



Tropical Atlantic Coupled Modes of Variability

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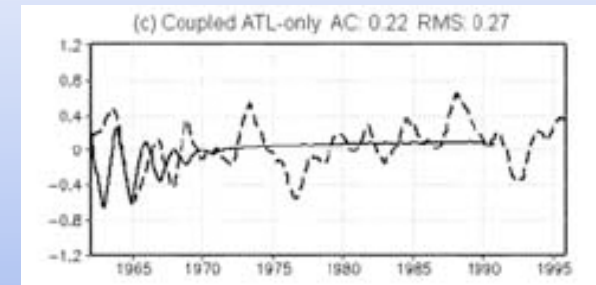




TAV in review

Damped Equatorial mode, e.g. Atlantic Niño:

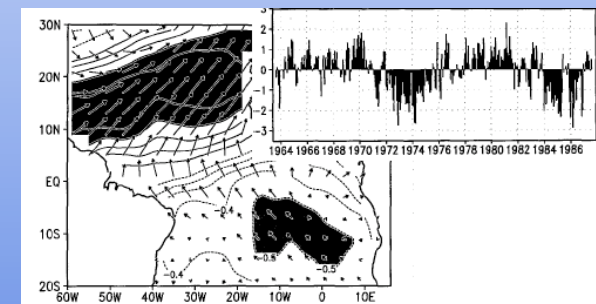
Zebiak (1993)
Chang et al (2000)
Nobre et al (2003)



(Nobre, Zebiak & Kirtman, 2003)

Thermally direct meridional mode, e.g. ITCZ:

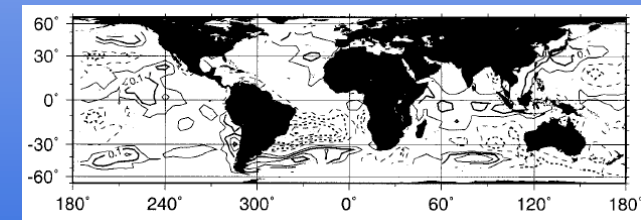
Moura and Shukla (1981)
Nobre and Shukla (1996)
Giannini et al (2001)



(Nobre and Shukla, 1996)

Thermally indirect, e.g. SACZ:

Robertson and Mechoso (2001)
Chaves and Nobre (2004)
De Almeida et al (2007)
Nobre et al (2011, in review)



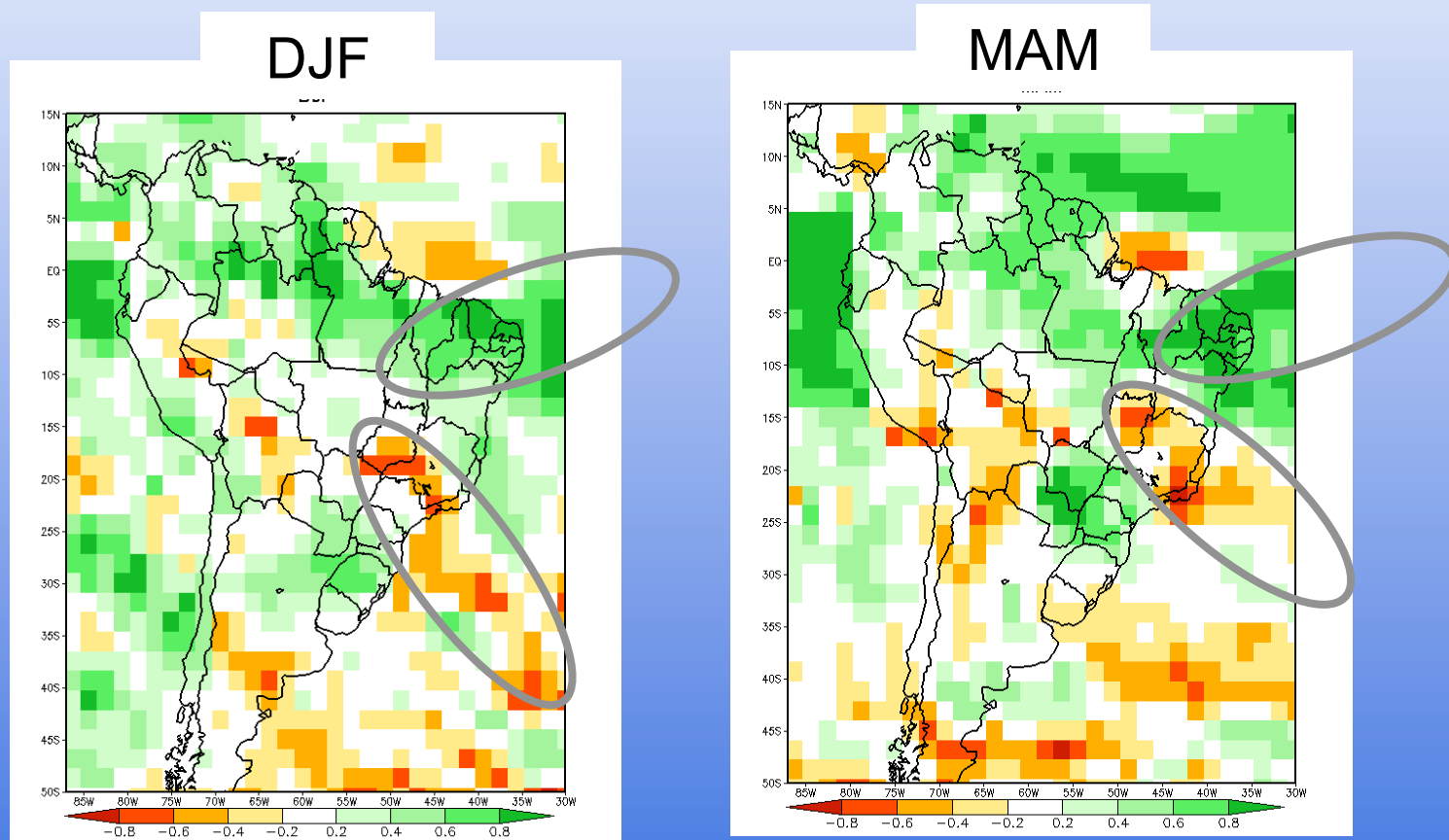
(Robertson and Mechoso, 2000)

