

CLIMATE STUDIES WITHIN THE CORDEX FRAMEWORK FOCUSED ON THE CENTRAL AMERICA DOMAIN

RAMÓN FUENTES FRANCO

Outline

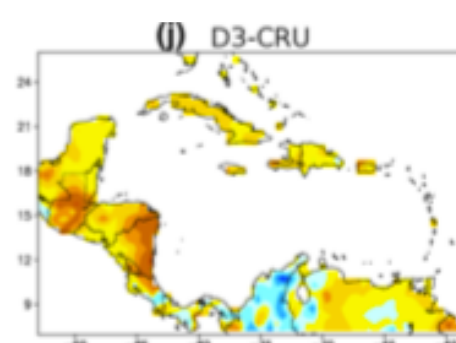
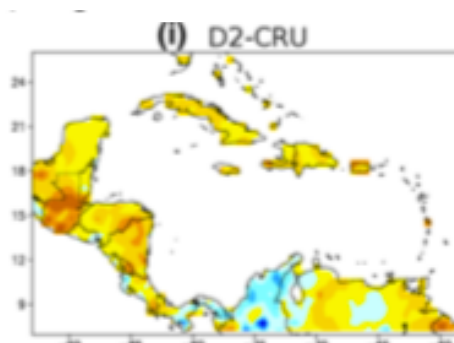
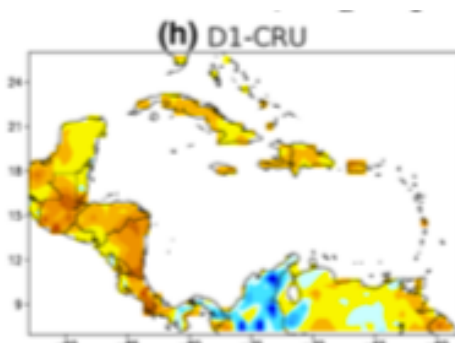
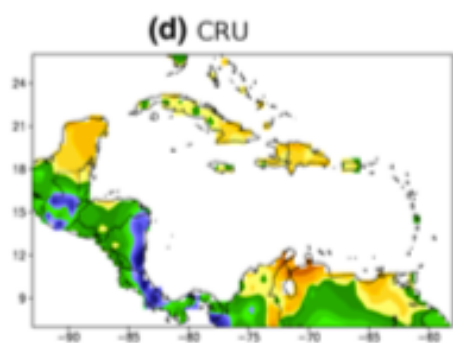
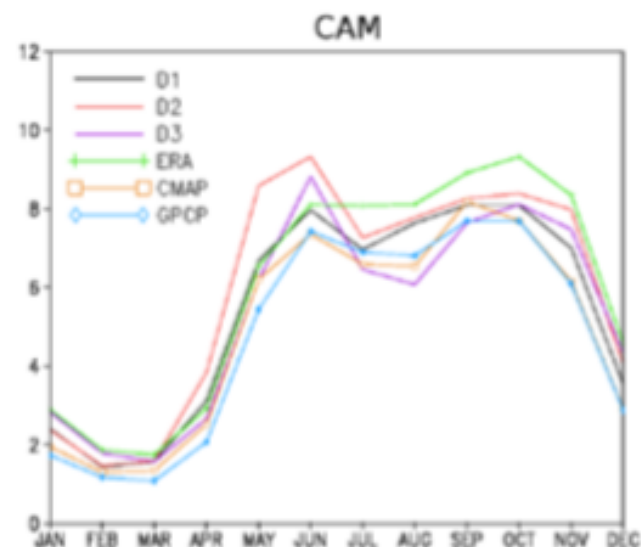
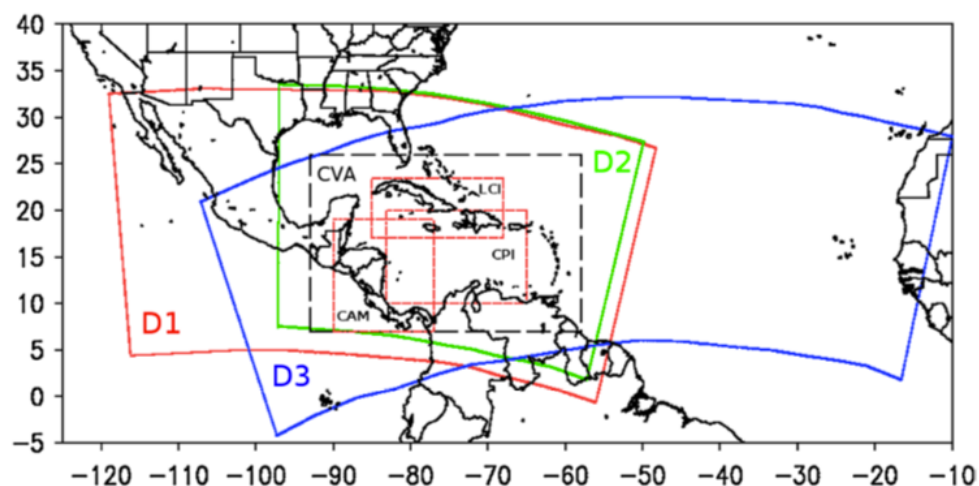
- Model sensitivity studies over the CORDEX Central America (CAM) domain.
- Assessment of historical forcing simulations over the CORDEX-CAM domain.
- Climate change scenarios over the CORDEX-CAM domain.
- Regional coupled models over the CORDEX-CAM domain

COordinated Regional Downscaling EXperiment CORDEX

- Modeling framework designed to:
 - Evaluate and improve RCD models and techniques
 - Provide a coordinated set of RCD-based projections/predictions for regions worldwide
 - Facilitate the communication with the IAV community and the involvement of the research community from developing countries

SENSITIVITY STUDIES

Sensitivity of precipitation to domain size and location



Sensitivity of midsummer drought and atmospheric circulation to SST daily cycle and land surface model

Mid summer drought in short (1998-2002) RegCM4 simulations

Wind at 925 hPa (1998-2002)

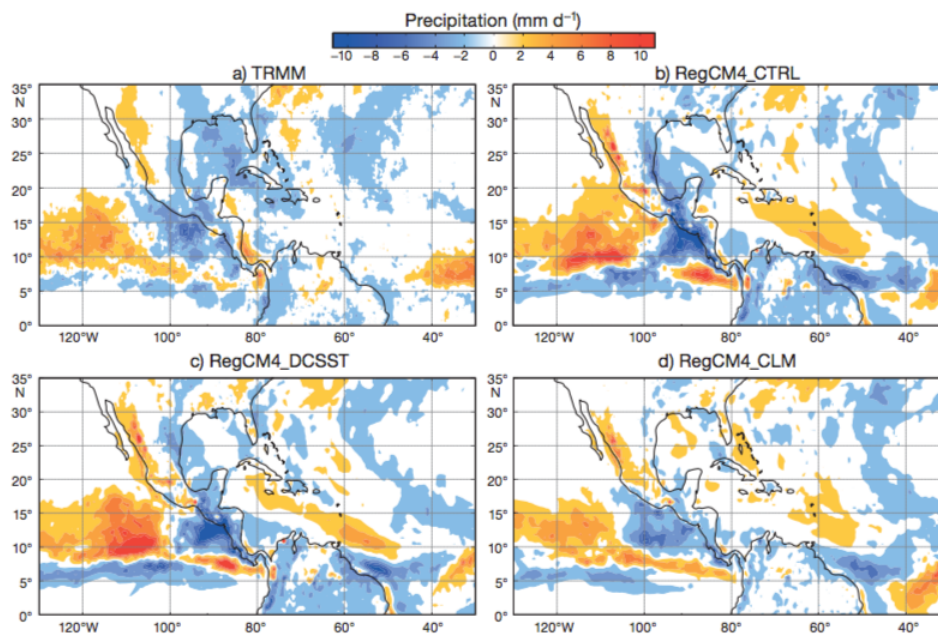


Fig. 5. Mid-summer drought precipitation 1998–2002. (a) TRMM, (b) RegCM4_CTRL, (c) RegCM4_DCSST, and (d) RegCM4_CLM

