US CLIVAR Eastern Tropical Ocean Synthesis Working Group

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- Coordinate a model assessment of surface flux errors for the equatorial Atlantic, mining all available observations.
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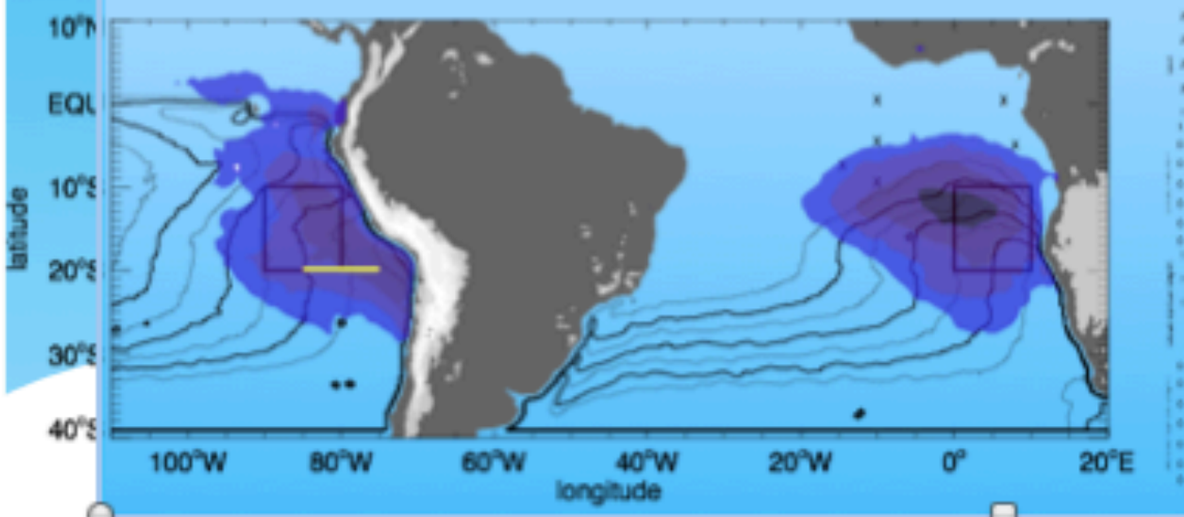

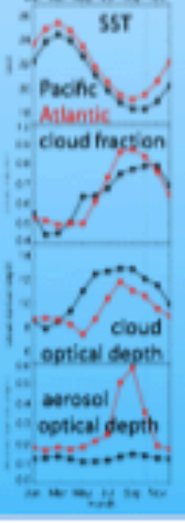

- along the Atlantic equator the lines 40°S to 10°N for both FPac and FAtl (near shore; 6.5E intersects with Sao Tome island)
- an E-W line along 18°S
- along the PIRATA line at 11°W
- spatial plot encompassing the Klein & Hartmann domains depicted in the figure to the left.

October-mean 17C-23C sea surface temperature climatology (2002-2010, TMI, black contour lines, 18-20-22C lines boldened), 2002-2009 MODIS Terra mean cloud fraction (blue-purple shading spans 60-100% cloud cover) . 'X' mark PIRATA buoys, Sao Tome island (0N, 6.5E), and San Ascension island (8S, 14.5W). Boxes indicate stratocumulus deck locations used within Klein and Hartmann (KH; 1993), yellow line along 20S, 75-85W corresponds to VOCALS/cruise enhanced sampling. Land topography indicated in 1 km height increments. Right four panels depict mean annual cycles in SST, cloud fraction, cloud and aerosol optical depth for the KH boxes, with a dashed line marking October and red and black lines indicating the southeast Atlantic and Pacific respectively.

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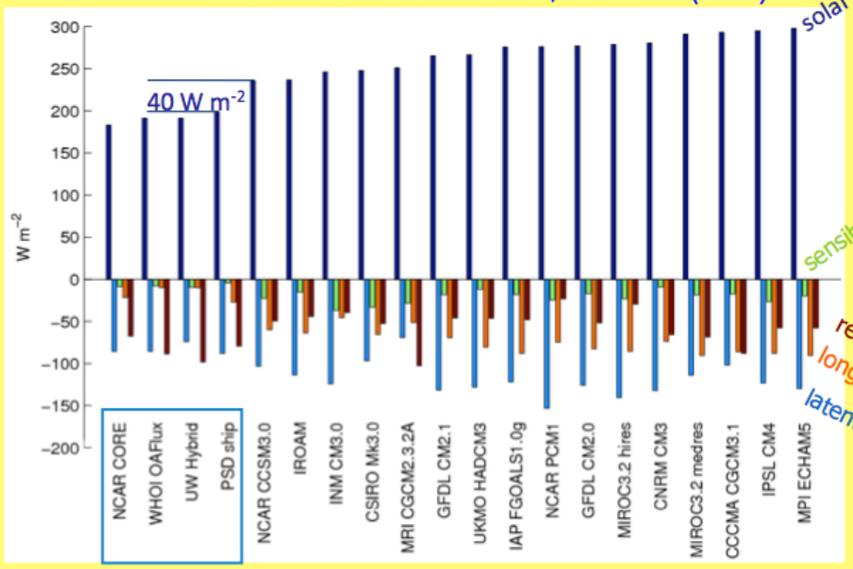
southeast Pacific

CGCMS: in southeast Pacific, ~1/2 surface heat balance error is from too few clouds, ~1/2 under-resolved ocean processes

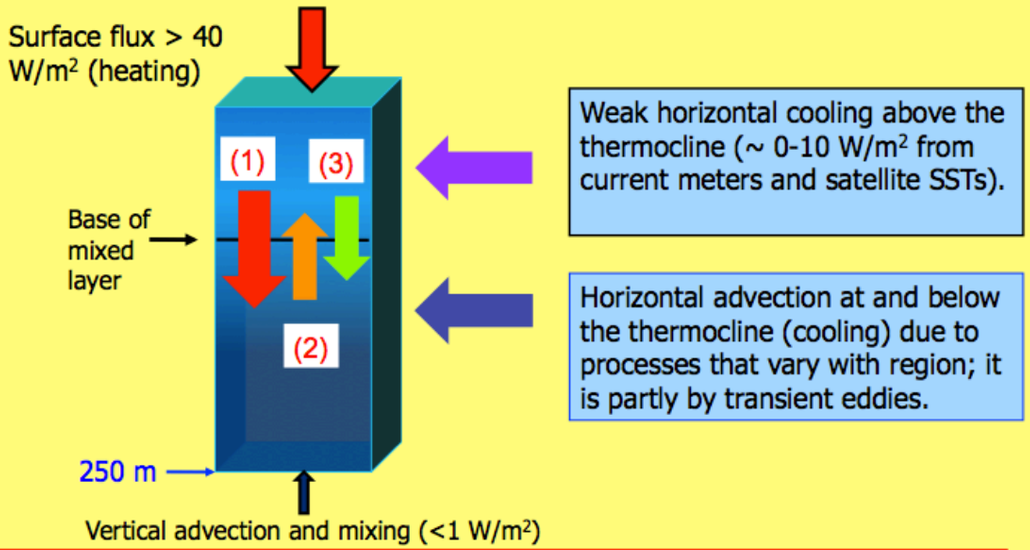
CGCMs: Surface heat balances along 20S, 75-85W

