

Multidecadal Modulations of Tropical Atlantic impact on ENSO

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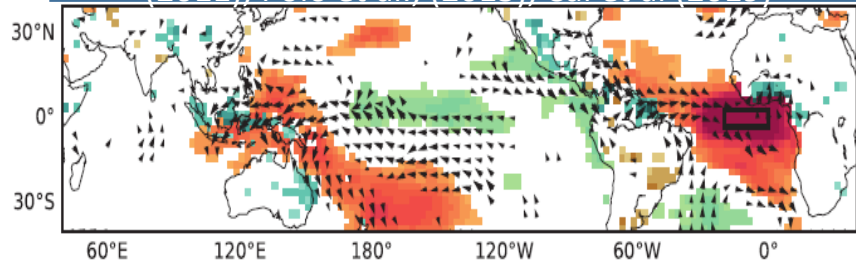
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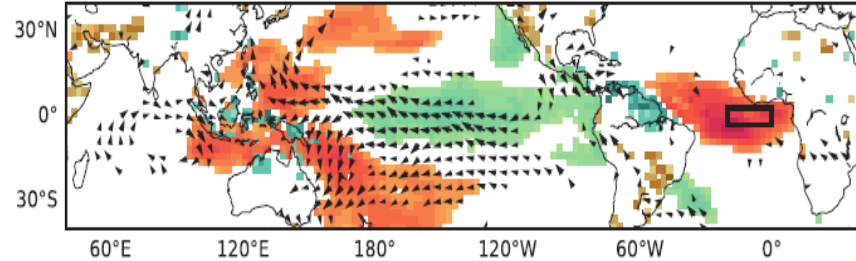
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Atlantic Niño impact on ENSO.

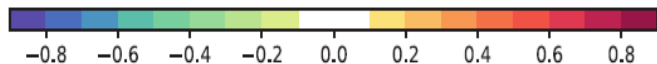
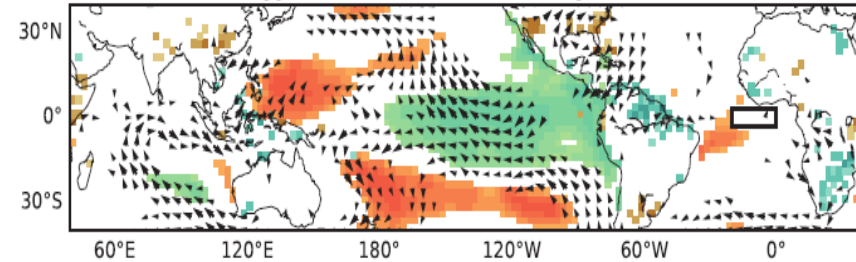
Rodríguez-Fonseca et al (2009, 2020), Ding et al (2011), Polo et al., (2015), Cai et al (2019)



