CHym performance under different regions
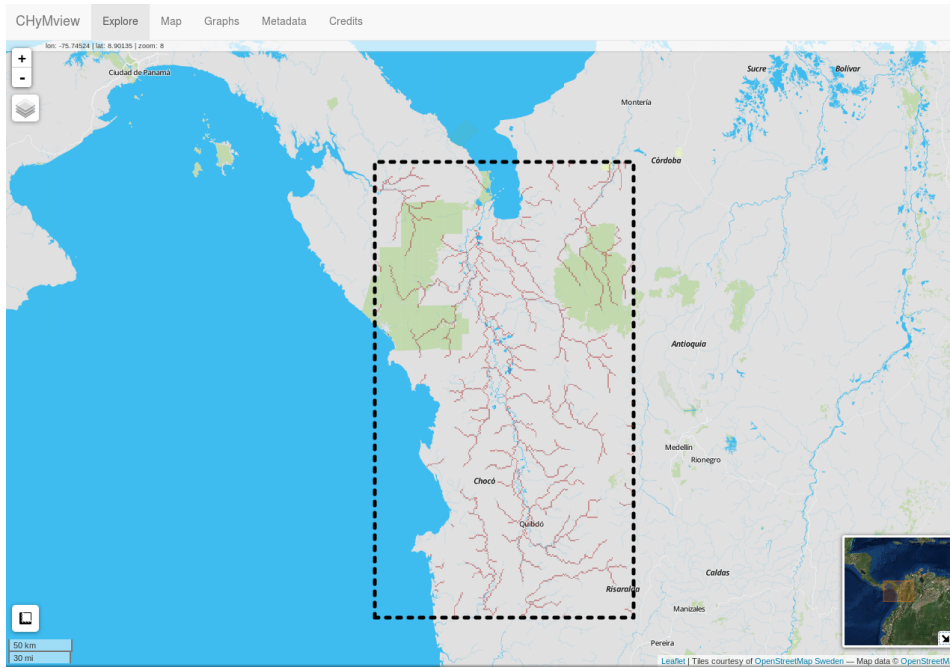
- *A. Martinez*
- *O. Garcia*
- *Y. Mahmoud*

Study Objectives

1. Test the CHym model performance with different datasets in humid and arid regions

2. Identify the typical simulated values and seasonal behavior

3. Look at the response of the simulated discharge and different ENSO phases
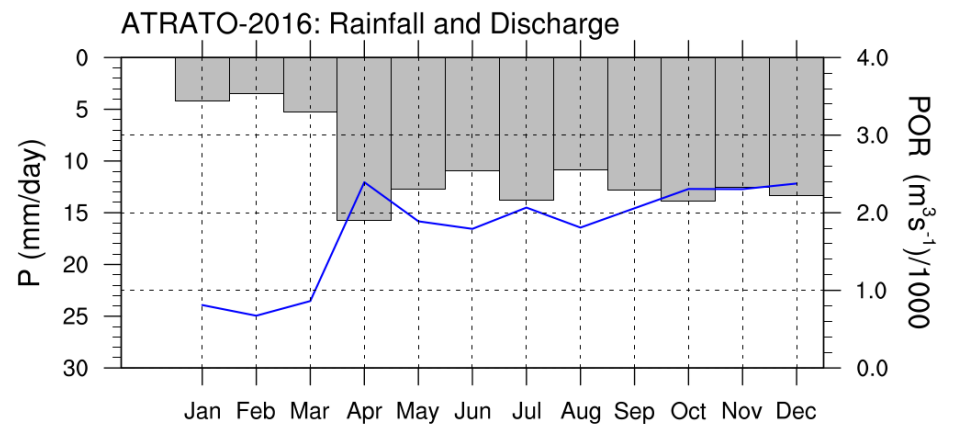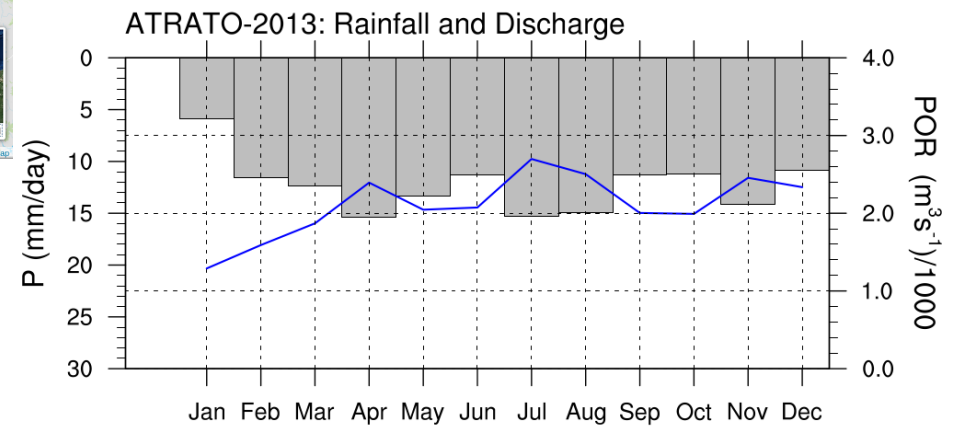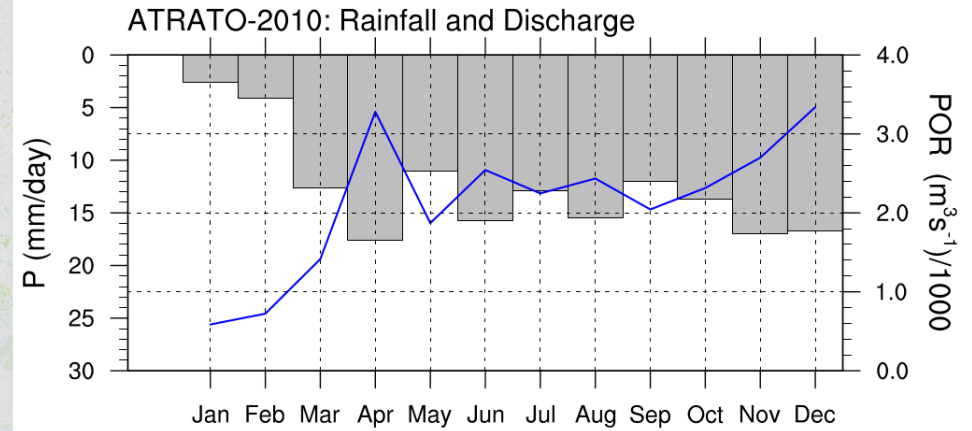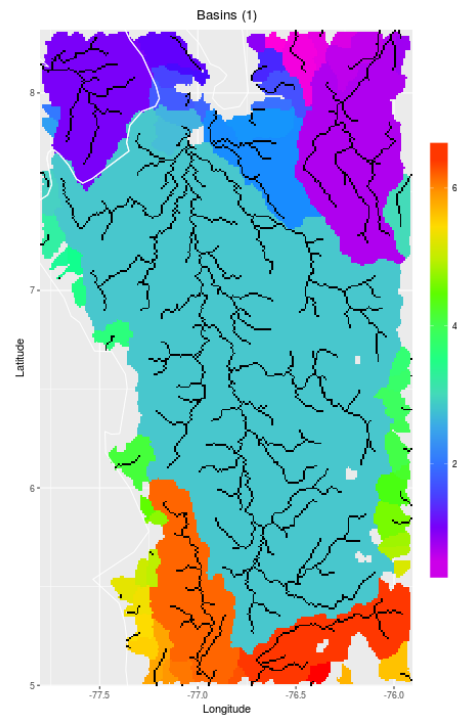
Case (1): Tropical South America

