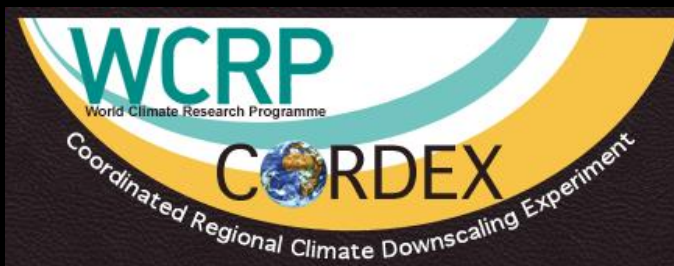


21ST CENTURY PROJECTIONS OF SUMMER PRECIPITATION OVER MEXICO AND CENTRAL AMERICA FROM THE PHASE I CORDEX REGCM HYPER-MATRIX SIMULATIONS

**Ramón Fuentes-Franco, Filippo Giorgi, Erika Coppola,
Edgar G. Pavia, Gulilat Tefera Diro, Federico Graef**

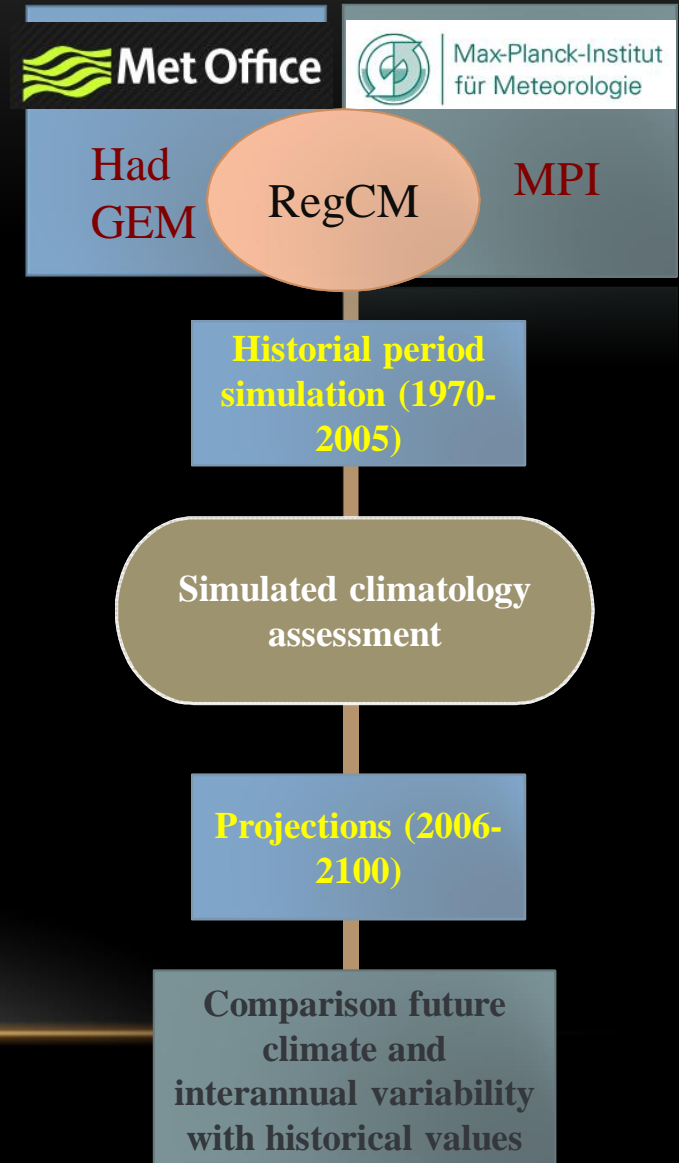


OBJECTIVES

- “ To assess the skill of the RegCM4 in reproducing the climate over Mexico and Central America in the 1976-2005 period, using CMIP5 GCMs as boundary conditions.
- “ To generate climate projections (2006-2100) using the CORDEX Central America domain.
- “ To evaluate the changes of summer precipitation's inter-annual variability and the possible mechanisms driving the changes.

METHODS

- “ 2 GCMs (MPI and HadGEM)
- “ 2 Different RegCM configurations
 - “ Convection: Emanuel or Grell
 - “ Surface: CLM or BATS
- “ Historical 1970 – 2005
- “ Projections 2006 – 2099