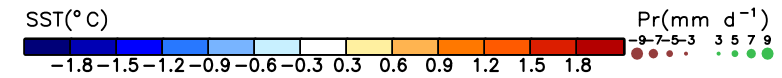
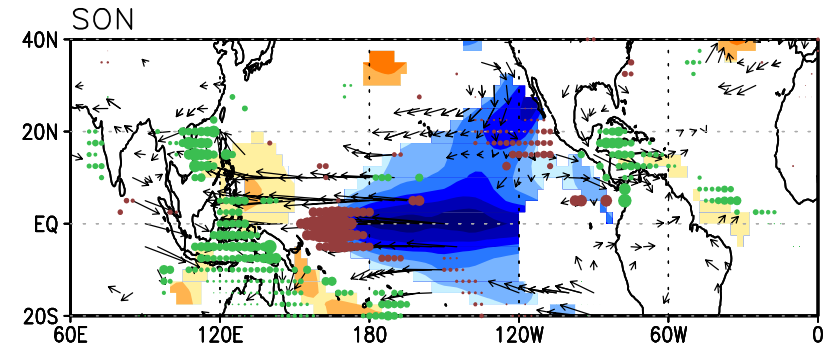
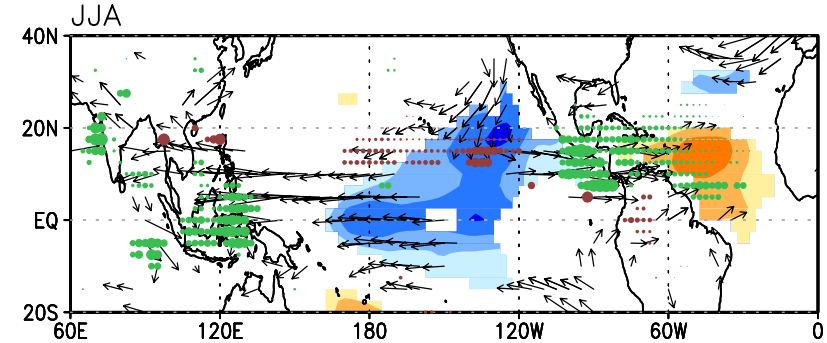
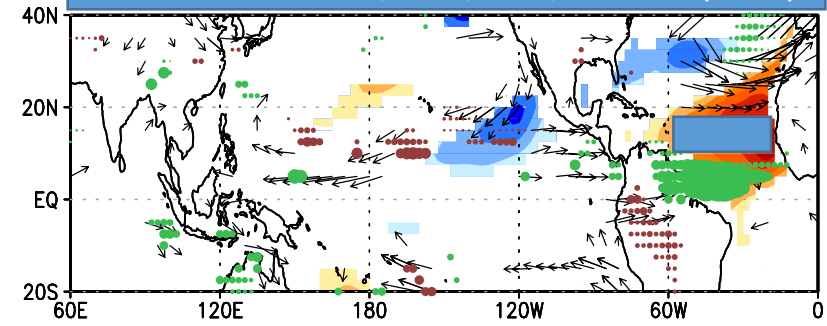
b) $r(\text{Atl3-SST JJA, SST-Wind850-Pt SON})$ 1968-2016 NCEP

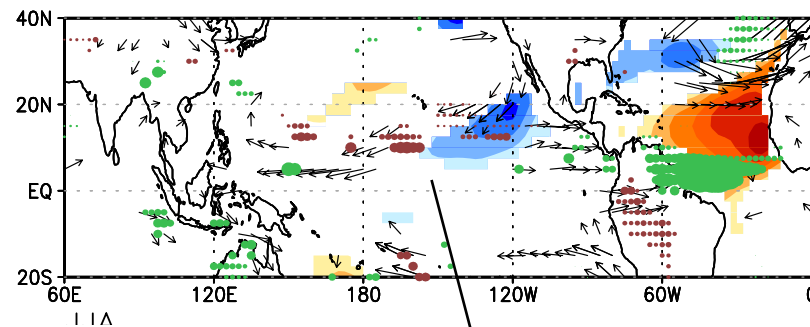
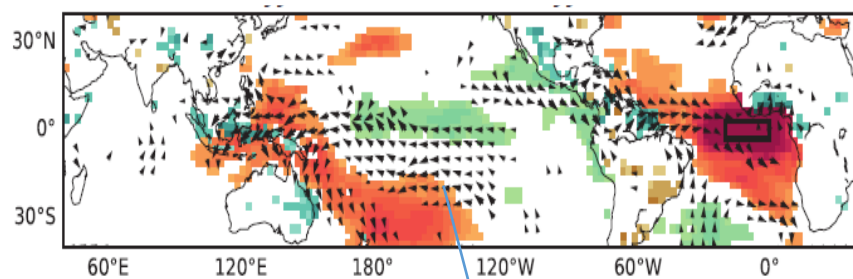