Continental convection and Cupled O-A Model bias





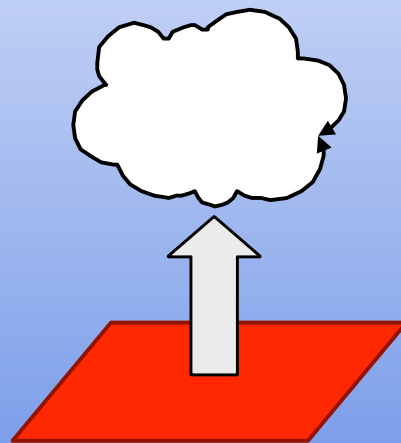
The SACZ 2-tier Quest



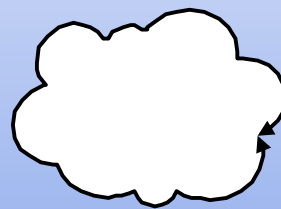
CPTEC AGCM, 50 years, 10 Member Ensemble, Kuo, T062L28, Obs SST

Marengo et al. (2002)

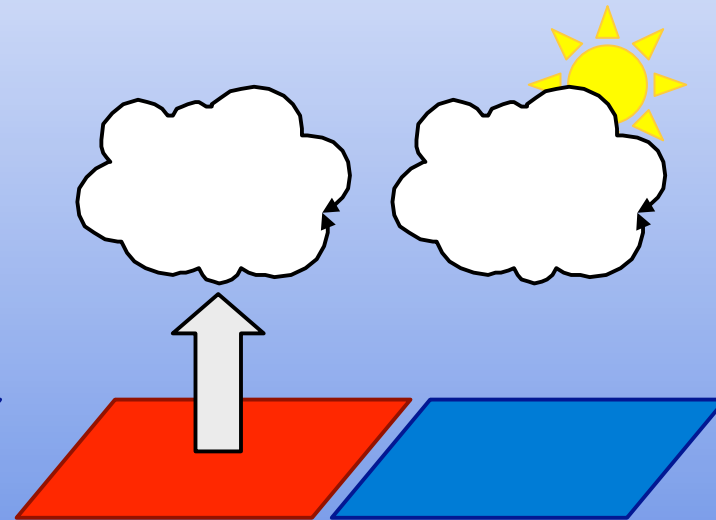
The dynamics of the SACZ



Hidrostatic



Robertson & Mechoso
(2000)



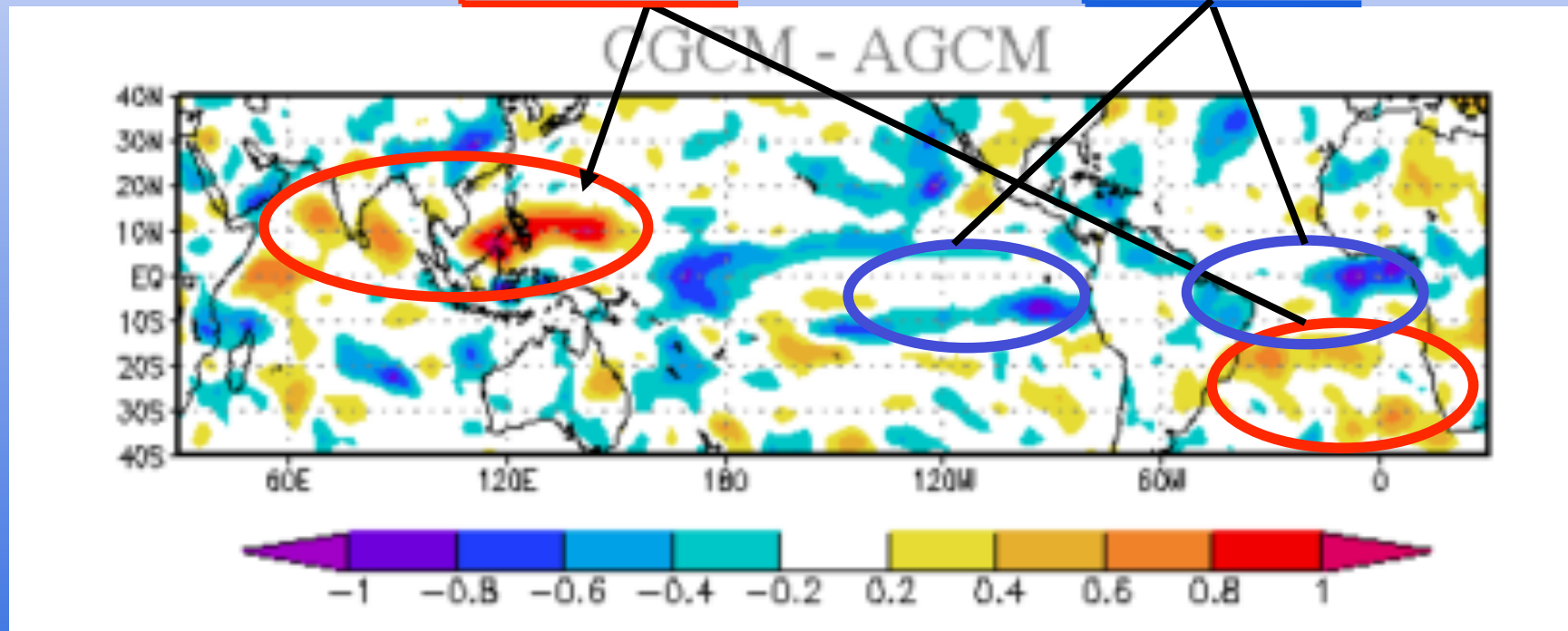
Chaves and Nobre (2004)
De Almeida & al (2007)
Nobre et al. (2011)

