



# **GoLoCarSce Project**

## Climate Modelling Update

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  - Domain Selection and Driving GCM
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# Tasks

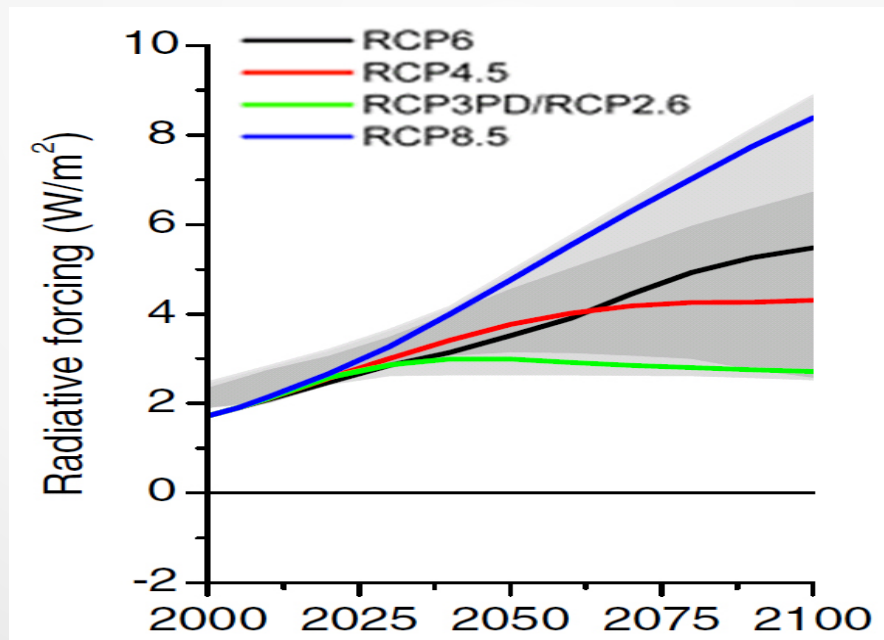
- Generate future climate scenarios at scales relevant to study sites of the GoloCarSce Project
  - Resolution must be 10 km or less
  - Climate projections must make use of “new” RCP scenarios
  - Climate projections must be generated within a year
    - or as close as possible
  - Validation of climate projections
  - No projections exist at a scale greater than 10km matching the period of interest.

# Progress

- Model & Scenario Selection
  - RegCM4.3
    - The model is flexible & portable
    - Applicable to any region of the World
    - With an hydrostatic limit of up to 10 km
    - Fully parametrizable
      - Convective & Cumulus scheme
      - Land Surface Schemes
      - PBL, aerosol, dust and ocean flux
    - Applicable for a wide range of studies.

# Progress

- Model & Scenario Selection
  - Four RCP Scenarios
  - Studies suggest that 4.5 & 8.5 are most “realistic” for the region