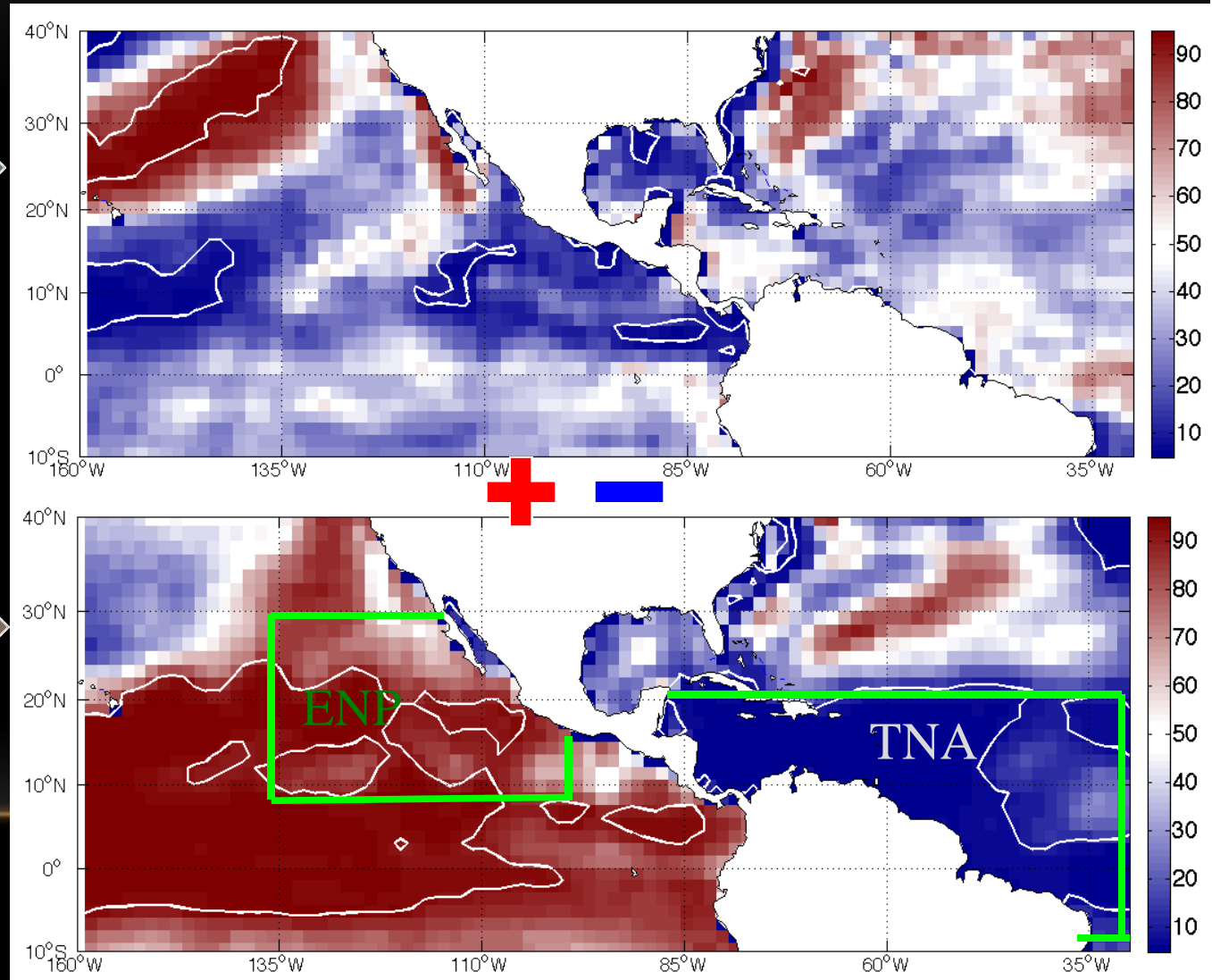


SST SIGNIFICANT ANOMALIES DURING WET AND DRY YEARS FROM OBSERVATIONS

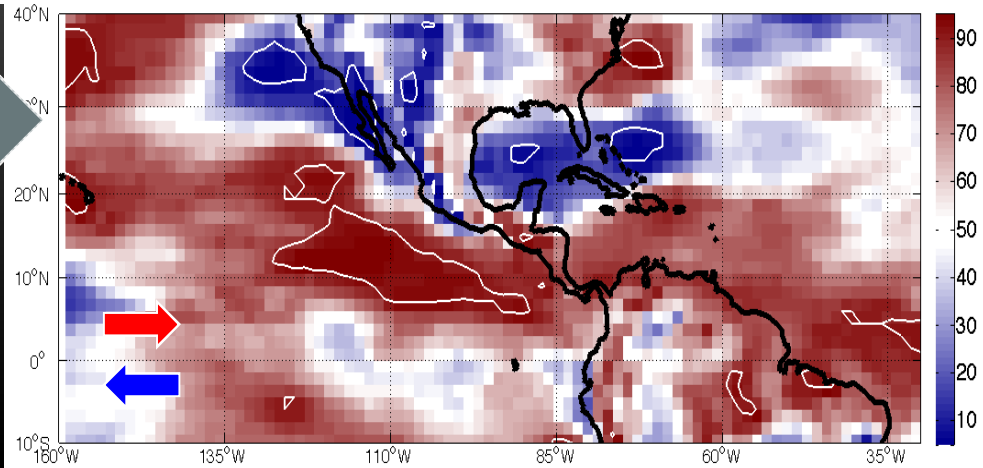
SST
Wet years

SST
Dry years

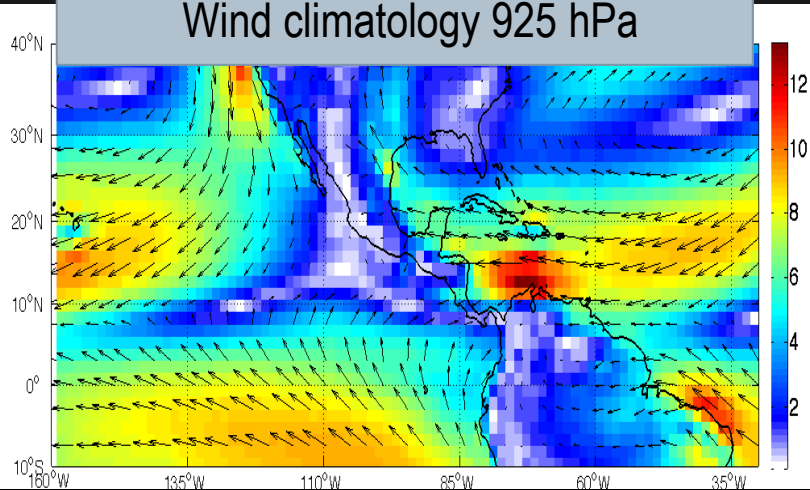
Coutour: significant 90%
Precipitation: CLICOM
SST: ERA-Interim