October-mean de Szoeke et al., *J. Climate* (2010)

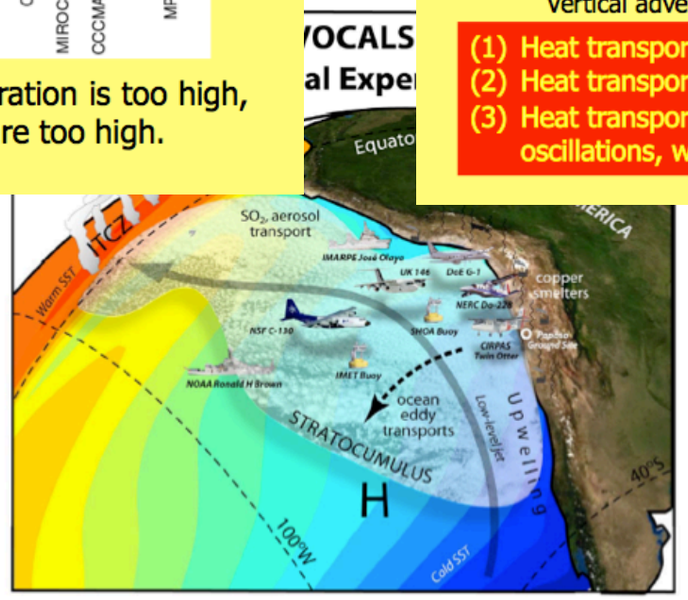


At the ocean surface insolation is too high, evaporation is too high, net heat flux into the ocean is too low, and SSTs are too high.

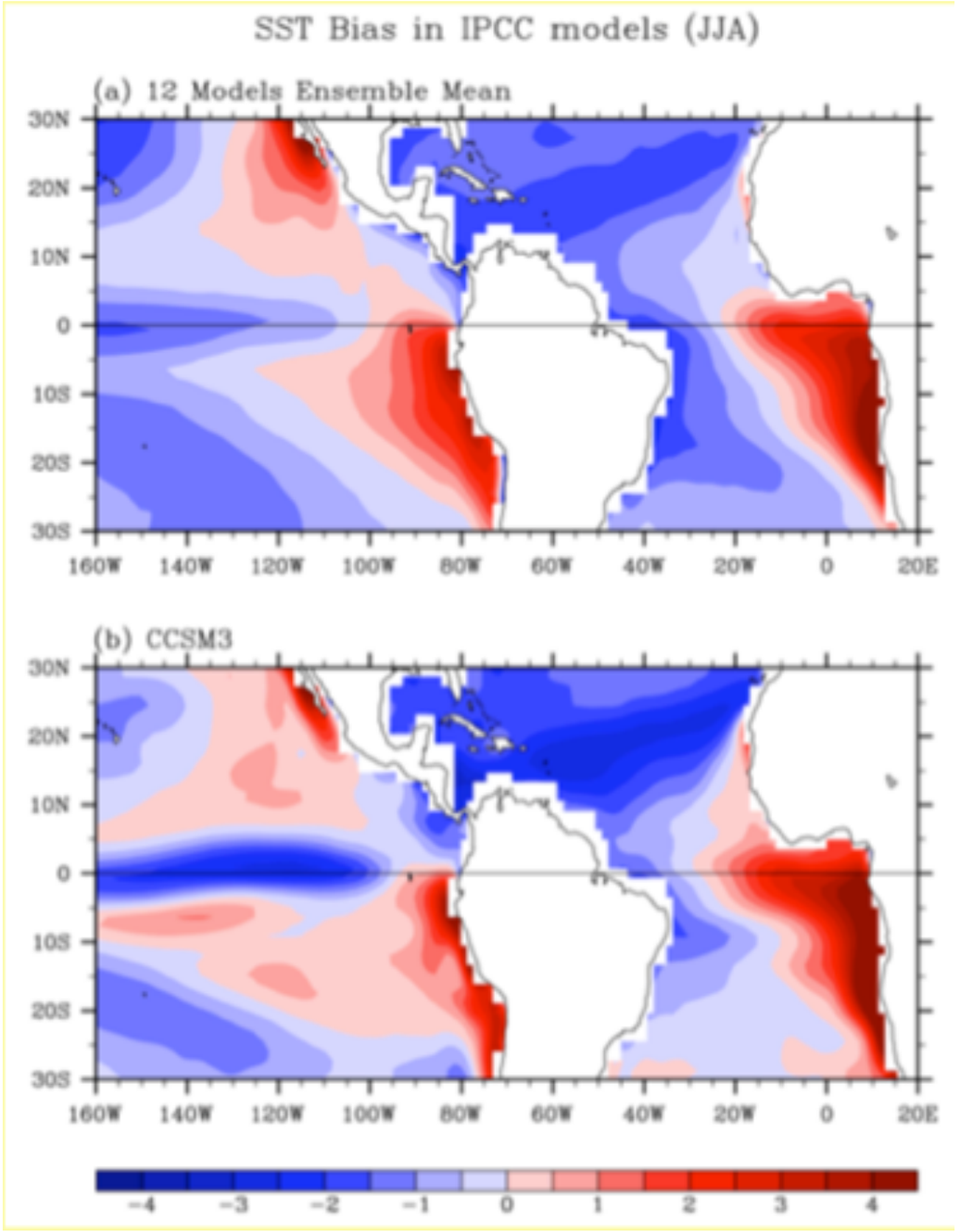
Hypothesis on the heat budget of the ocean column



(1) Heat transport by turbulence processes
(2) Heat transport by submesoscale eddies
(3) Heat transport by processes such as mixing associated with near-inertial oscillations, with a possible contribution by others such as salt fingering.