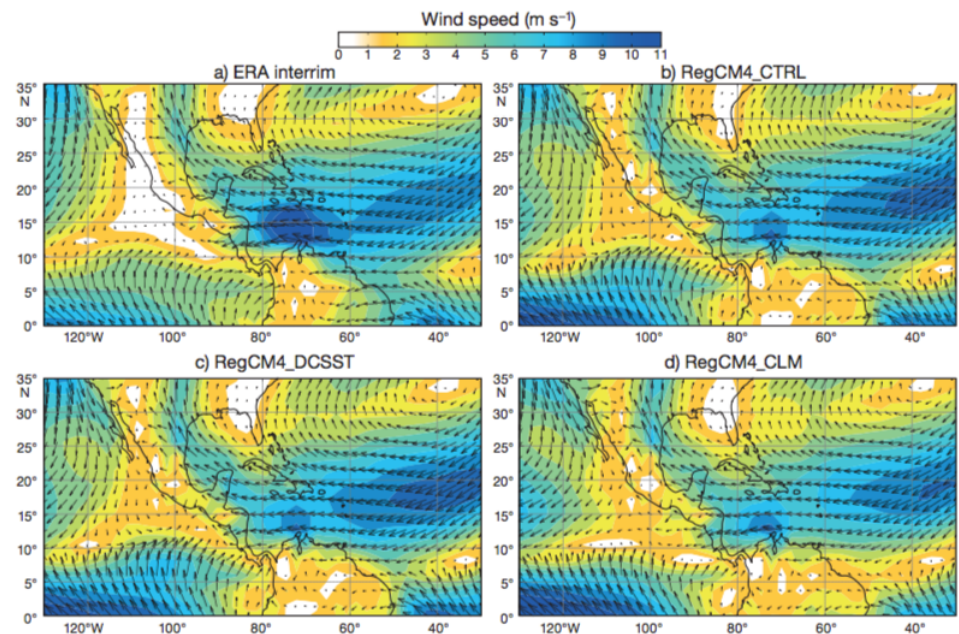
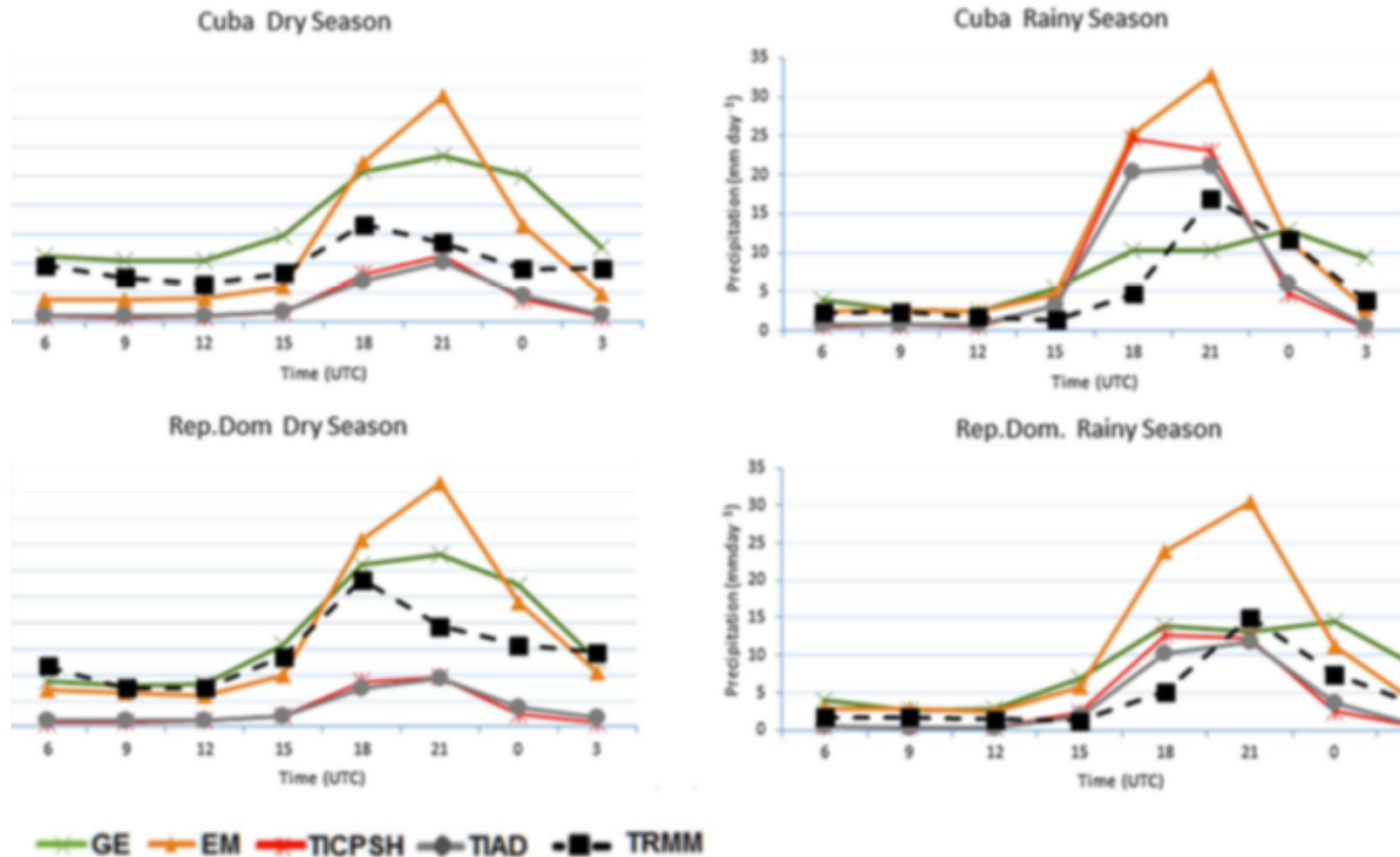
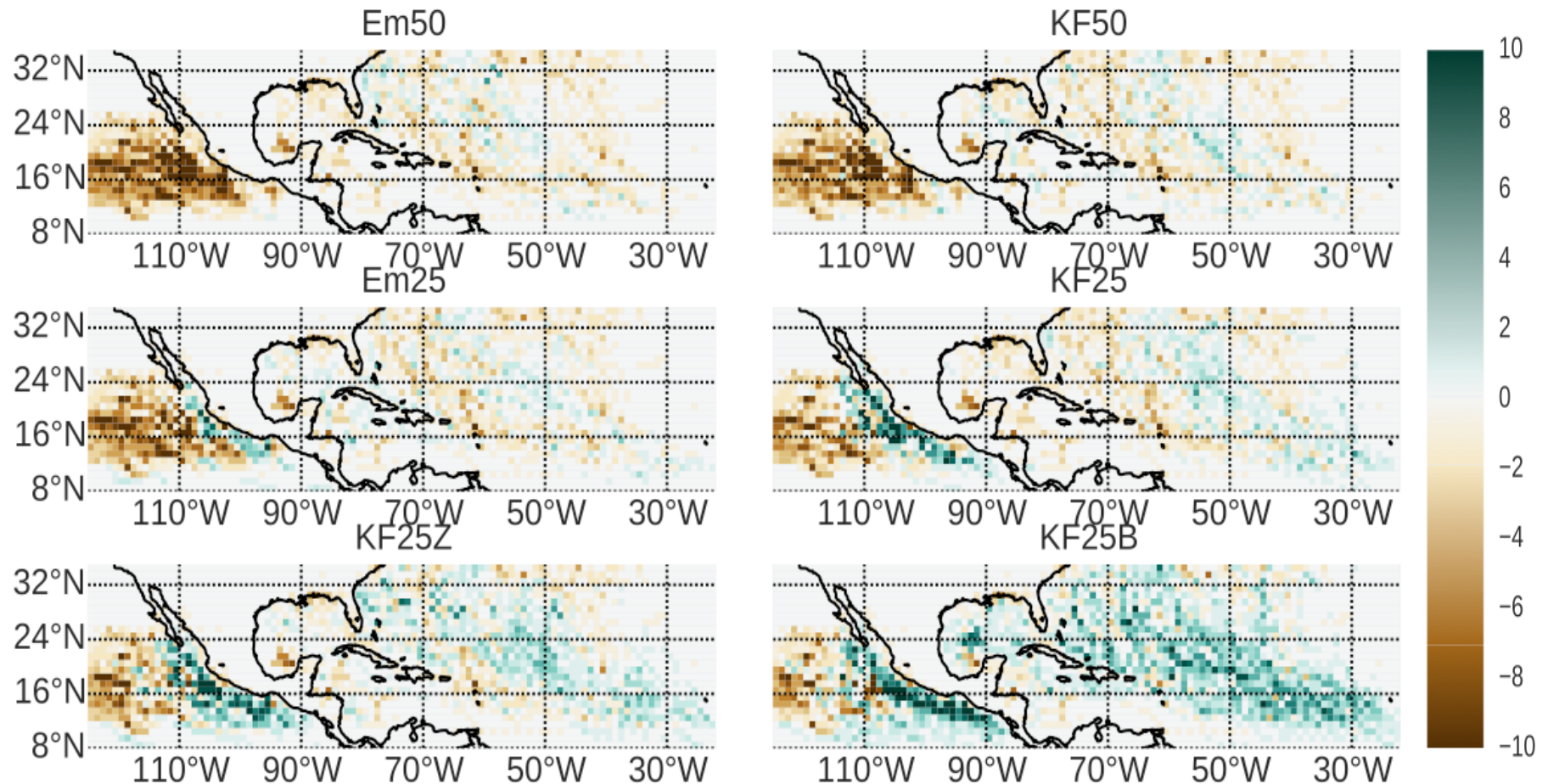