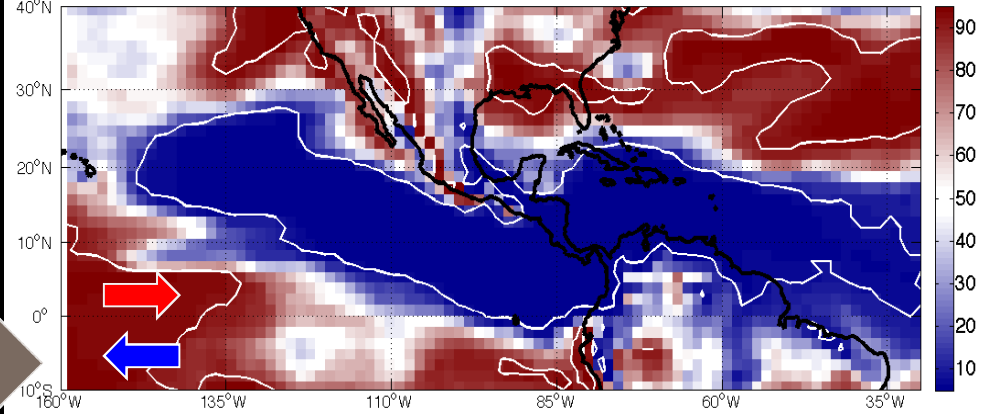
Zonal wind 925 hPa
Wet years



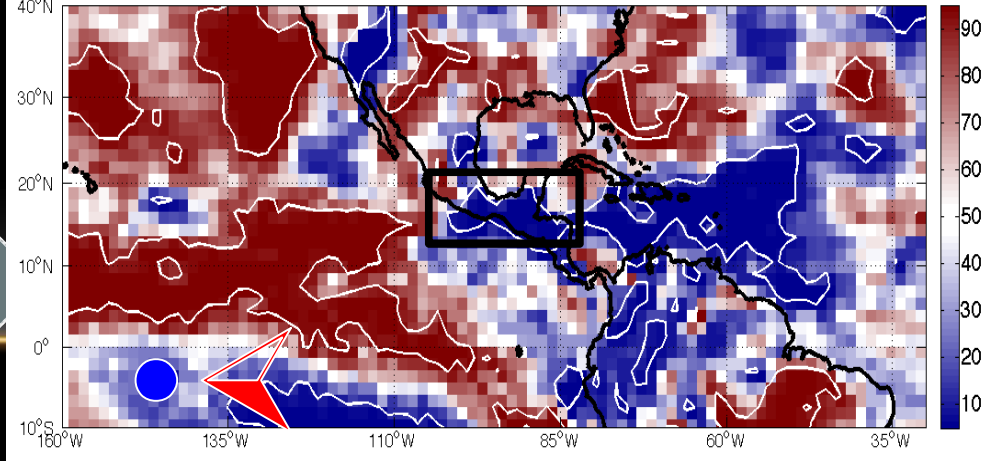
Wind climatology 925 hPa



Zonal wind 925 hPa
Dry years

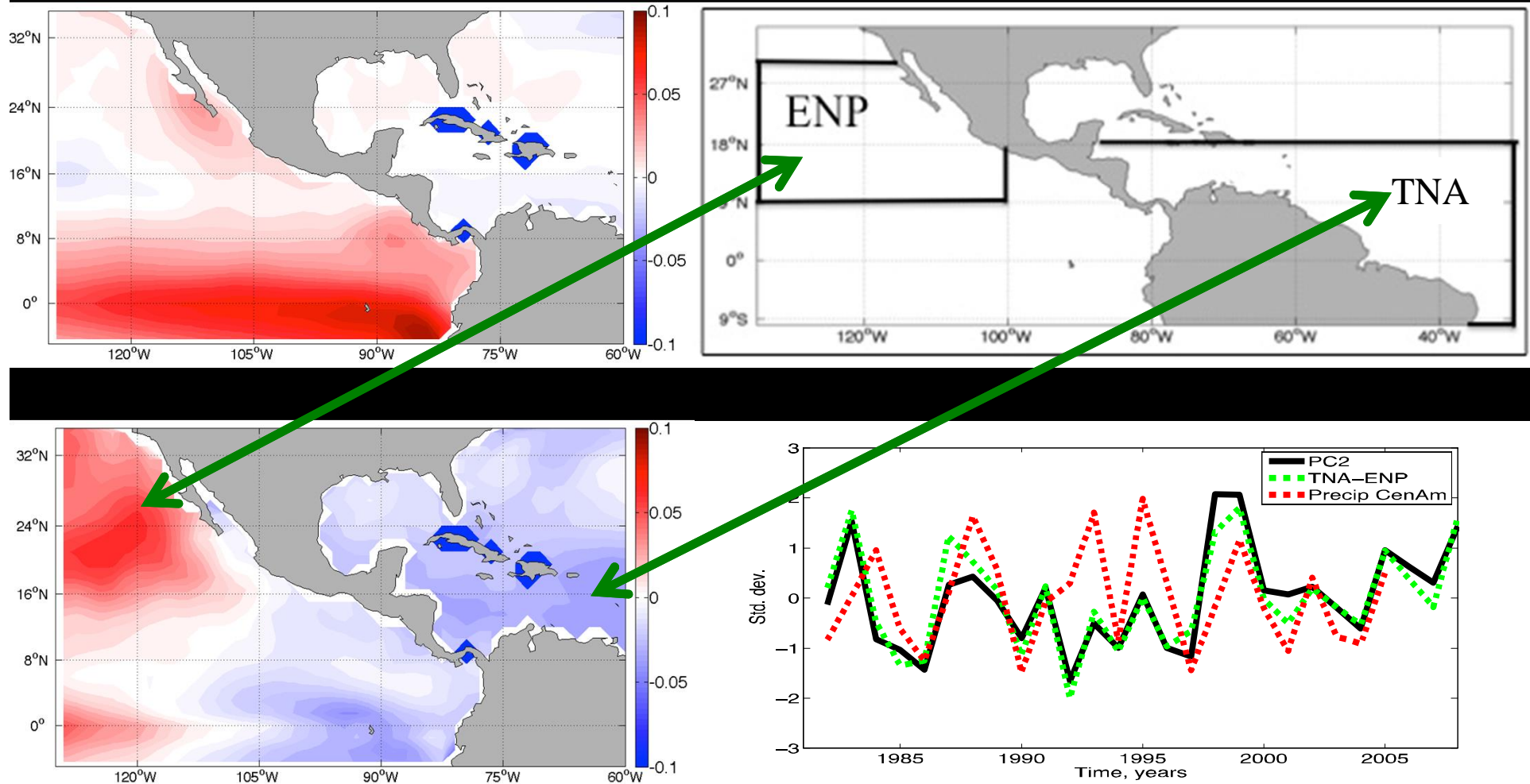


Vertical velocity
500 hPa (ω)
Wet years

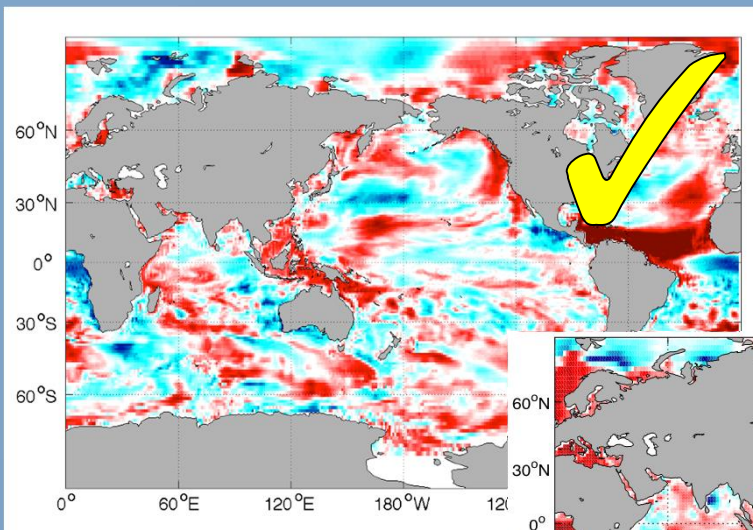


u, ω : ERA-Interim. P : CLICOM.

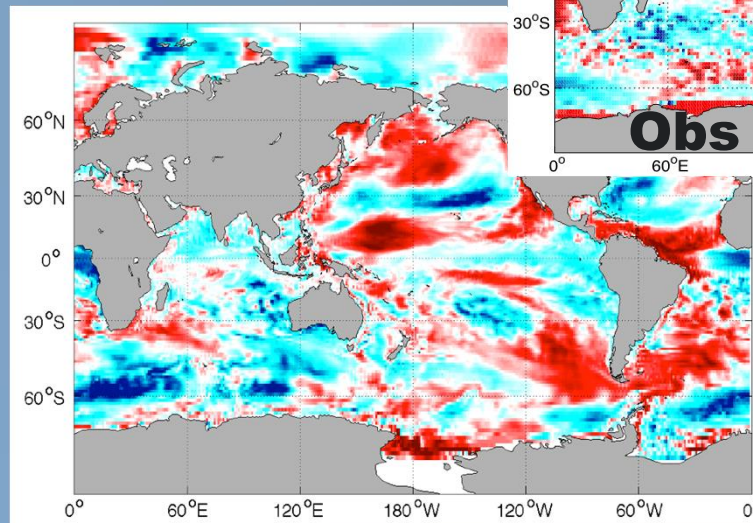
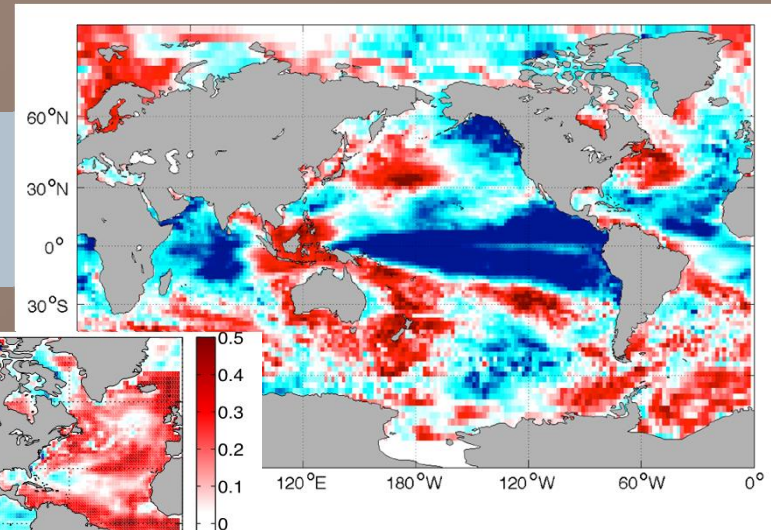
MODES OF SST VARIABILITY (ERA-INTERIM)



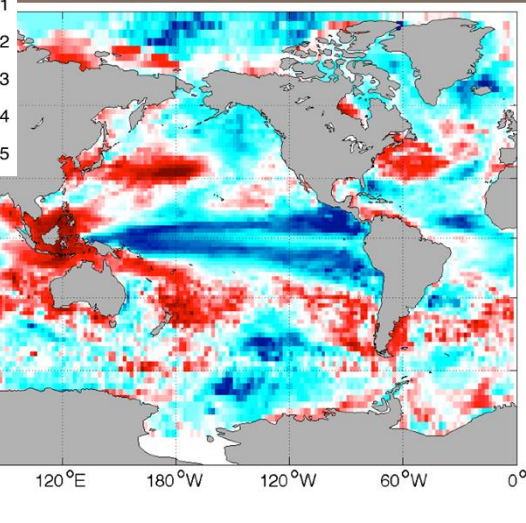
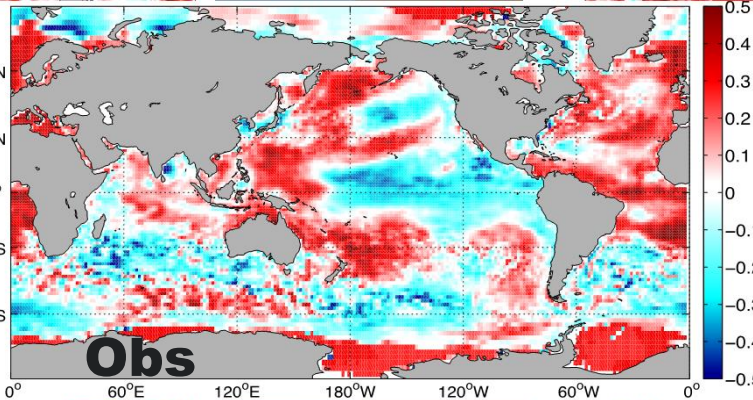
CORRELATION OF SST WITH PRECIPITATION OVER MEXICO FROM DIFFERENT CONFIGURATIONS



