

# Paleo perspective of the South American Monsoon System

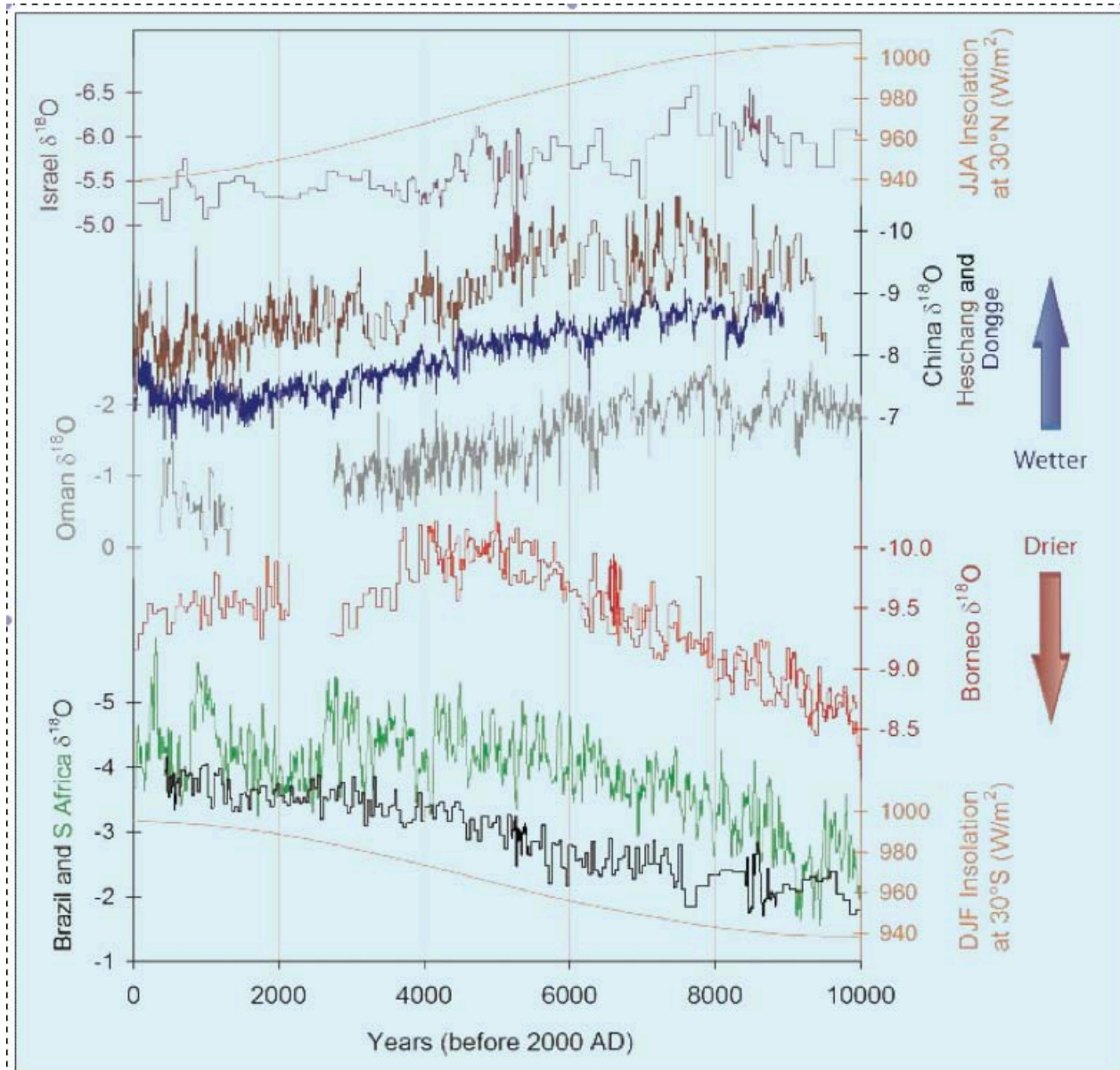
...or relevance of paleo work  
for understanding climate  
variability in South America

