The tropical variability in πCtl2

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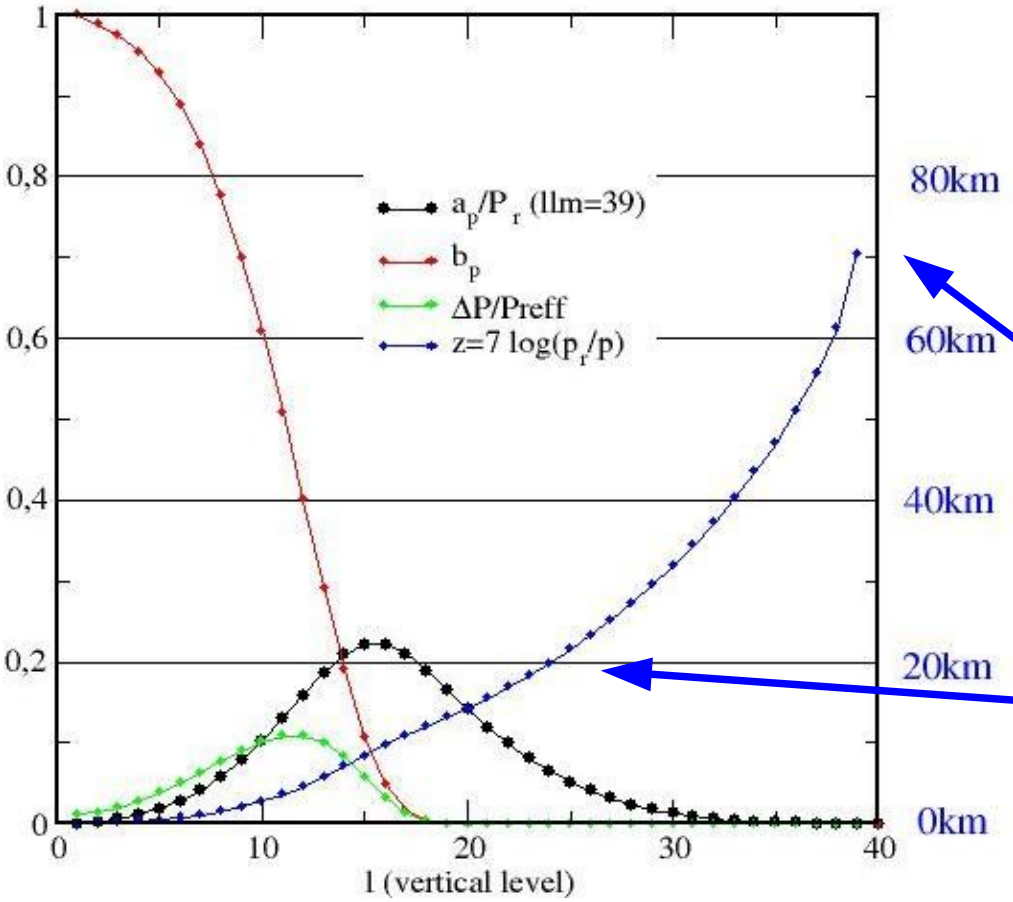
All the simulations done with the ESM IPSLCM5, include the stratosphere
The equilibrium pre-industrial 1000yrs, starting in 1800 control is done with the stratosphere. Two historical runs are also completed.



Ocean model: NEMO-LIM,2°x2°x31 levels with sea-ie model

Vegetation model: Orchidée

Coupling: OASIS from CERFACS

Atmospheric model: LMDz, 96x95x39

The experiments extent up to Z_{top}=70km, and includes orographic and non-orographic GWs parameterizations

The resolution in the low stratosphere is around 1.5-2km

Aerosols and volcanoes prescribed using INCA, Stratospheric Ozone prescribed via REPROBUS

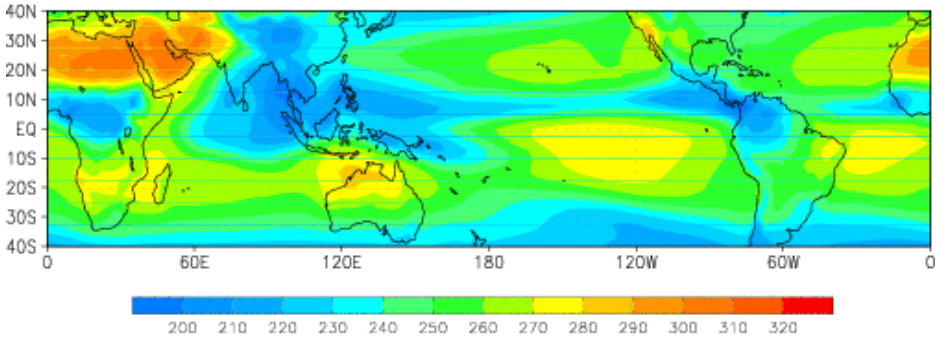
The tropical tropospheric variability in the ESM IPSLCM5

The model needs to have realistic tropospheric climate and variability
(ENSO, MJO, and stratospheric PWs depend on theses)
Also needed if one wishes to adress which amount of waves needed for the
QBO forcing are explicitely solved by the model

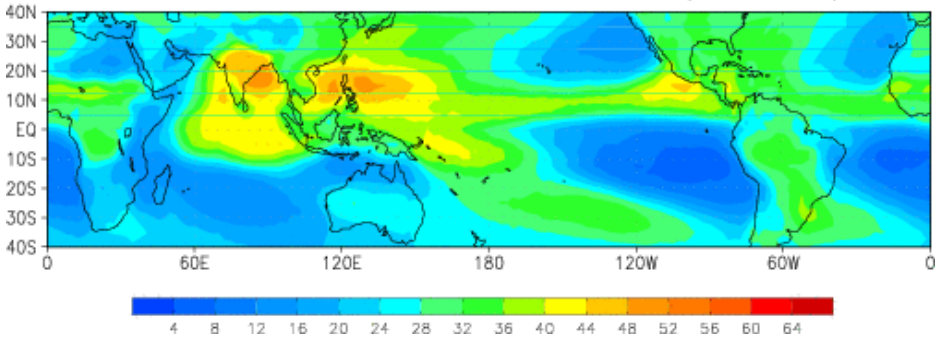
OLR diagnostics from the control run (1800-2350)