lon: -75.74524 | lat: 8.90135 | zoom: 8

Ciudad de Panamá

Sucre   Bolívar

Montería

Córdoba

Antioquia

Medellín   Rionegro

Chocó

Quibdó

Caldas

Risaralda

Manizales

Pereira

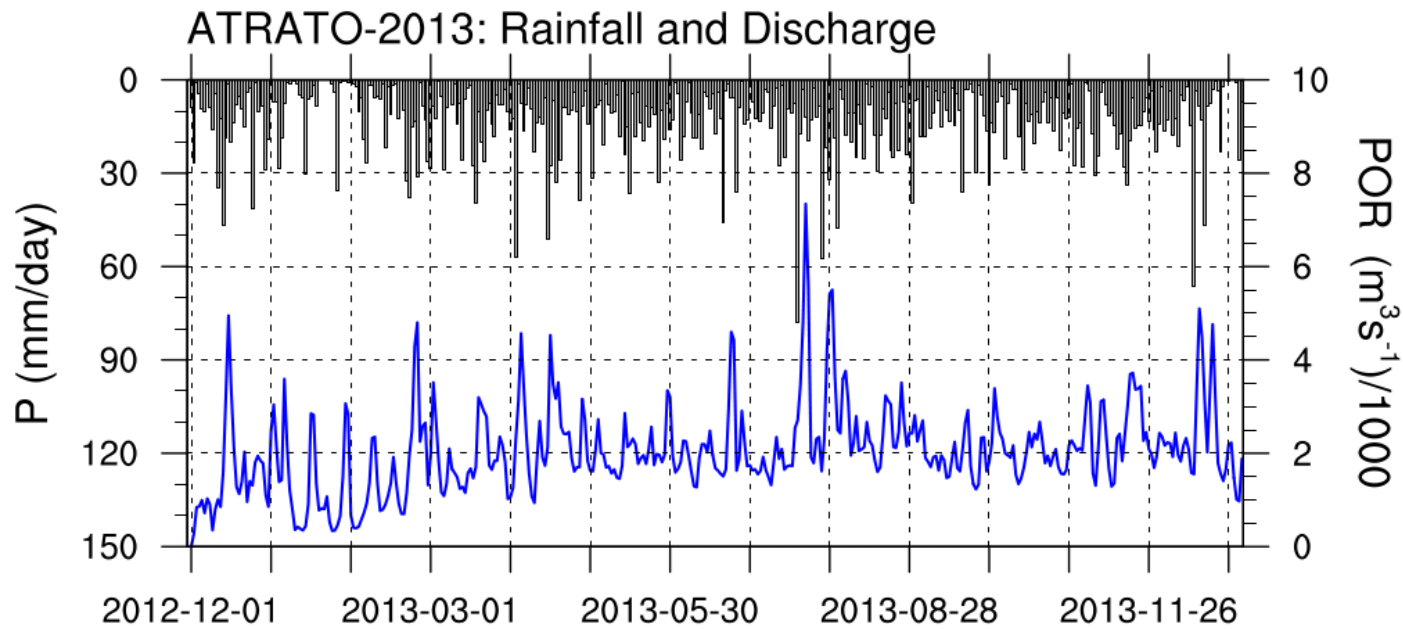Leaflet | Tiles courtesy of OpenStreetMap Sweden — Map data © OpenStreetMap

Atrato River:

Country: Colombia
Area : ~ 38000 km^2.
Length: ~ 750 km.
In one of the rainiest

places in the Americas.

CHyM:

Area : 34147.2 km^2.