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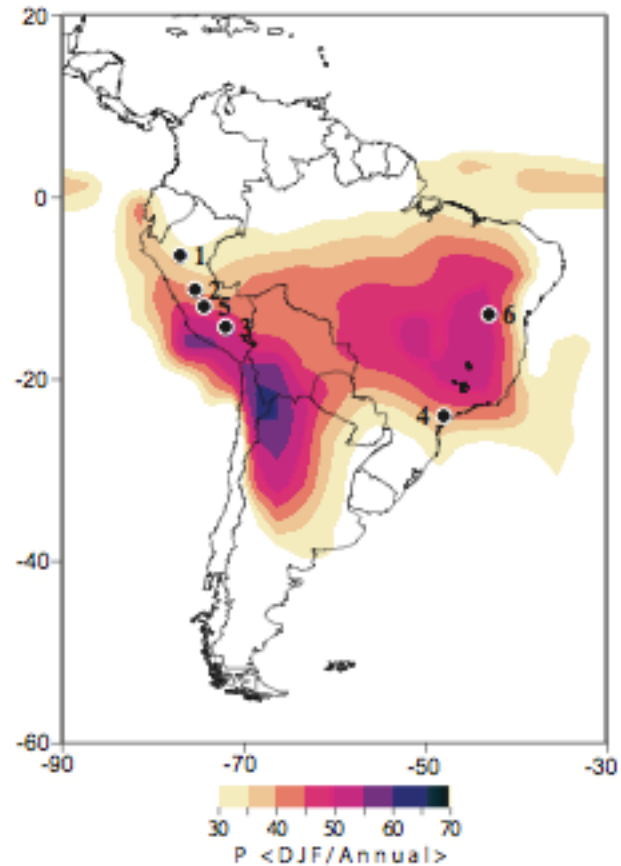
# Research areas (many of them sponsored by PAGES: Past Global Changes, IAI)

- [The 2k Network](#)
  - [LOTRED-SA](#) (Long-Term Climate Reconstruction and Dynamics of South America): 500-600 year temperature reconstructions for Southern South America.
- PDSI (Palmer Drought Severity Index) reconstruction for Southern South America, central Chile, Patagonia
- SAM reconstructions (Patagonia)
- Southern Hemisphere Westerlies (Patagonia)
- ENSO variability reconstruction: Peru, Altiplano, Central Chile. Community is composed by: Tree-ring, Ice-cores, pollen, speleothems, ....
- PMIP3 Paleo Modelling Intercomparison Project has 3 Benchmark experiment: LGM, MidHolocene and now past1000. All three experiments are part of CMIP5