OLR NOAA (1979−2008)

Mean Summer (MJJASO)



Standard Deviation Summer (MJJASO)



OLR piControl2 (2200−2220)

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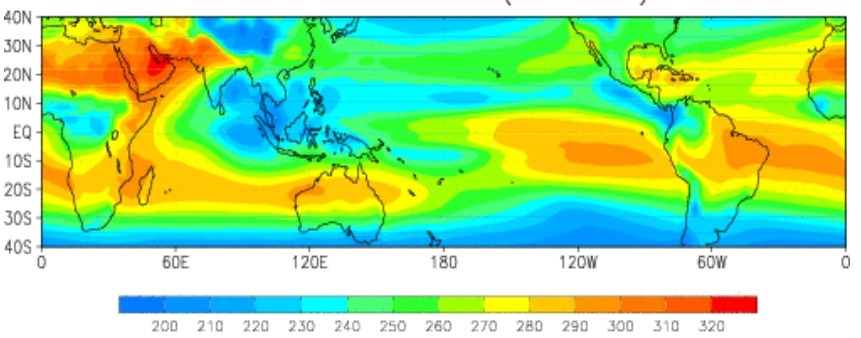

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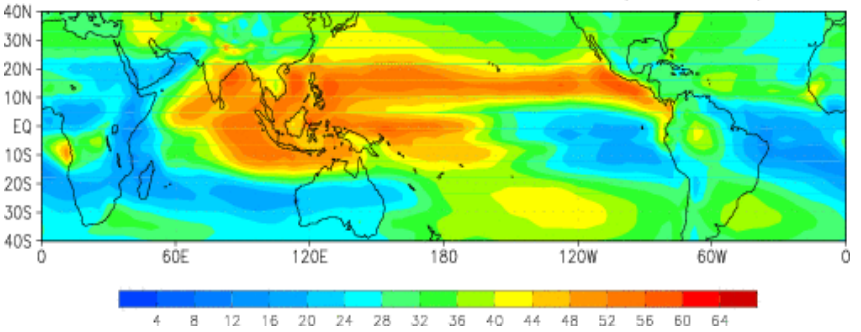

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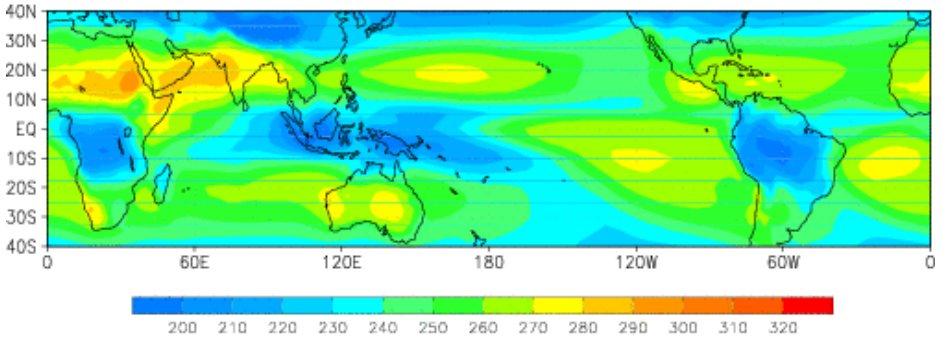
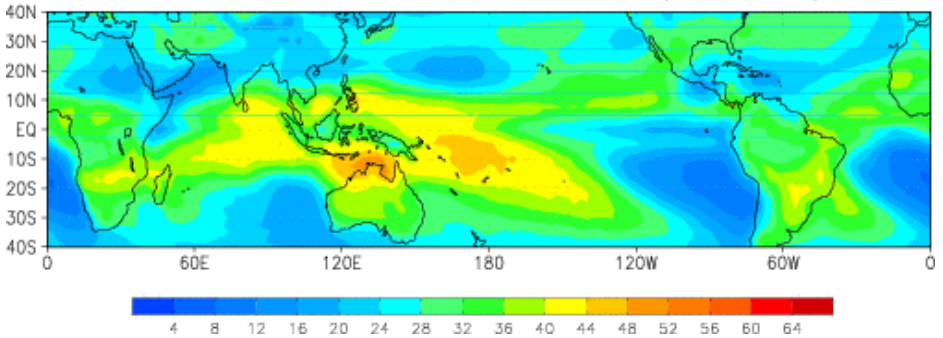


Standard Deviation Winter (SONDJF)



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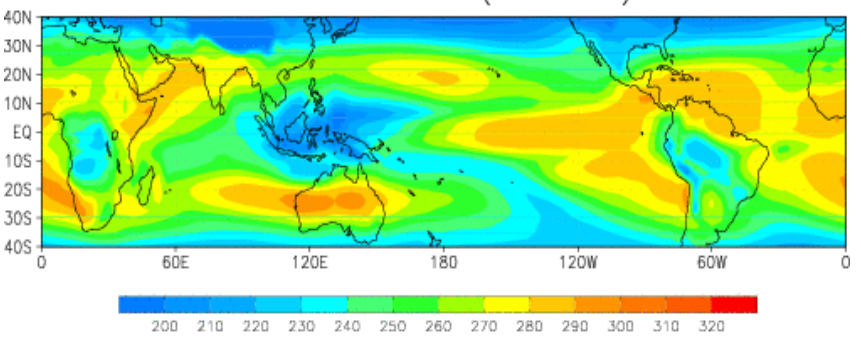