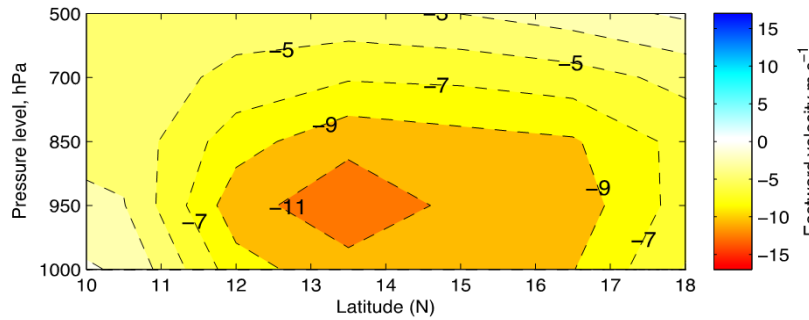
Emanuel
CLM



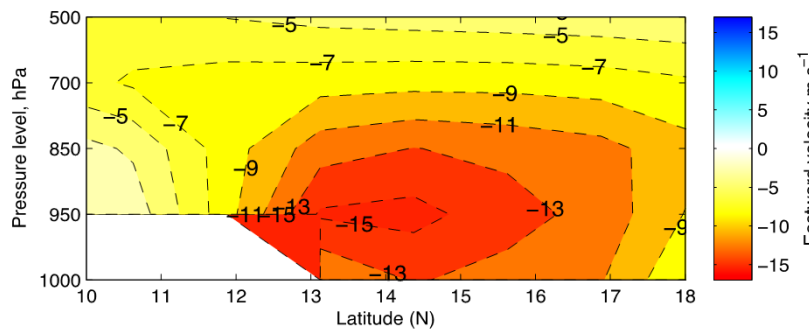
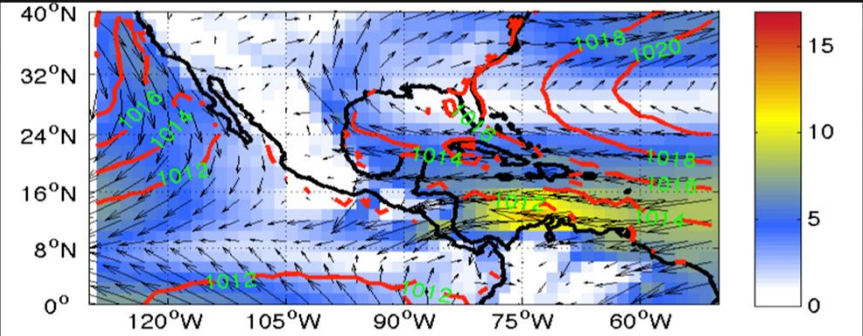
Grell
BATS



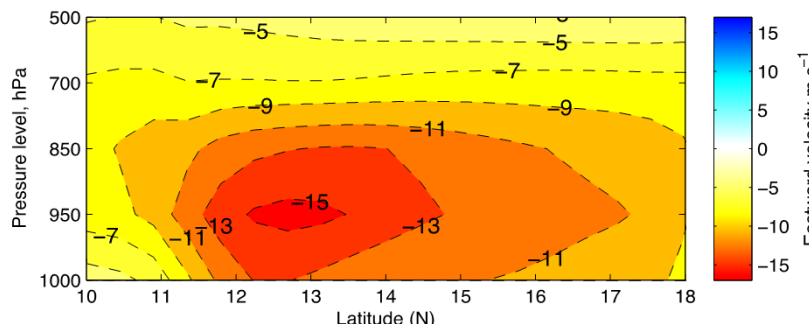
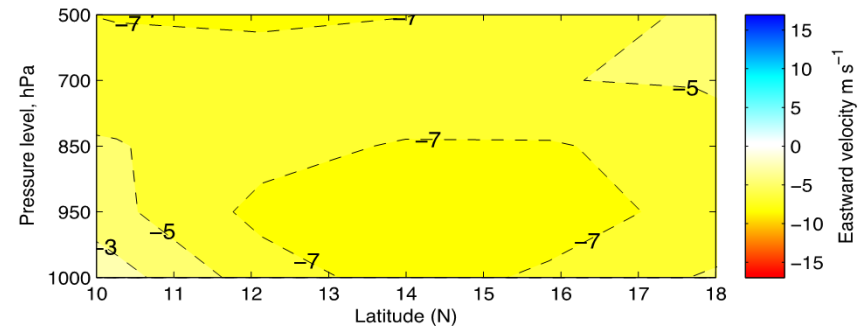
CARIBBEAN LOW LEVEL JET IN DIFFERENT SIMULATIONS



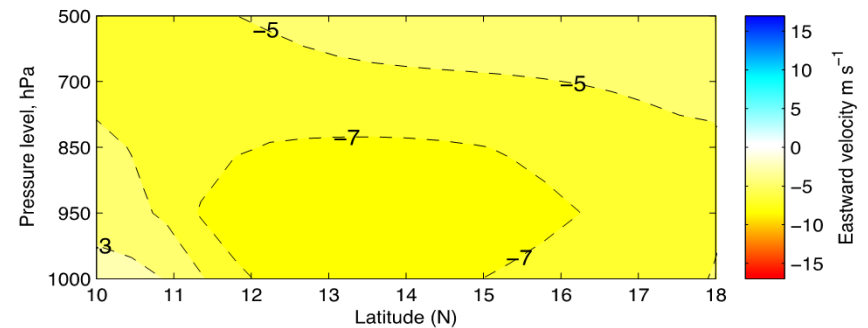
ERA-Interim



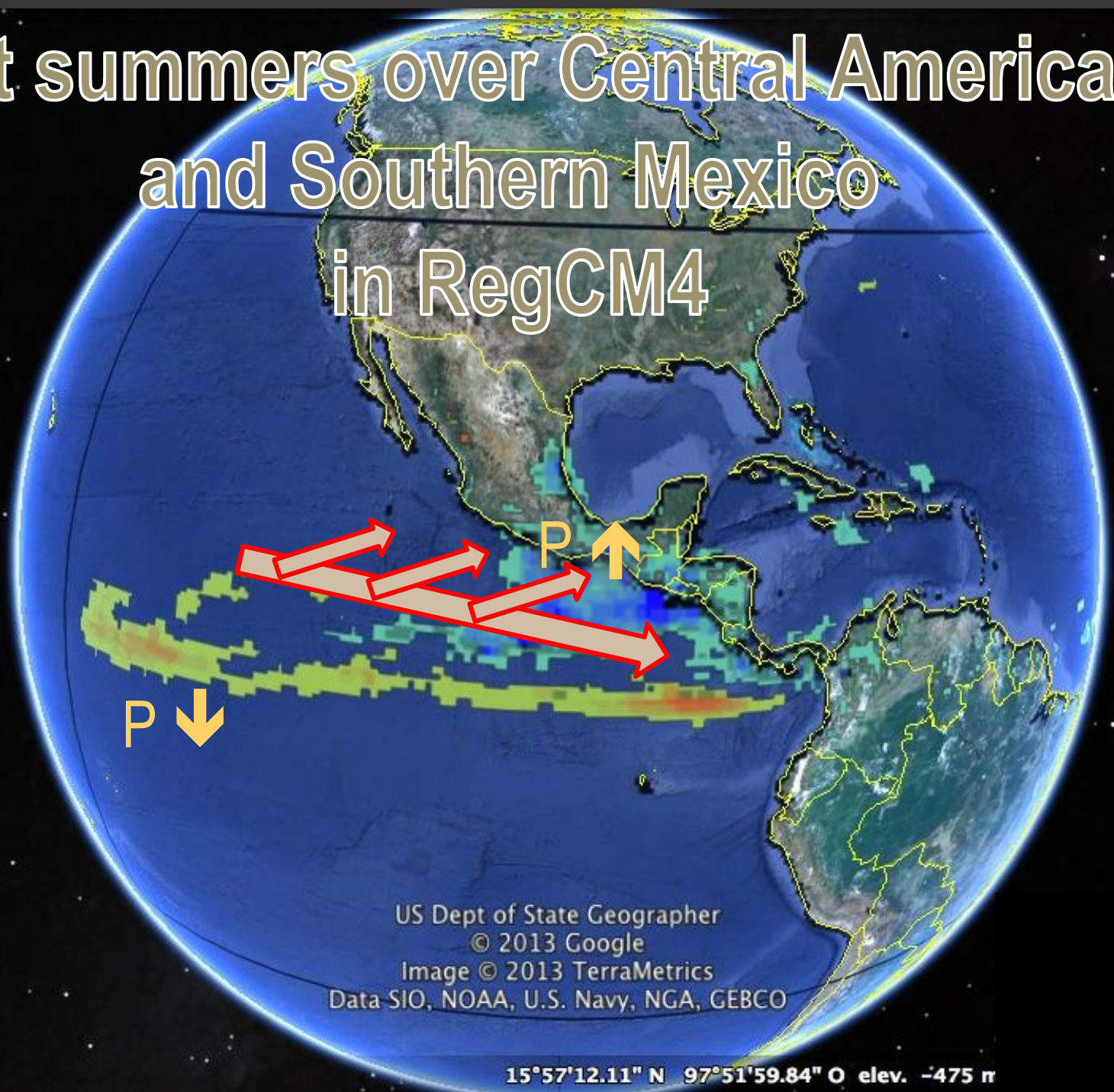
GCM



RegCM4



Wet summers over Central America and Southern Mexico in RegCM4



US Dept of State Geographer
© 2013 Google
Image © 2013 TerraMetrics
Data SIO, NOAA, U.S. Navy, NGA, GEBCO