# Monsoon response to insolation forcing on orbital time-scales



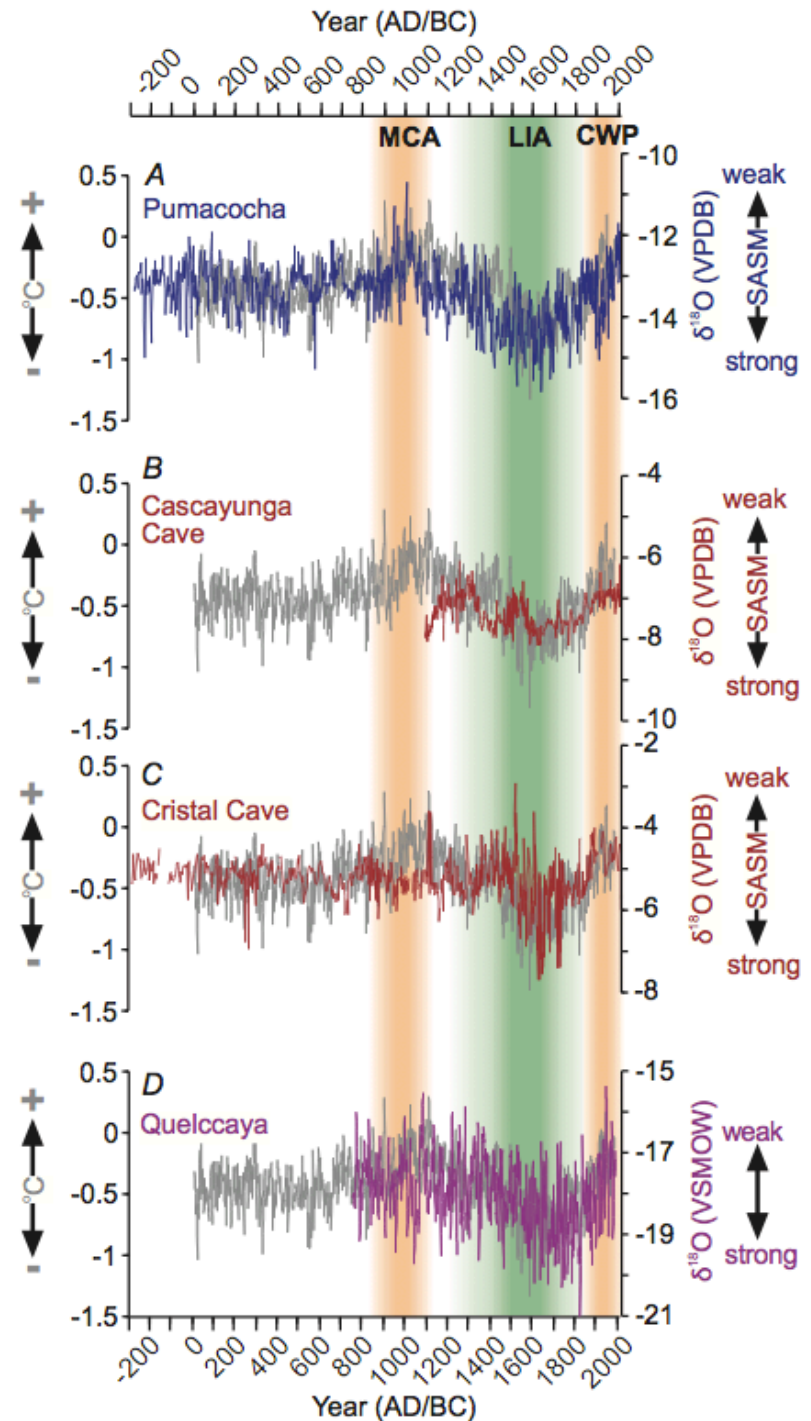
- In recent years a number of annually resolving precipitation proxies have been published for the SAMS region
- Edge of the Monsoon region?



**Fig. 2.** Percentage of annual precipitation falling during the mature stage of the South American Summer Monsoon (DJF), based on CMAP data (1979–2004). Numbers indicate location of high-resolution stable isotope records within the monsoon belt: 1: Cascayunga cave; 2: Laguna Pumacocha; 3: Quelocaya ice cap; 4: Cristal cave; 5: Huagapo cave; 6: Diva de Maura and Torrinha cave.

**Viulle et al, 2012: A review of the South American Monsoon history as recorded in stable isotopic proxies over the past two millennia. *Climate of the Past.***

SAMS precipitation is well correlated to NH temperature reconstruction, and ITCZ reconstructions