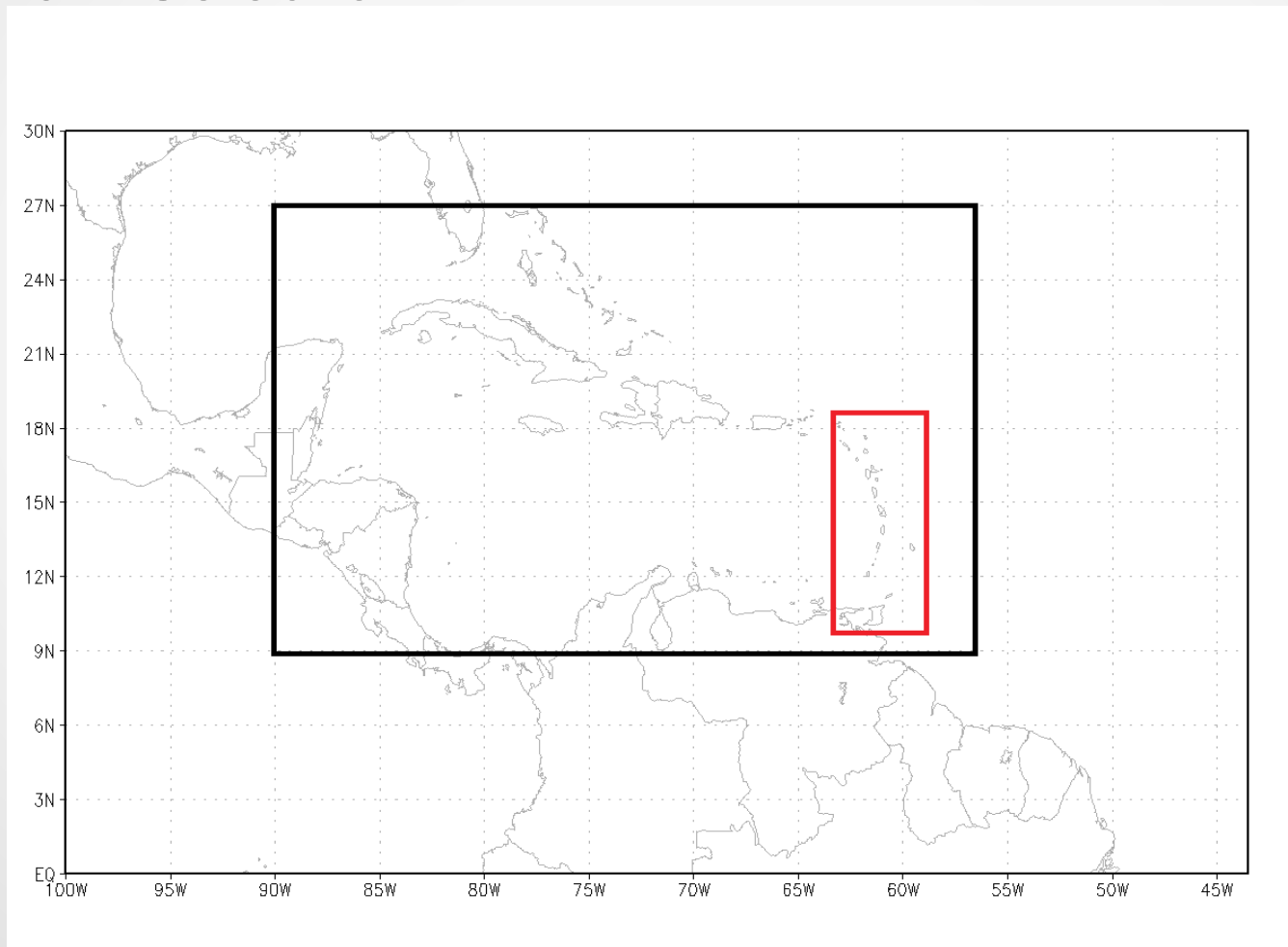


# Progress

- Domain Selection
  - Domain has to be large enough to simulate all the features associated with Caribbean climate, e.g.
    - CLLJ
    - Influence of Tropical Cyclone
  - Domain must be large enough to allow nesting
    - 60 to 25 km
    - 25 to 10 km