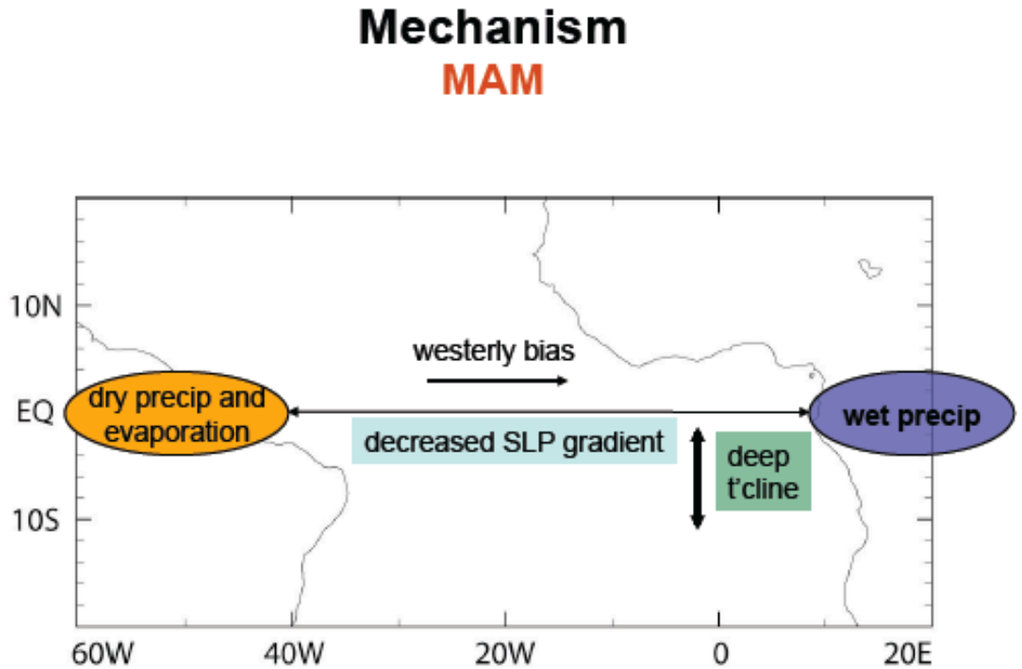
... similar issues w/ SST in Pacific & Atlantic..:



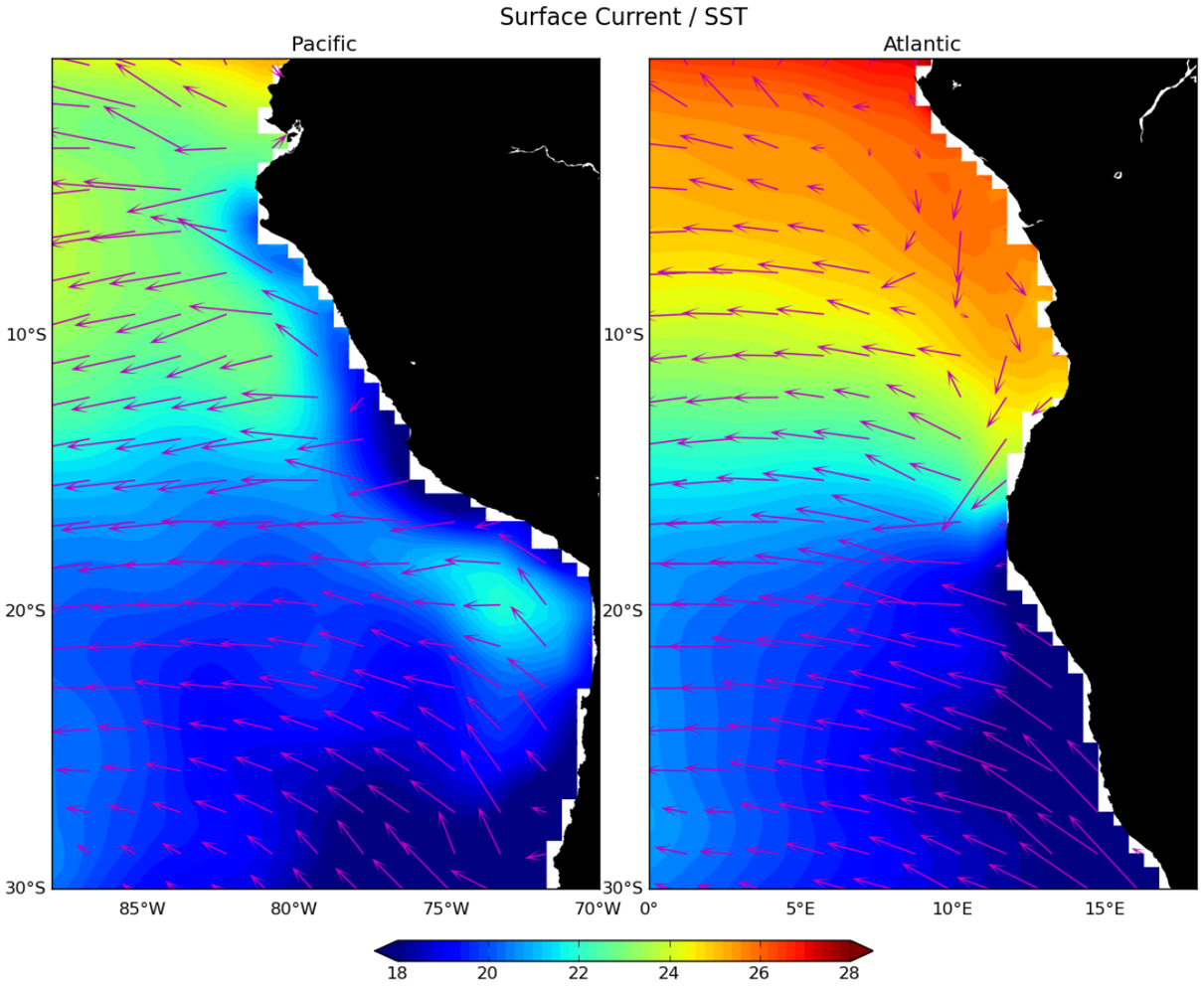
tropical Atlantic differences from the Pacific:

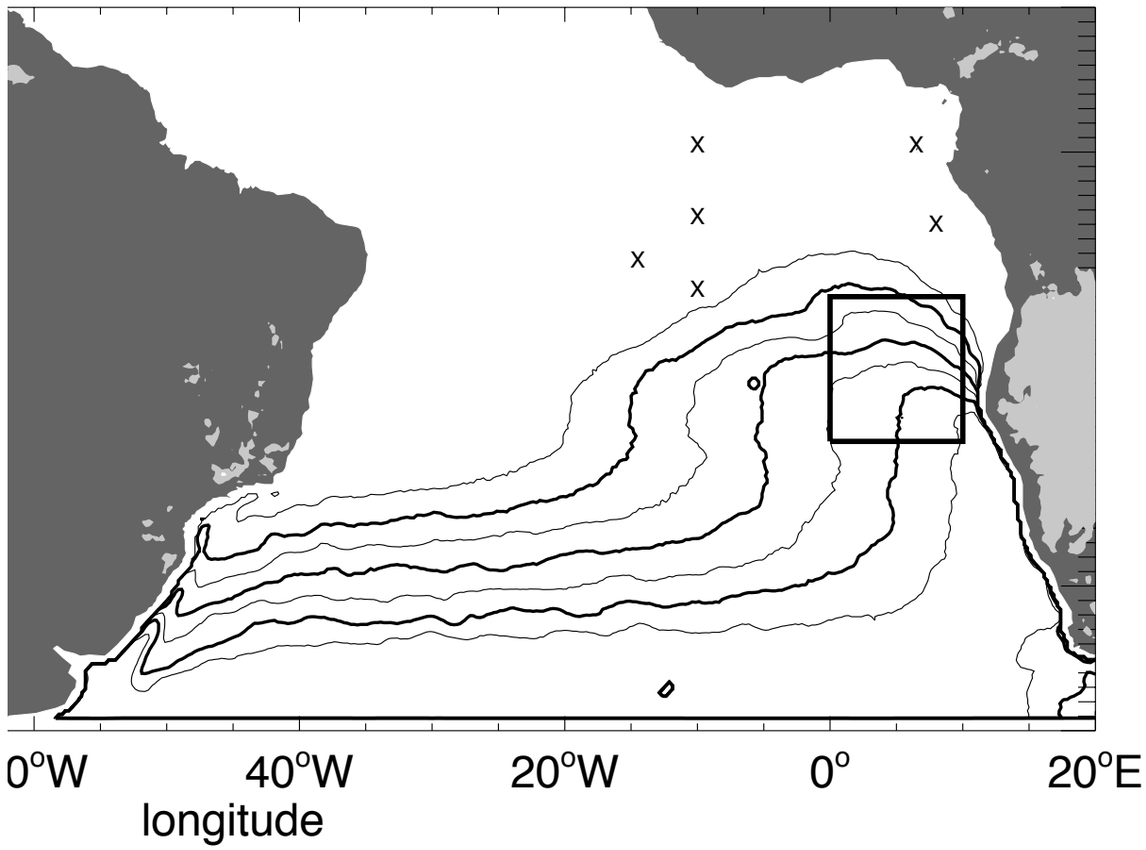
- continental influences more obvious

(monsoonal moisture fluxes& large-scale circulation, aerosol outflow)



- regional oceanography very different
-more existing datasets from tropical Atlantic than Pacific
- much international research (French, German, S. Africa)





Miami workshop April 2011

Ping Chang

US CLIVAR Eastern Tropical Ocean Synthesis Working Group Membership

US Members	Institution
Michela Biasutti	Columbia U/LDEO
Ping Chang	Texas A&M
Amy Clement	U Miami
Simon de Szoeke (co-chair)	Oregon State U
Takeshi Doi	NOAA/GFDL
Tom Farrar	WHOI
Ben Kirtman	U Miami
Roberto Mechoso (co-chair)	UCLA
Brian Medeiros	NCAR
Ingo Richter	U Hawaii/IPRC
Ed Schneider	George Mason U/COLA
Rob Wood (co-chair)	U Washington
Paquita Zuidema (co-chair)	U Miami

International Contributing Members	
Peter Brandt	U Freiburg, Germany
Carmen Grados	IMARPE, Peru
Alban Lazar	Sorbonne U/IPSL, France
Pierrick.Penven	IRD, France
Chris Reason	U Cape Town, South Africa
Mathieu Roualt	U Cape Town, South Africa
Irina Sandu	ECMWF
Laurent Terray	CEFACS, France

April telecon (first) identified starter tasks

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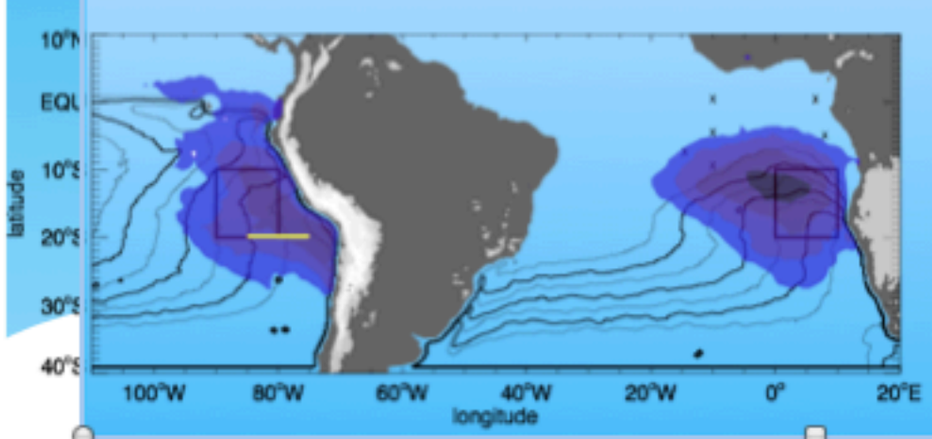

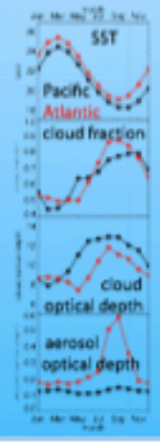

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new US CLIVAR Working Group:

Upper-ocean heat budget synthesis for the eastern equatorial Pacific and Atlantic Oceans

P. Zuidema, S. de Szoeke, R. Mechoso, R. Wood

Working Group Objectives:

1. Promote collaboration between observationalists and modelers, and atmospheric scientists and oceanographers, active in the southeast oceanic basins.
2. Develop a model assessment of surface flux errors similar to deSzoeke et al. (2010) for the equatorial Atlantic, mining all available observations. Models are of current CMIP development age. Observable metrics include shortwave radiation; longwave radiation; turbulent fluxes; wind stress; atmospheric circulation (e.g., location and strength of atmospheric anticyclone); and large-scale ocean circulation (as well as SST). Data sources include the PIRATA buoys at 8E, 8S and 0E, 0S (which includes a subsurface mooring) and research cruises (6) into the Gulf of Guinea as part of the AMMA/EGEE program.
3. Identify recent model improvements and common and persistent model errors, in both CMIP5 and higher-resolution coupled models.
4. Provide recommendations of cases for community simulation and evaluation using eddy-permitting ocean models, sharing specified model conditions and output datasets. The followup to these cases is likely to fall outside the two-year time line of the WG, but attempts will be made to foster this follow-on activity.