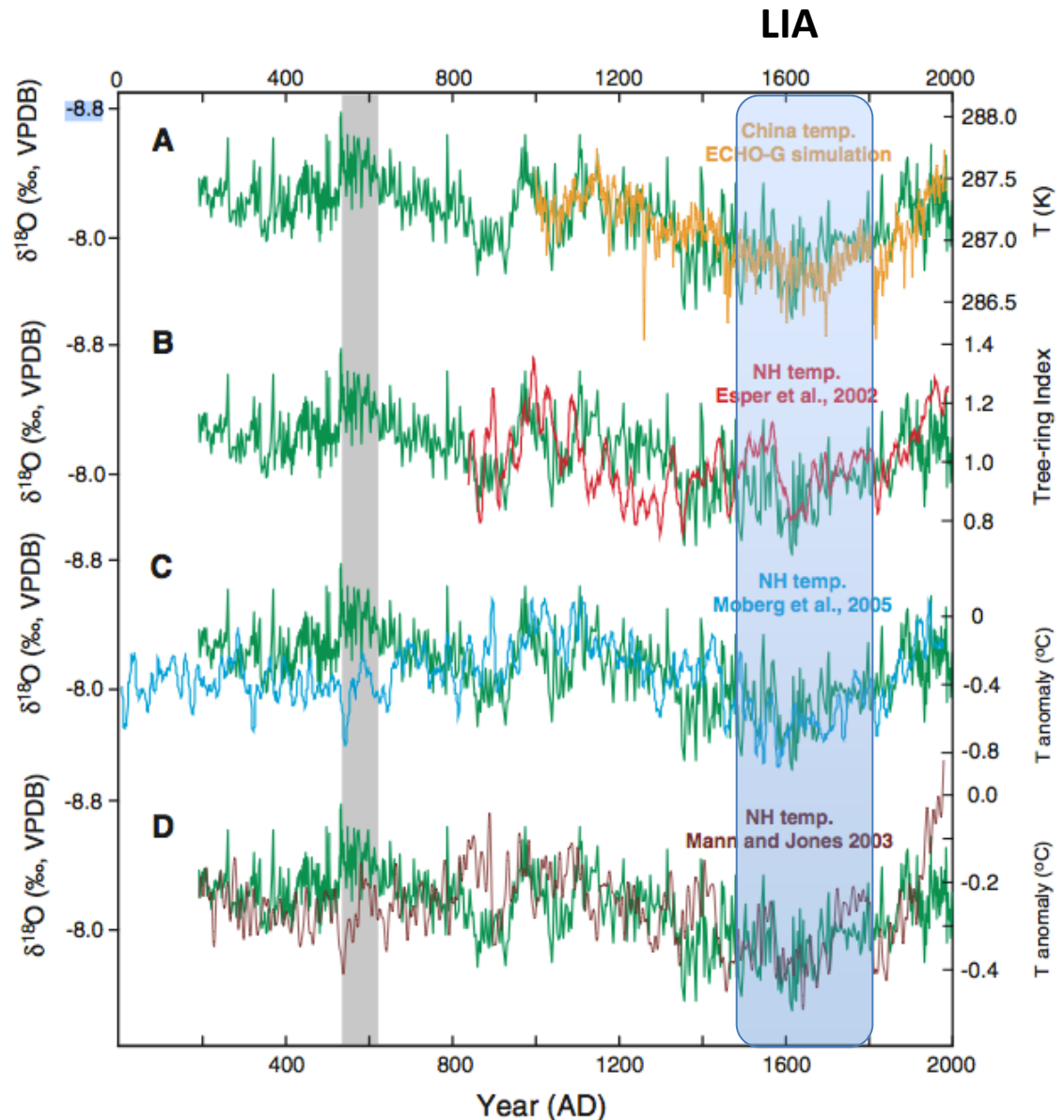
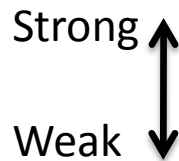


