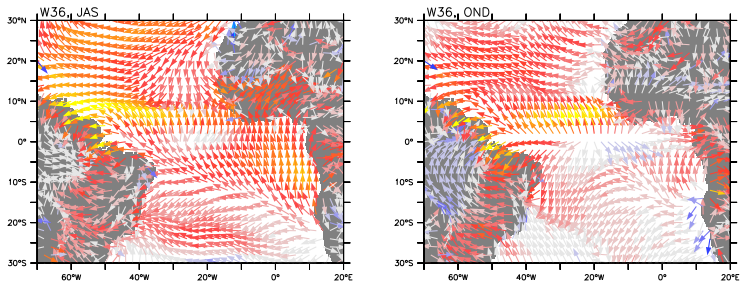
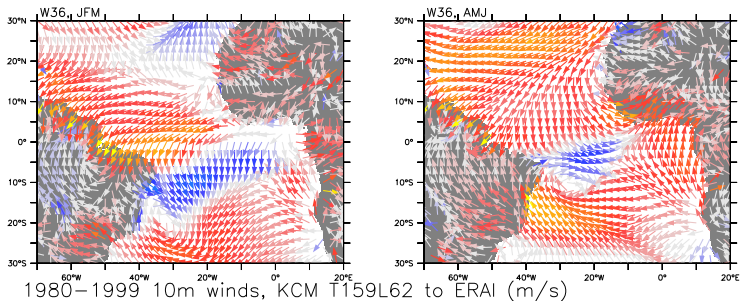
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10m wind bias, T159 L62

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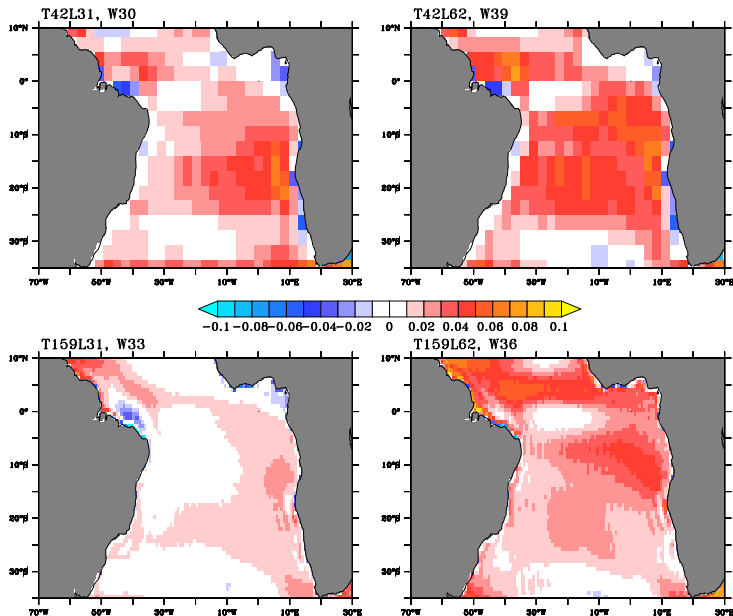
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Total wind stress bias w.r.t. ERA-Interim [JAS]

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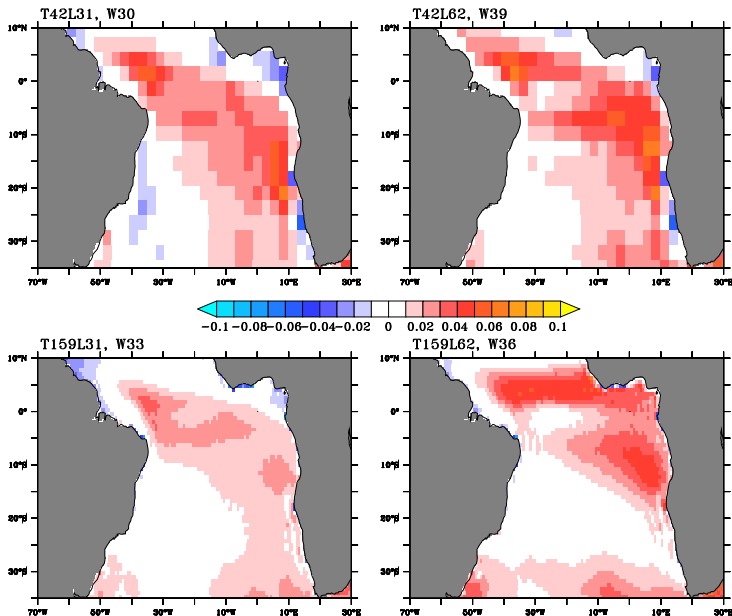
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Merid. wind stress bias w.r.t. ERA-Interim [JAS]