2-year timeline

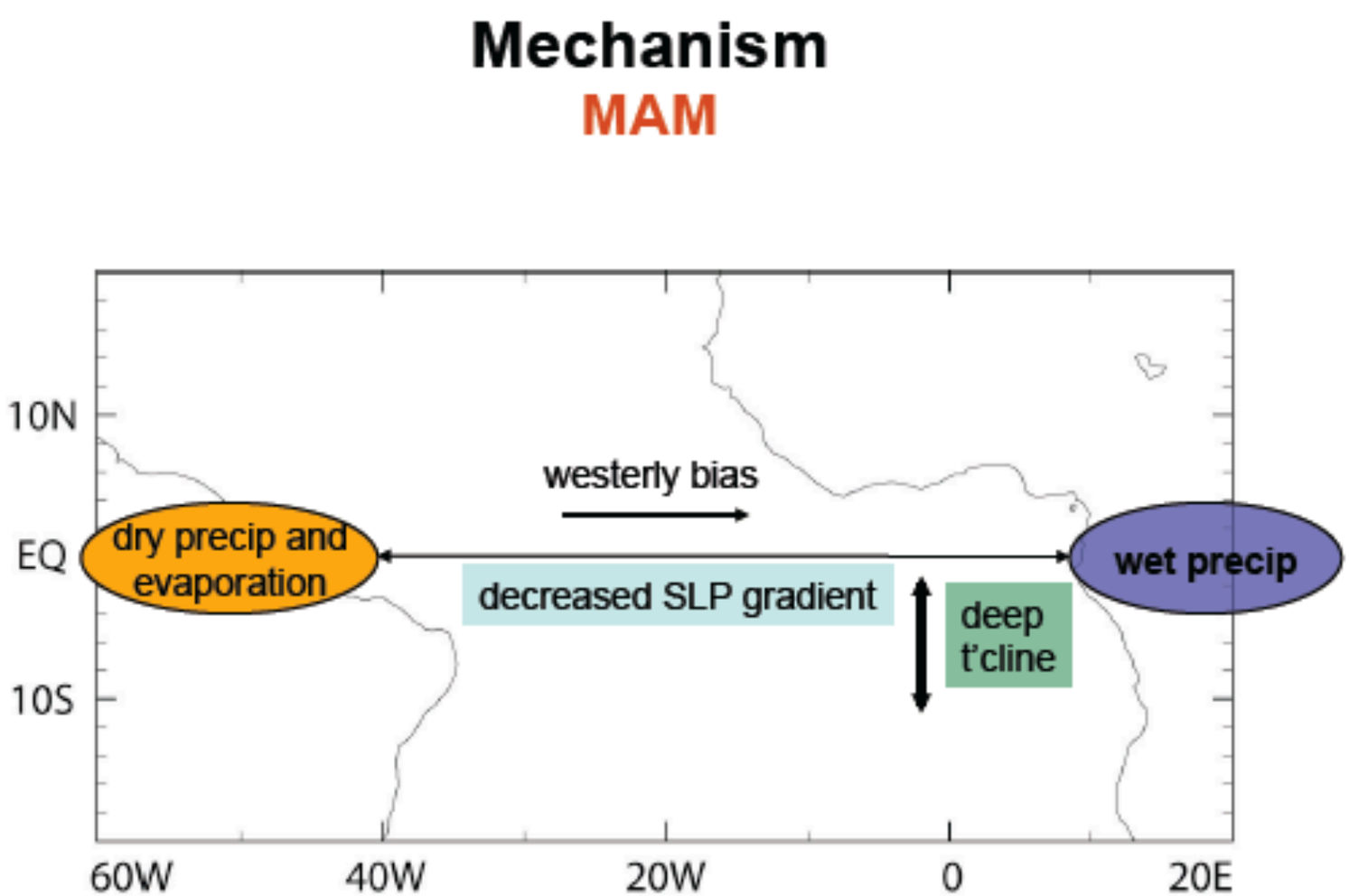
Working Group Activities, Timeline, and Outreach:

~6x/yr telecons; active website and email list; annual WG meetings held contemporaneously at 'meetings of convenience'; BAMS/EOS publication.

Year 1: Establish a website, identify and begin assembling the satellite datasets, buoy and research cruise datasets, begin model assessment. Identify the geographical region/line/point along which to compare observations and models. Identify the anticipated contributions from WG members. (propose to) convene an AGU session with a WG meeting appended (1 day).

Year 2: populate the website, WG meeting (1 day) appended to a meeting of interest. Finalize recommendations for the case specification of a community simulation.

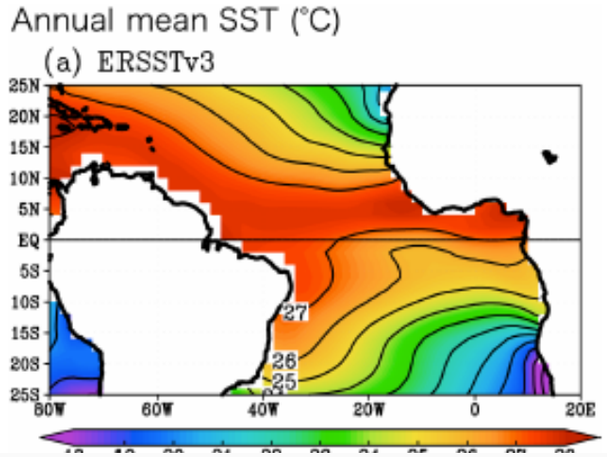
one hypothesis relevant to VAMOS: poor land convection ->weak equatorial trade winds ->insufficient upwelling