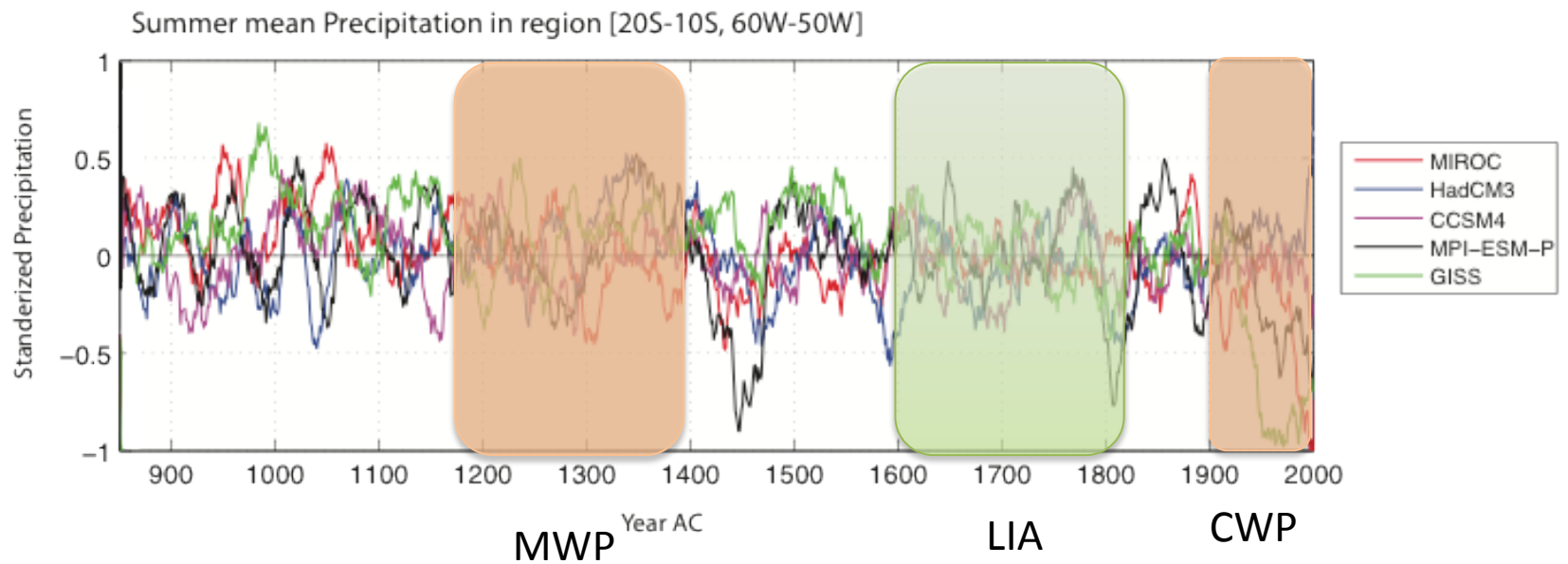
Vuille et al, 2012

# China: Asian Monsoon

- Speleothem record from China indicates that the previous “anti-phased” relationship between the NH and SH Monsoons also hold for the last millennium.

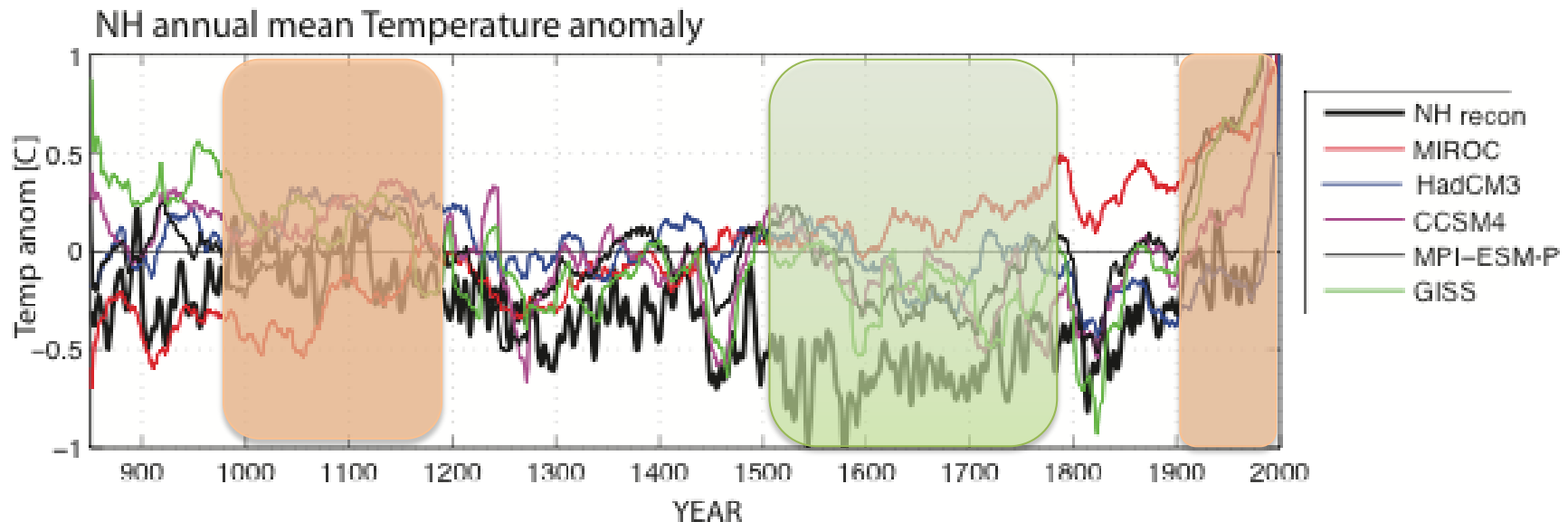
Monsoon precipitation is related to NH temperatures