# Progress

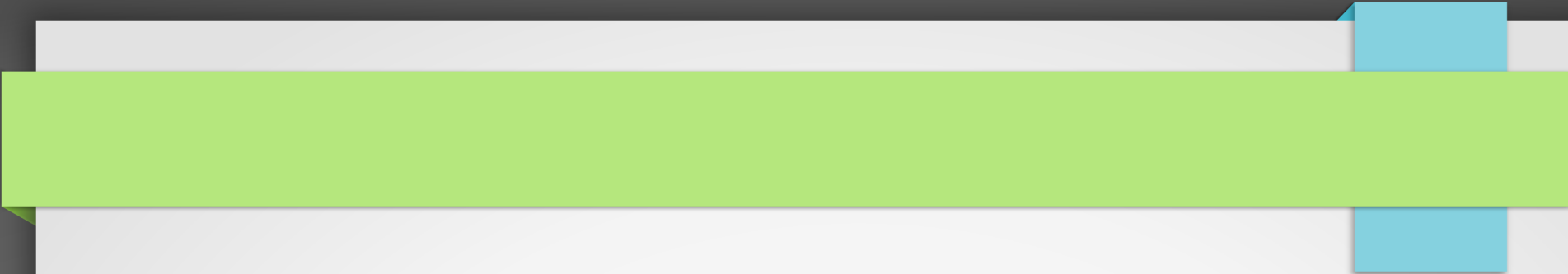
- Domain Selection



# Results

- Schemes chosen to match Castro et al 2007
  - Grell & Emmanuel Convective Scheme
  - Zheng Closure
  - BATS land Surface Scheme

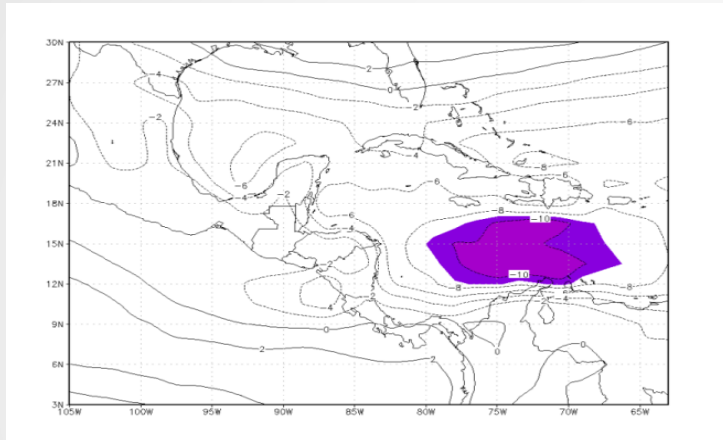




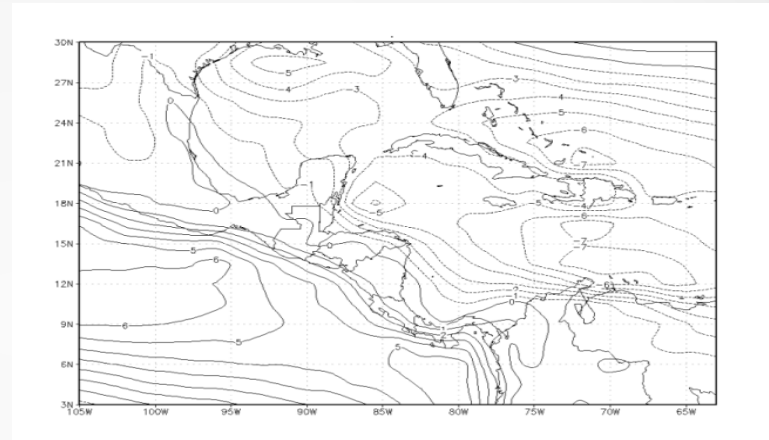
# A quick evaluation of Parameters chosen