c) $r(\text{Atl3-SST JJA, SST-Wind850-Pt DJF})$ 1968-2016 NCEP

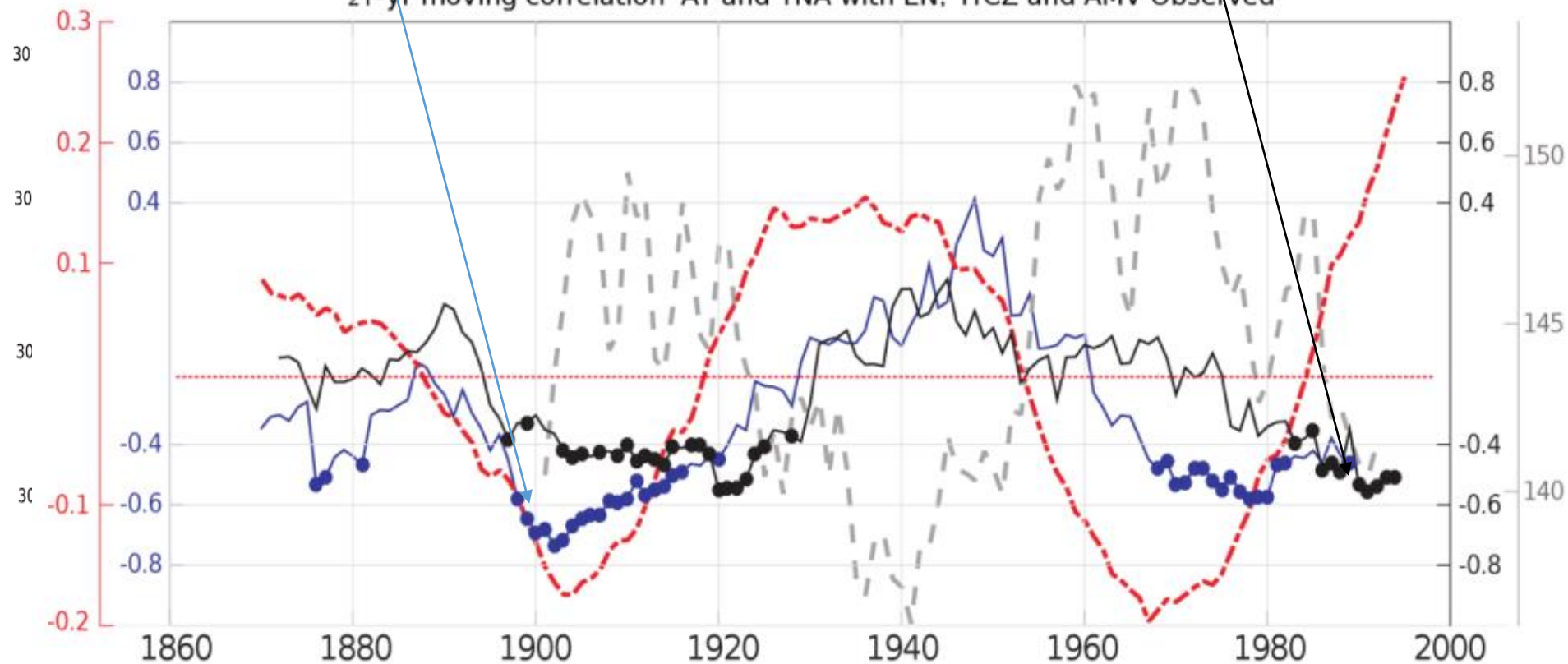


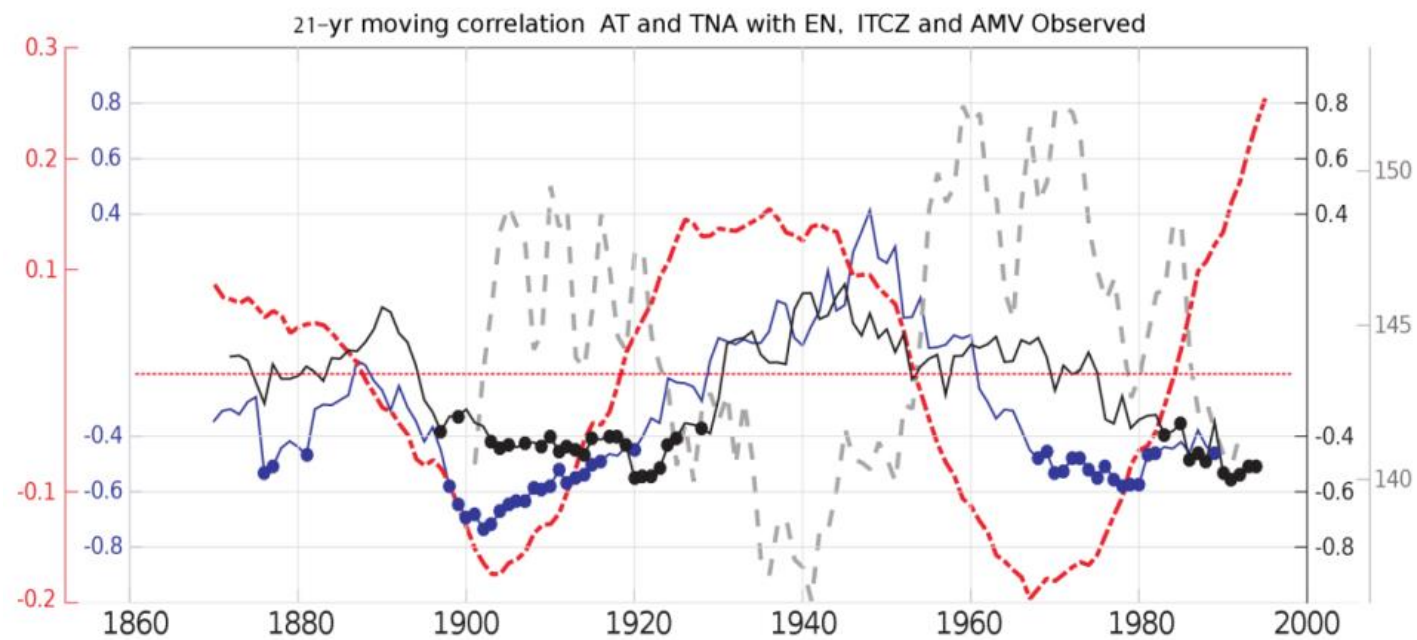
Tropical North Atlantic impact on ENSO. Ham et al., 2013, 2014; Cai et al (2019)