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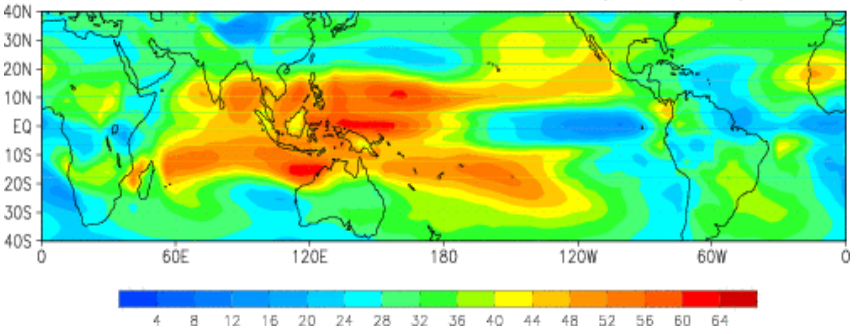
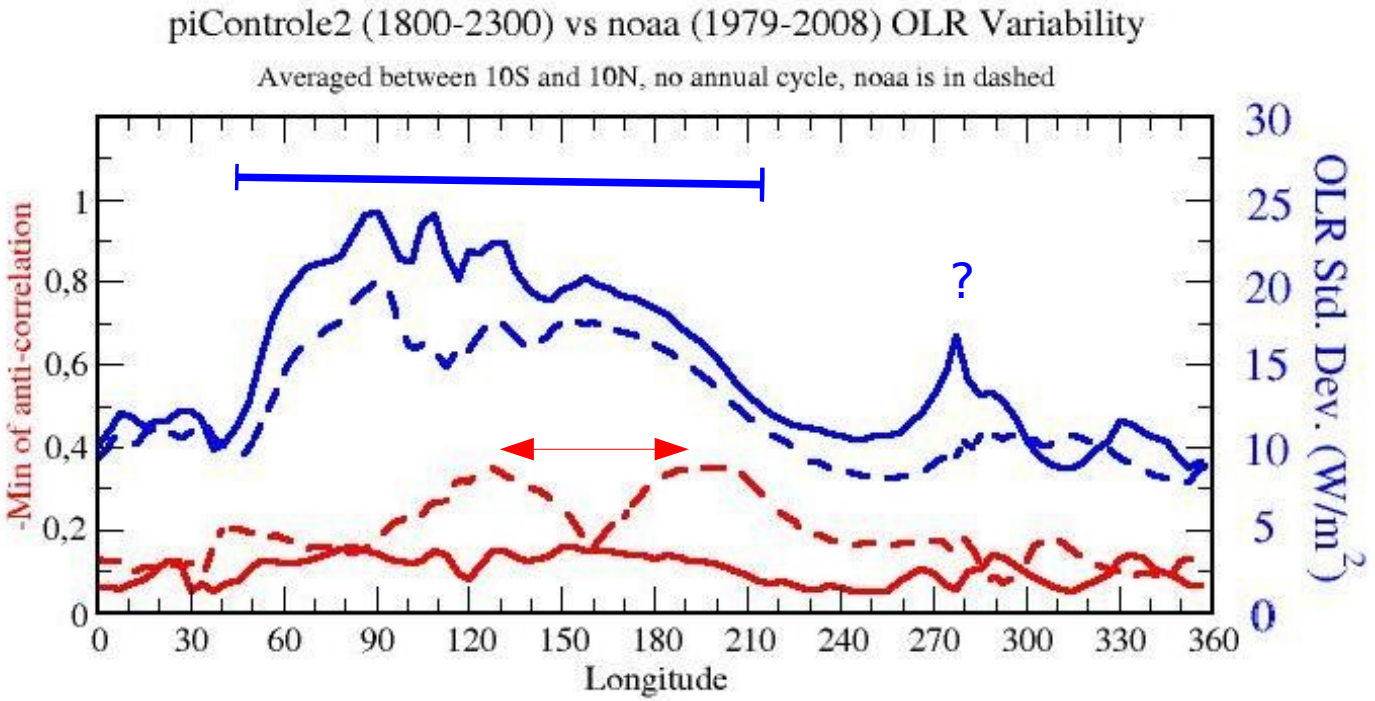


The tropical tropospheric variability in the ESM IPSLCM5

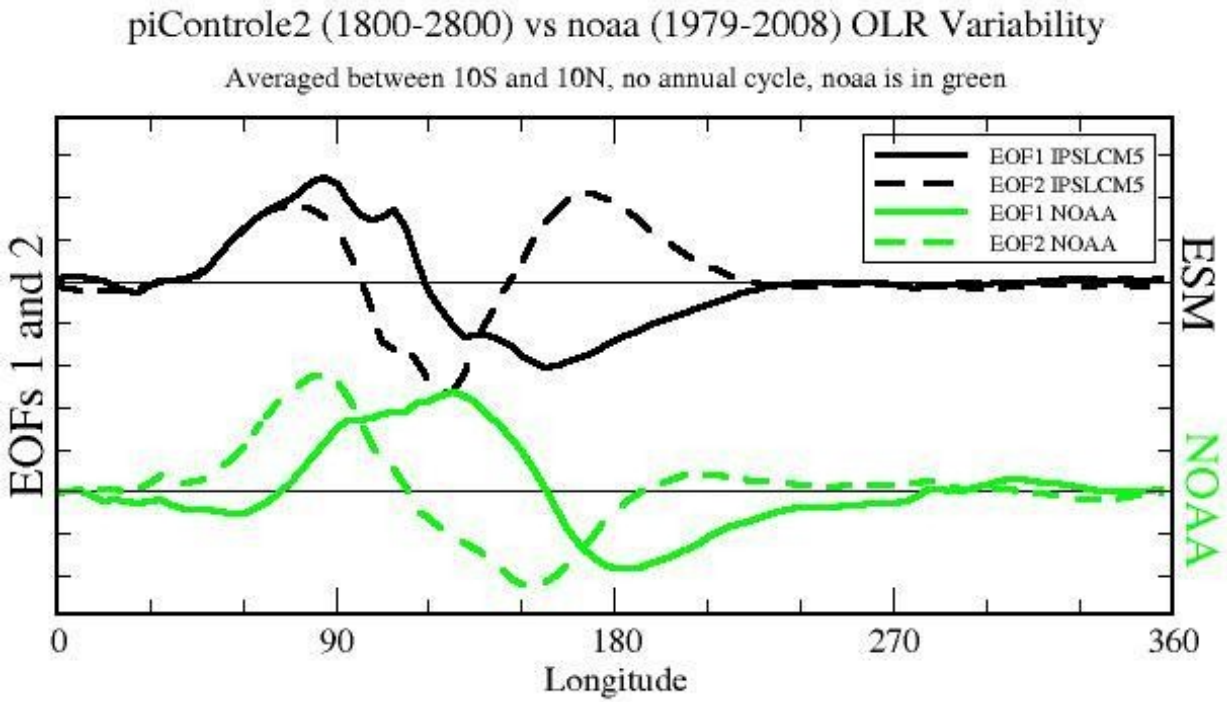


The model has enhanced variability from the Southern Indian ocean to the Mid-pacific, as in the Obs.