# Results

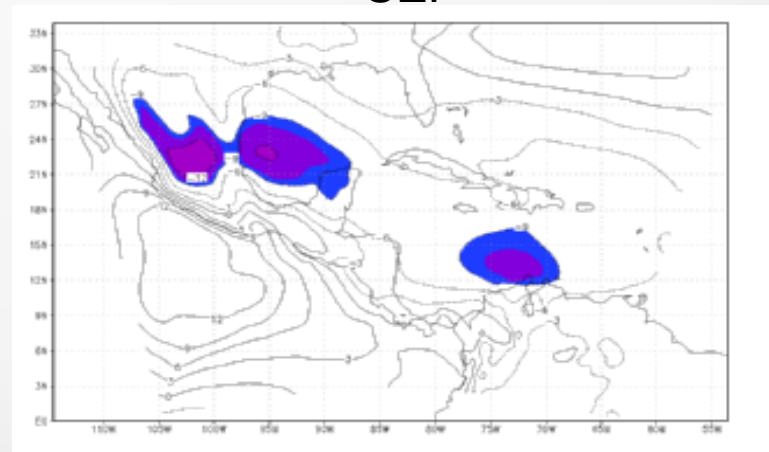
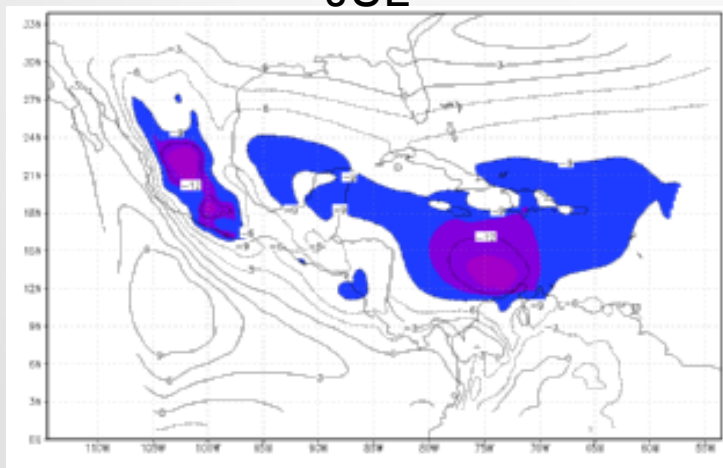
- CLLJ