Fig. 8. Low level wind speed at 925 hPa, 1998–2002. (a) ERA-Interim, (b) RegCM4_CTRL, (c) RegCM4_DCSST, and (d) RegCM4_CLM

Sensitivity of daily cycle of precipitation to convection parameterization



Sensitivity of tropical cyclones density to resolution and convection scheme



Fuentes-Franco et al. 2017

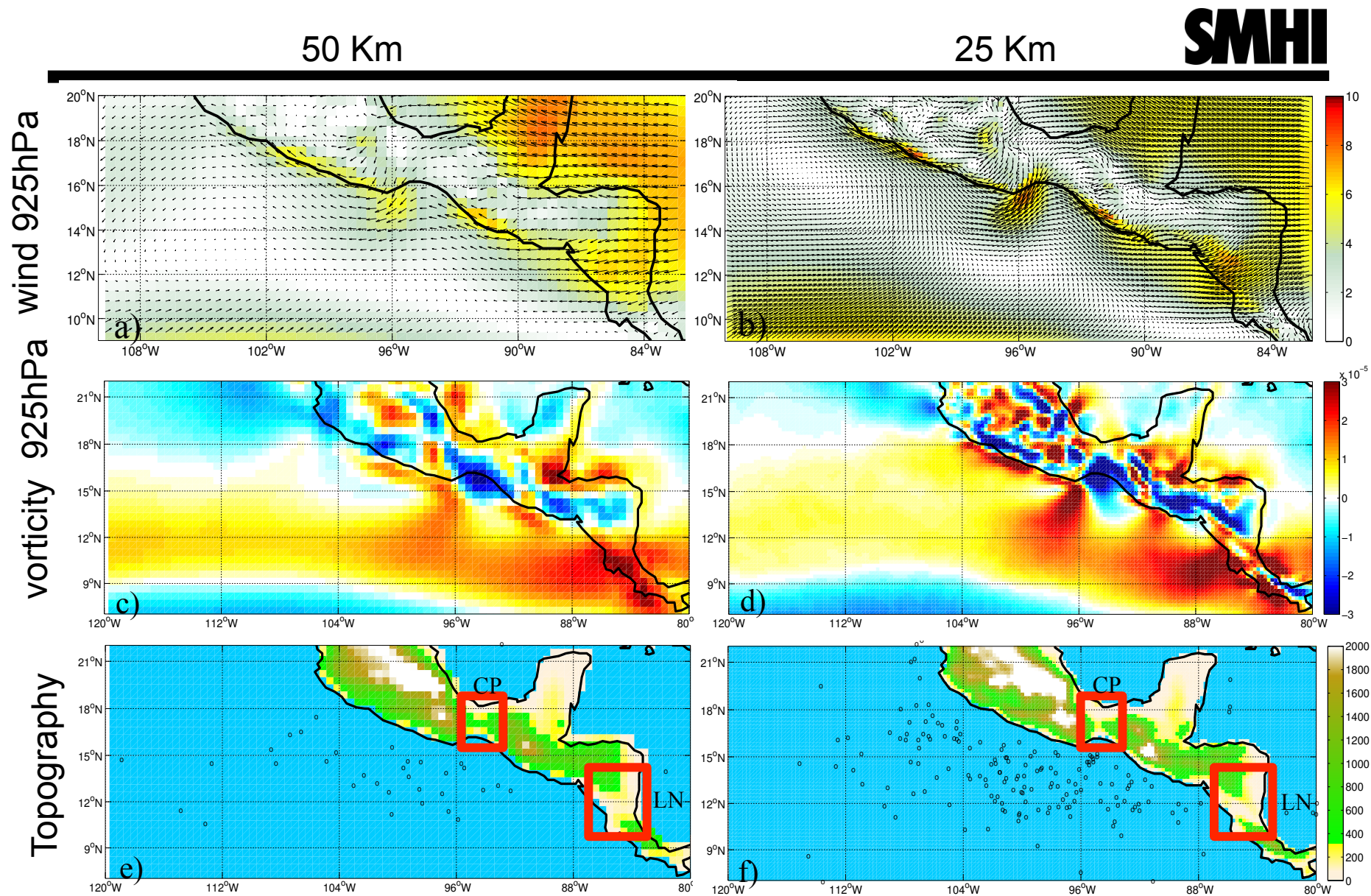
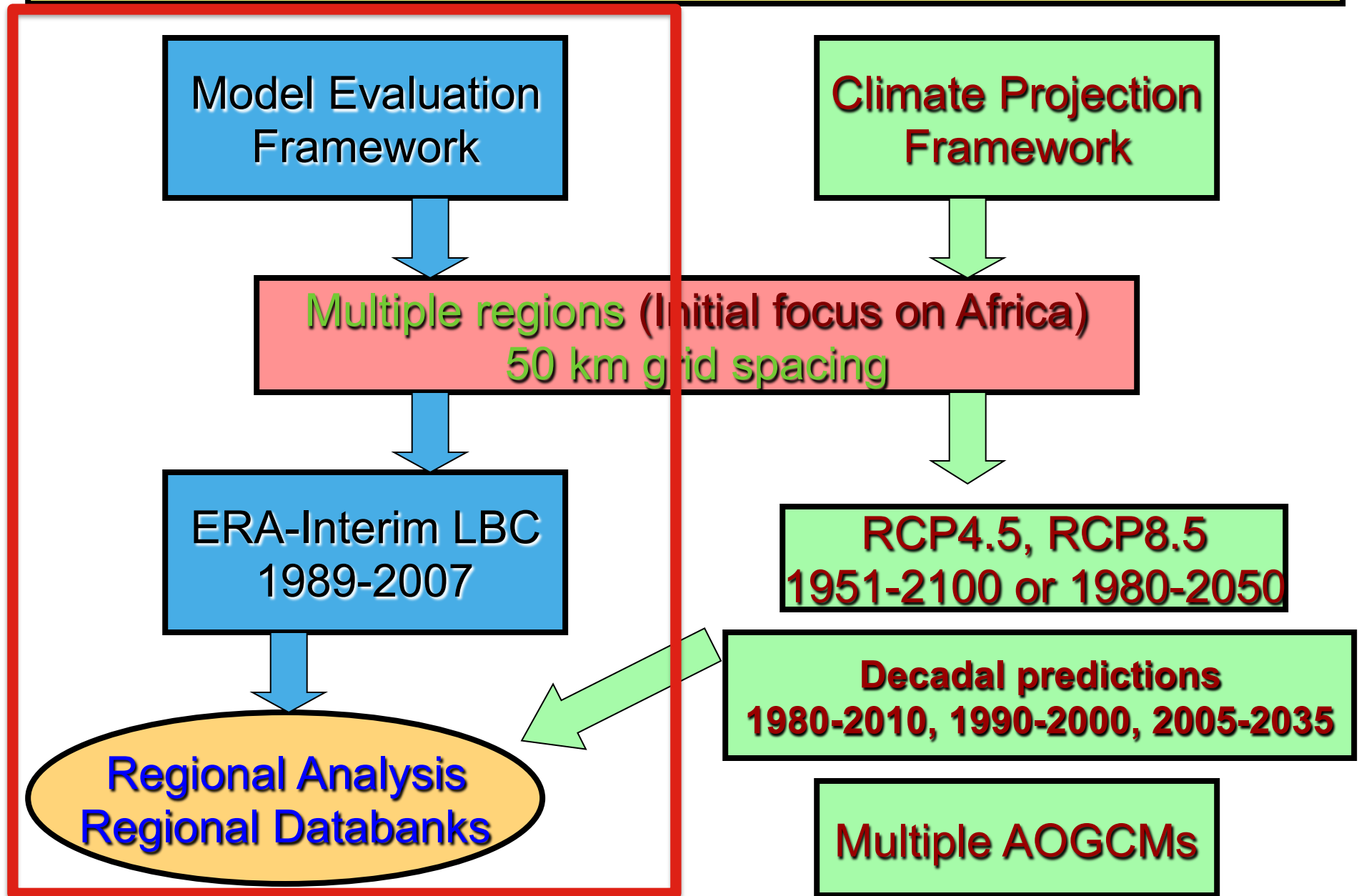