But a spurious peak of enhanced variability over Central and South America (?)

There is a significant underestimation of the anticorrelation between the maritime continent and the central pacific, remember that this anticorrelation is a signature of the Madden-Julian Oscillation (see the teleconnection arrow)

The tropical tropospheric variability in the ESM IPSLCM5

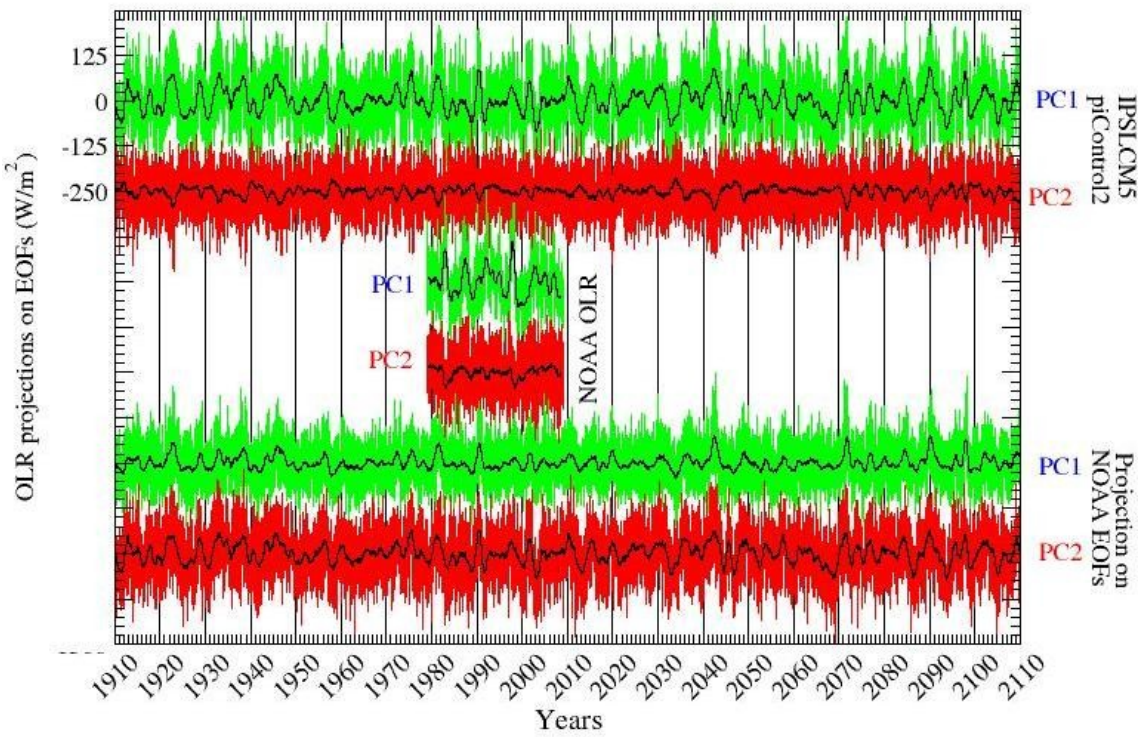


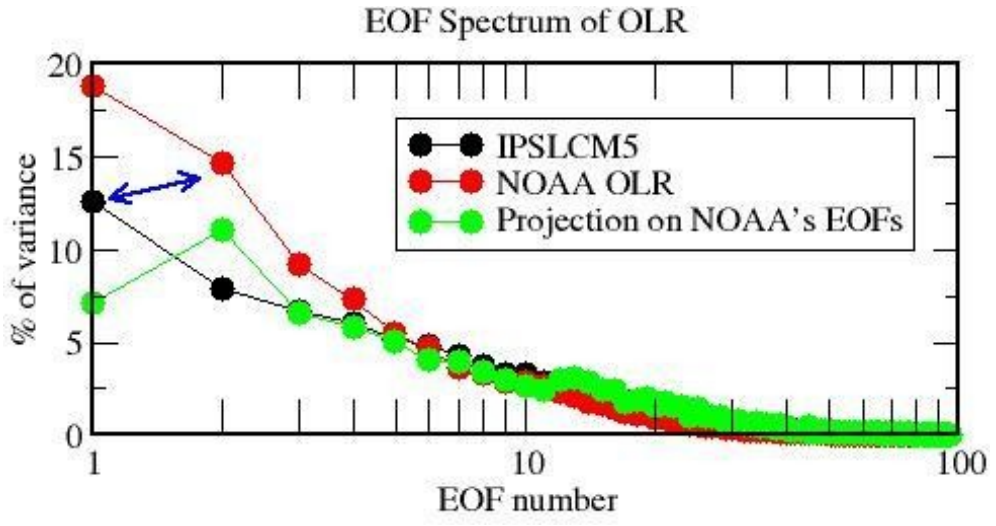
EOF1 in IPSLCM5 is more like the EOF2 from observations
Both correspond to an excess in precips. over the western and central pacific;
and a deficit over the Equatorial Indian Ocean

EOF2 in IPSLCM5 slightly reminiscent of like EOF1 from observations
(but this is only true for that they are both associated with excess precipitation over the maritime continent; for the western Indian ocean this is not clear at all!

The relative short scale of EOF2 (3 pronounced extrema) in IPSLCM5 call for a more regional analysis.

The tropical tropospheric oscillations in the ESM IPSLCM5





ENSO type:

PC1s in IPSLCM5 and NOAA shows more inter-Annual variability than PC2s

This is despite the fact that EOF1 in IPSLCM5 is More like EOF2 in NOAA!