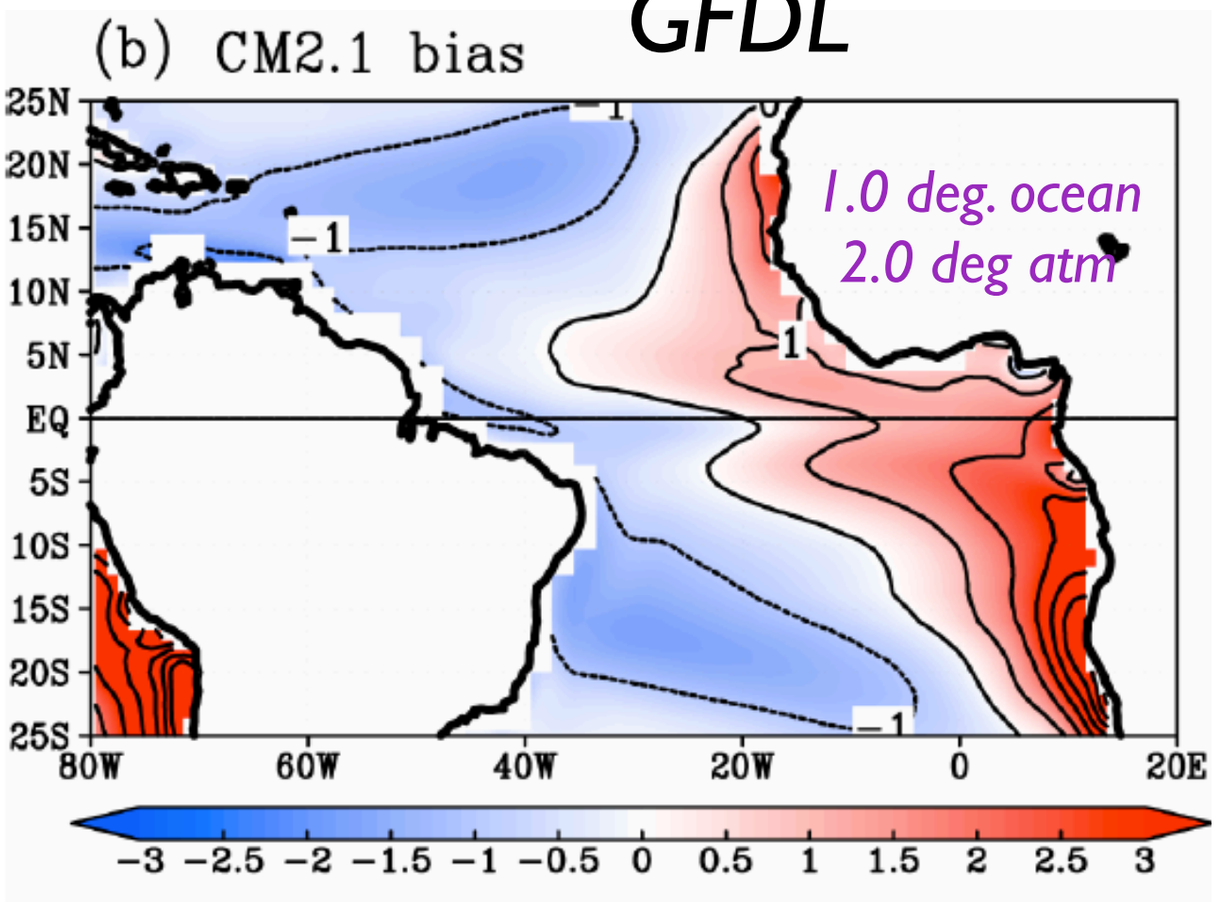
Richter & Xie

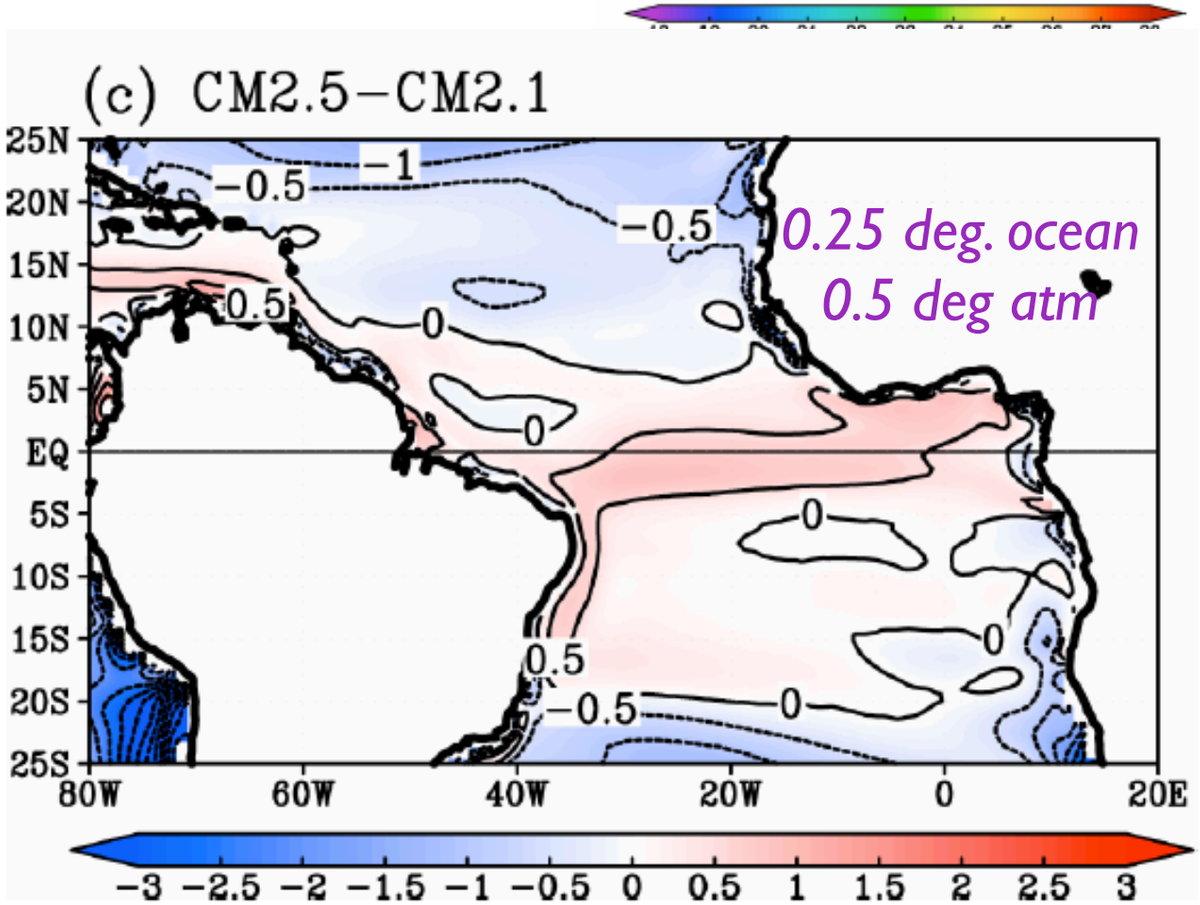
do higher resolution, the latest parameterizations, help?