DEM: NASA

Basins (1)

ATRATO-2010: Rainfall and Discharge

P (mm/day) — POR (m^{3}s^{-1})/1000

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

ATRATO-2013: Rainfall and Discharge

P (mm/day) — POR (m^{3}s^{-1})/1000

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

ATRATO-2016: Rainfall and Discharge

P (mm/day) — POR (m^{3}s^{-1})/1000

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
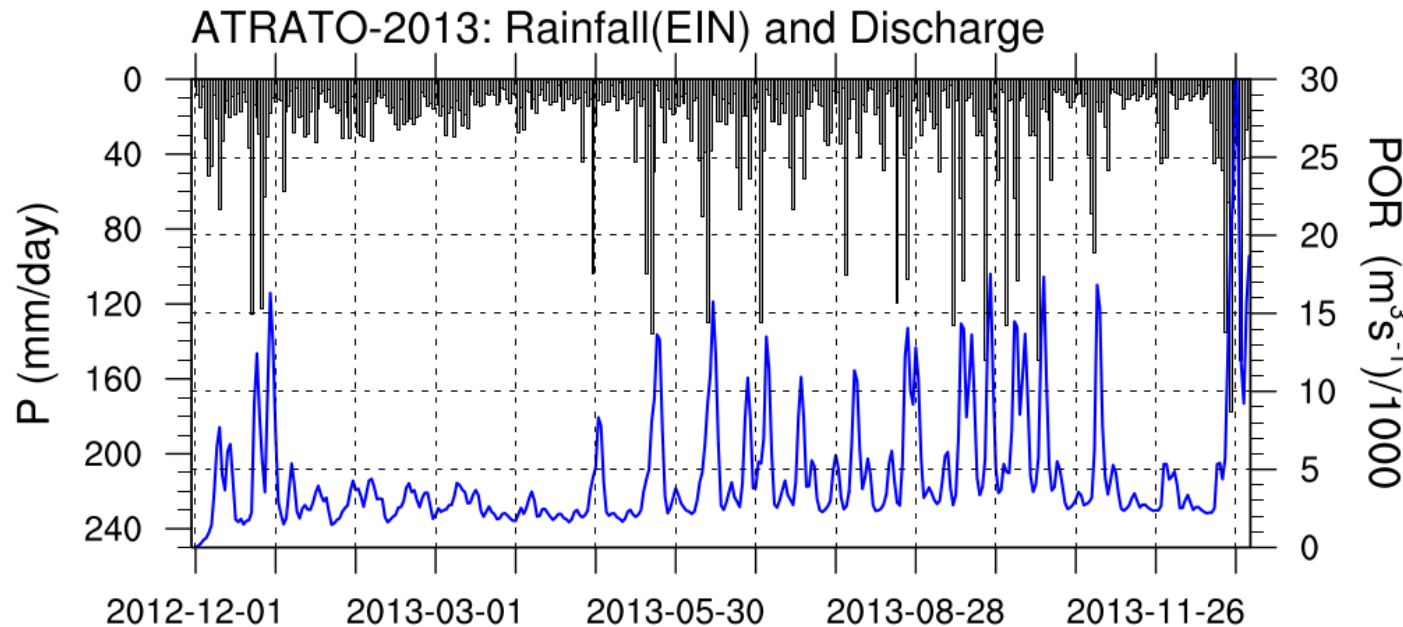
ATRATO-2013: Rainfall and Discharge

Rainfall: TRMM

Precipitation rarely exceeds 60 mm/day.

Discharge peaks exceed 4000 m^3/s.

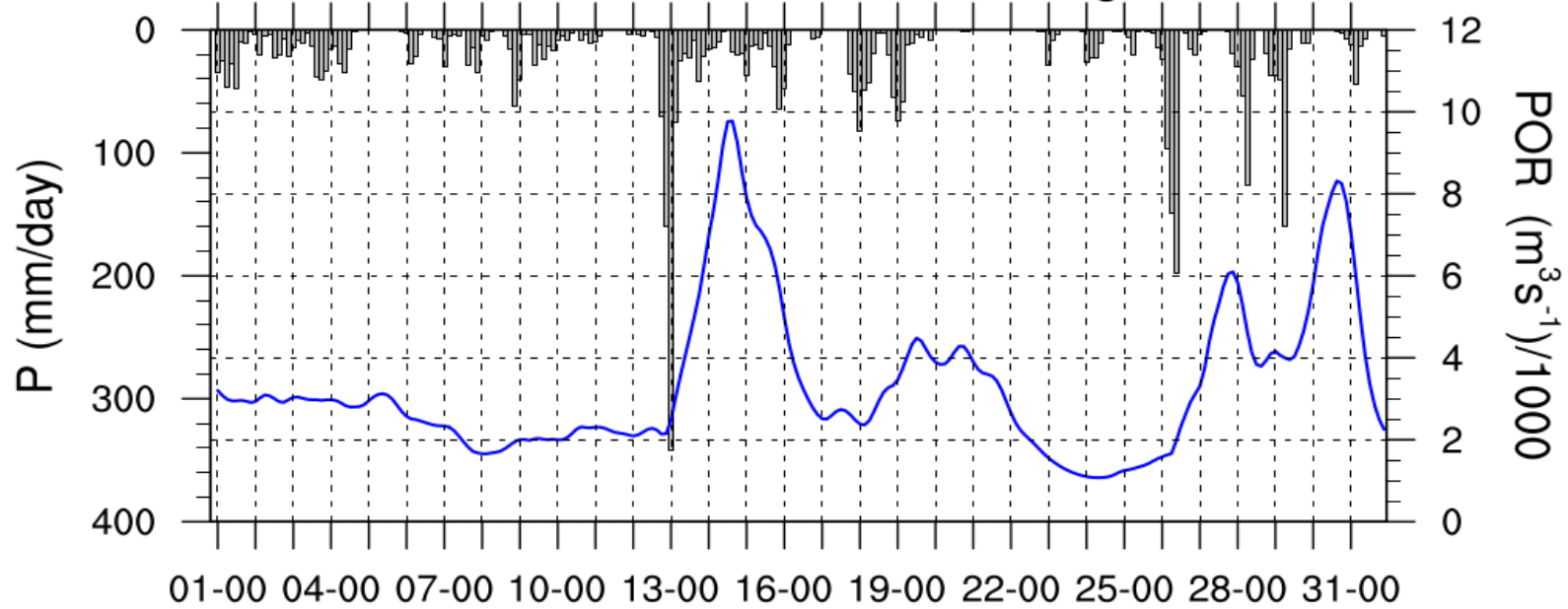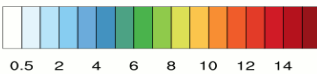*Notice the differences in the axes!*
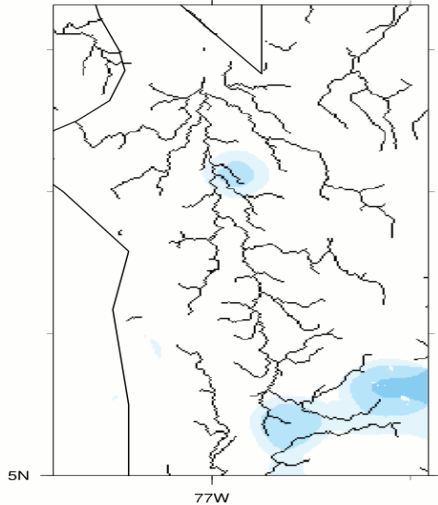
Rainfall: ERAIN