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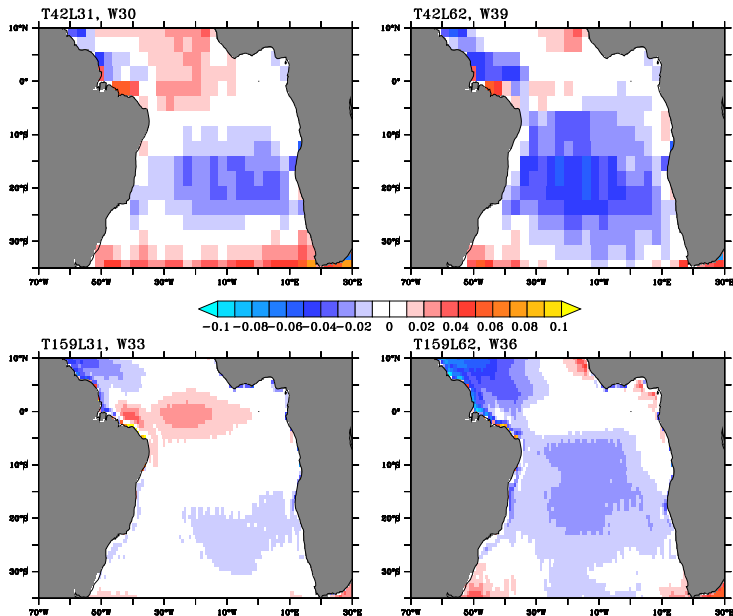
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Zonal wind stress bias w.r.t. ERA-Interim [JAS]

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Impact of reducing the SST bias on the skill of hindcasts in the Equatorial Atlantic

- ▶ KCM, T31 L19, ORCA2
- ▶ force with observed wind stress anomalies (ERA-40)
- ▶ apply heat flux correction for SST and Salinity
- ▶ correction method does not depend on mean state, but varies spatially and temporally
- ▶ 6 ensemble members control run
- ▶ 7 ensemble members heat flux correction

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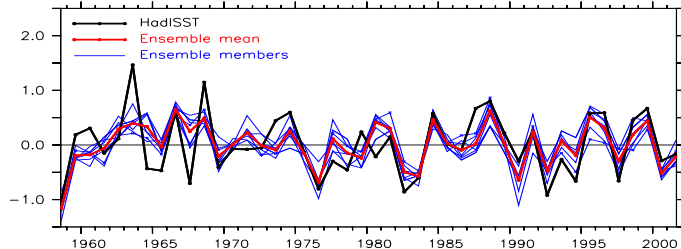
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SST anomalies w.r.t. HadISST, ATL3

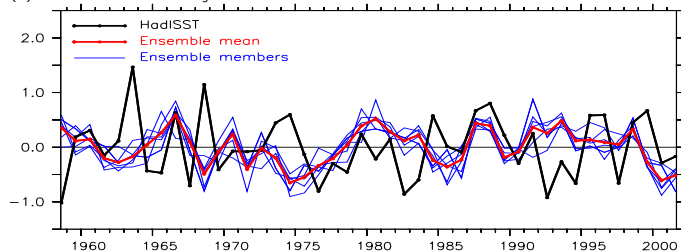
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(a) SST anomalies averaged over Atl3 for HadISST and model with heat flux correction



(b) SST anomalies averaged over Atl3 for HadISST and model without heat flux correction



Correlation model SST - HadISST in JJA:
without (-0.1) and with heat flux correction (0.71)

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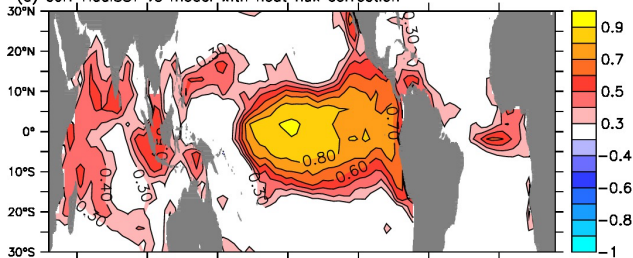
Correlation pattern

Model SST and HadISST

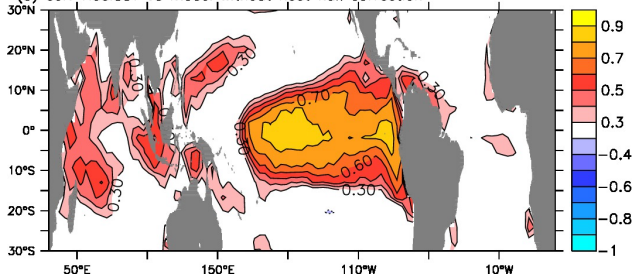
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(a) corr HadISST Vs model with heat flux correction