Coupled Ocean-Atmosphere processes at play

DJF Precipitation Forecasts anomaly correlations

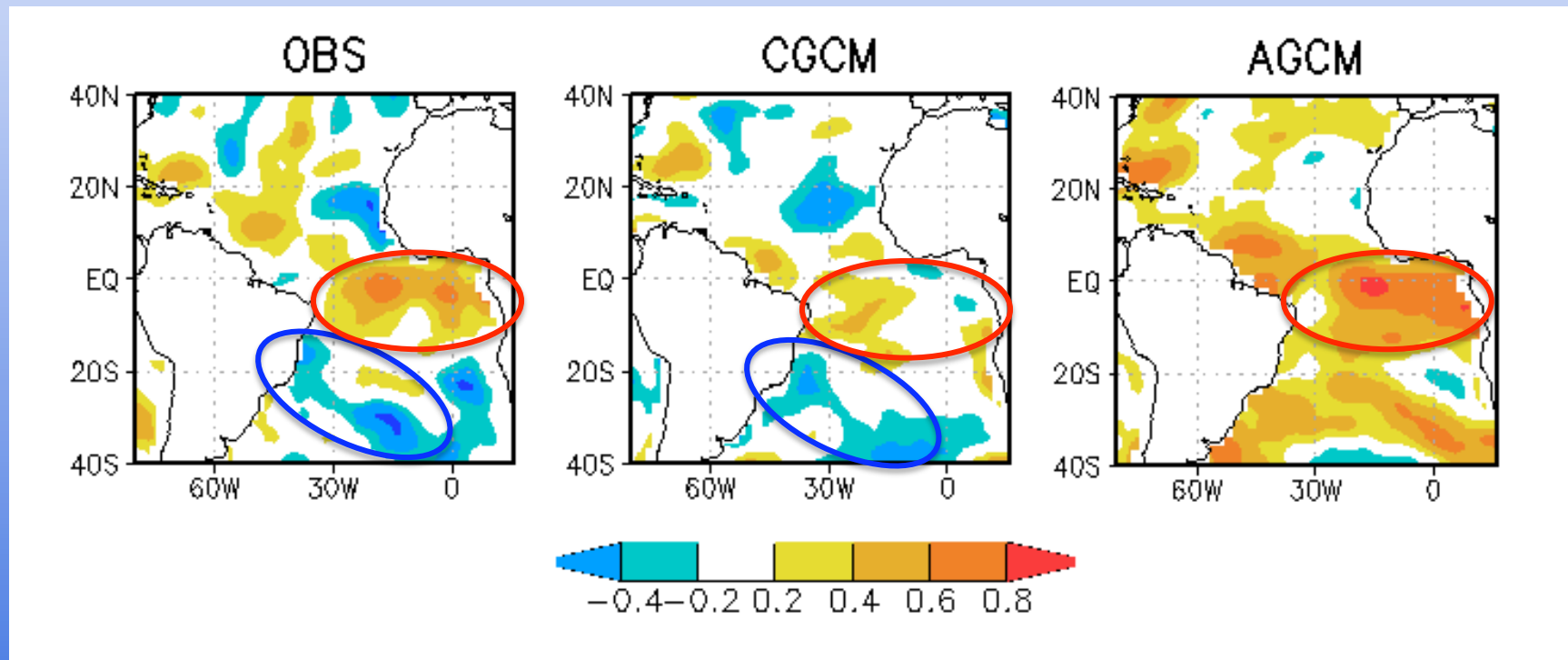
Increased
Coupled Model
Forecast Skill

Decreased
Coupled Model
Forecast Skill



20 years, 10 member ensemble CGCM & tween AGCM runs

Rainfall – SST Anomaly Correlations

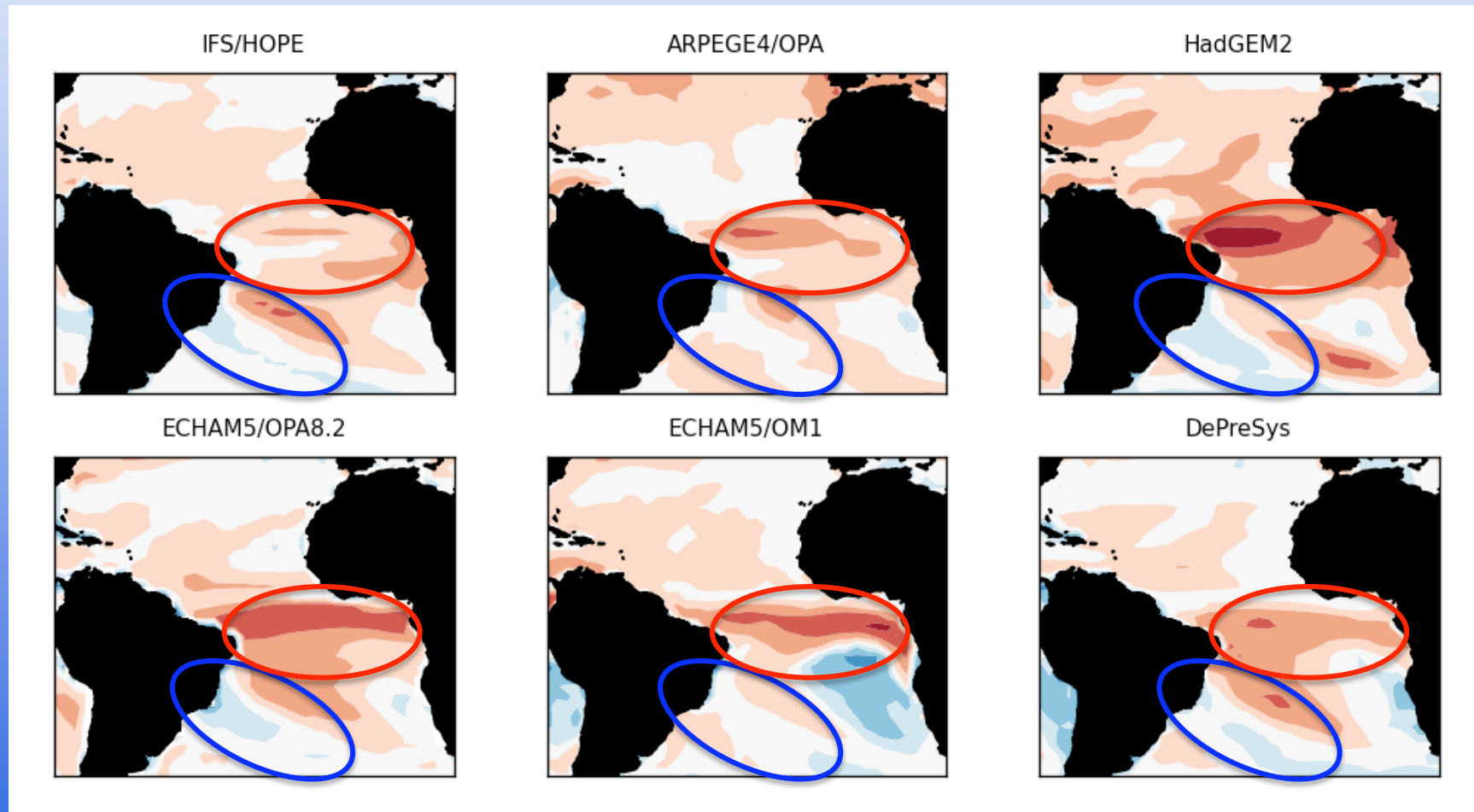


20 years, 10 member ensemble CGCM & tween AGCM runs

Nobre et al. (2011, submitted)