21-yr moving correlation AT and TNA with EN, ITCZ and AMV Observed





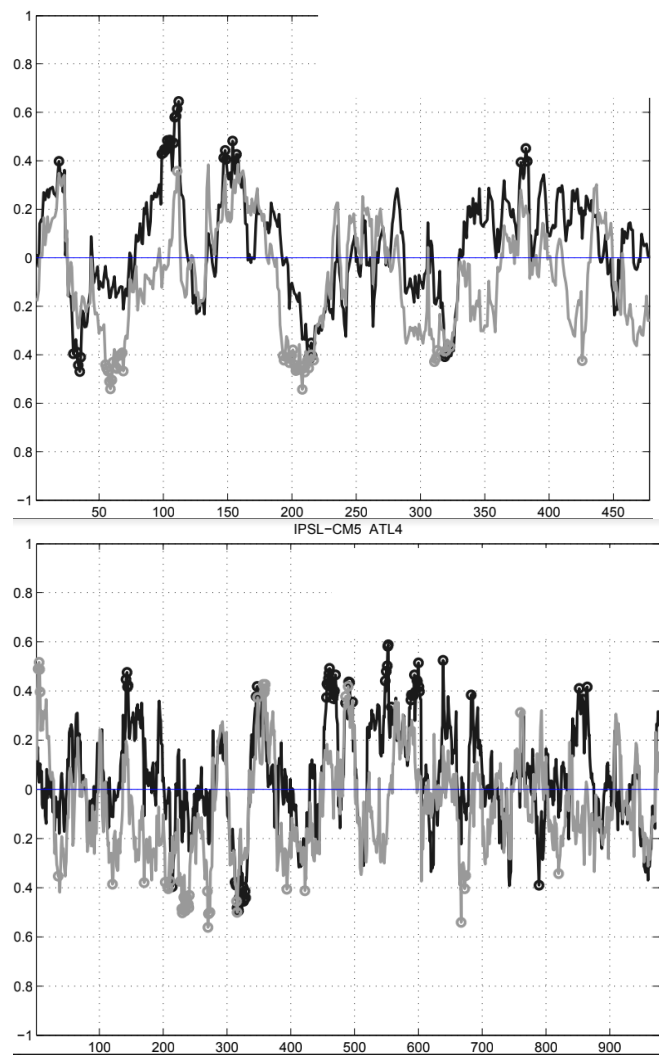
From **Observations** and sensitivity experiments it has been shown that:

- Atlantic Niño seems to impact ENSO :
 - AMO negative Martín del Rey et al (2014,2015)
 - ...**but not enough observations** (only 2 periods with AMO neg in the record!!)
 - Equatorial ITCZ: Losada et al (2022)
- TNA impact ENSO in AMO pos
 - Wang et al (2017) corroborates this **but just valid for one observational period!!**

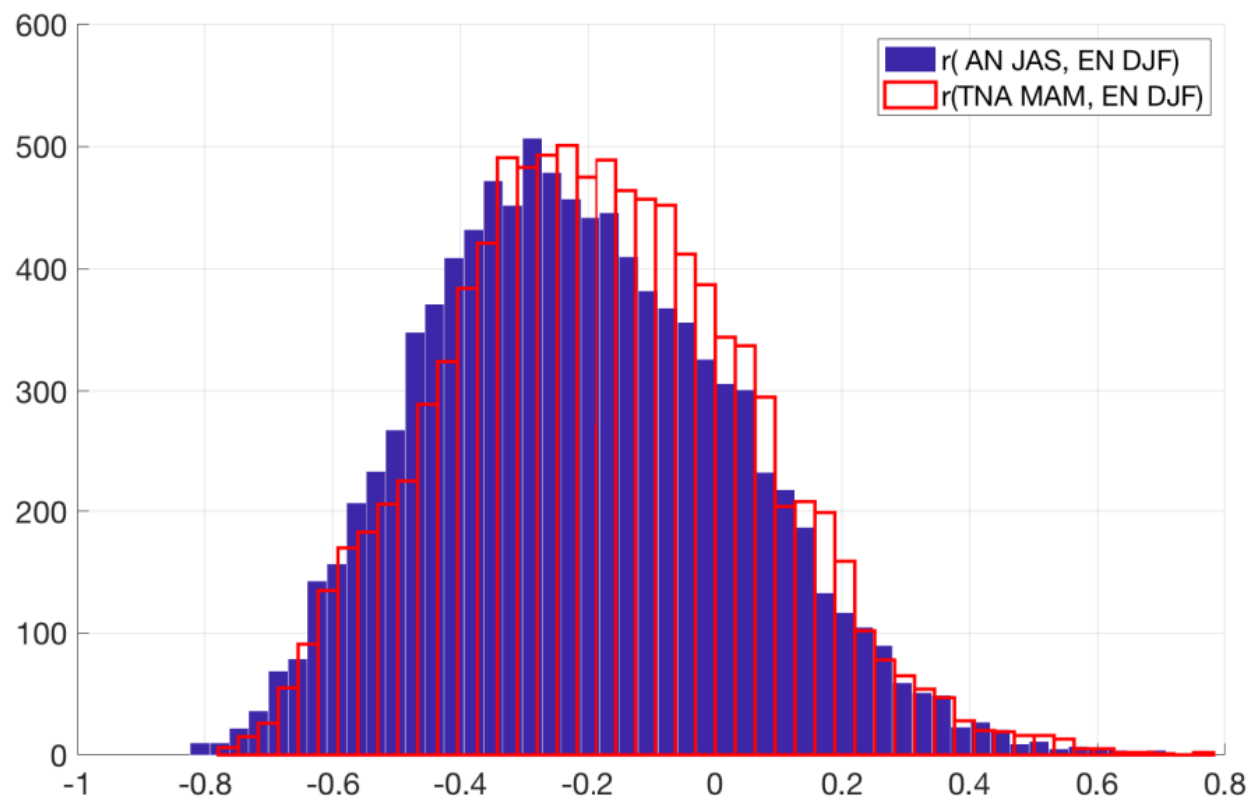
We need longer time series to assess the multidecadal modulation

So...we had an idea!!!