15°57'12.11" N 97°51'59.84" O elev. -475 m

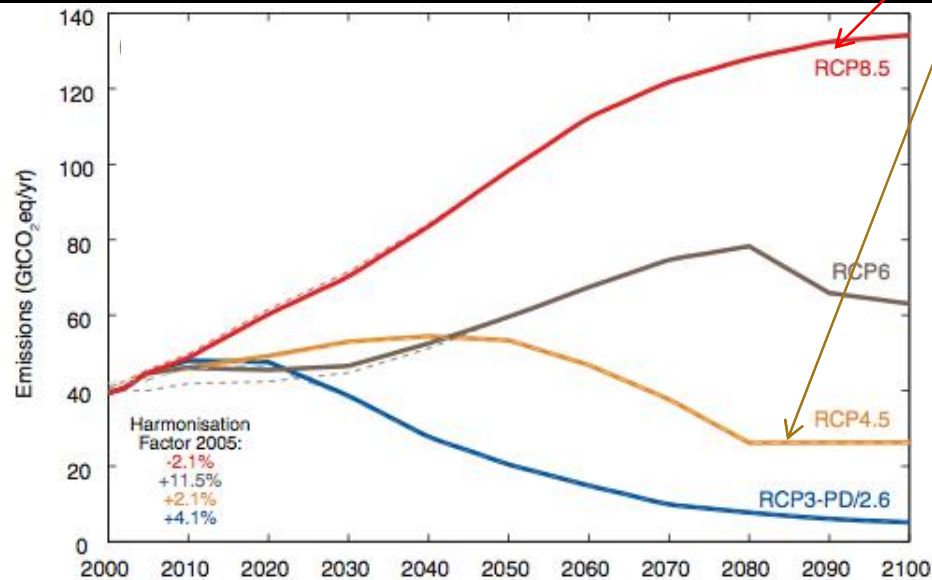
Dry summers over Central America and Southern Mexico in RegCM4



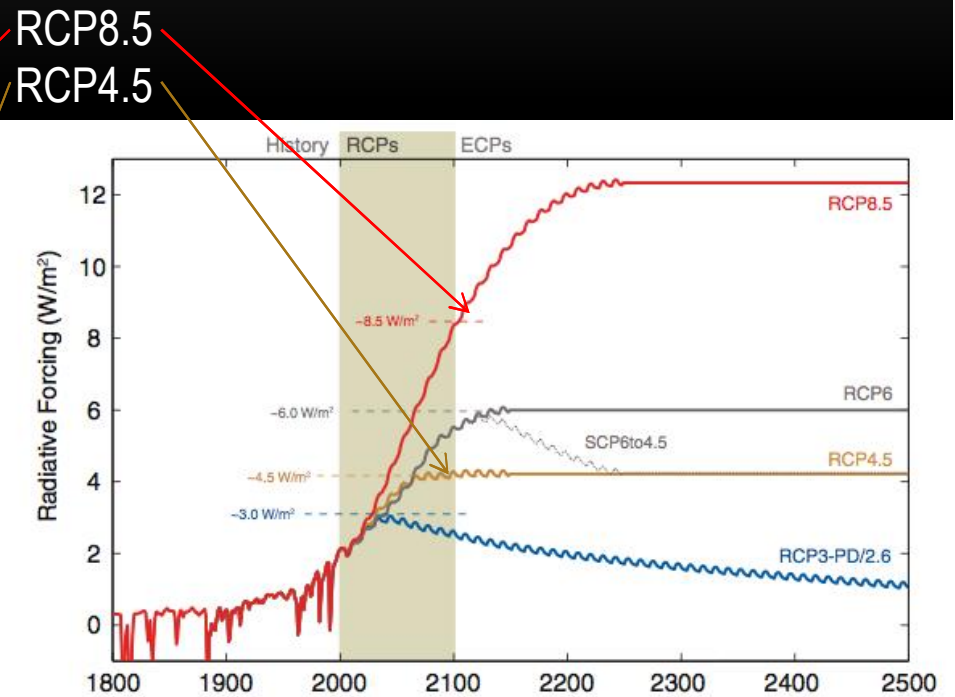
US Dept of State Geographer
© 2013 Google
Image © 2013 TerraMetrics
Data SIO, NOAA, U.S. Navy, NGA, GEBCO

15°57'12.11" N 97°51'59.84" O elev. -475 m

REPRESENTATIVE CONCENTRATION PATHWAYS (RCP)

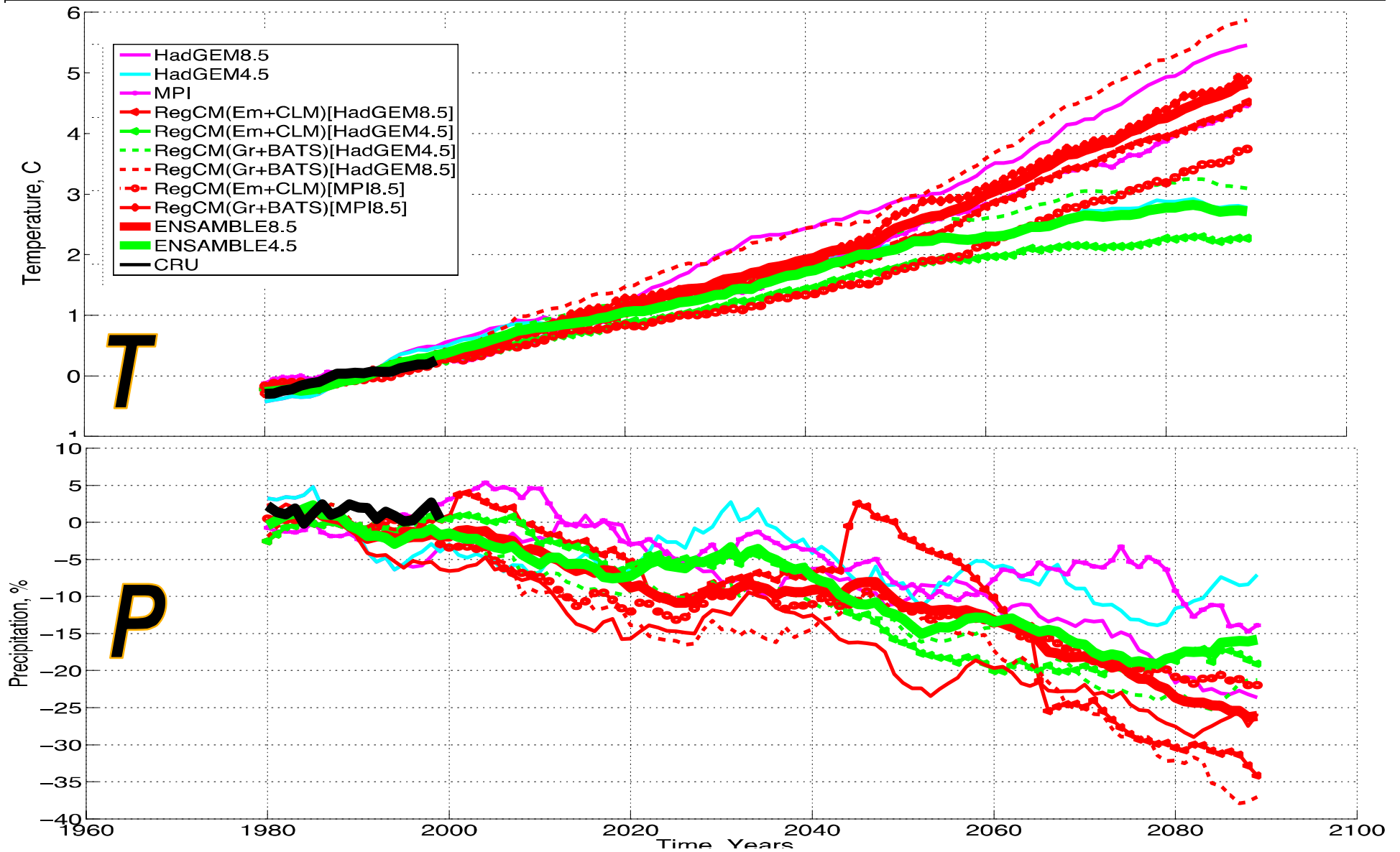


GHG emissions under the four RCP.