Figure 4. Wind speed at 925hPa [ms^{-1}] during JJASON for a) KF50, b) KF25 simulations. Vorticity [s^{-1}] at 925 hPa for c) KF50, and d) KF25 simulations. Topography [m] for e) KF50 and f) KF25 simulations. The black circle shows the first detected cyclones. Red rectangles show the locations of Chivela Pass (CP) and Lake Nicaragua (LN) where gap winds are generated.

ASSESSMENT OF HISTORICAL FORCING SIMULATIONS OVER THE CORDEX-CAM DOMAIN

CORDEX Phase I experiment design



Assessment of Maximum Dry Spell length and P95 of precipitation on RegCM4 driven by ERA-Interim reanalysis

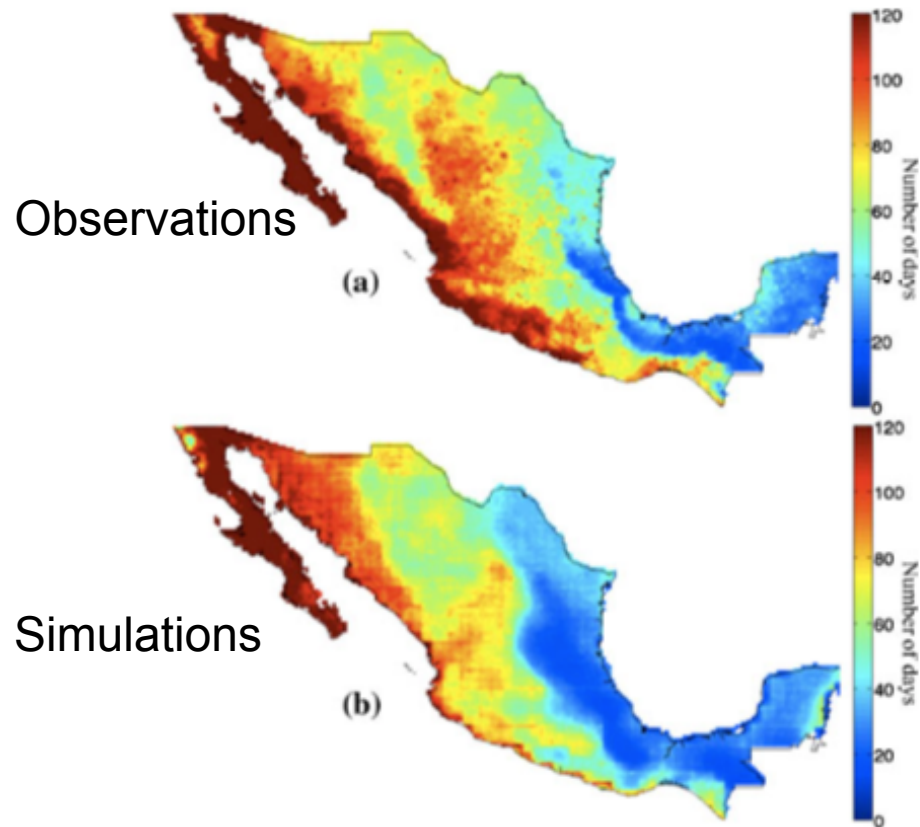


Fig. 12 Average of the maximum dry spell length (MDSL) 1982–2008, **a** observed and **b** simulated

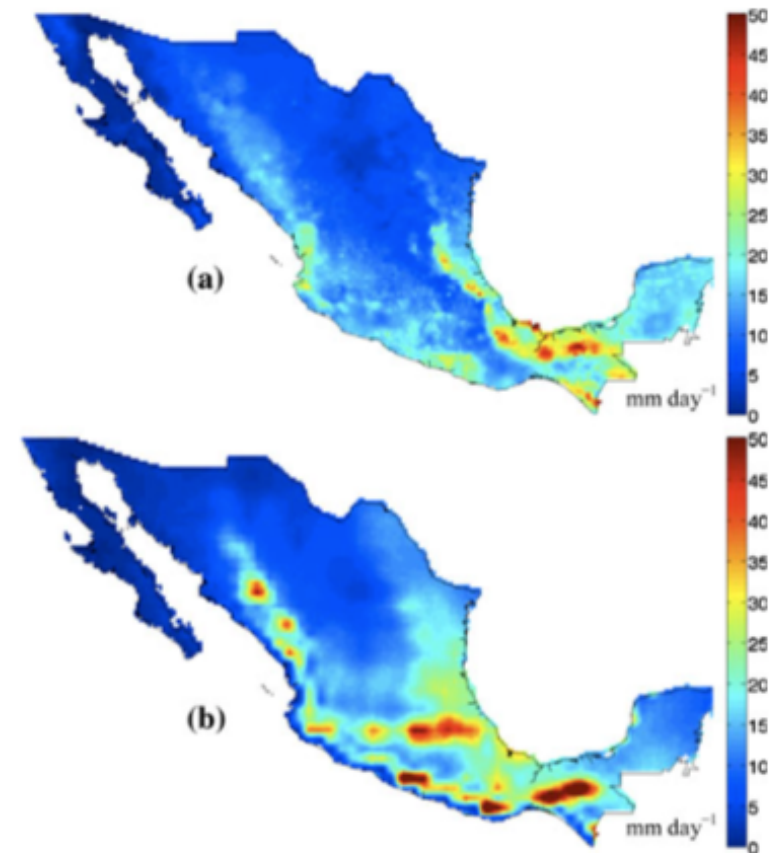
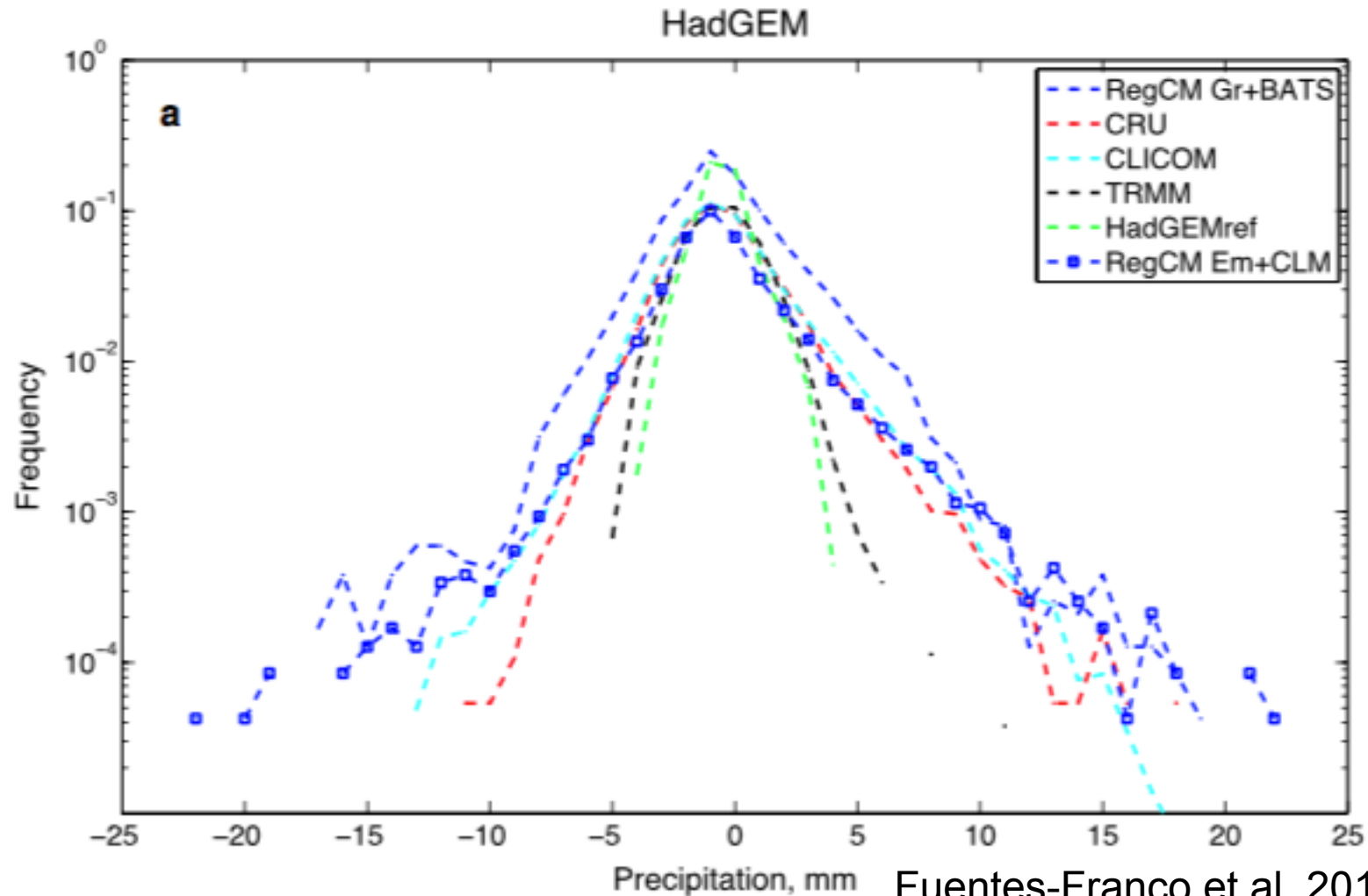