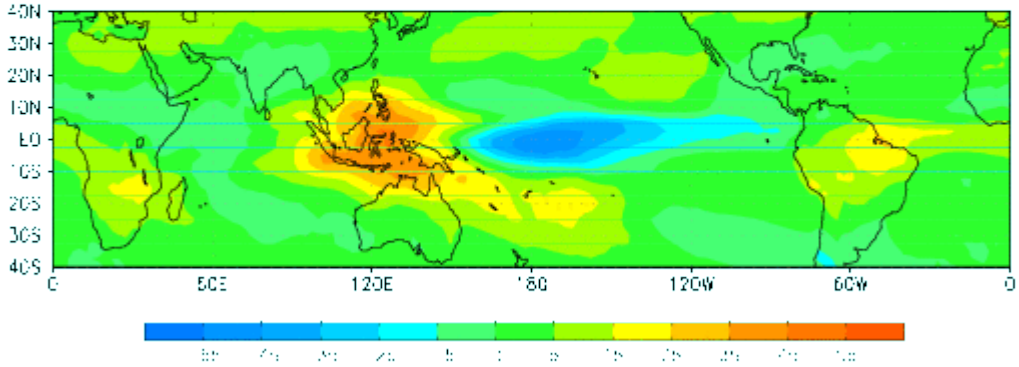
The Inter-Annual variability seems more confined to The western Pacific

The selected years are rather Insensitive if we choose EOF 1 from model or from observations to Attribute Nino years

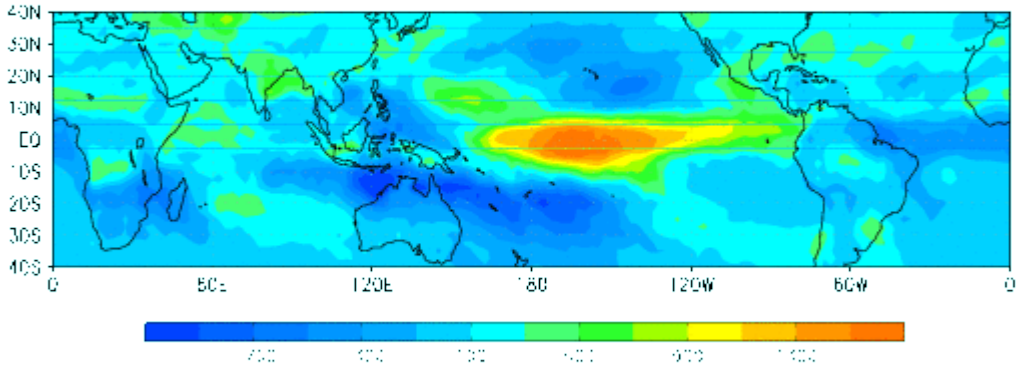
The tropical tropospheric oscillations in the ESM IPSLCM5

OLR NOAA (1979–2008)

Mean (NINO–NINA)

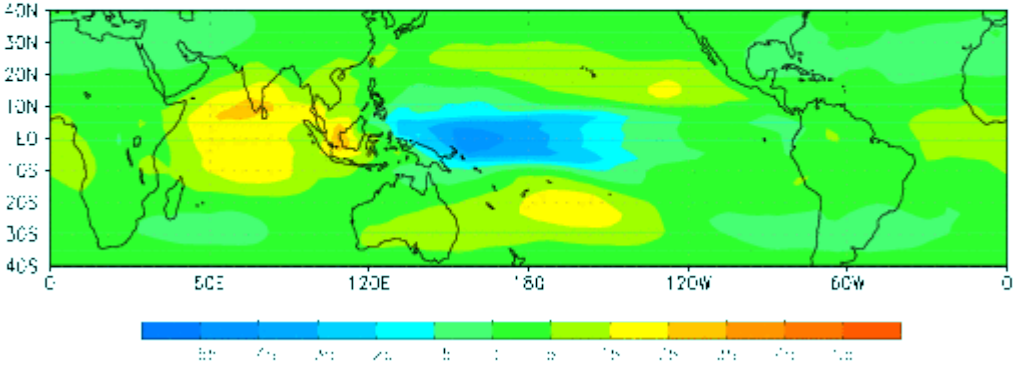


shifts in Variance



OLR piControl2 (1800–2000)

Mean (NINO–NINA)