Use the CMIP preindustrial model simulations as a benchmark for testing interbasin teleconnections



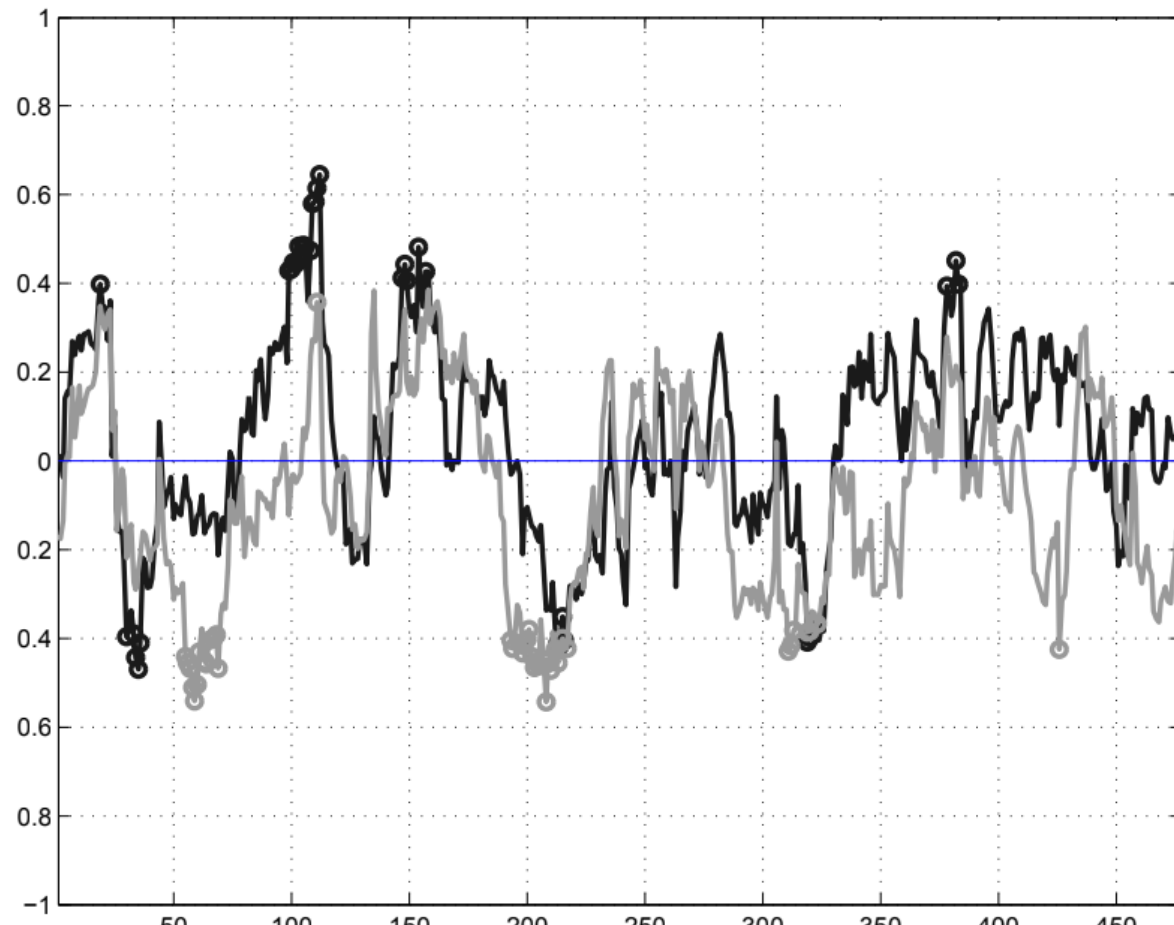
PDF of correlation scores for all CMIP5 models



Do these curves mean something?

What is the background conditions favouring Atlantic-Pacific TBI?