(b) corr HadISST Vs model without heat flux correction



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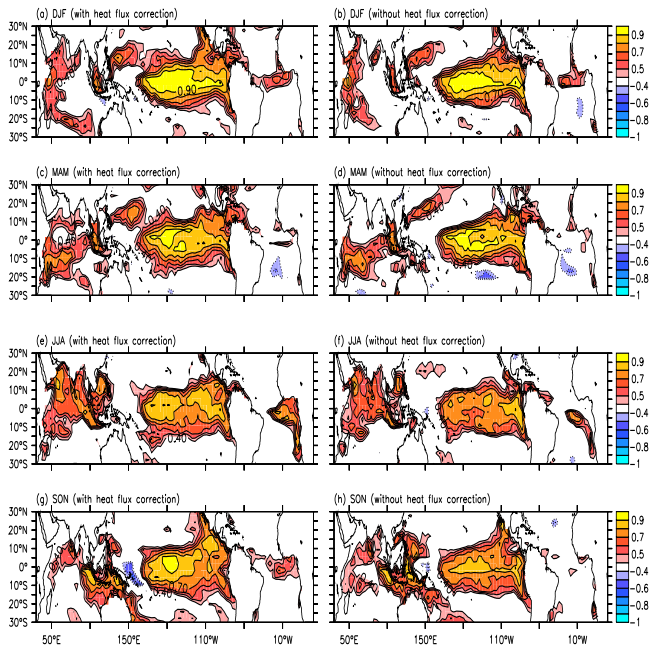
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Seasonal SST Correlation

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- ▶ Increase of horizontal resolution reduces magnitude of common biases
- ▶ Spatial pattern remain
- ▶ Increase of vertical resolution improves variability

PART II

- ▶ Skill in hindcasting equatorial Atlantic SST anomalies significantly improves when SST bias is reduced

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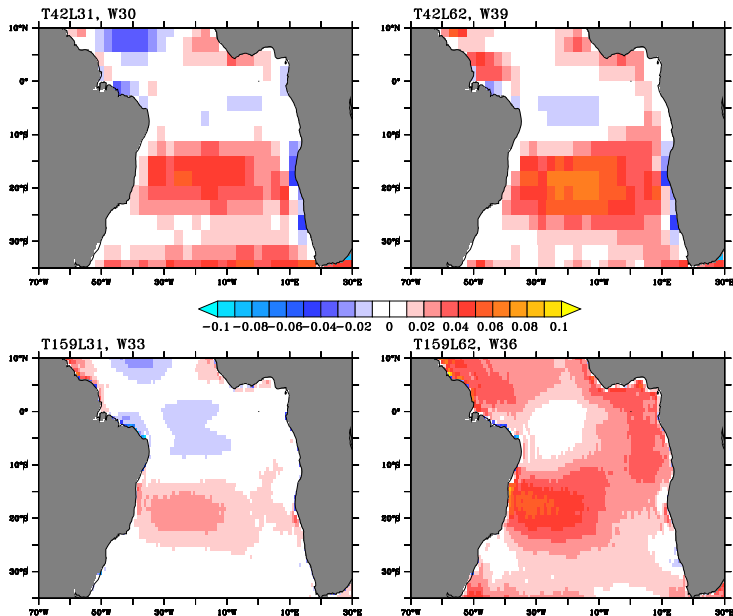
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Total wind stress bias w.r.t. ERA-Interim [AMJ]

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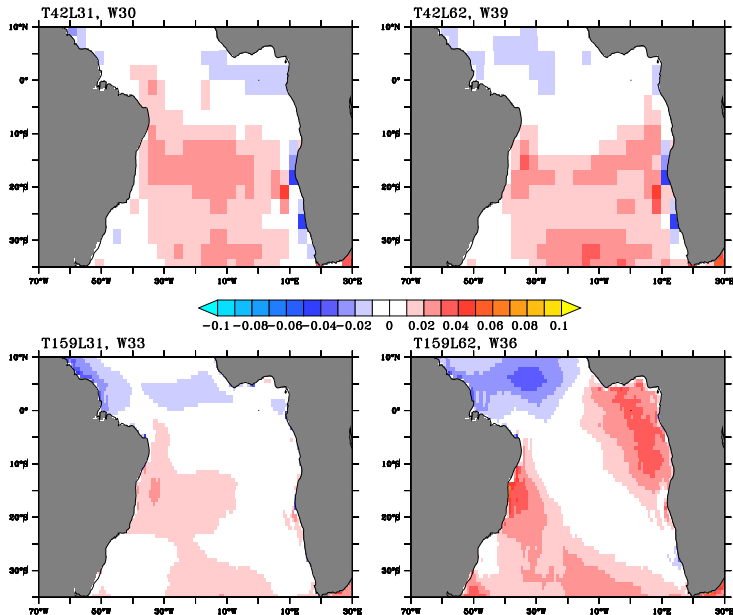
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V-wind stress bias w.r.t. ERA-Interim [AMJ]