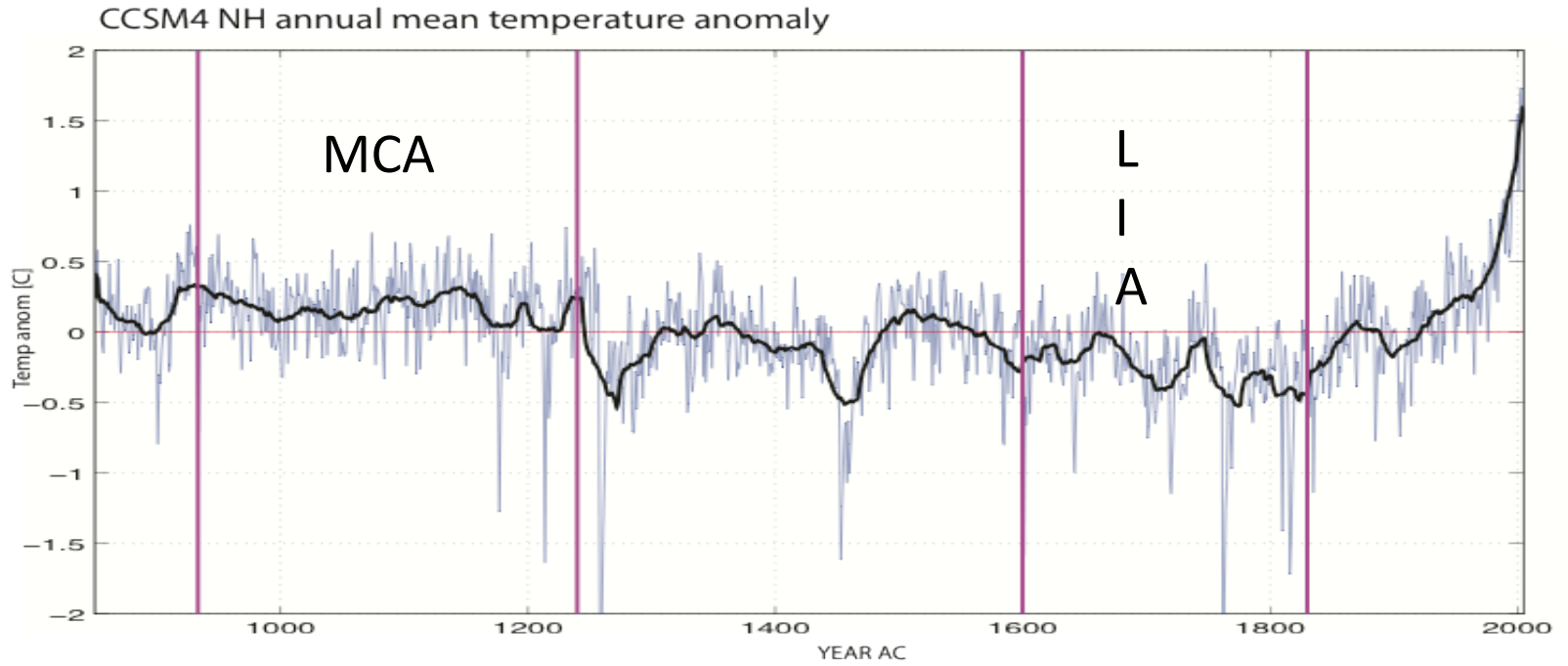
- Clearly current AOGCMs do not reproduce the observed at decadal and centennial scale precipitation variability in SASM region
- Is the ITCZ variability correctly simulated?
- What processes are missing?