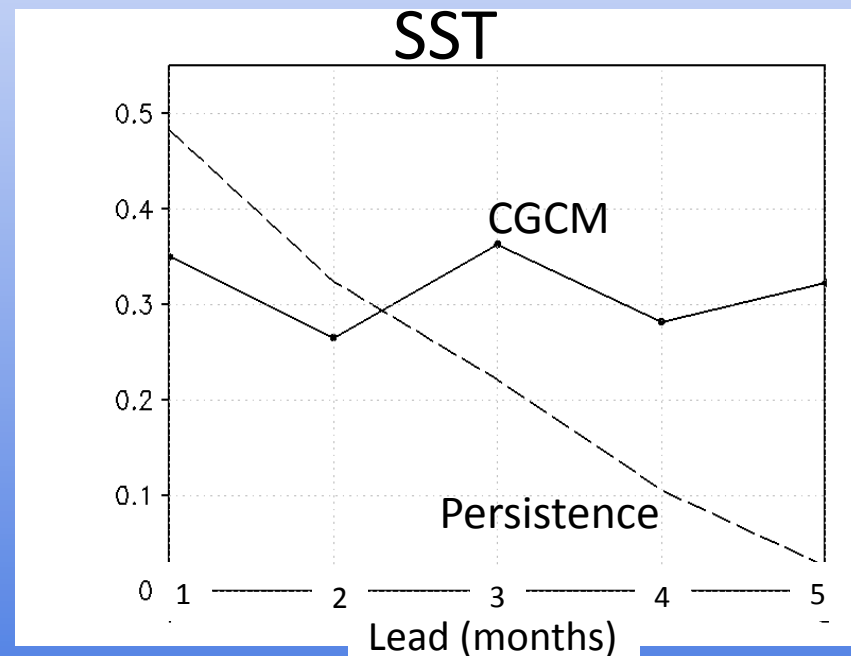
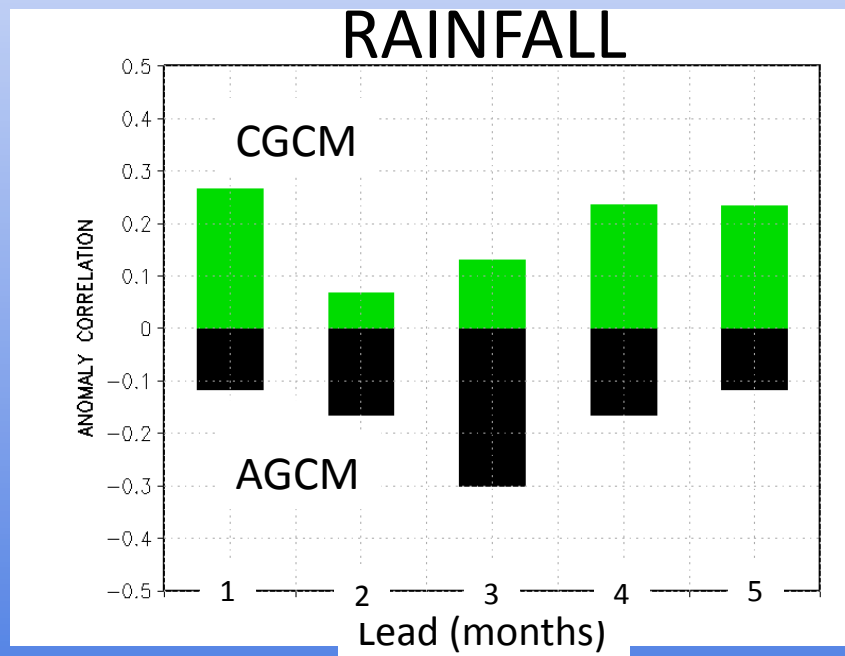


Ensembles Coupled Forecasts SST-Rainfall Anomaly Correlations





Coupled Model Enhanced Precictability over South Atlantic



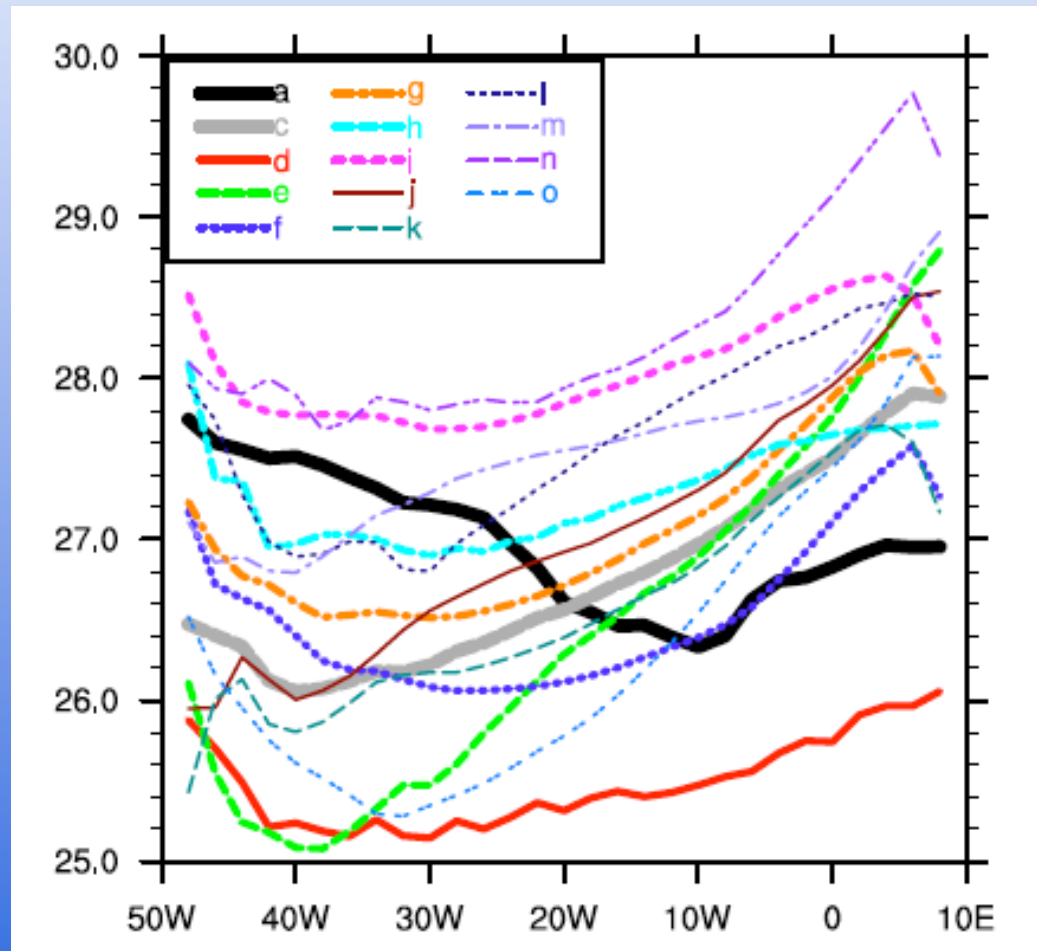


... and what about the loss of predictability along the equator?...