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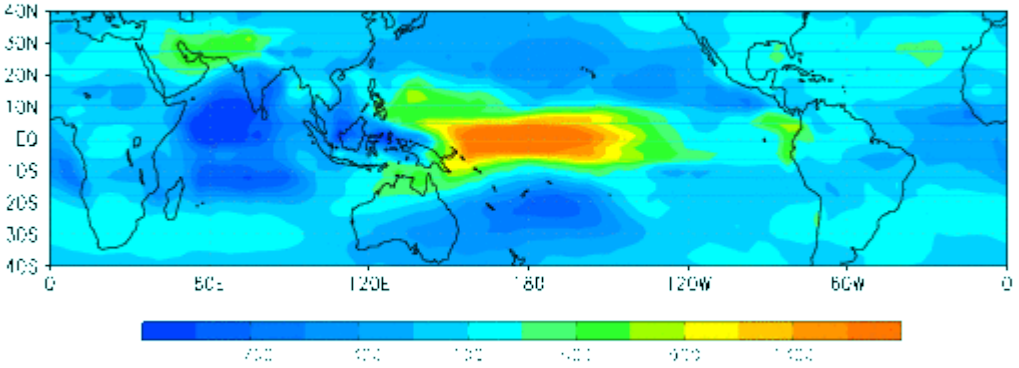
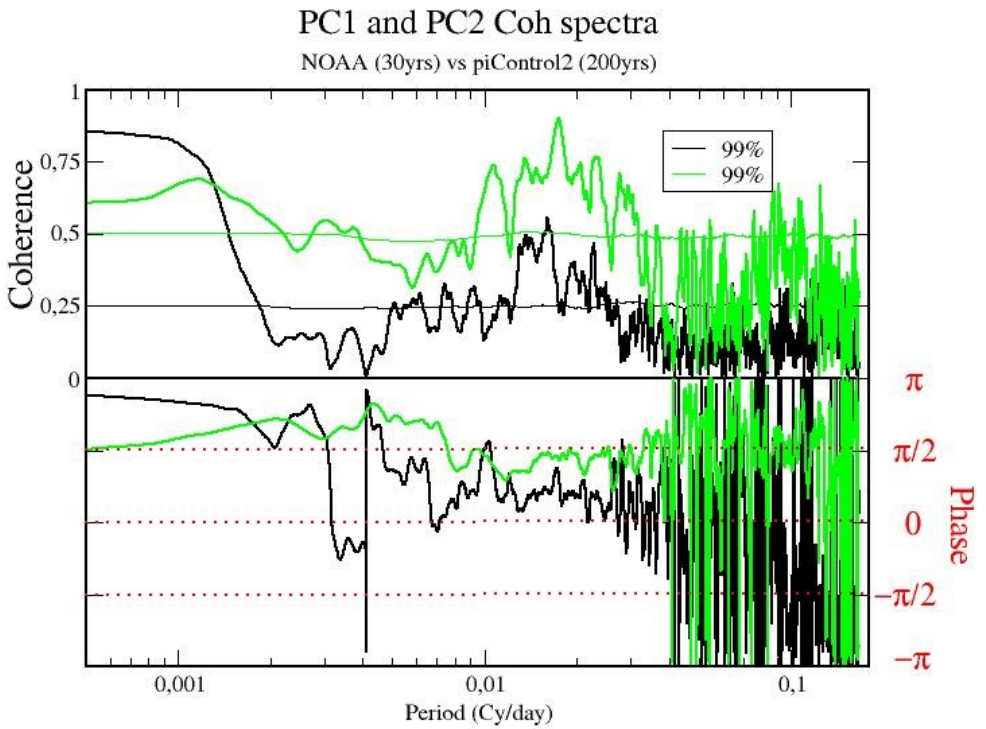


The tropical tropospheric oscillations in the ESM IPSLCM5

Coherency spectrum between
PC1 and PC2,
NOAA OLR Dashed (20 yrs)
PiControl2 (200yrs only, sorry!) Solid

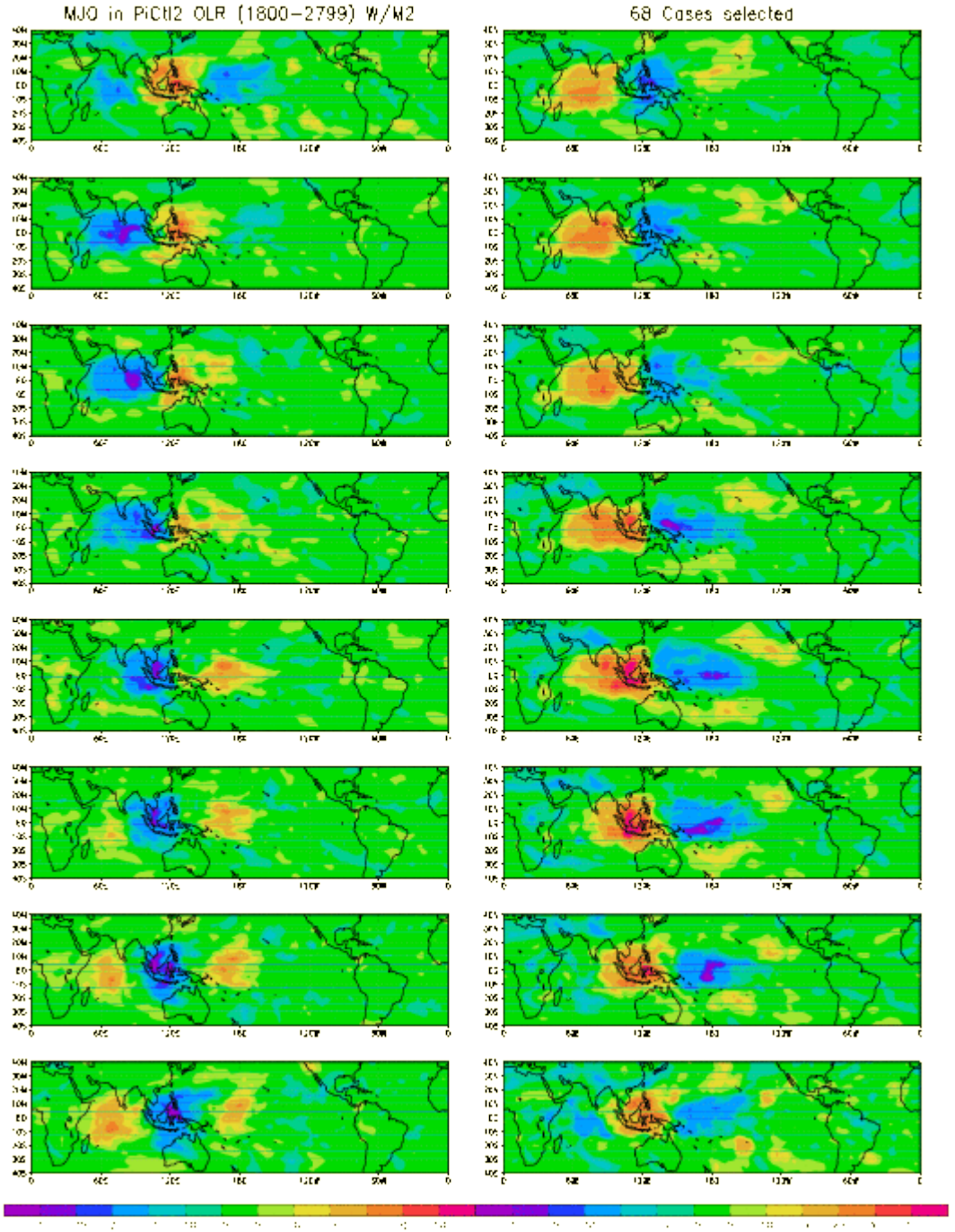


MJO-type:

The intraseasonnal variability is characterised in the NOAA OLR by the fact that the PC1 and PC2 signals are significantly coherent and in quadrature.
This is almost absent from IPSLCM5

More precisely and in the IPSLCM5, the coherency is weak and the PC1 and 2 signals are almost in phase: the signal is more a standing oscillation than an Eastward propagating one.