however...in NH temperatures the models tend to reproduce to some extent the low frequency variability.....

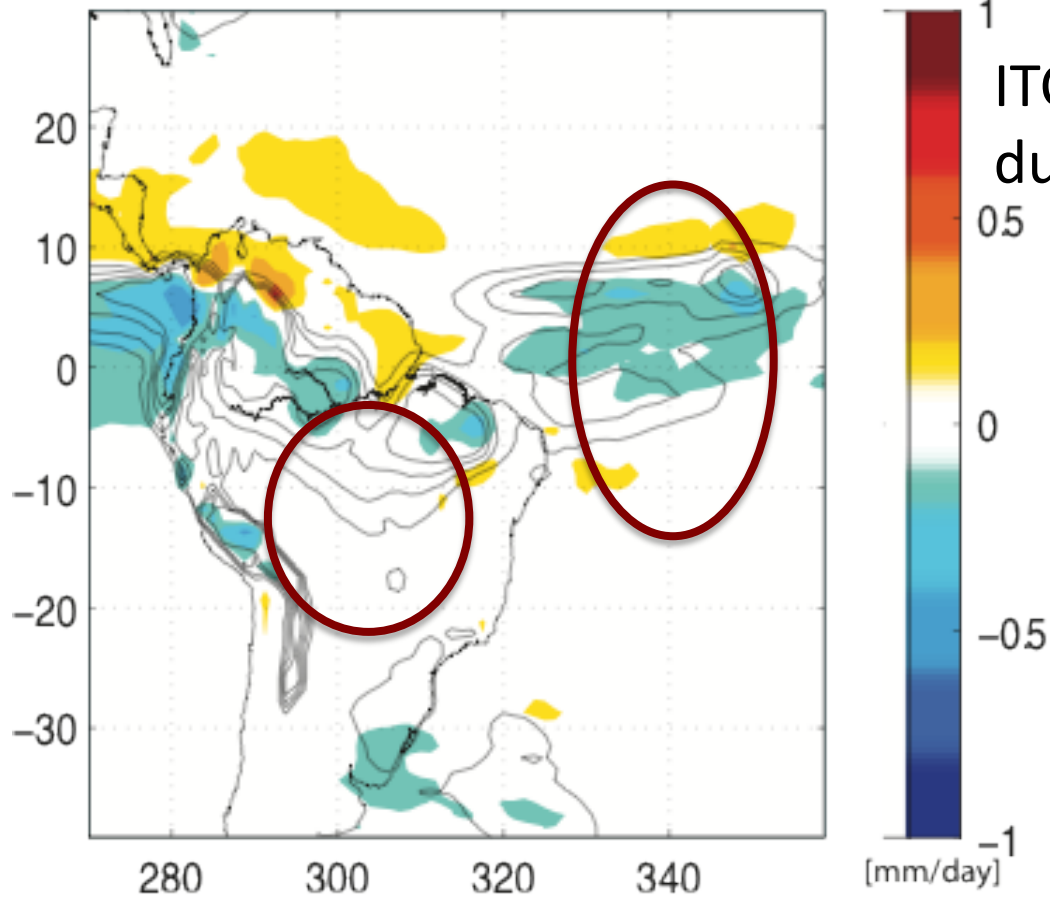




# just out of curiosity...



MCA - LIA annual mean precipitation



ITCZ was drier (northward shift?)  
during the MCA compared to LIA

Does not translate into  
a DRIER MONSOON !