Fig. 13 **a** Observed 1982–2008 average of annual P95 and **b** the corresponding RegCM4 simulation

Assessment of precipitation distribution on RegCM4 driven by HadGEM in the historical period 1976-2005



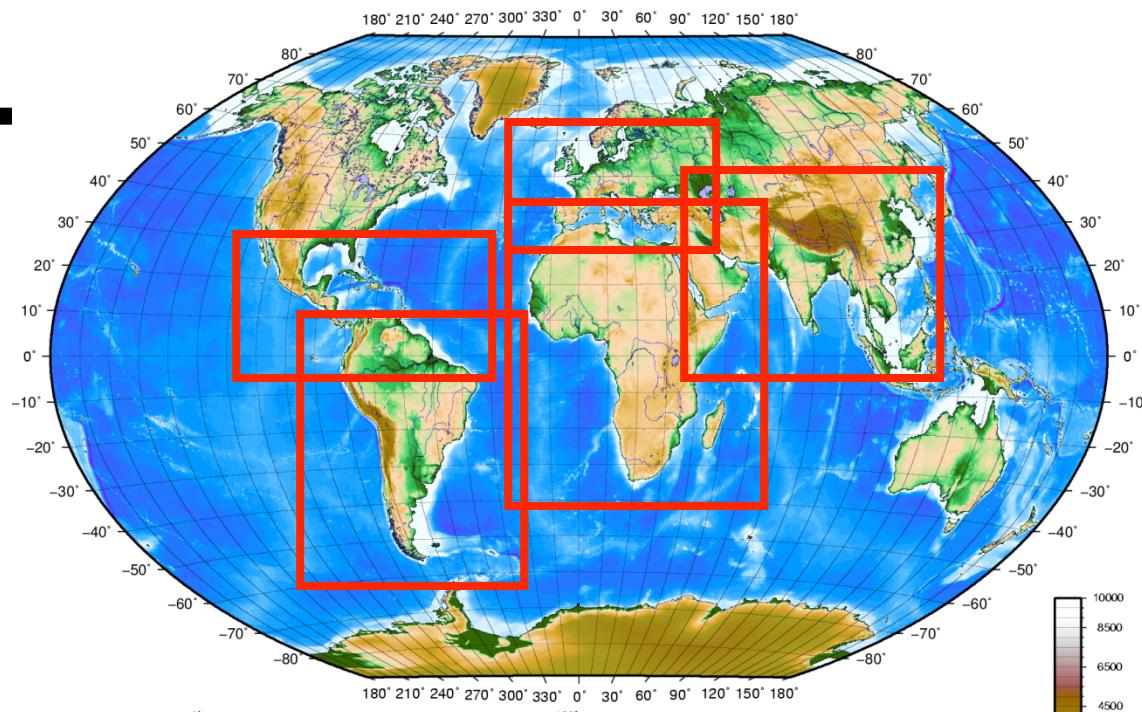
CLIMATE CHANGE SCENARIOS OVER THE CORDEX-CAM DOMAIN

The CREMA Phase I Experiment

**Contribution to the
Coordinated Regional
Downscaling Experiment
(CORDEX) by the
RegCM community**

**Collaboration with
U. San Paolo (Brazil)
CICESE (Mexico)
Indian Institute of technology