JUL

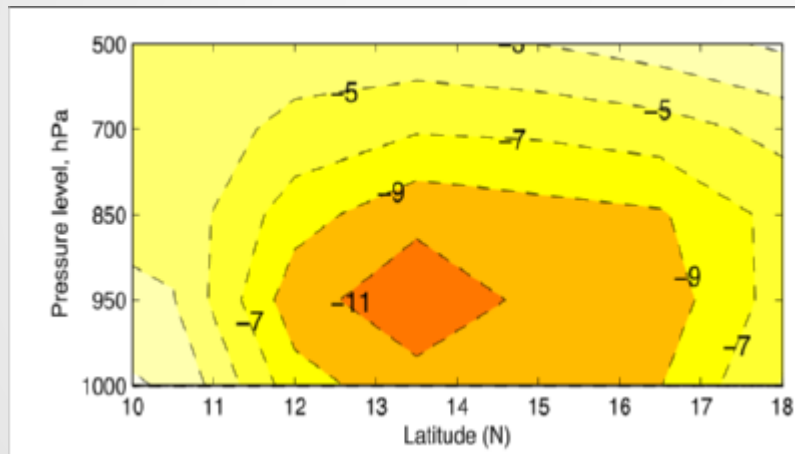


SEP

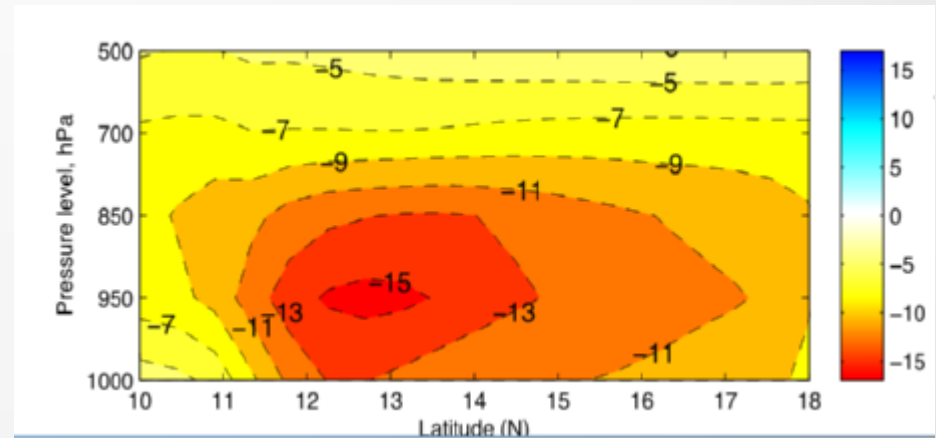


# Results

- CLLJ
  - Note that the extent and position of the CLLJ is captured



EIN15

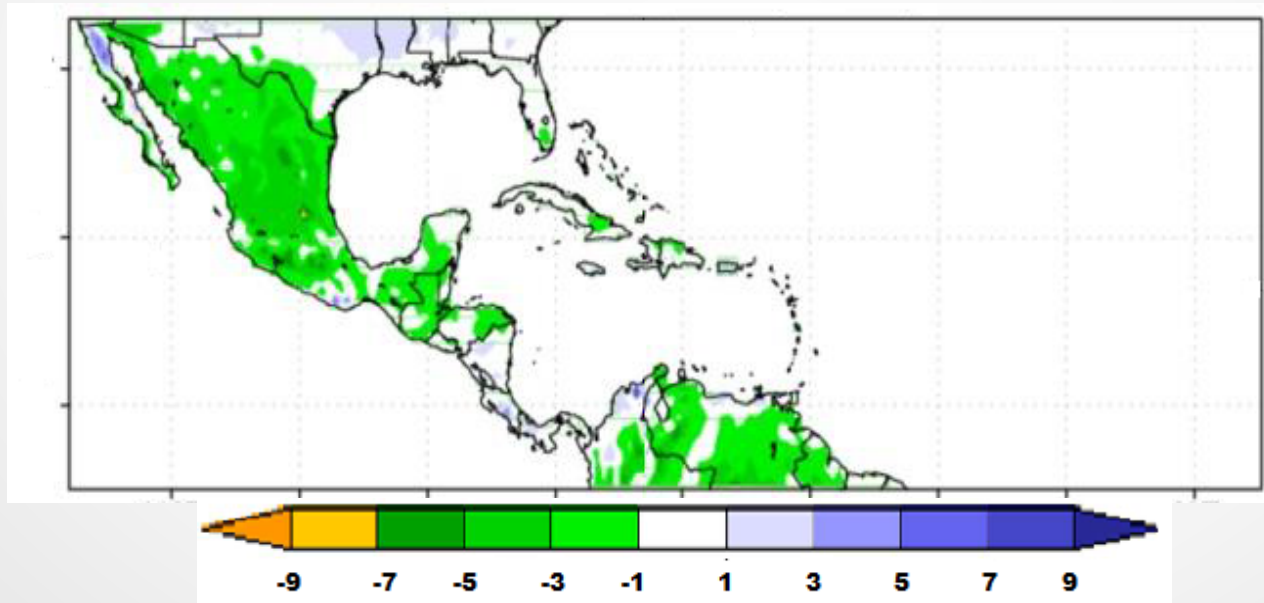


REGCM4.3

# Results

- Temperature

REGCM – CRU



# Progress

- Driving GCMs
  - HadGEM2-ES
  - MPI-ESM-MR
  - GFDL-ESM2M
  - IPSL-CM5A-LR
  - CanESM2
  - CSIRO-MK36
  - CNRM-CM5
- Each GCM has RCP 4.5 and RCP 8.5 as well as a historical period.

# Progress Completed

All boundary data for HadGEM2-ES, MPI-ESM-MR, GFDL-ESM2M Downloaded

GCM	60 Km			25 Km			10 Km		
	4.5	8.5	HIST	4.5	8.5	HIST	4.5	8.5	HIST
HadGEM2-ES	■	■	■						
MPI-ESM-MR									
GFDL-ESM2M									
IPSL-CM5A-LR									
CanESM2									
CSIRO-MK36									
CNRM-CM5	■	■	■	■		■			

8.5 & 4.5 – 2010 to 2100

HIST – 1950 to 2005

# Progress

- Anticipated Timeline

## **IDEAL**

- Given each 4-6 year of model simulation at 60 km run takes 1 day
  - Each 60km simulation will take maximum 30 days assuming 2020 – 2100
  - Given 2 computers maximum time for all 7 driving GCMs is 180 days
  - Similar timeline for 25 km simulations

## **REALITY**

- Each 60km simulation will take maximum 45-60 days assuming 2020 – 2100
- Similar timeline for 25 km simulations