Total radiative forcing in the four RCP

CLIMATE PROJECTIONS FOR TEMPERATURE AND PRECIPITATION OVER MEXICO



HISTOGRAMS OF P AND T

RCP8.5near: 2010-2039

RCP8.5med: 2040-2069

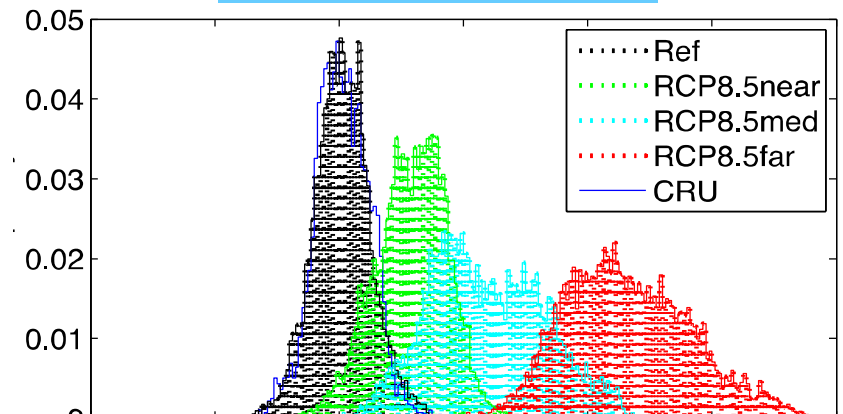
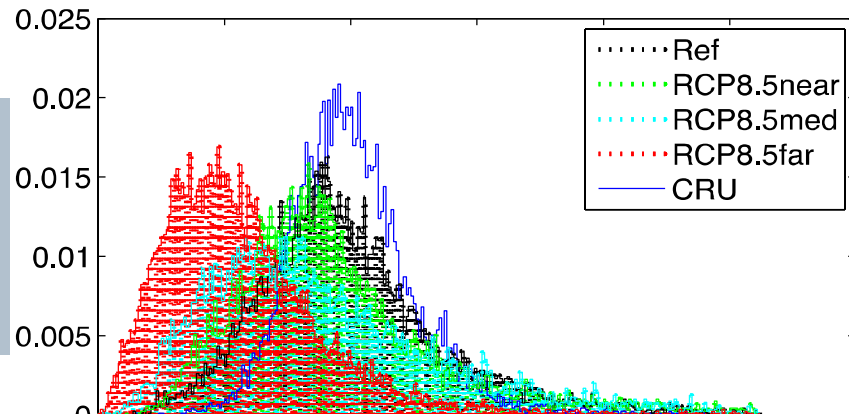
RCP8.5far: 2070-2099

Precipitation, %

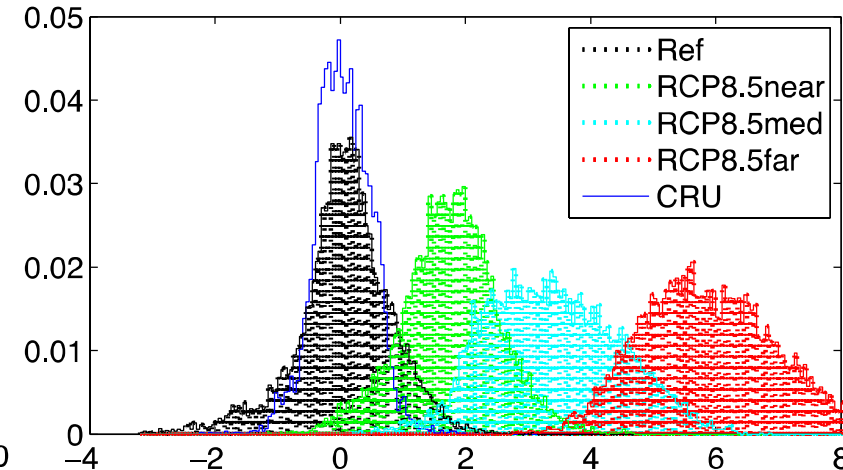
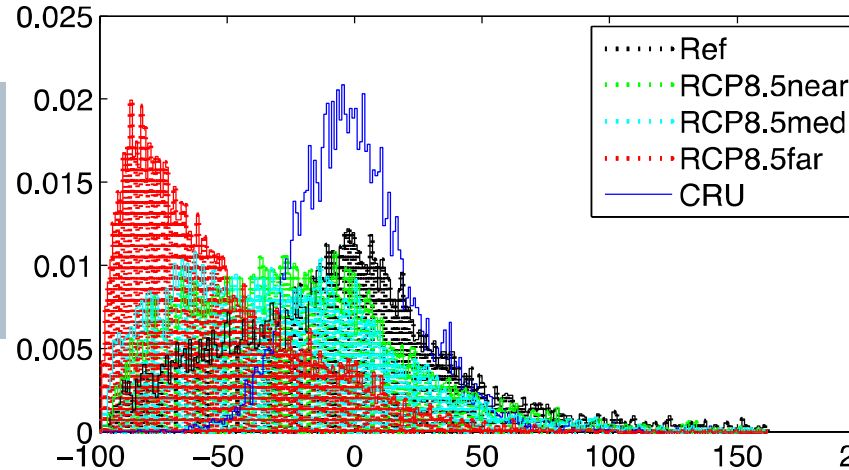
Temperature, °C