Precipitation can exceed 80 mm/day.
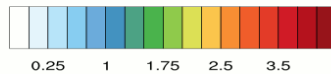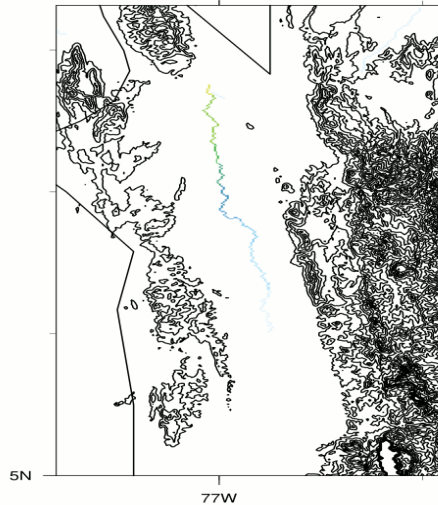
Discharge can be as high as 30000 m^3/s !.

ATRATO-Dec-2010: Rainfall and Discharge

RAI-TRMM_2010-12-12_03:00:00

POR-CHyM_2010-12-12_03:00:00

Precipitation event started around 18UTC on the 12th.

Peak precipitation at 00UTC on the 13th.

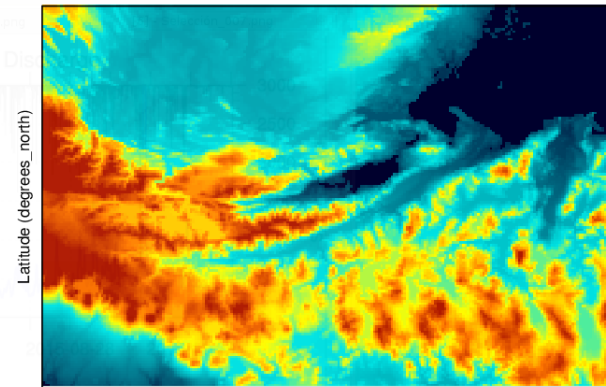Peak discharge at 12UTC on the 14th (~ 36 hours after peak precip.).

Case (2): Central America

Motagua Basin (Guatemala)

DEM Elevation (m)

Basins (1)

Actual area 15 132 km2

CHyM calculated area 15 369 km2

Domain: Central America

-91.50, 14.00 to -87.47, 16.68

250 x 150 cells (435 x 298.2 km2)

Resolution 0.018 deg (1971 m)

Years Simulated:

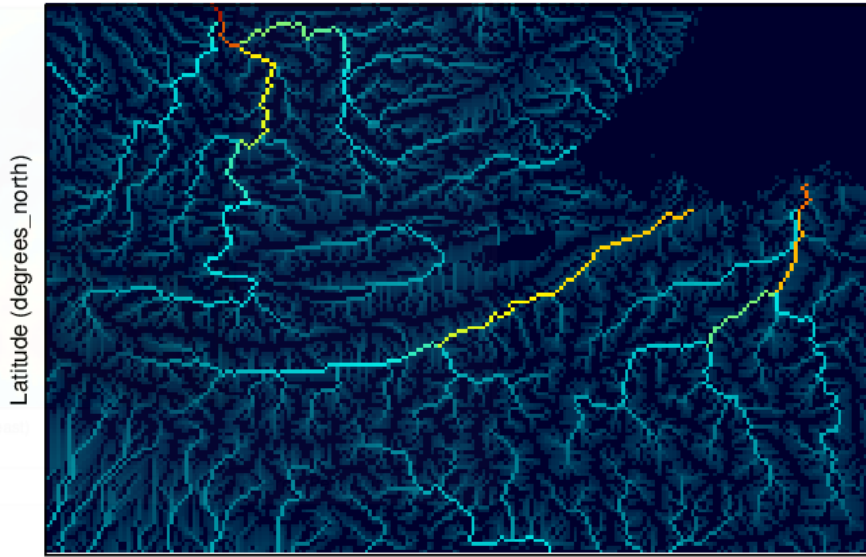- 2000(strong La Niña)
- 2013 (Neutral)
- 2015(strong El Niño)

Data Sources:

- HydroSheeds DEM
- TRMM Precipitation
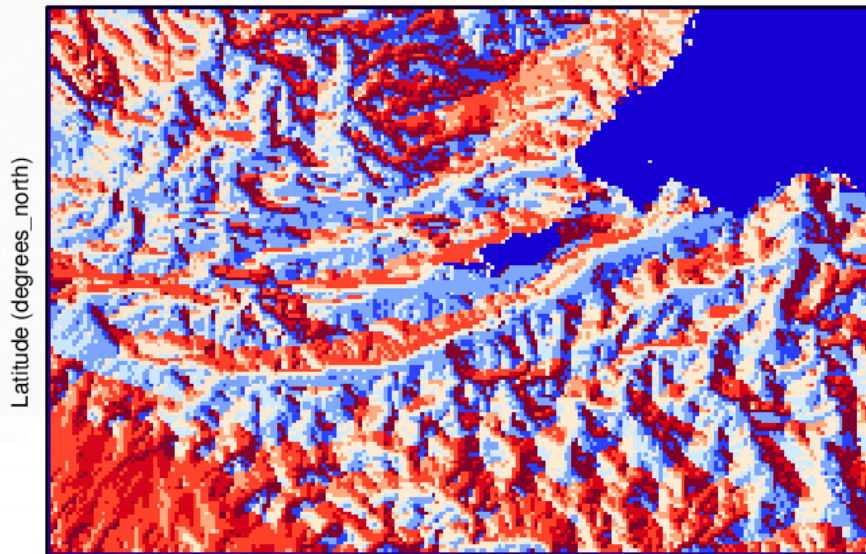- ERA dataset Temperatures