# Progress

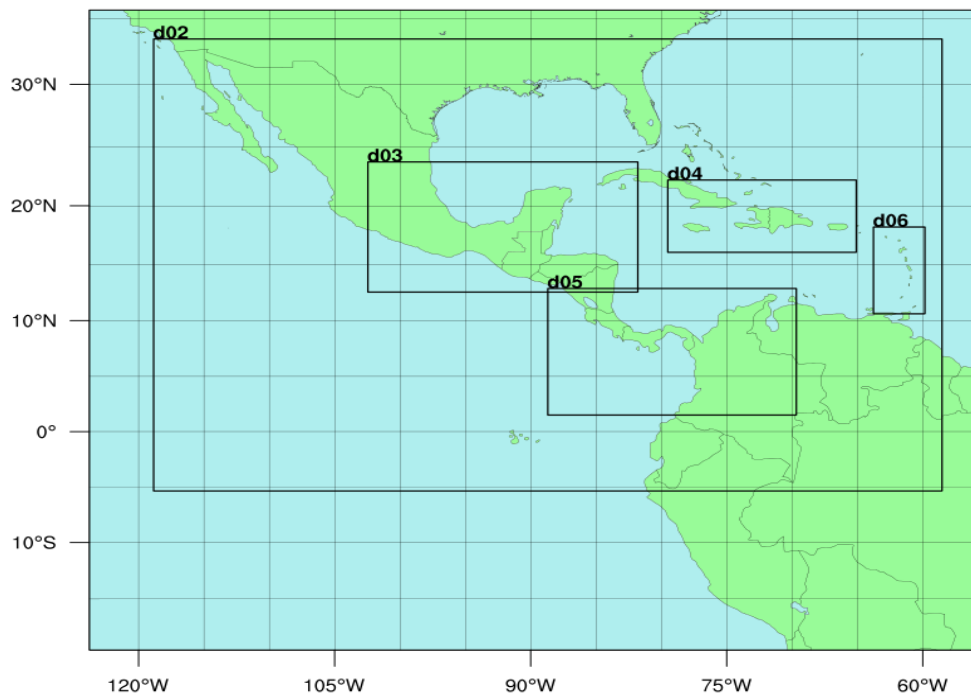
- Anticipated Timeline
  - **IDEAL**
  - Given each 8-10 year of model simulation at 10 km takes 1 day
    - Each 10km simulation will take maximum 10 days assuming 2020 - 2100
    - Given 2 computers maximum time for all 7 driving GCMs is 70 days



# Progress

- Inputs to other models
  - WRF Data (courtesy of IDB/UNL Project of which CSGM was apart)
    - NCEP: a three-year simulation (1991-1993) using NCAR/NCEP global reanalysis data for initial and boundary conditions.
    - CONT (control): a five-year simulation (nominally 2006-2010) using NCAR CCSM4 IPCC RCP8.5 for initial and boundary conditions.
    - CHNG (change): a five-year simulation (nominally 2056-2060) using NCAR CCSM4 IPCC RCP8.5 for initial and boundary conditions.
    - DIFF (difference): the monthly-average differences between the two CCSM4 climatologies.

# Progress



- D01 - 36km domain
- D02 - 12km domain
- D03 - 4 km domain
- D04 - 4km Greater Antilles domain
- D05 - 4km domain
- D06 - 4km Lesser Antilles domain

Data is located on T&T HPC and can be used as preliminary input to other models

# Progress

## Inputs to other Models

### RegCM (Courtesy of ICTP)

- HadGEM2-ES
- MPI-ESM-MR
- 50 km Resolution
  
- Available on T&T cluster.

# Future Work

- Possibility of adding PRECIS
  - Extensively used in the region
    - Already validated
    - Non-parametrizable
  - Will be launched in May
  - Doesn't require nesting to give desired resolution

# Limitations

- Largest Limitation is due to connectivity issues
  - Difference in connectivity speed of the two HPC
  - Simultaneous writes by both HPC tends to extend simulation time
  - Storage Capacity now at 75%
- Power outages



Thank you