DHMZ (Croatia)**

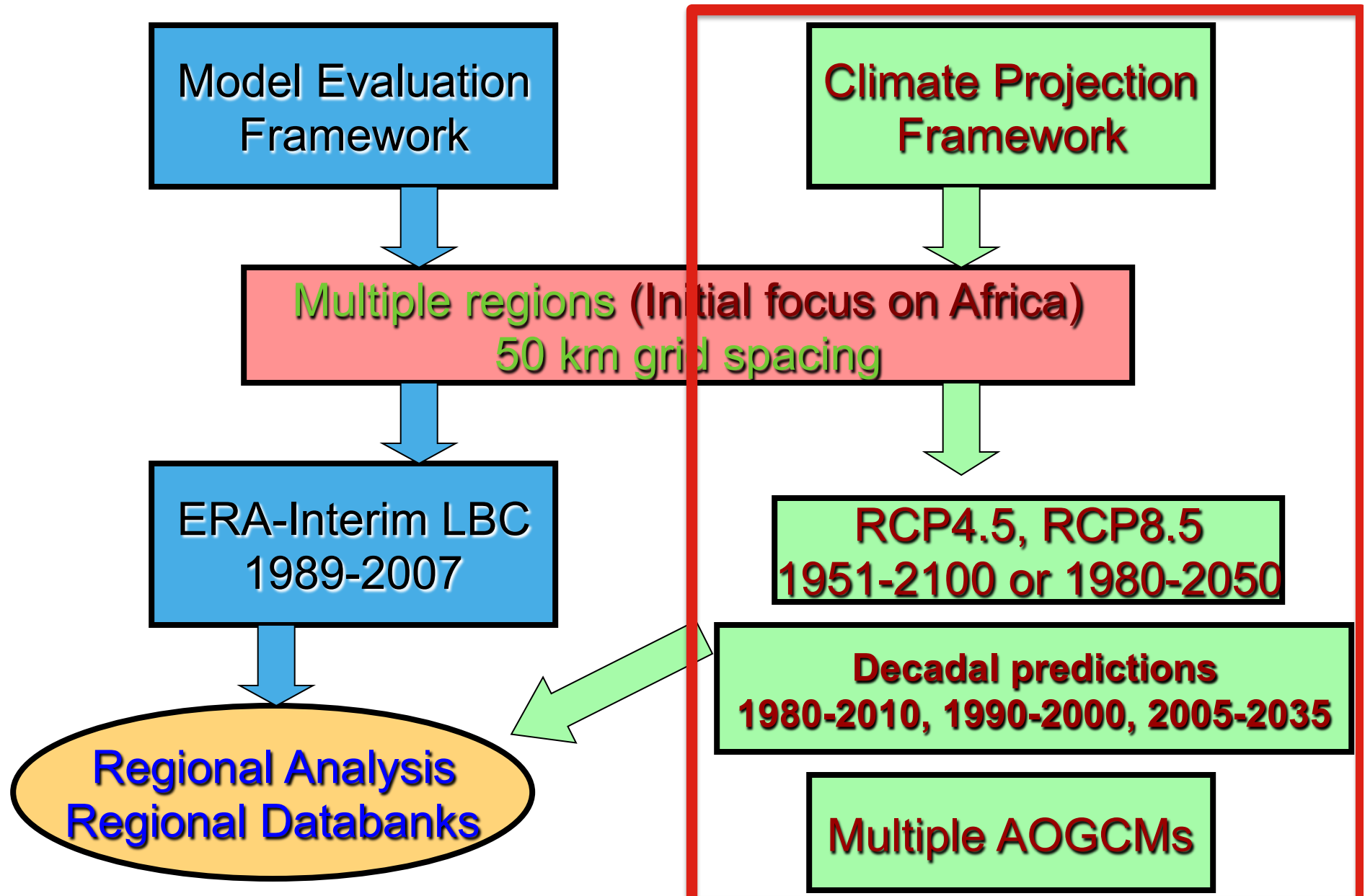
**Special Issue of
Climatic Change**



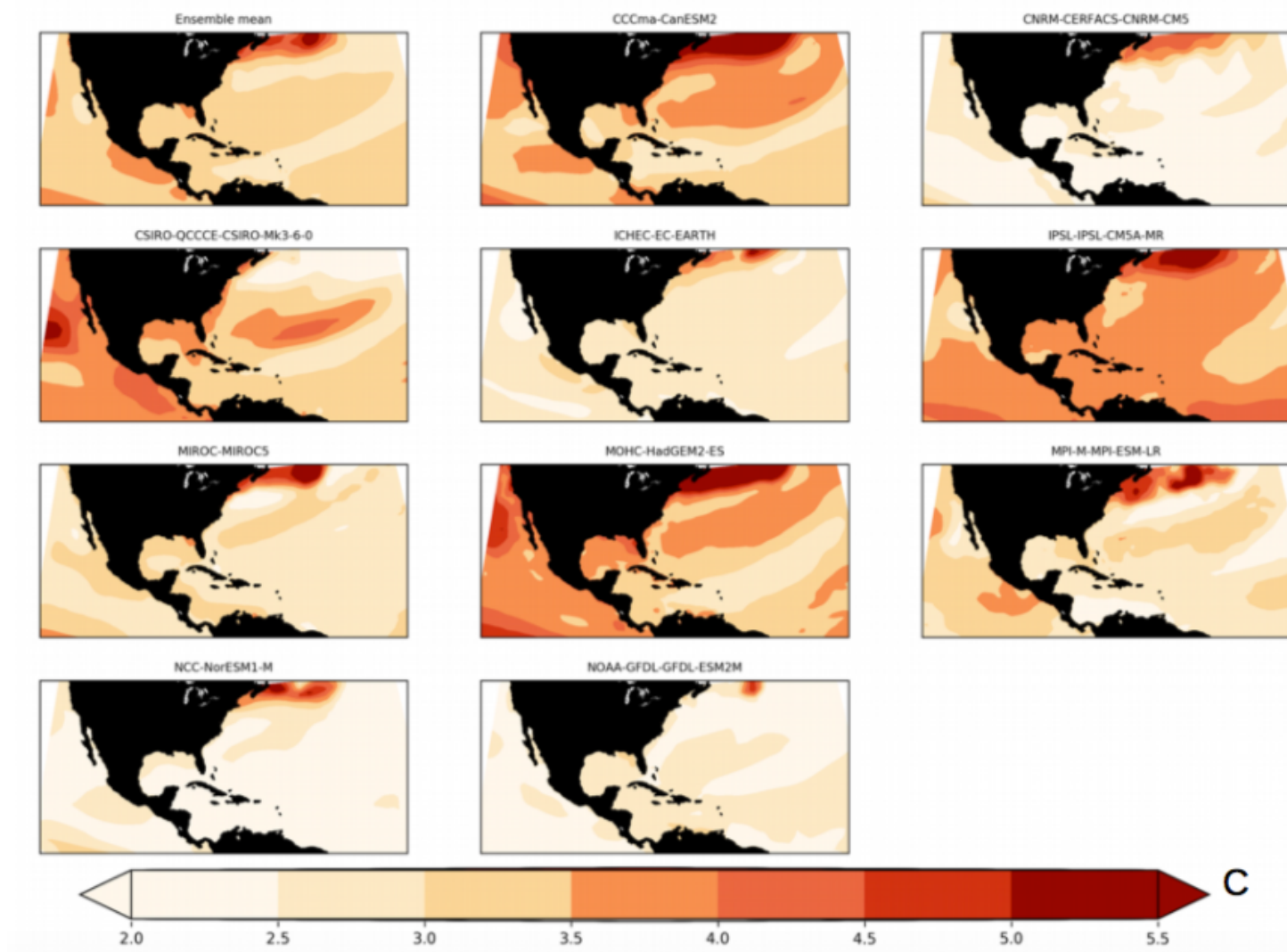
**34 Scenario simulations (1970-2100)
over 5 CORDEX domains
with RegCM4 driven by
three GCMs, 2 GHG
scenarios (RCP4.5/8.5) and
different physics schemes**

**3 months dedicated time on ~500
CPUs at the ARCTUR HPC
~200 Tbytes of data produced**

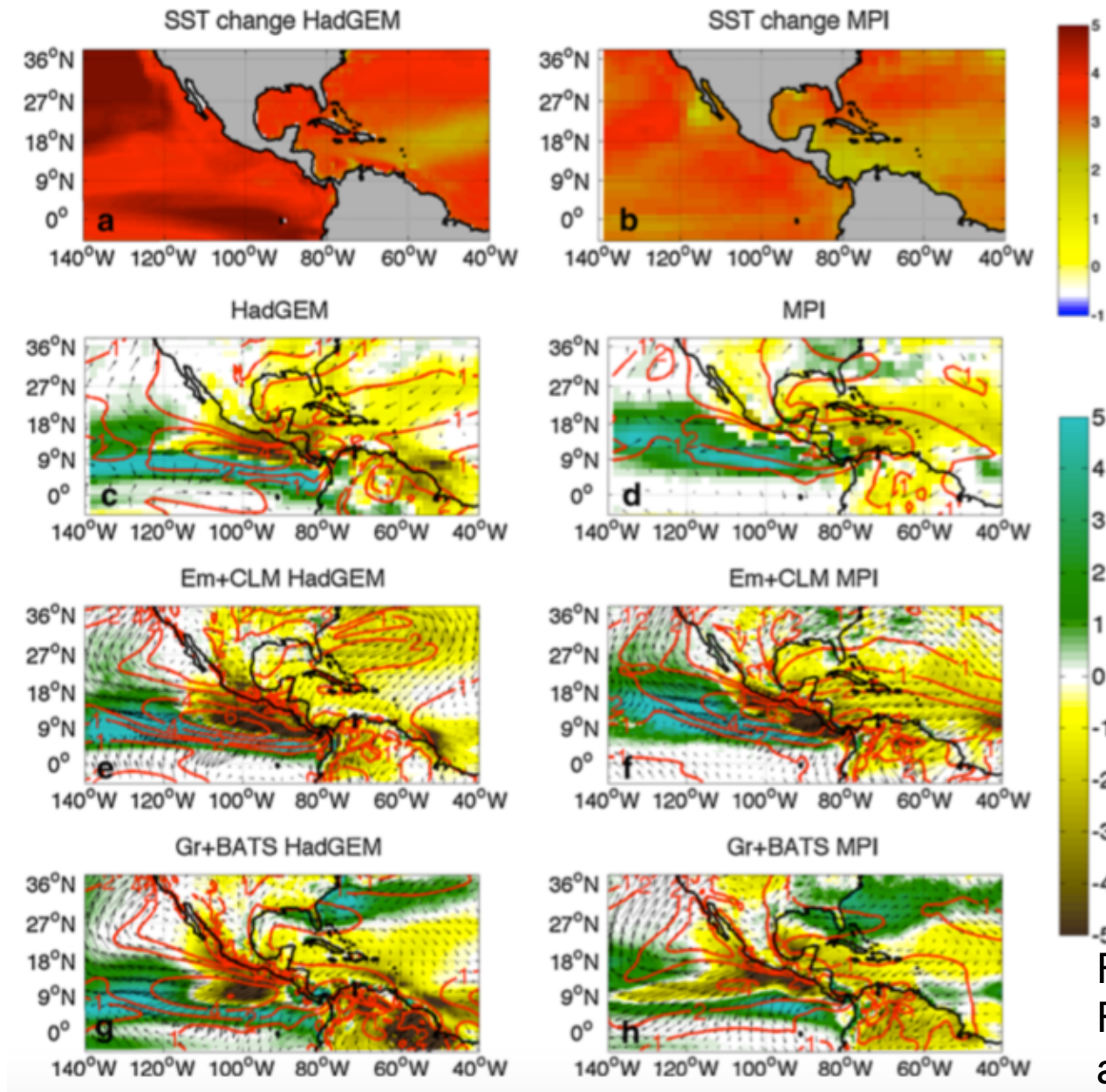
CORDEX Phase I experiment design



Mean SST change on CMIP5 (2071-2100 minus 1976-2005)