Spin-up time of 1 month

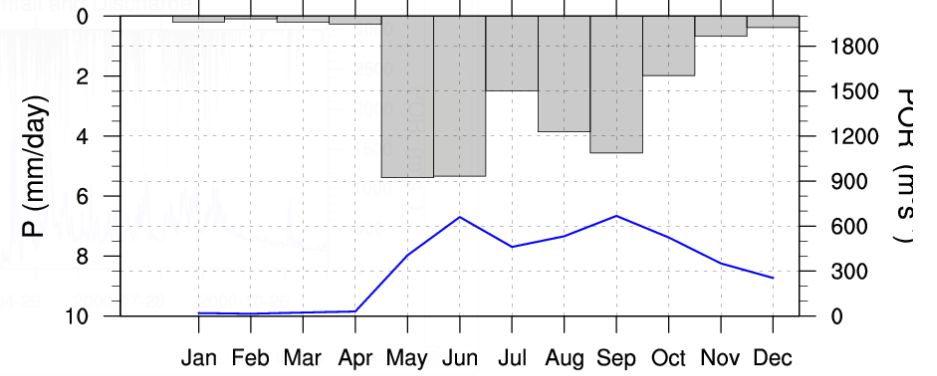Default values for cpar!

Drainage area (km^2)

Longitude (degrees_east)
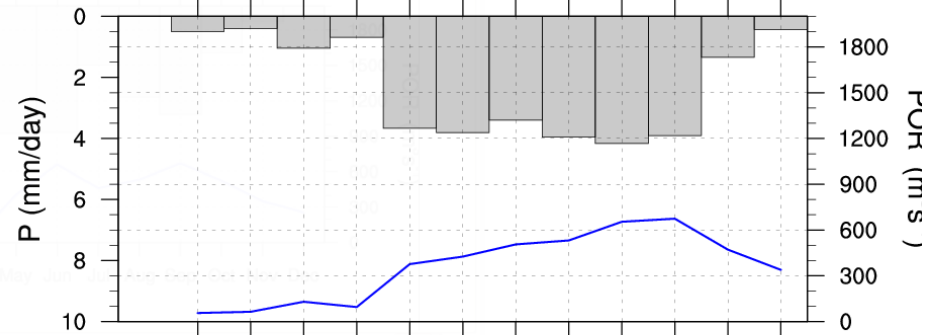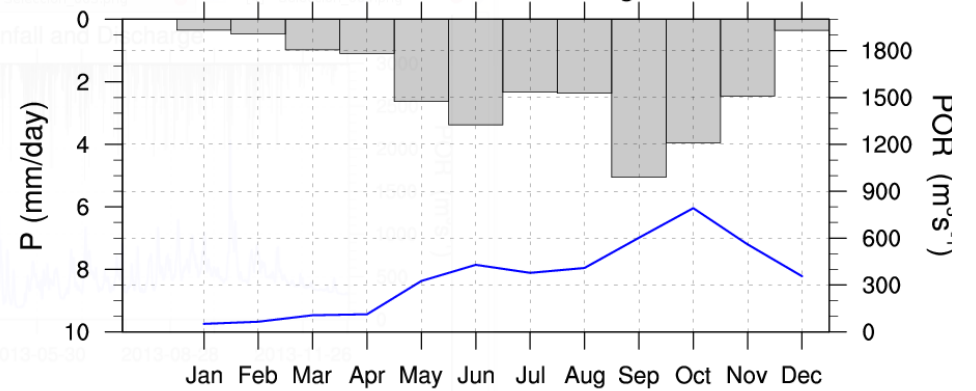

Flow direction matrix (1)