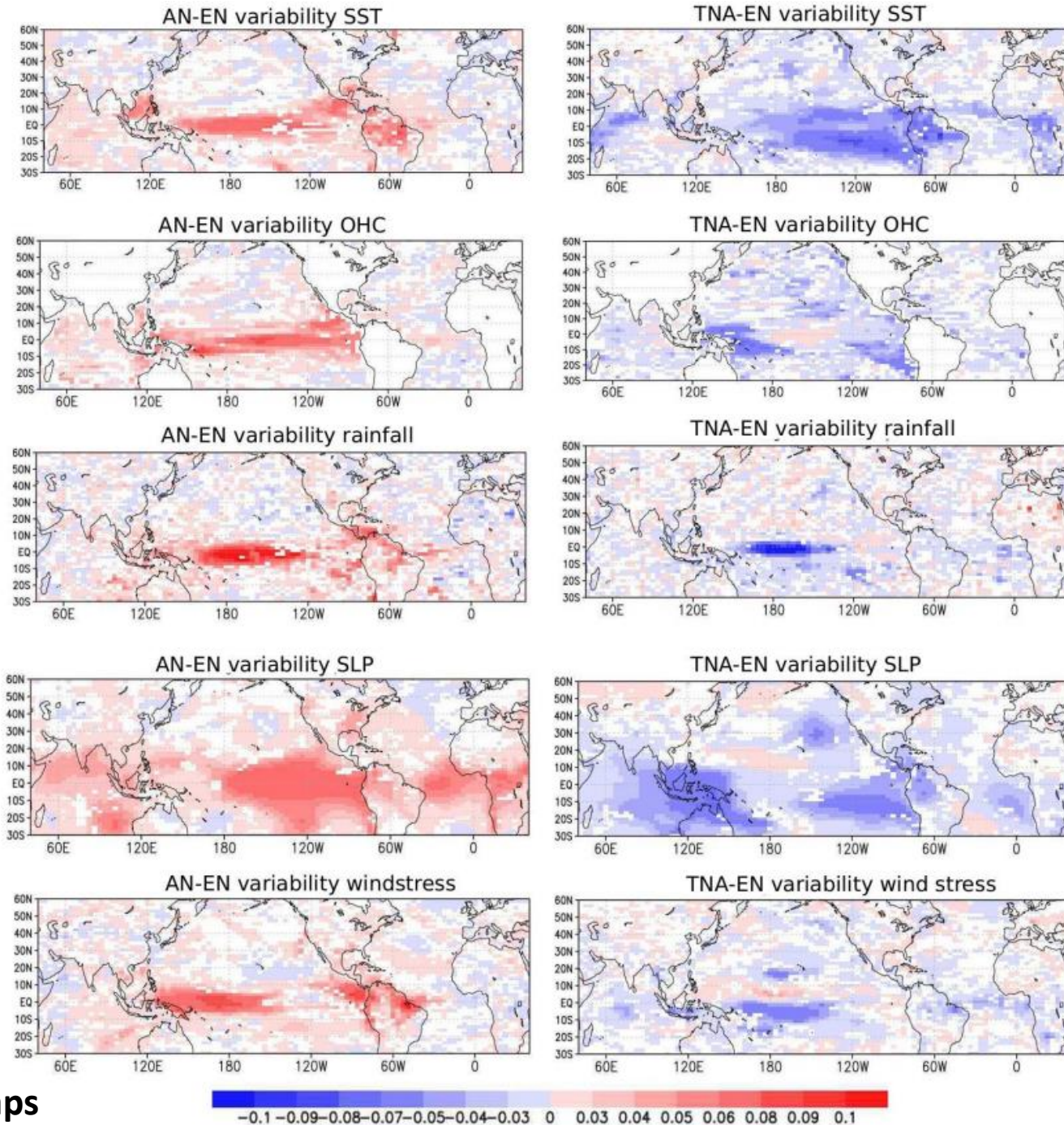
Regression and correlation maps of these curves could give us an answer.



Regarding Variability

Significant **increase** of the **Equatorial Pacific mean state variability** in the periods in which the **Atlantic Niño leads ENSO**

Significant **decrease** of the **Pacific mean state variability** in the periods in which the **TNA leads ENSO**