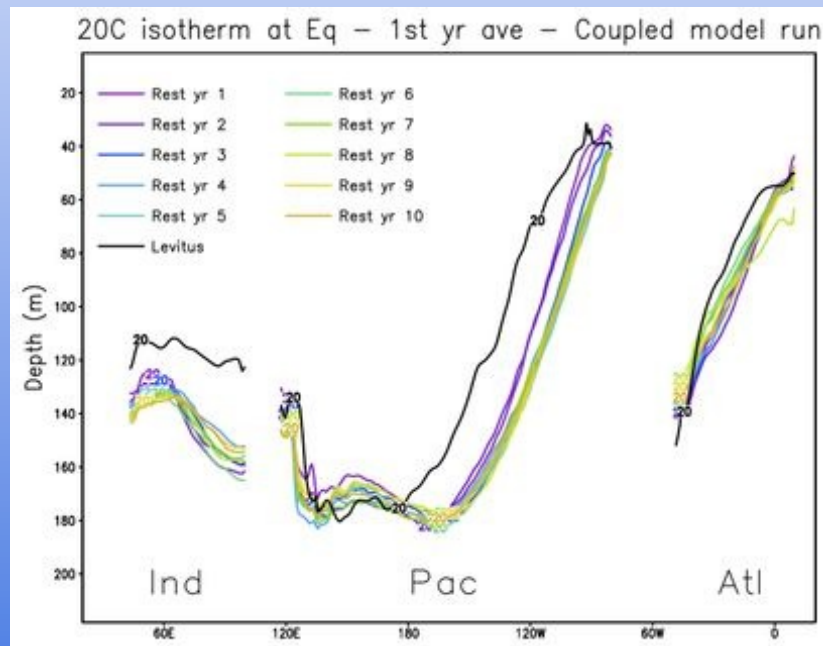
Coupled O-A Models inability to simulate Eq. Atlantic SST gradient