Longitude (degrees_east)
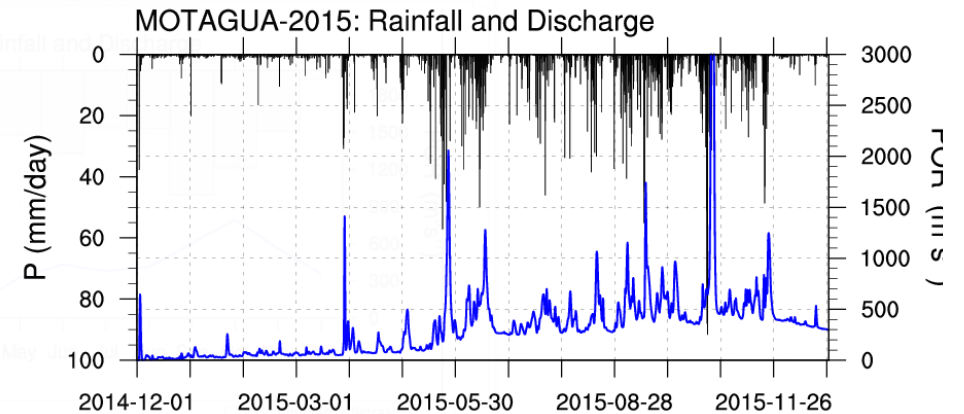

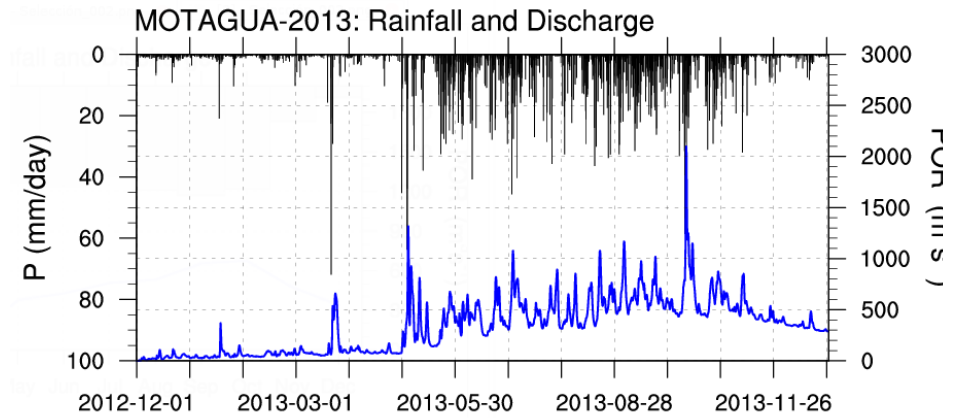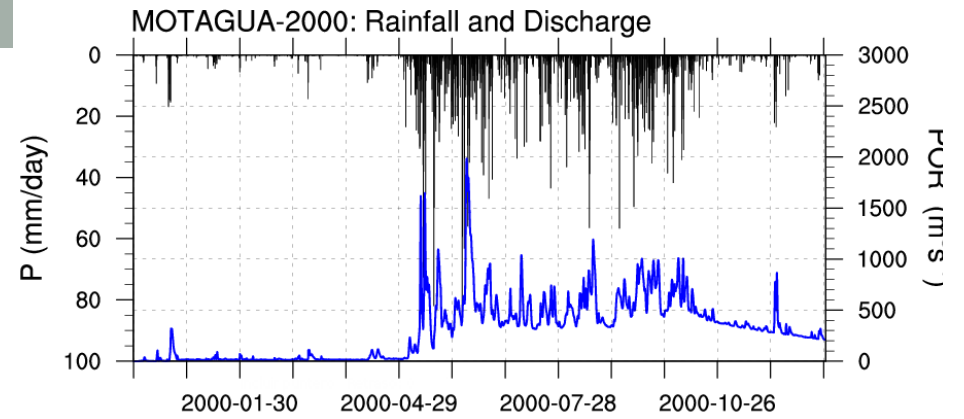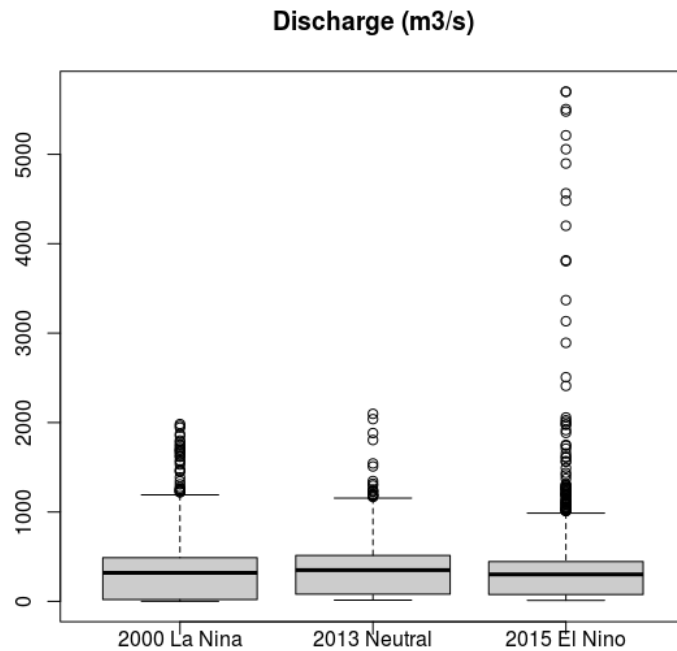MOTAGUA-2000: Rainfall and Discharge

MOTAGUA-2013: Rainfall and Discharge

MOTAGUA-2015: Rainfall and Discharge

The differences between years are clear when the daily discharges are compared.

Discharge (m3/s)

MOTAGUA-2000: Rainfall and Discharge

MOTAGUA-2013: Rainfall and Discharge

MOTAGUA-2015: Rainfall and Discharge

Case (3): Egypt - Flood 2010

The experiment tests the CHym hydrology model over Egypt as an Semi arid/Arid region with observation (ERA-Interim) and climate model Simulation (RegCM output)