Multimodel ensemble of the regression maps

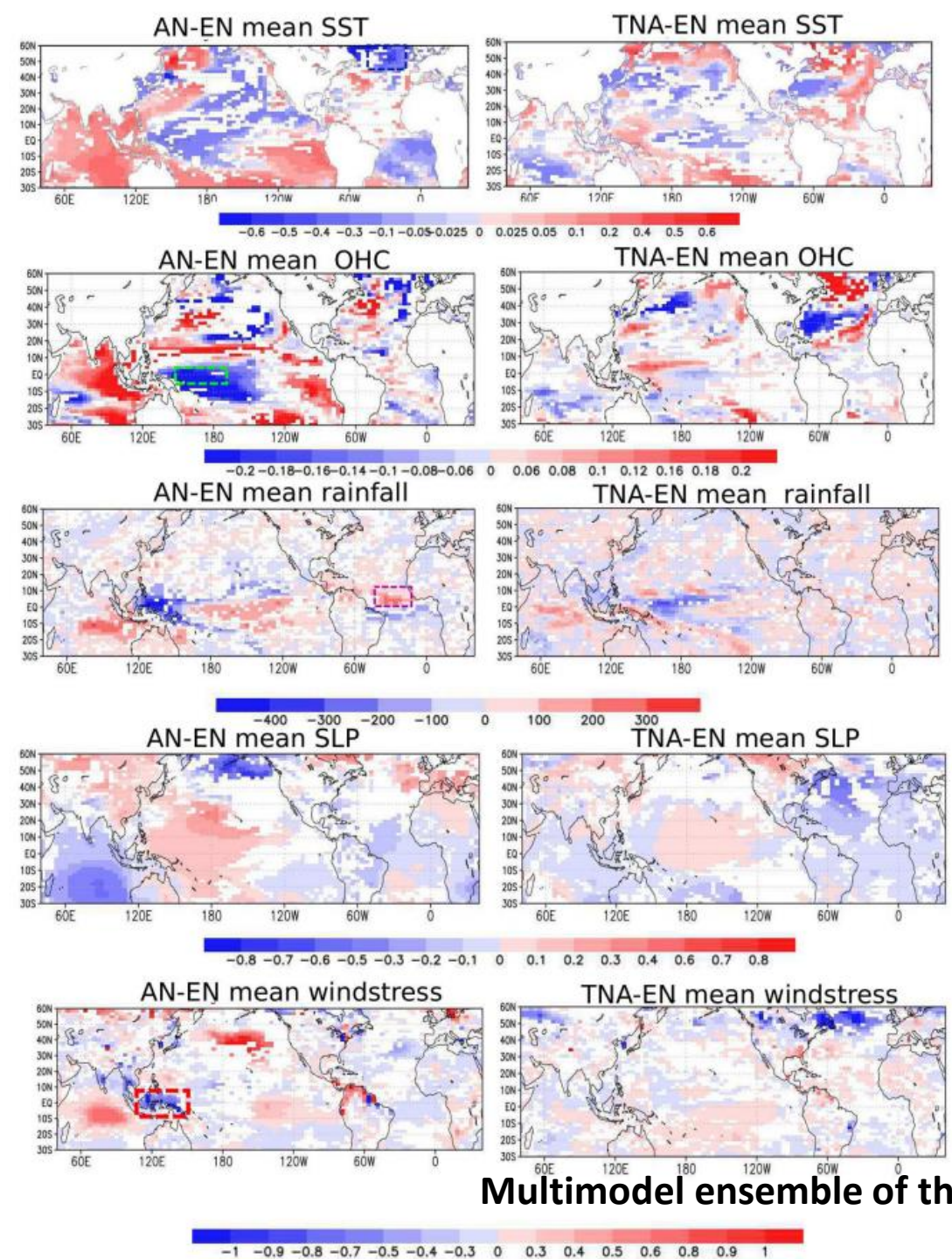
Regarding Mean State

Atlantic Niño Impact on ENSO:

Strong SST and rainfall gradient

shallower western Pacific thermocline

Stronger wind convergence in the Eastern Indian Ocean



TNA impact on ENSO:

Clear change in the North Atlantic Subtropical Gyre

In agreement with Wang et al (2017)

Multimodel ensemble of the regression maps

CONCLUSIONS

Tropical Atlantic-Pacific Interbasin connections (TNA-ENSO and Atlantic Niño-ENSO) are non stationary and only active during some particular decades

Results from a multimodel ensemble of CMIP5 PI-Control simulations show:

Atlantic Niño Impact on ENSO:

Regarding Variability :

Increase in Tropical Atmospheric and Oceanic interannual variability. Specially over the Pacific

Regarding Mean State:

Strong SST and rainfall gradient

shallower western Pacific and Indian thermocline

Stronger wind convergence in the Eastern Indian Ocean

TNA impact on ENSO:

Regarding Variability:

Decrease in Tropical Atmospheric and Oceanic interannual variability

Regarding Mean State:

Significant change in the North Atlantic Subtropical Gyre and AMV positive modulation.

In agreement with Wang et al (2017)