Emanuel
CLM



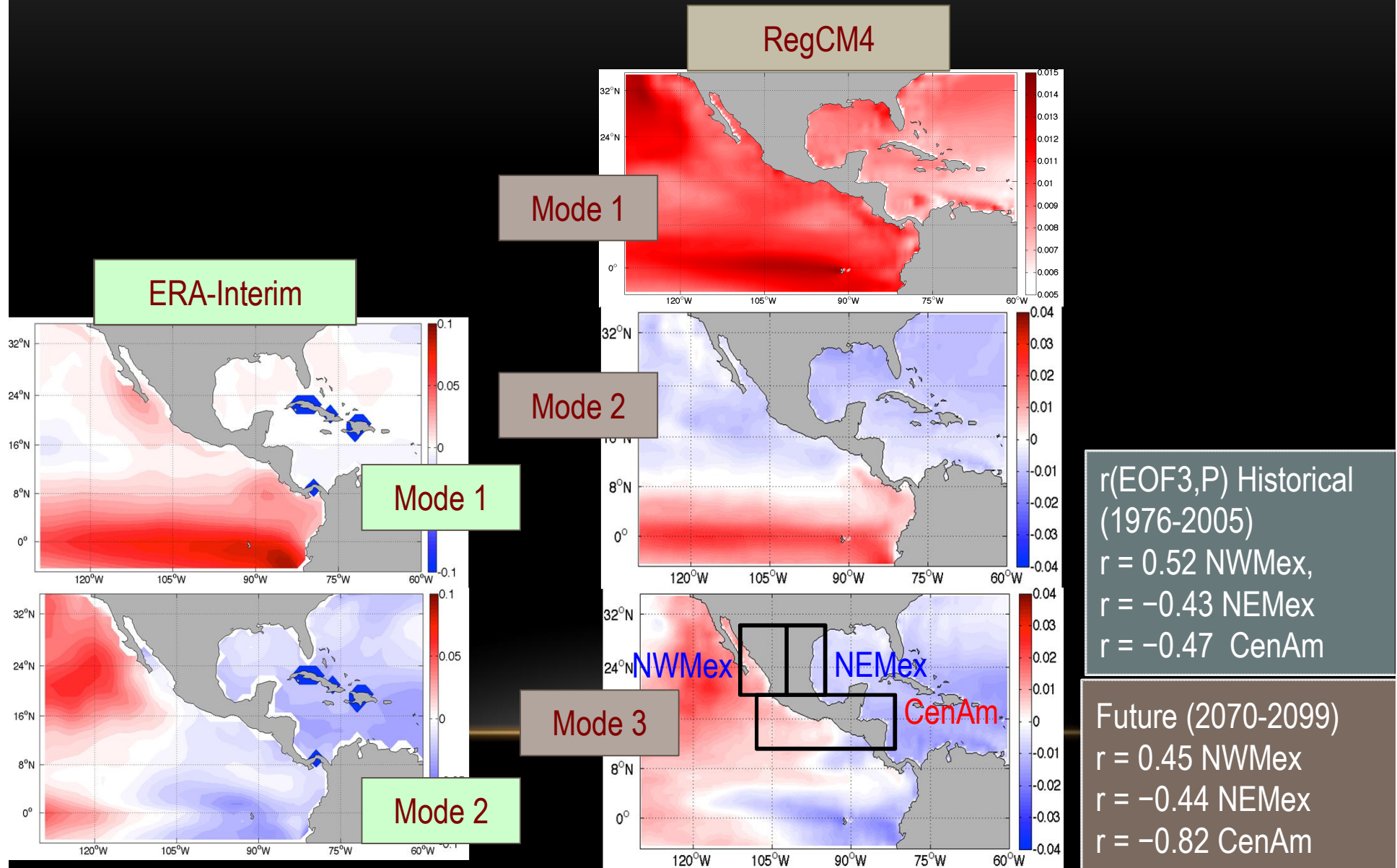
Grell
BATS



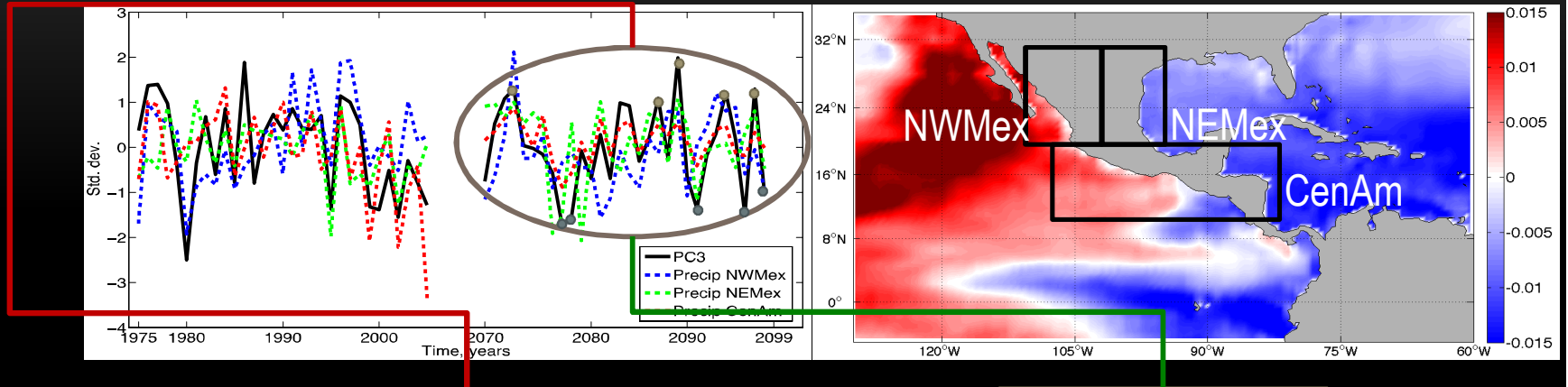
DYNAMICAL PROCESSES INVOLVED IN CHANGES OF PRECIPITATION OVER MEXICO AND CENTRAL AMERICA

Historical + Far future
(1976-2005, 2070-2099)

OBSERVED AND SIMULATED MODES OF SST VARIABILITY



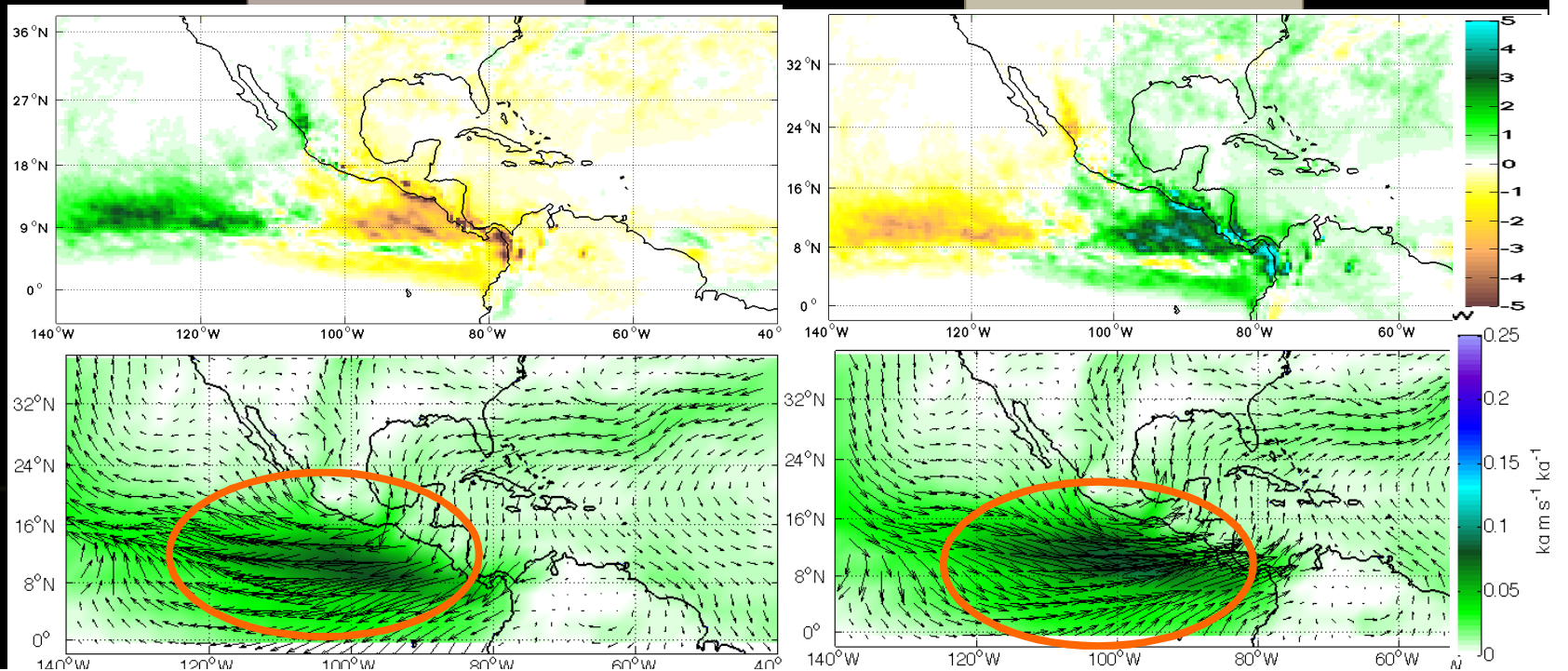
PRECIPITATION AND HUMIDITY TRANSPORT ANOMALIES FROM THE REGRESSION ON THE 3RD SST MODE TIME SERIES (PC3)



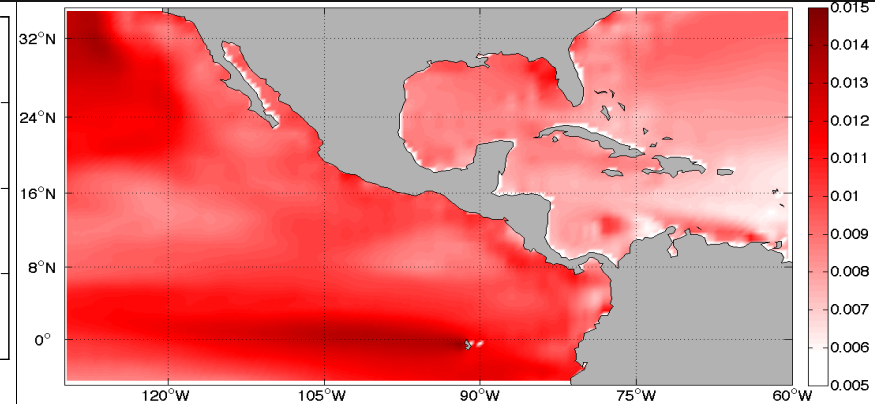
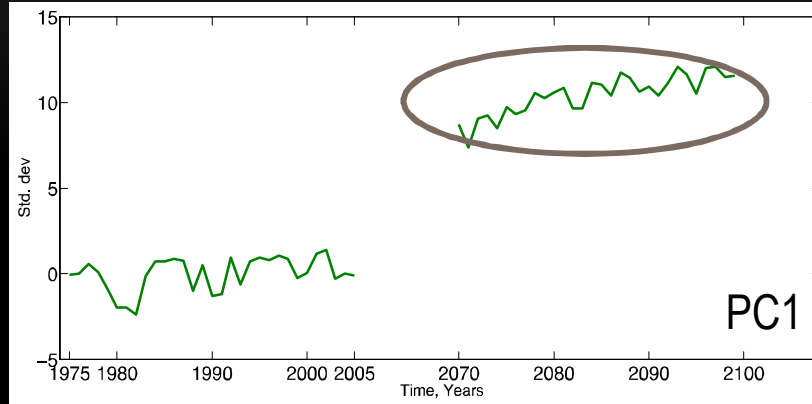
5 years PC3 +