Nlon = 800
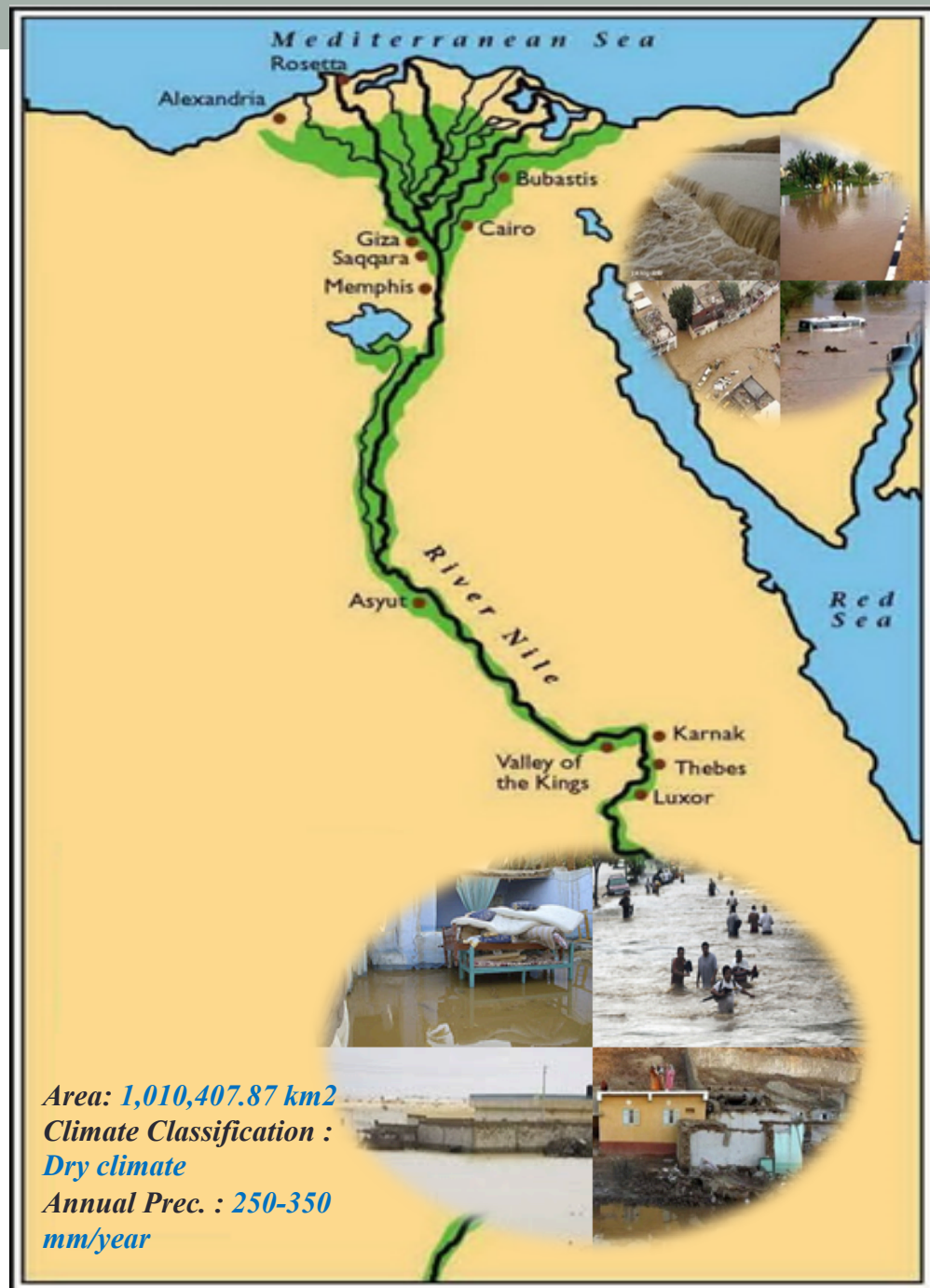Nlat = 1200
Slat = 28.4
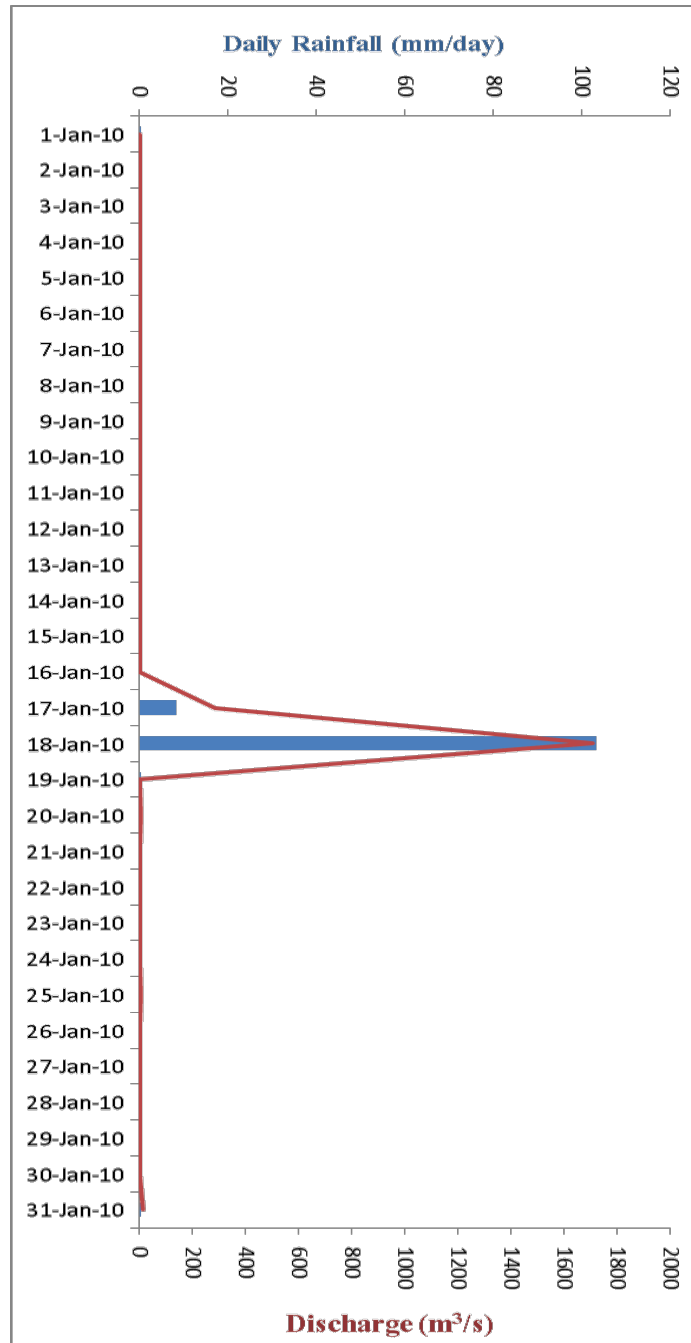Slon = 22.0
Dij = 0.0009
Demf = Nasa
Chym_sdate= 2009010100 to 2011010100
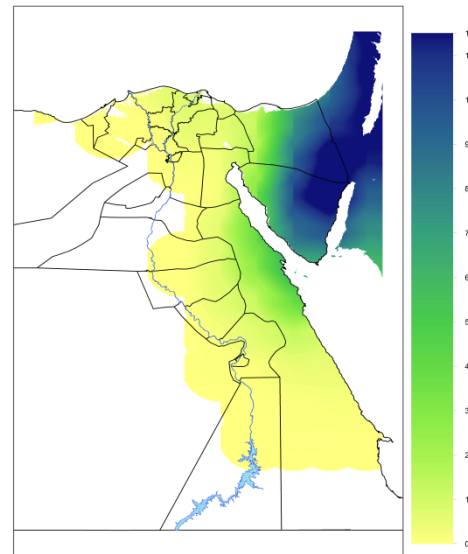Chym_dsource = **'EIN75' & 'AFR44-MPI-rcp8.5'**