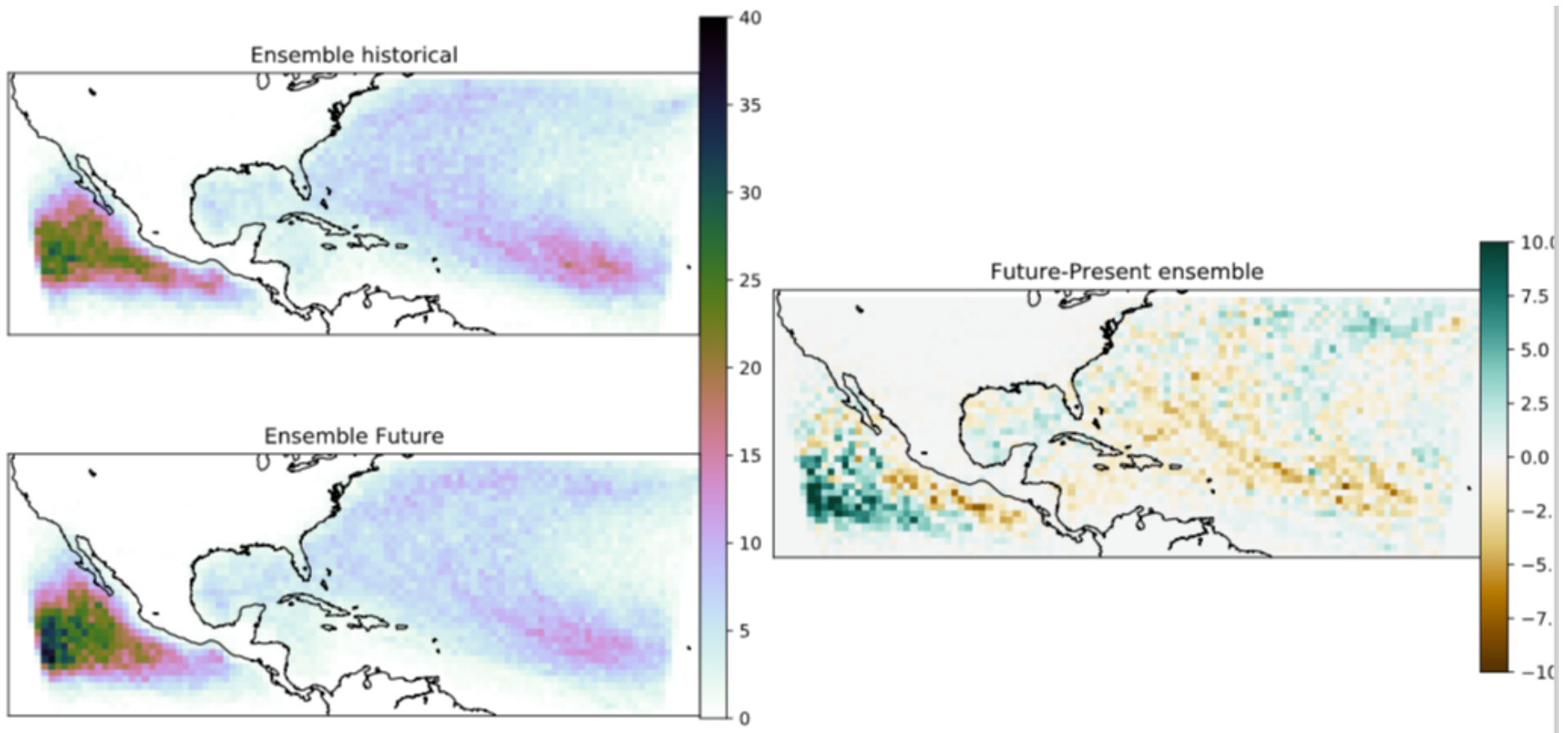


Changes on atm-circulation and precipitation associated to SST changes **SMHI**



Fuentes-Franco et al. 2015

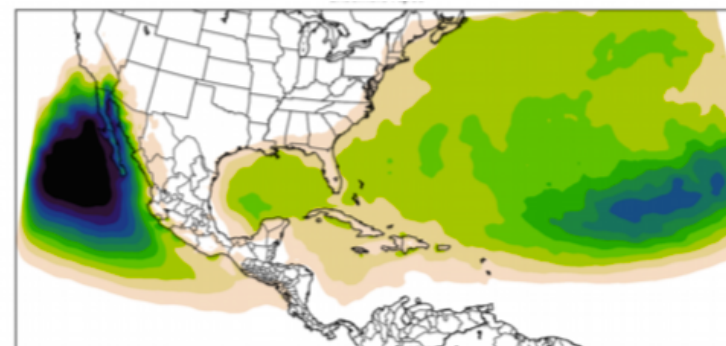
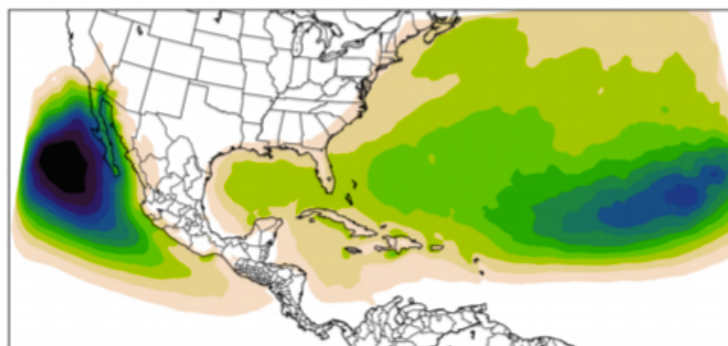
Tropical cyclone density and change in an ensemble of RCA projections



Precipitation associated to tropical cyclones in an ensemble of RCA projections

1976-2005 period

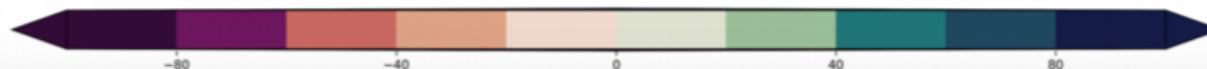
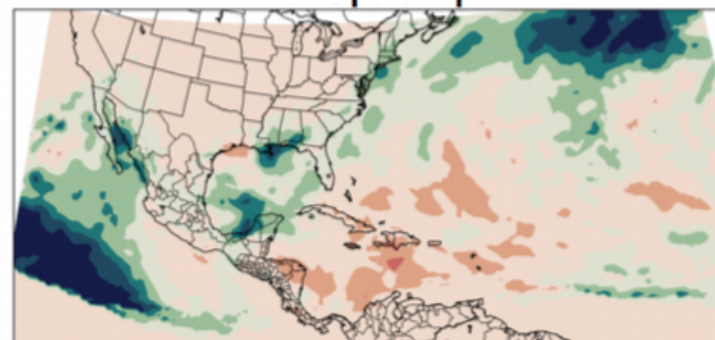
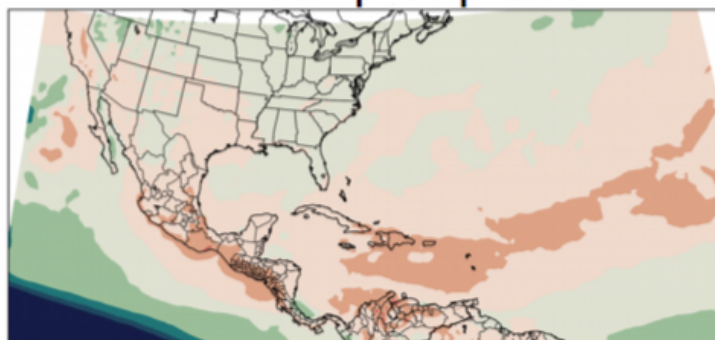
2071-2100 period