5 years PC3 -

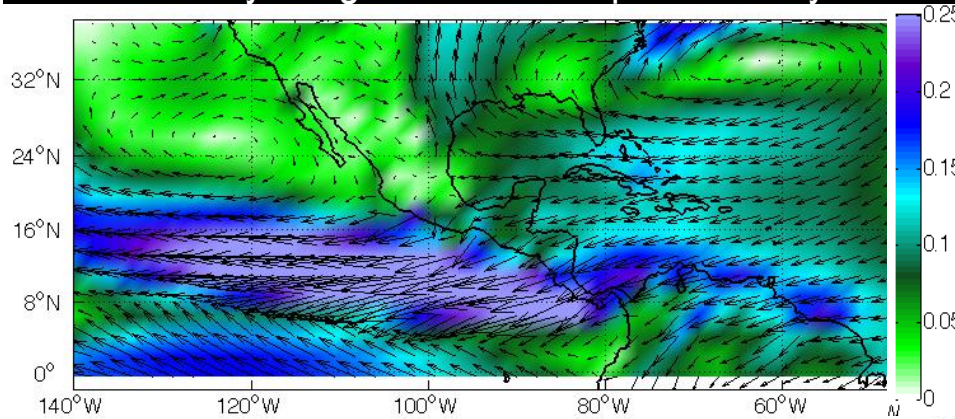
Precipitation anomaly
Humidity transport anomaly



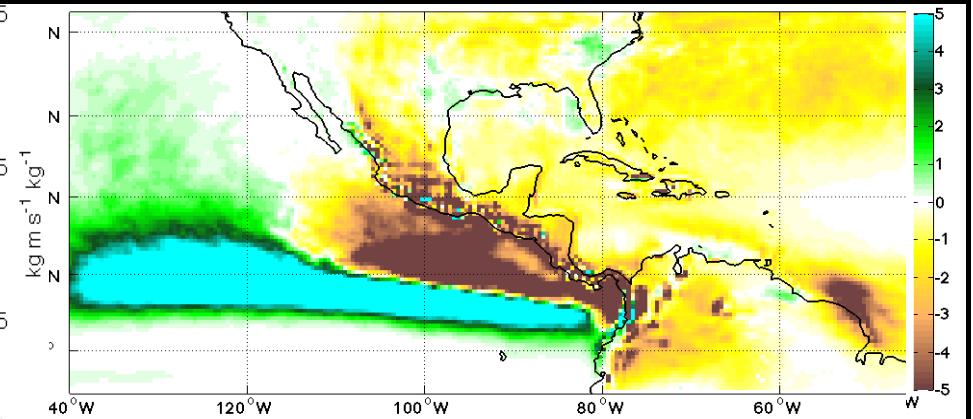
PRECIPITATION AND HUMIDITY TRANSPORT ANOMALIES FROM THE REGRESSION ON THE 1ST SST MODE TIME SERIES (PC1)



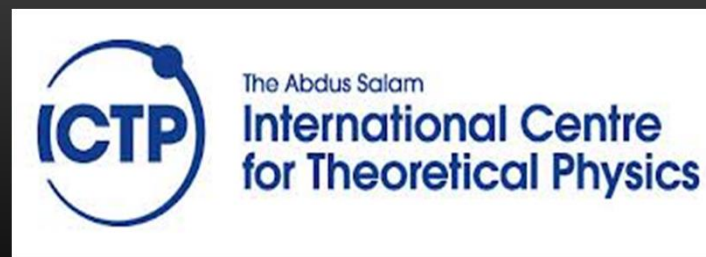
Vertically integrated water vapor anomaly



Precipitation anomaly

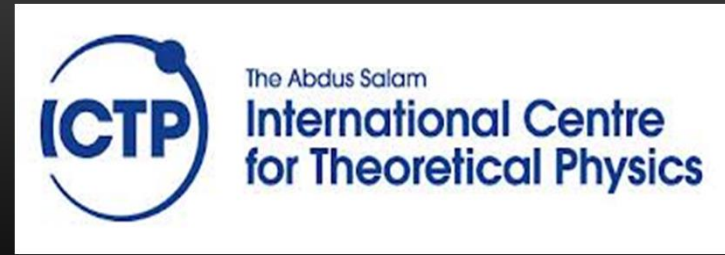


Intensification of Subtropical Anticyclones



CONCLUSIONS

- “ The relationships between model precipitation over Mexico and global dynamical variables show patterns similar to those of observations.
- “ The projections show an increase in the average temperature (between 3 and 6 °C) and a decrease in precipitation (between 15 and 60%) by the end of the 21st Century.



CONCLUSIONS (CONTINUES)

- “ The strengthening of the subtropical high pressure centers (apparently in response to permanent El Niño conditions) will intensify the Caribbean Low Level Jet. This will cause a decrease in convergence over Central America, Southern and Eastern Mexico, which in turn will decrease precipitation and increase temperature.

THANK YOU



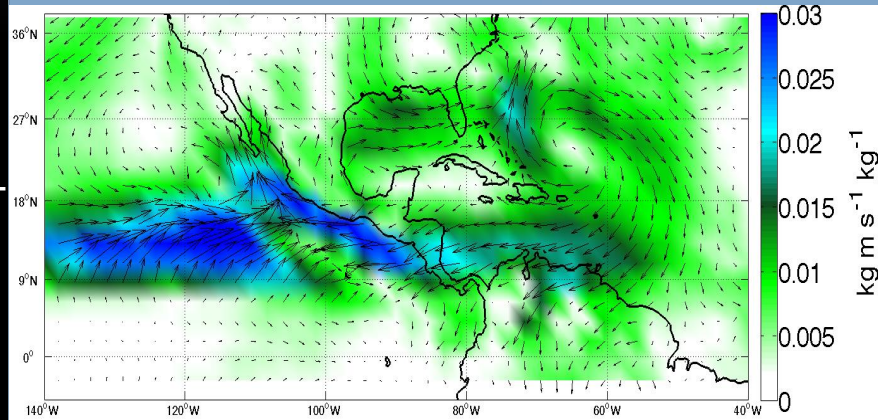
Sucede que me canso
de ser dios
sucede que me canso
de llover
sobre mojado
Sucede
que por aquí
nada sucede
sino la lluvia
lluvia
lluvia
lluvia...

THANK YOU!

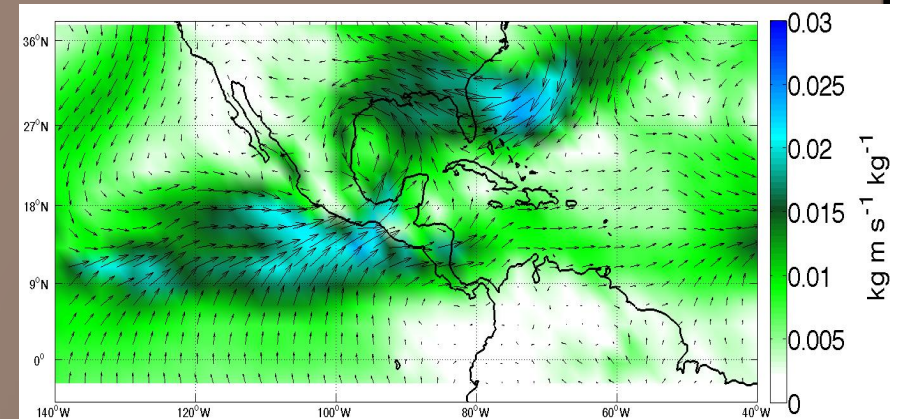
HUMIDITY TRANSPORT ANOMALIES CALCULATED FROM THE WETTEST – DRIEST YEARS

Historical period

NWMex



NEMex



Future period