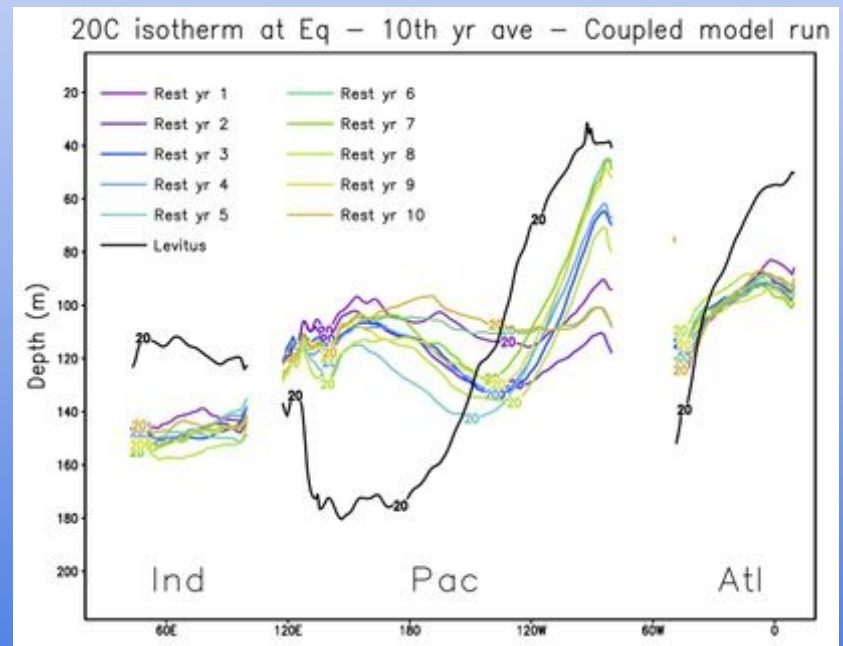


CPTEC's CGCM 2.1 Z20 multi-year runs

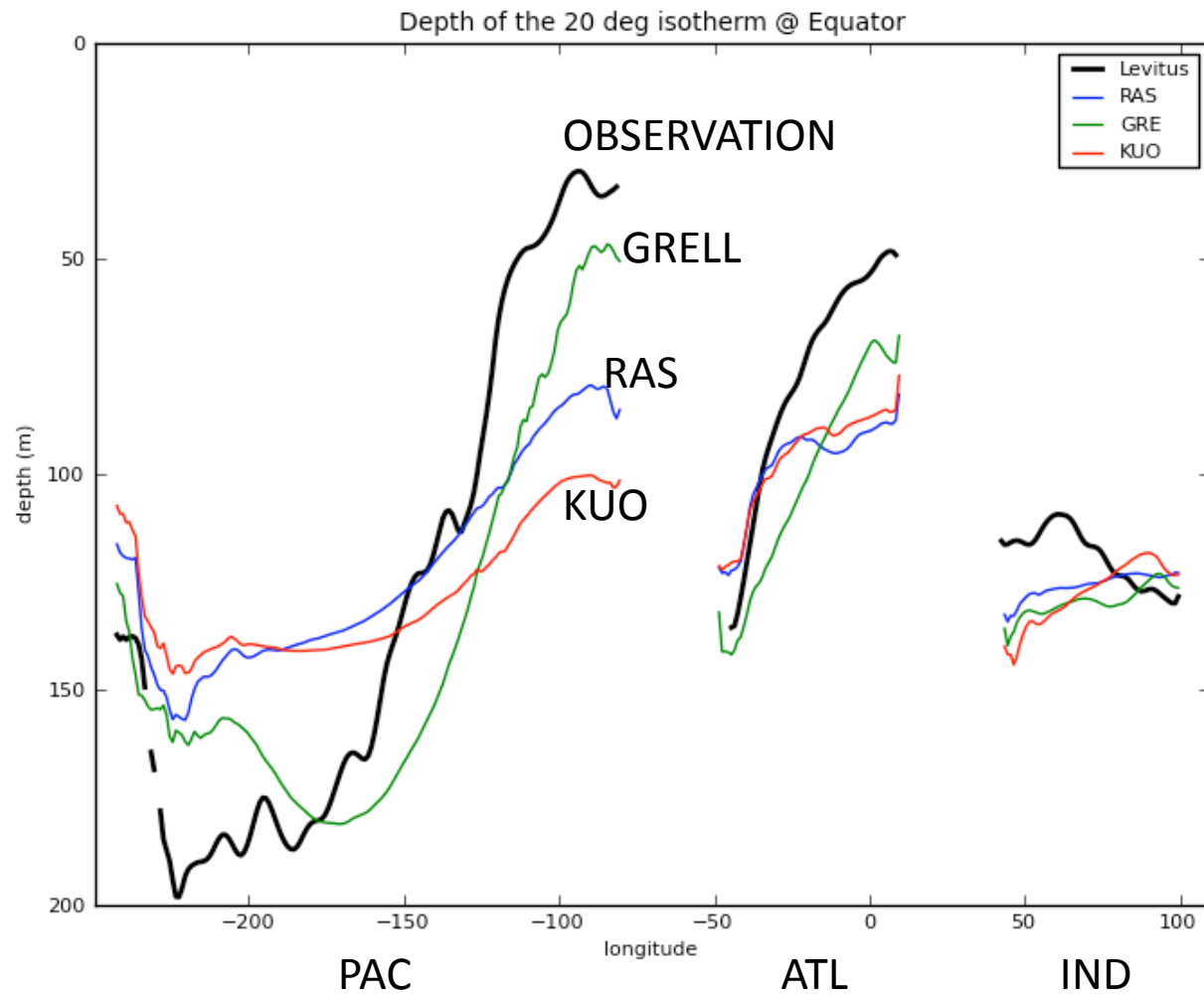
1st Year Several IC



10th Year Several IC

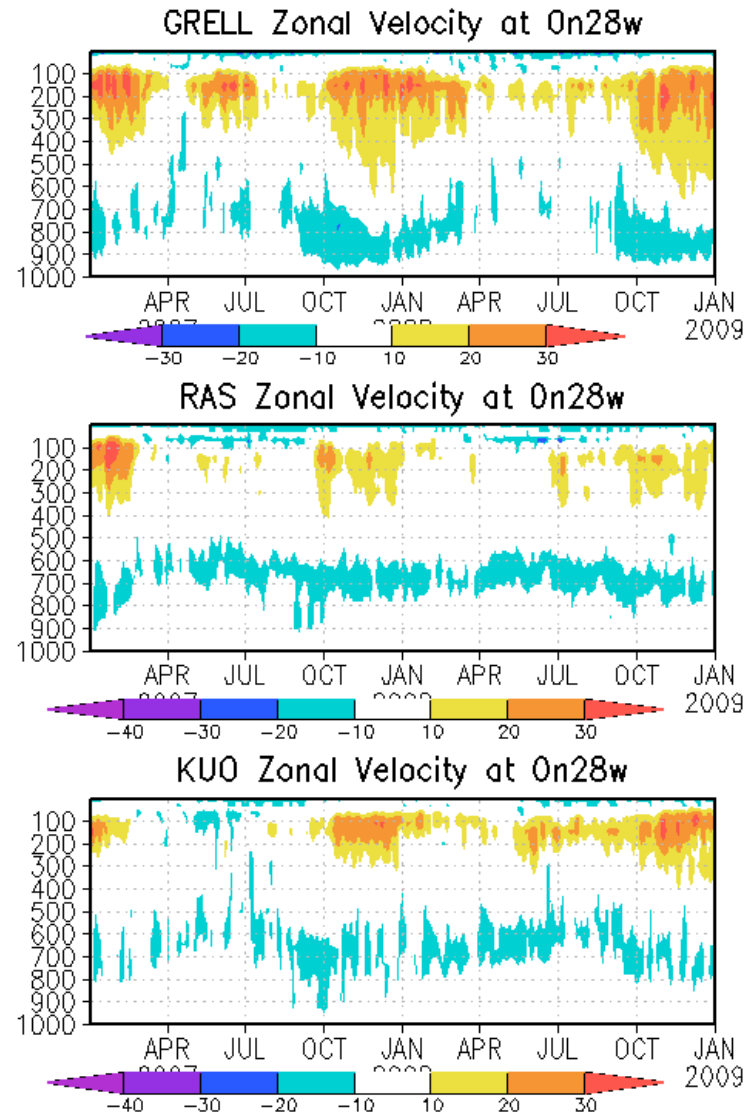


CPTEC CGCM 2.1 Z20





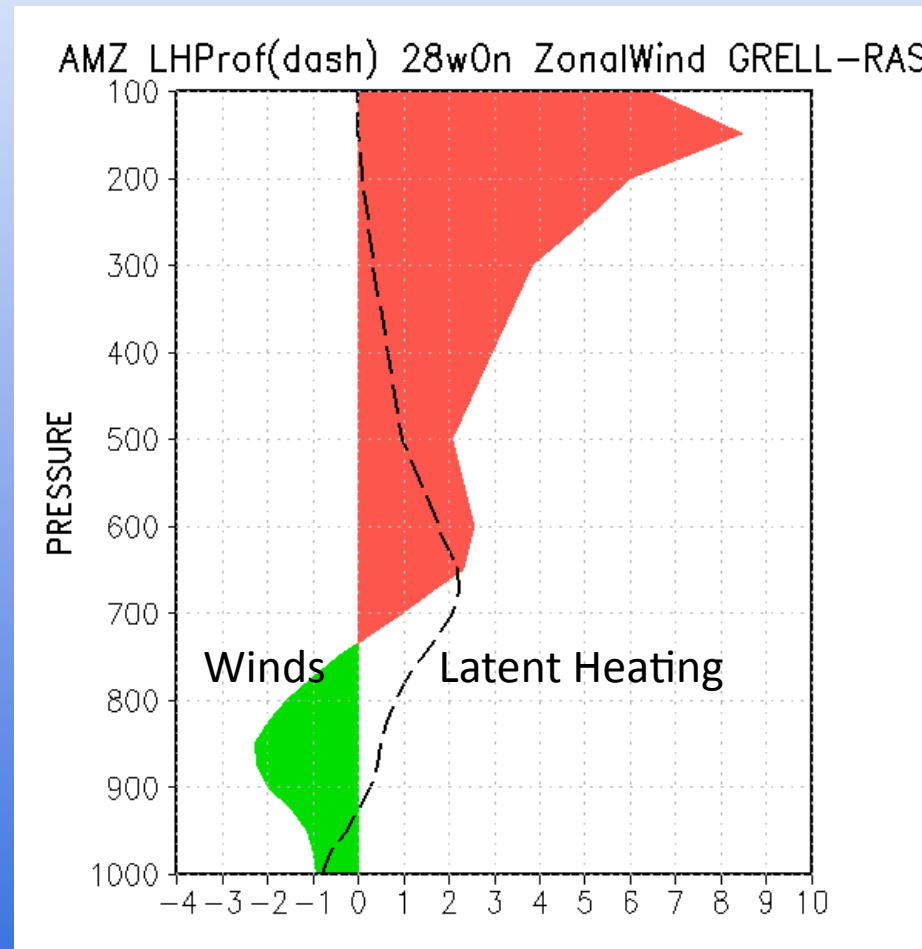
Eq. Atlantic Zonal Wind Vertical Profile



Nobre et al (2011, in prep.)