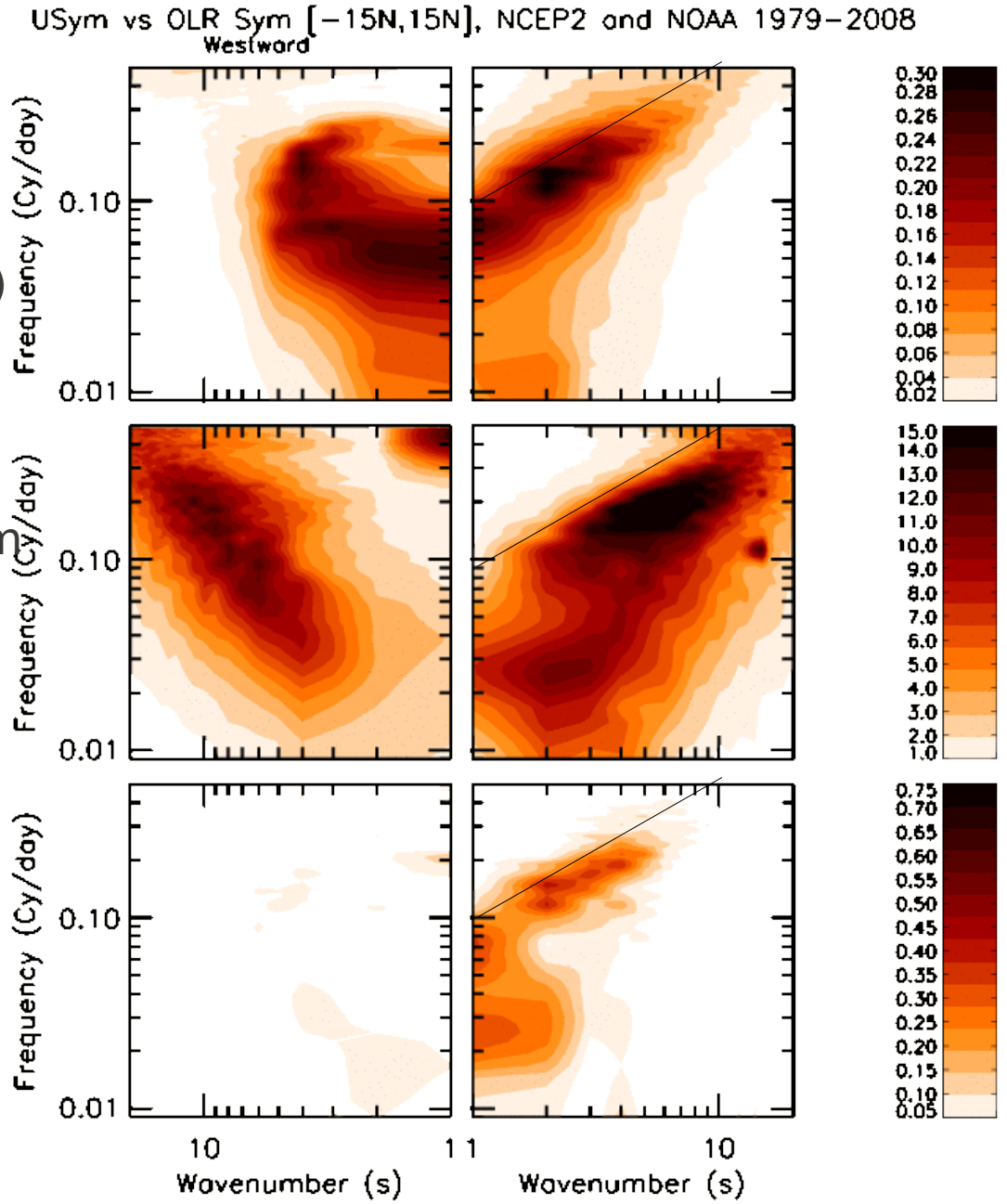
The tropical tropospheric oscillations in the ESM IPSLCM5



Composite MJO out of piCtl2 (68 cases out of 1000yrs!).

Big ones propagate properly, but there are very few!

The tropical waves in the ESM IPSLCM5



U from NCEP (50hPa)