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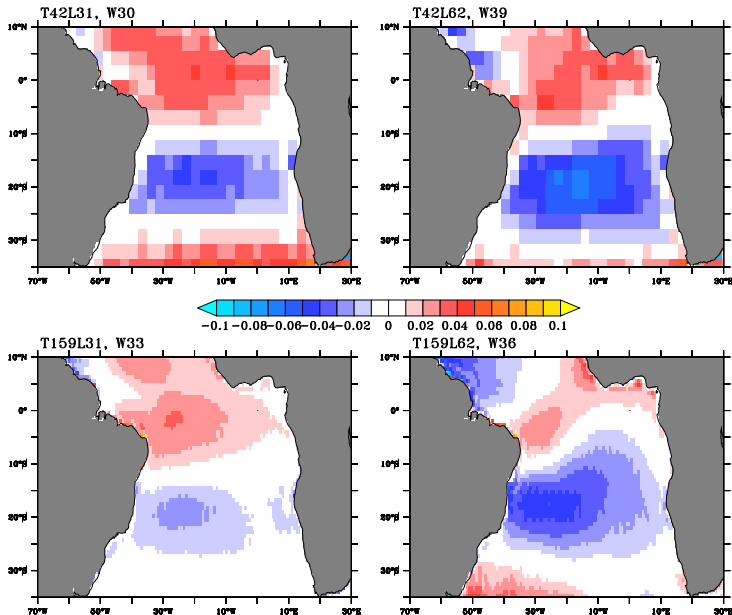
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U-wind stress bias w.r.t. ERA-Interim [AMJ]

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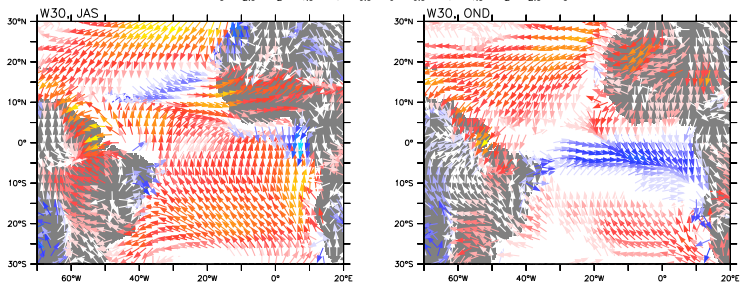
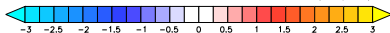
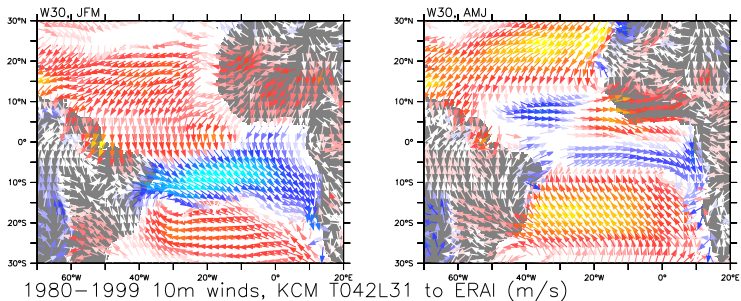
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10m wind bias, T42 L31

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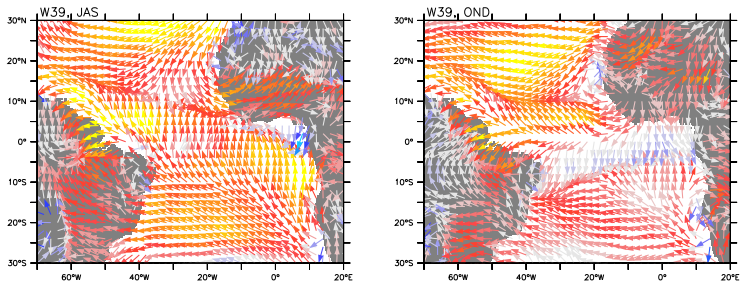
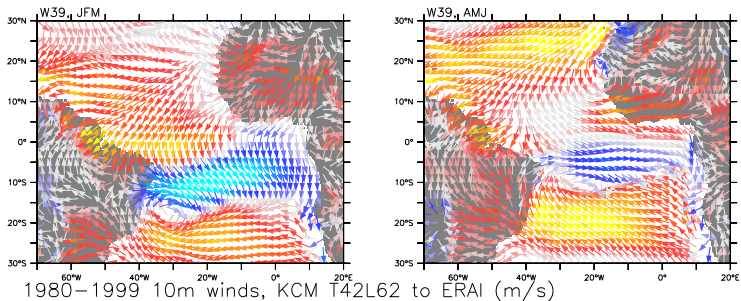
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10m wind bias, T42 L62

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