Doi et al., 2012

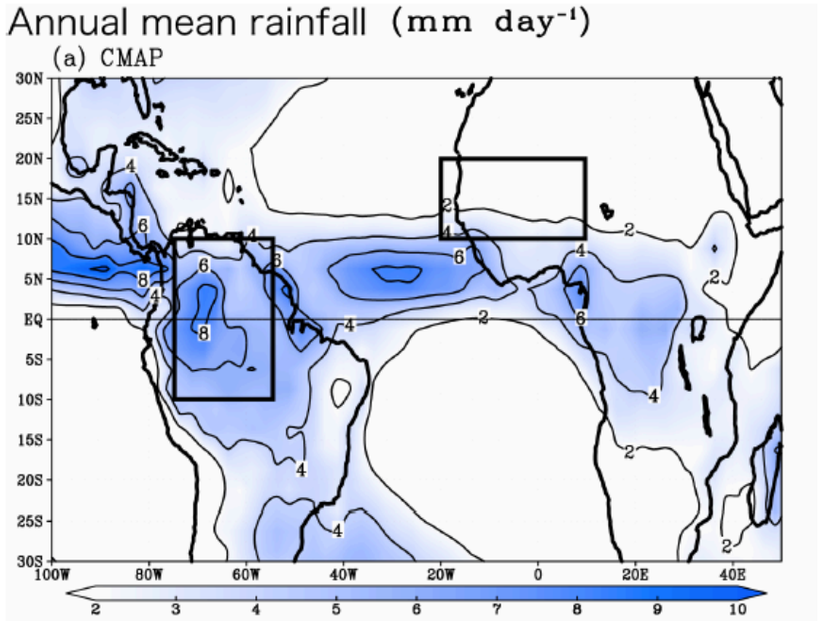


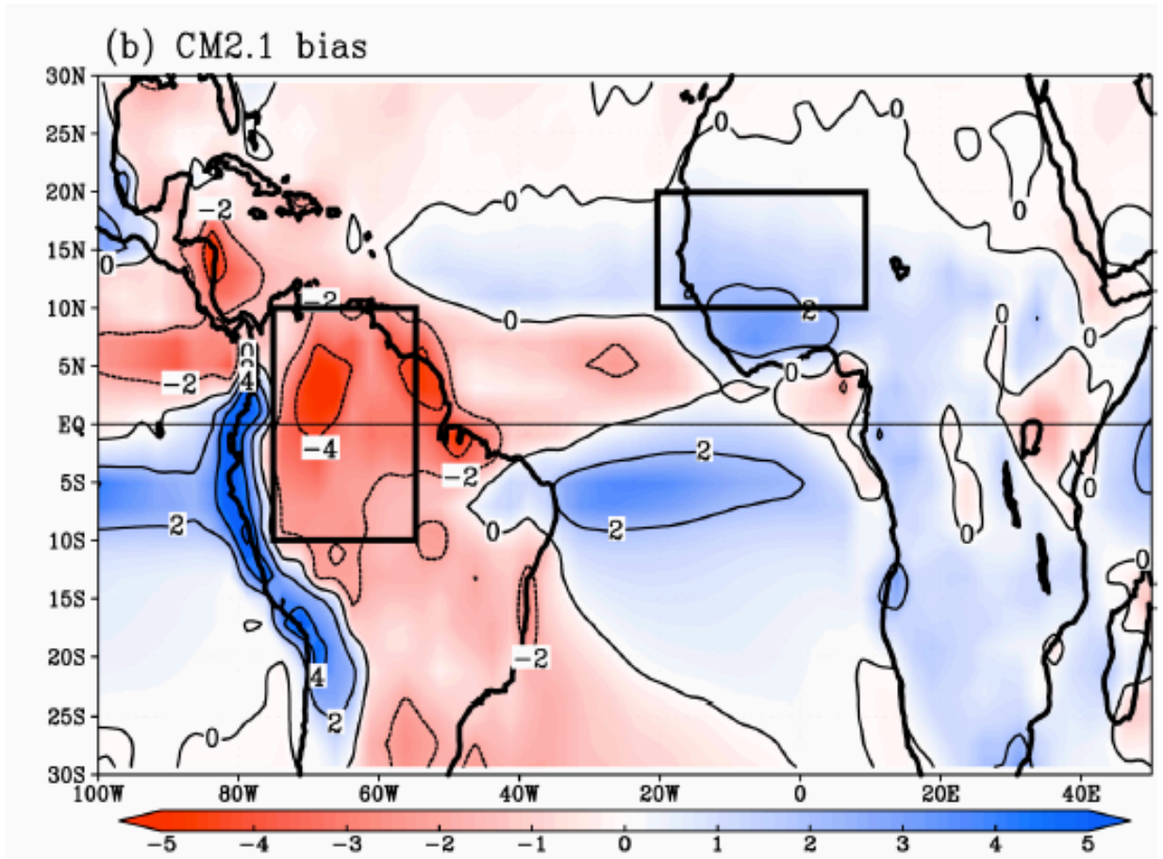
GFDL

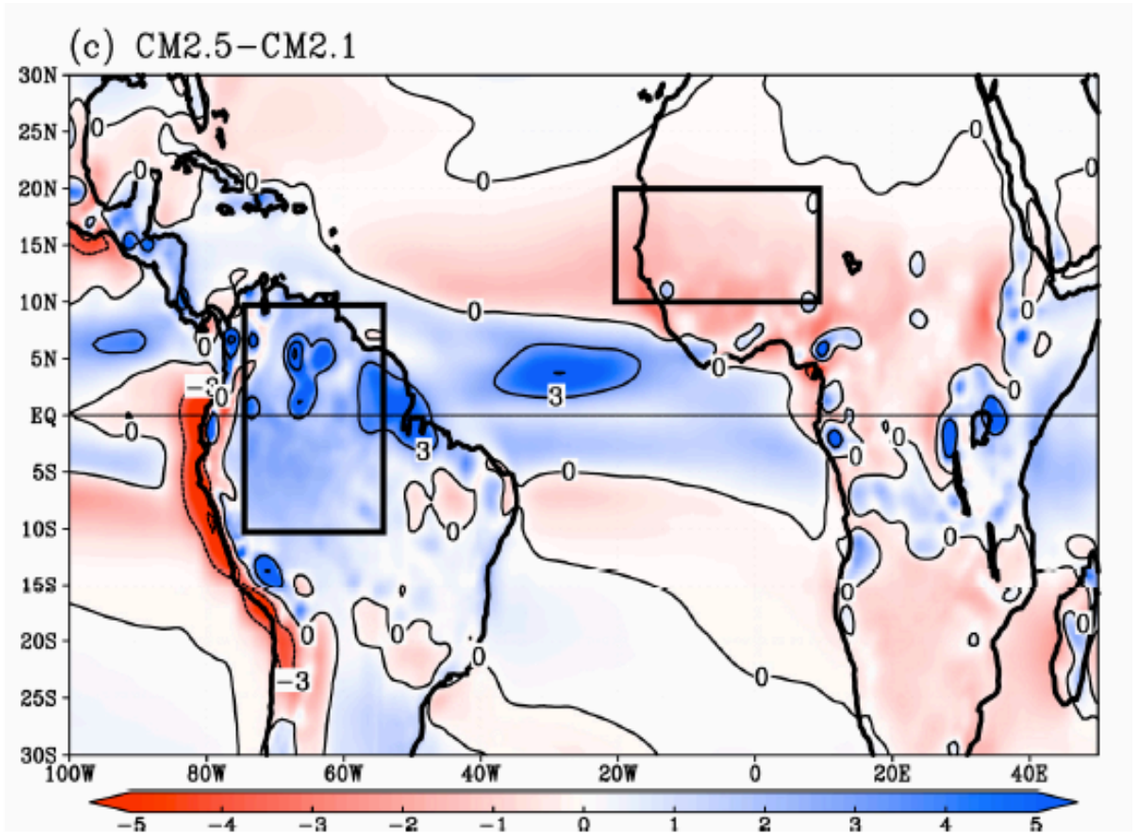


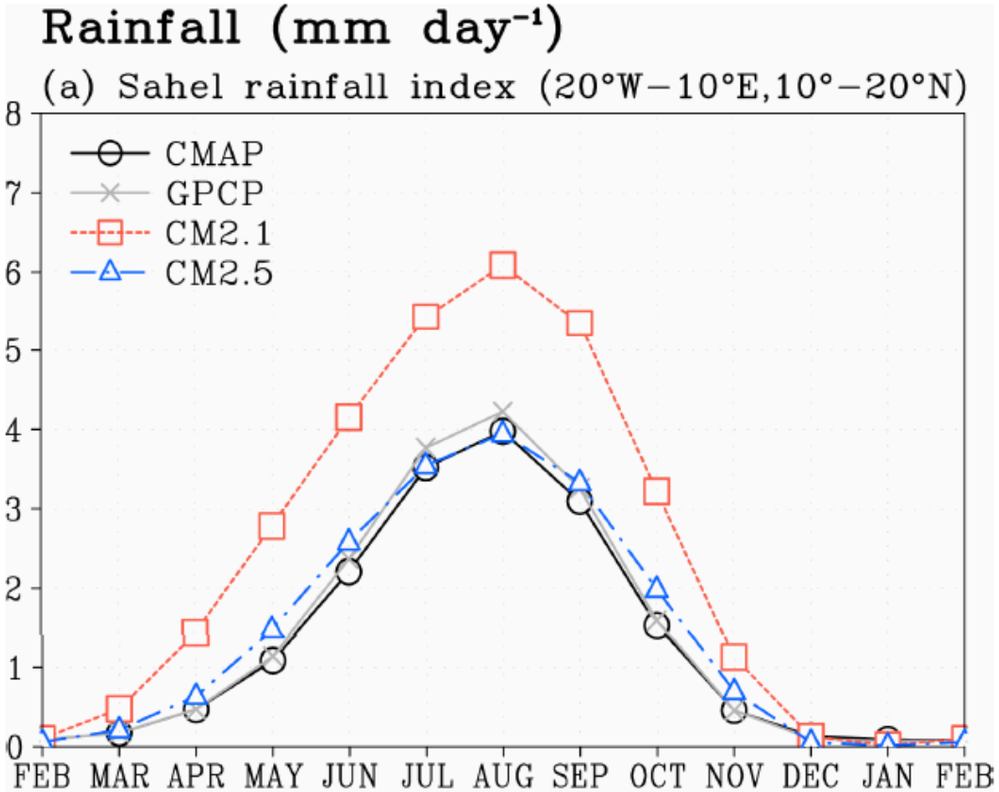


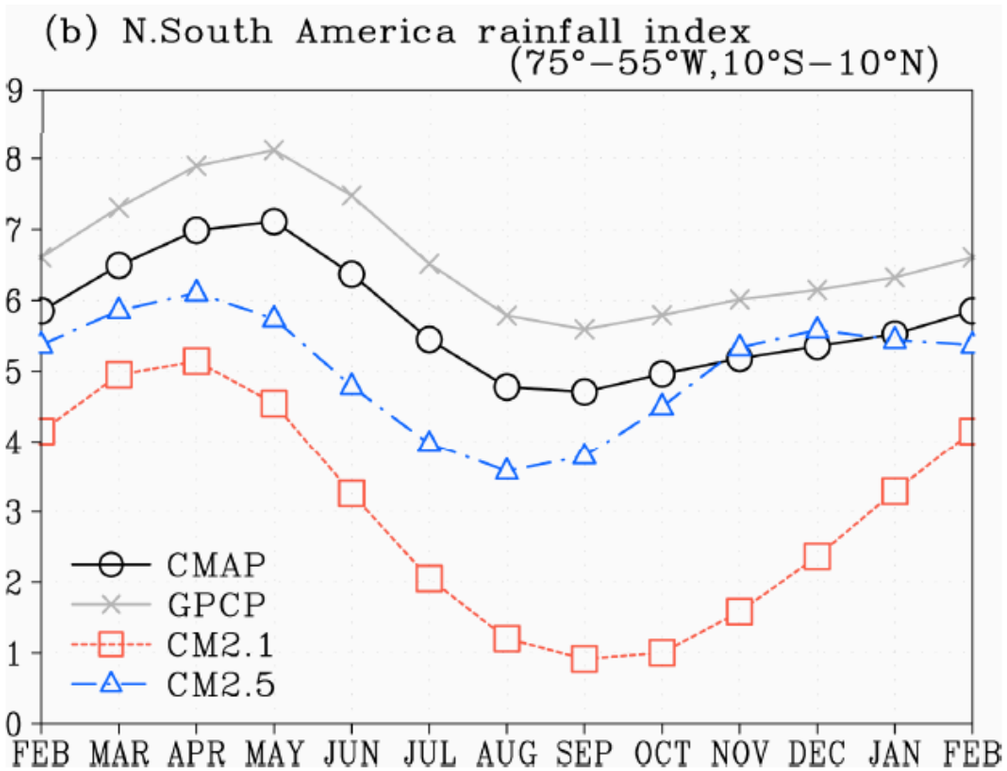
but - CM2.5 precipitation much more realistic than in CM2.1

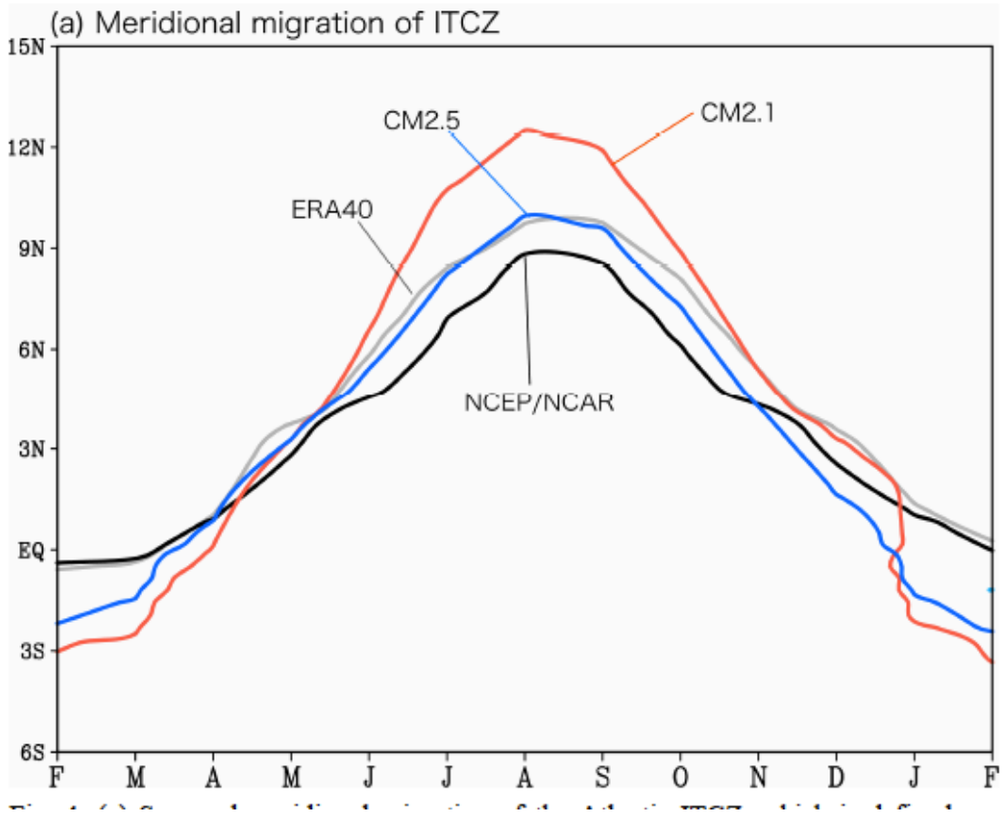







Rainfall (mm day⁻¹)
(a) Sahel rainfall index (20°W–10°E,10°–20°N)
CMAP
GPCP
CM2.1
CM2.5
0
1
2
3
4
5
6
7
8
FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC JAN FEB


(b) N.South America rainfall index
(75°–55°W,10°S–10°N)
CMAP
GPCP
CM2.1
CM2.5
0
1
2
3
4
5
6
7
8
9
FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC JAN FEB


(a) Meridional migration of ITCZ
15N
12N
9N
6N
3N
EQ
3S
6S
F
M
A
M
J
J
A
S
O
N
D
J
F
CM2.5
CM2.1
ERA40
NCEP/NCAR