OLR from NOAA

Cohe rency

Free stratospheric Kelvin Waves

not so distinct

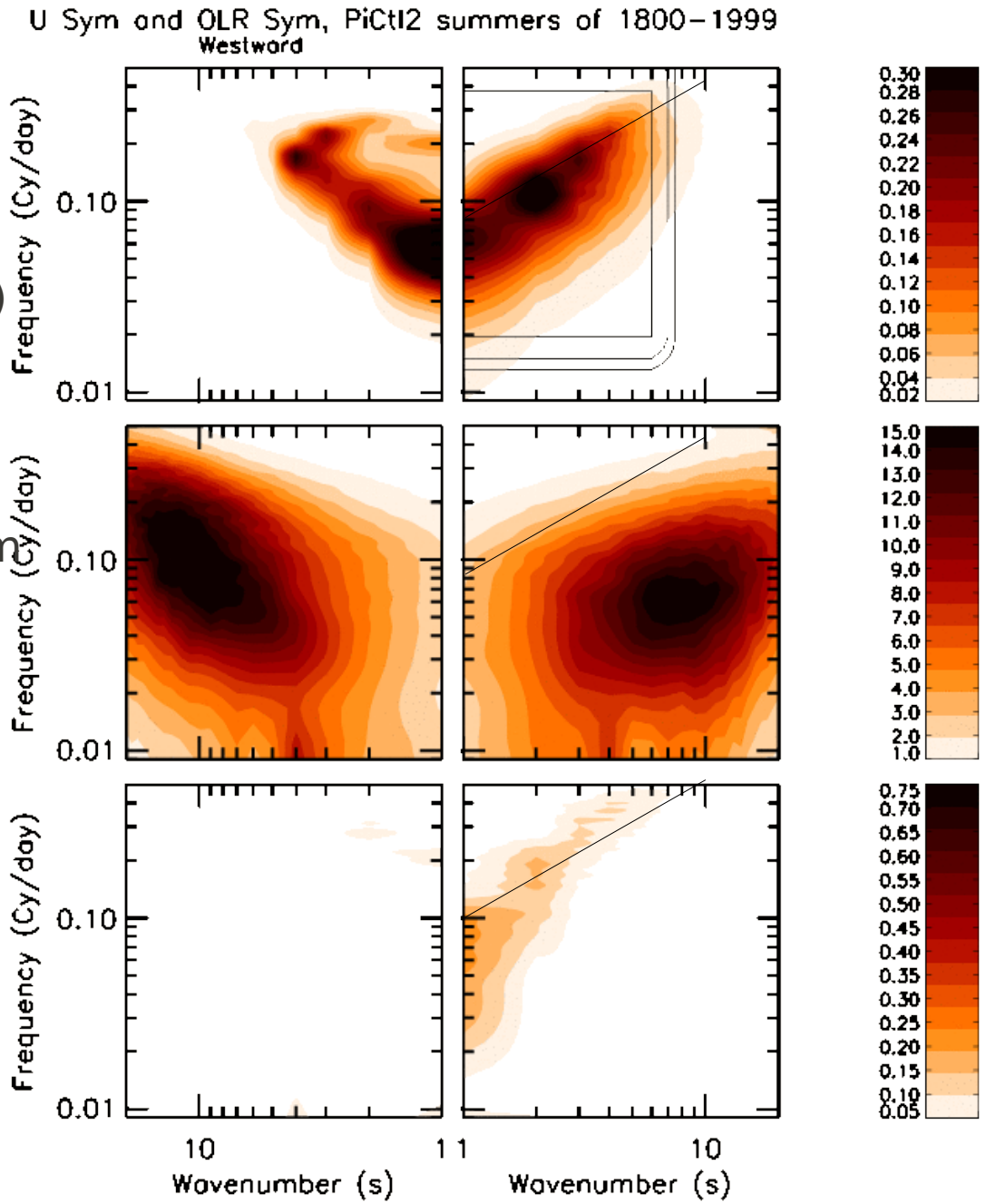
from the tropospheric "coupled waves"

The tropical waves in the ESM IPSLCM5

U from NCEP (50hPa)

OLR from NOAA

Cohe rency

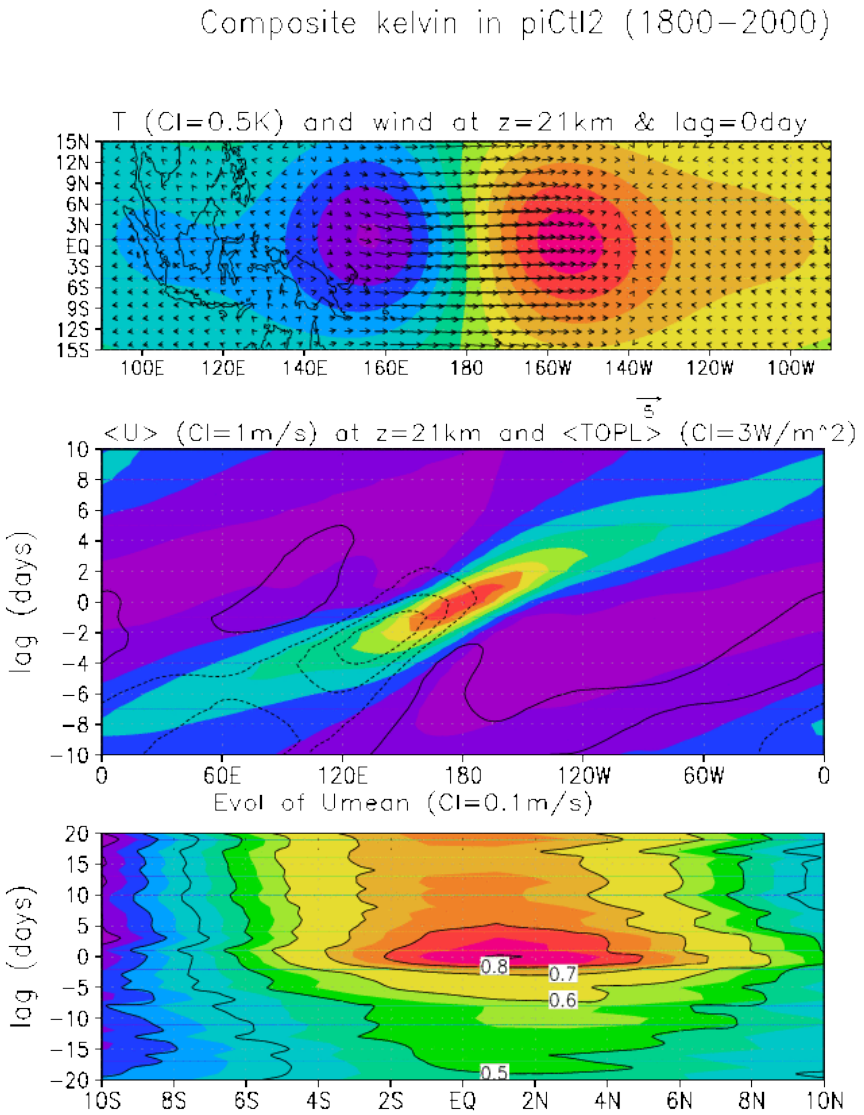


Free stratospheric Kelvin Waves

But no tropospheric waves signatures on convection!

A little on precipitations though, and as for CMIP4

The tropical waves in the ESM IPSLCM5



Composite analysis illustrates better the structure of the waves

(here at 50hPa, except for the OLR)

The tropical waves in the ESM IPSLCM5

Weak sensitivity to ENSO! (is there is an ENSO to QBO relation?)