Mean change from ensemble

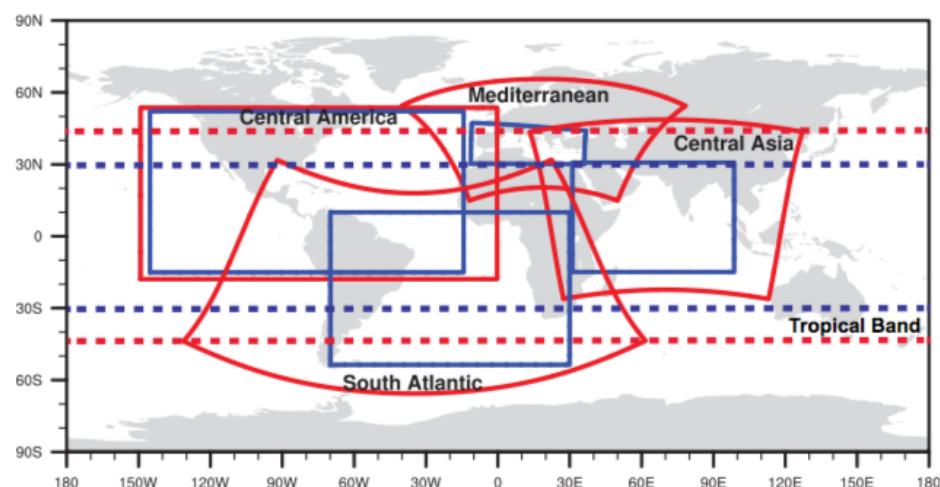
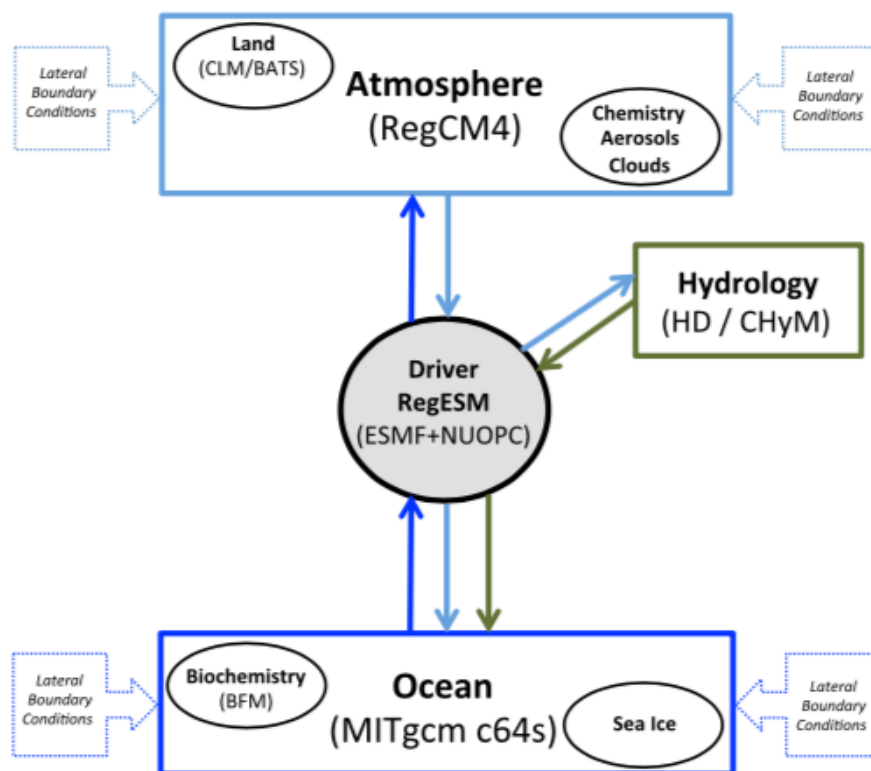
Total precipitation

TCs precipitation



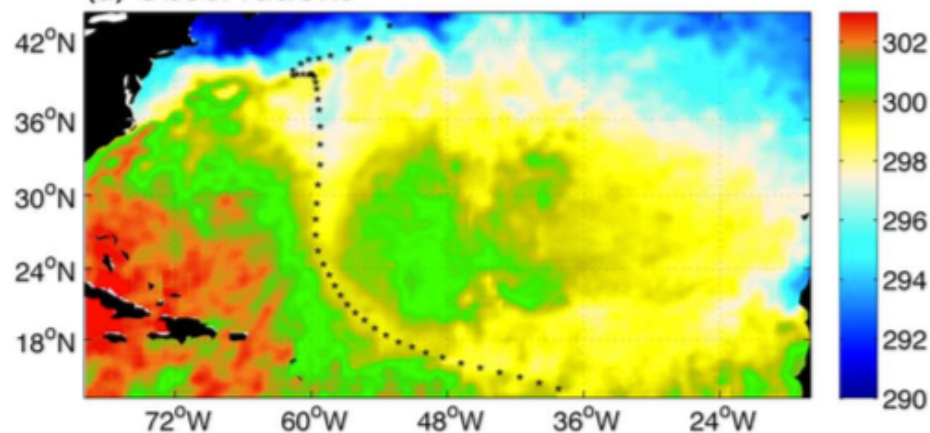
COUPLED SIMULATIONS OVER THE CORDEX-CAM DOMAIN

Regional Earth System Model RegCM-ESM

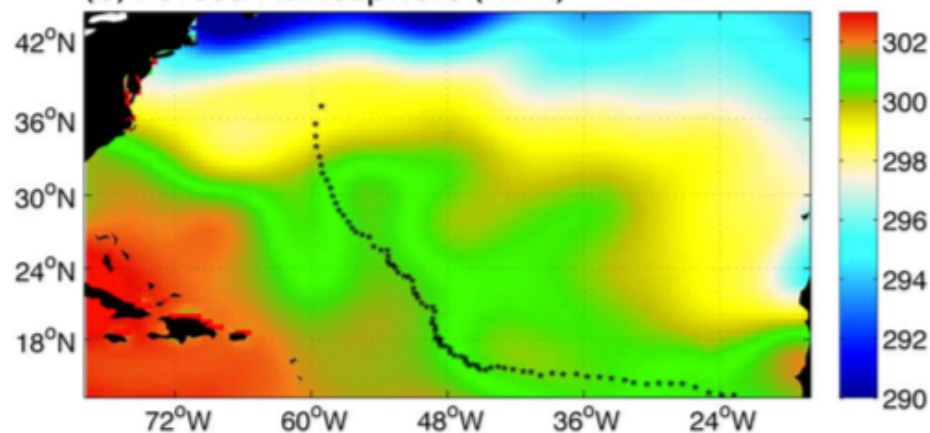


Tropical cyclones in a coupled model compared to an atmospheric only model

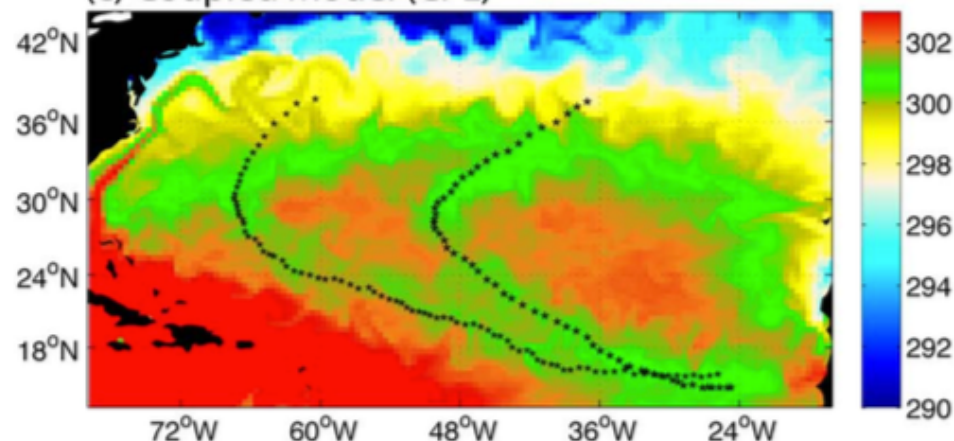
(a) Observations



(b) Forced Atmosphere (ATM)



(c) Coupled Model (CPL)



THANK YOU!
CONTINUE TO ENJOY THE MEETING!