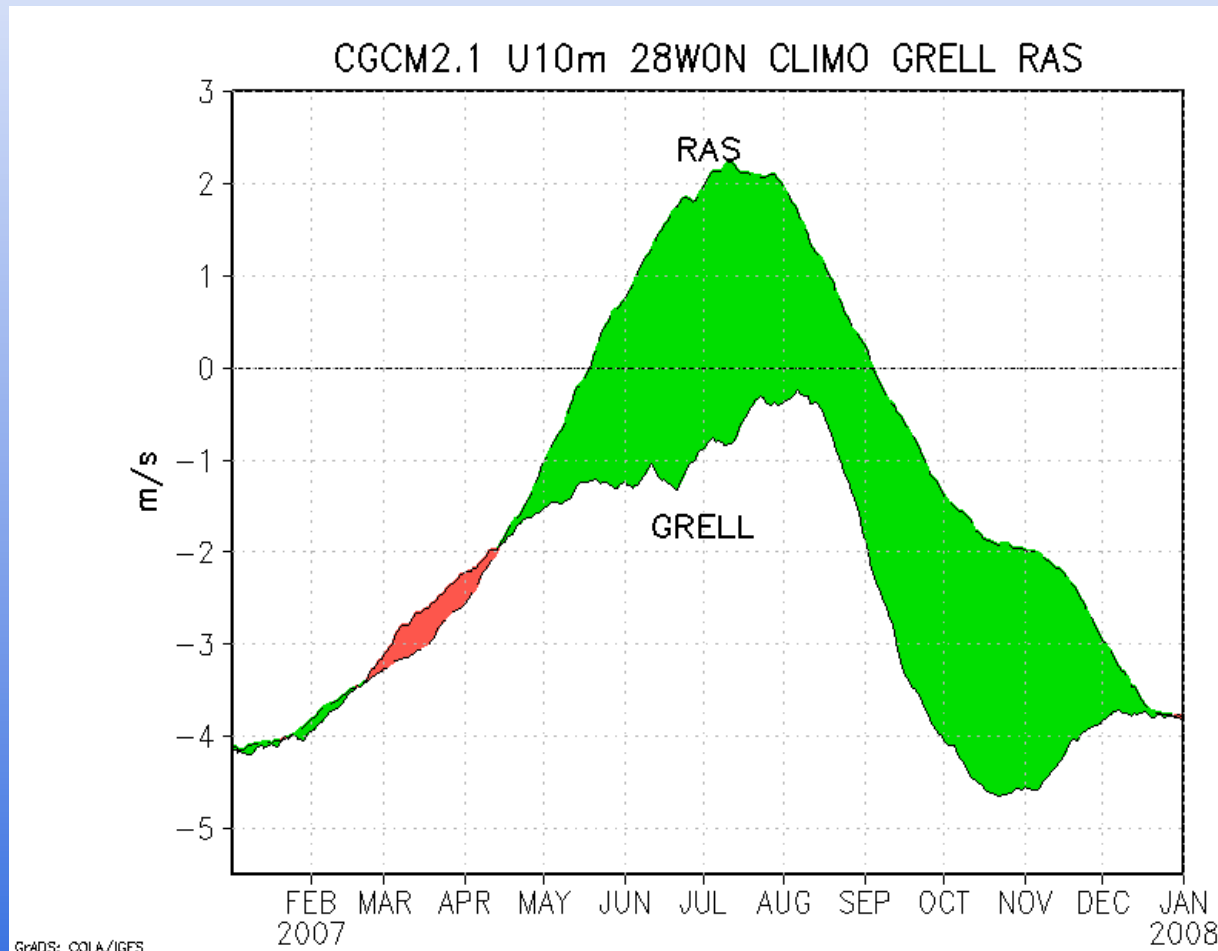


Winds and Latent Heating



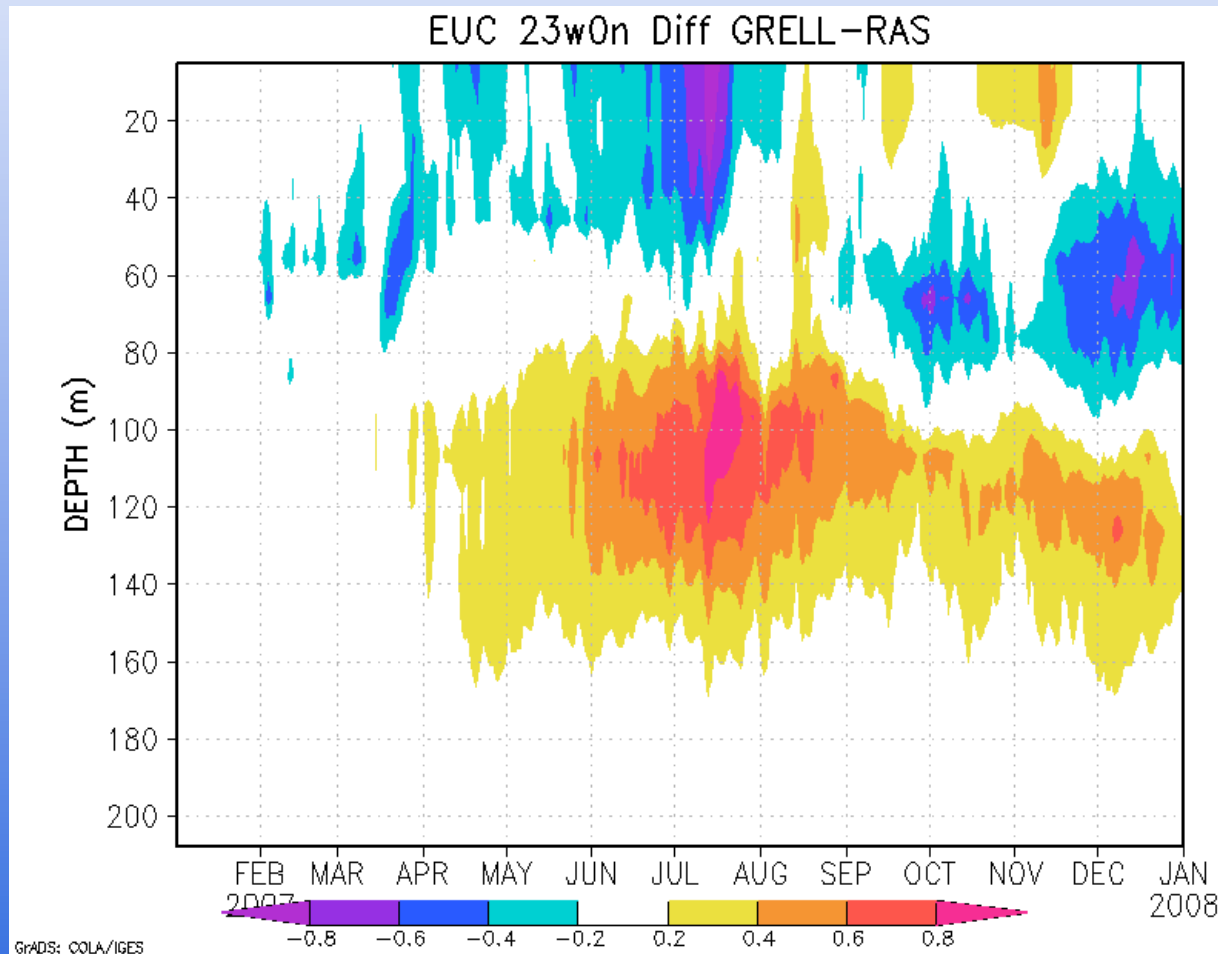


Equatorial Atlantic SFC Winds “see” what’s going on over the Continent...





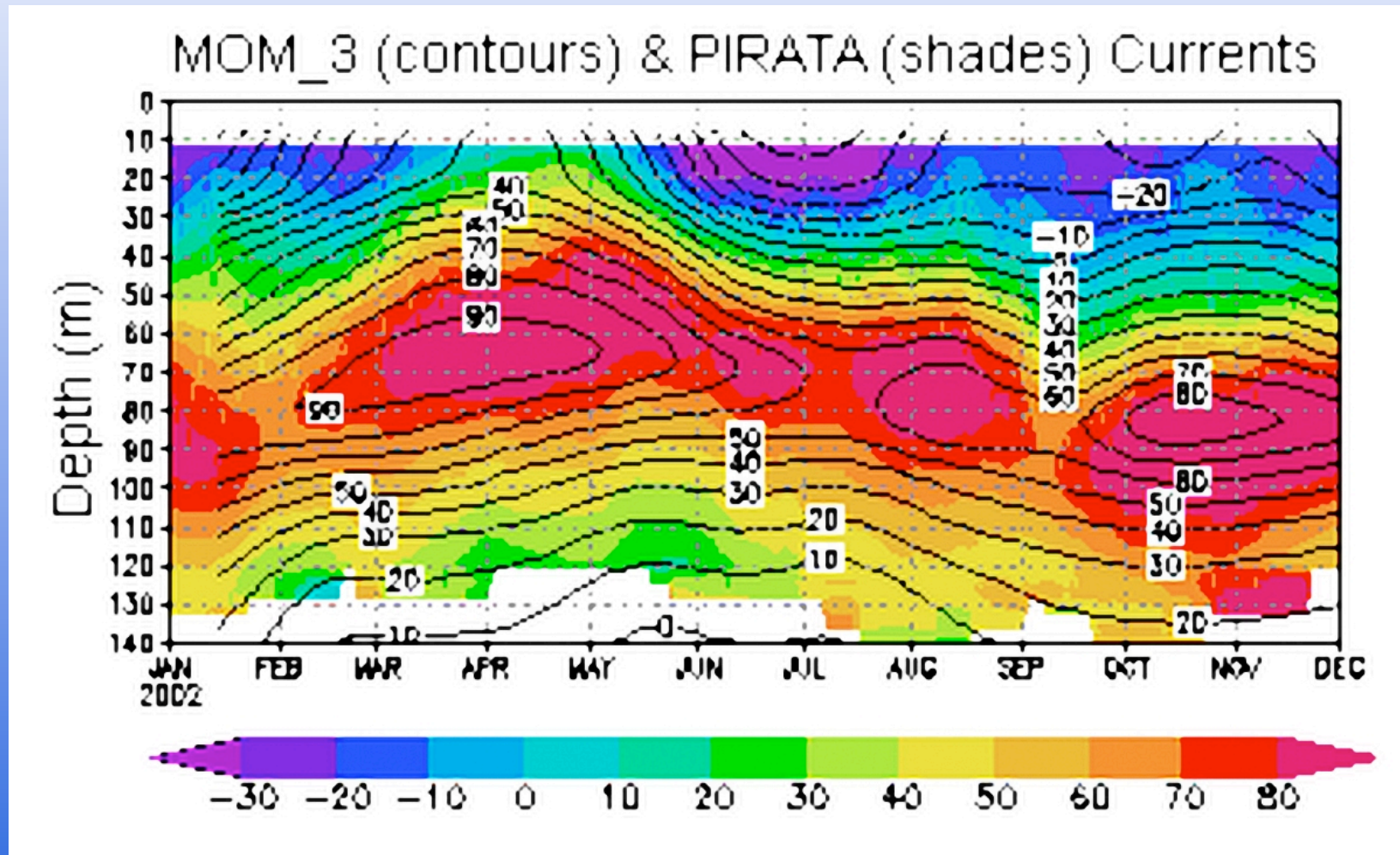
... reflecting in the Shallowing of the Atlantic EUC



Nobre et al (2011, in prep.)



Atlantic EUC Obs & Forced Simulation at 23W





Conclusions

- Coupled modes of ocean-atmosphere essential to represent SACZ rainfall over cooler waters.
- Vertical heating profile over the Amazon plays an important role in reducing systematic errors of coupled model ocean circulation (and temperature) over the equatorial Atlantic.



Thank You.

PIRATA ARRAY
MAINTENANCE IN THE
TROPICAL ATLANTIC