Chym Setting

Area: *1,010,407.87 km2*
Climate Classification :
Dry climate
Annual Prec. : *250-350 mm/year*
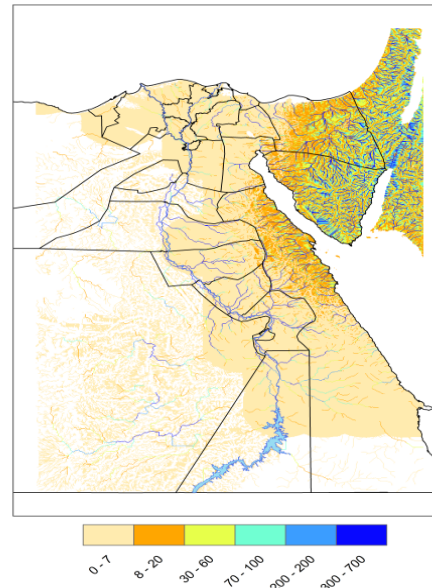
Daily Rainfall (mm/day)

Discharge (m³/s)

Rainfall 18 Jan.2010

Total Rainfall in Jan.

Discharge 18 Jan.2010

0 - 7   8 - 20   30 - 60   70 - 100   200 - 200   300 - 700

Discharge in Jan.

16   60   140   290   950   5500
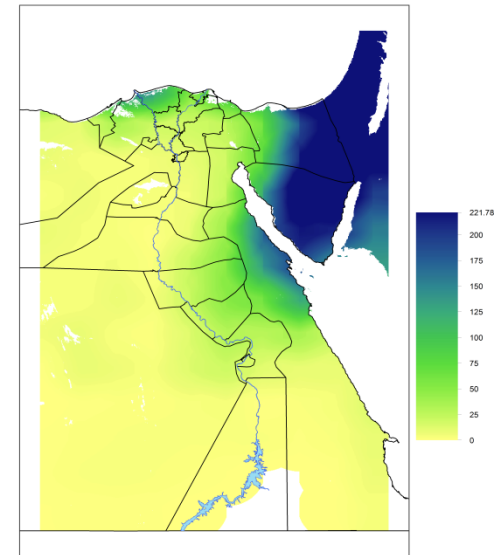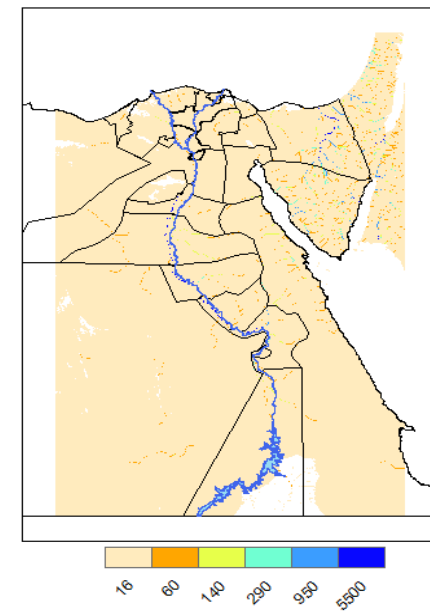
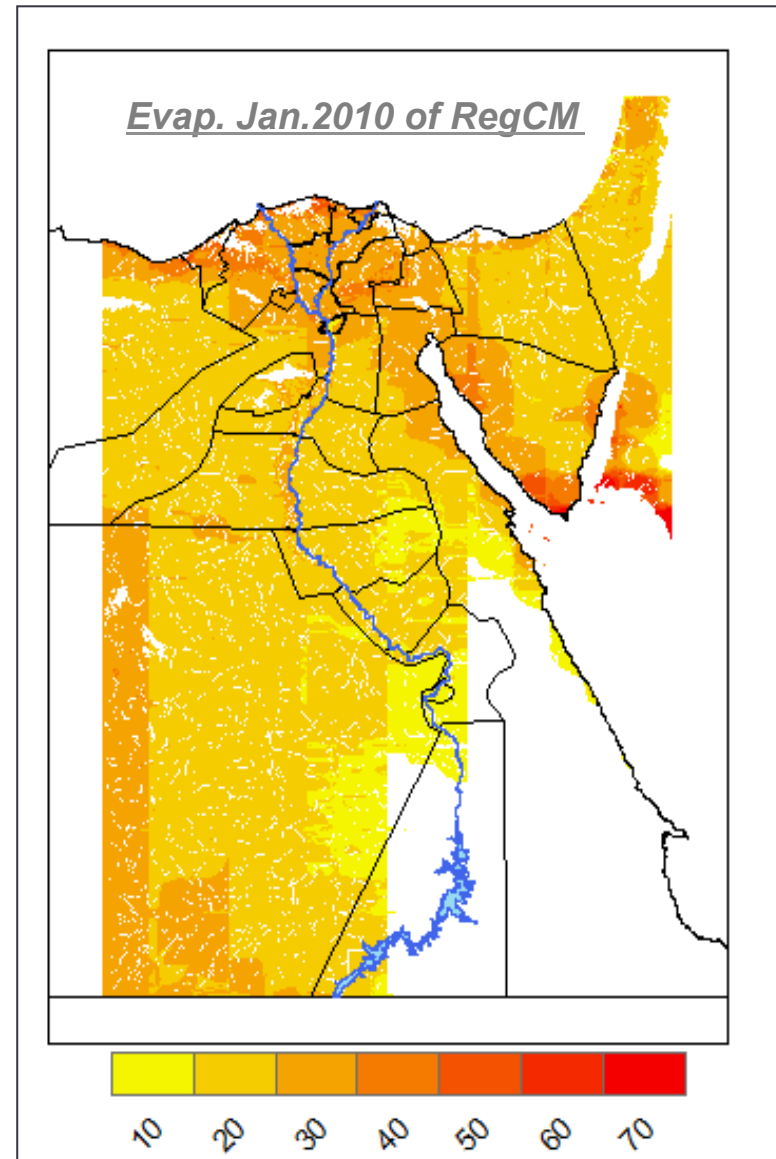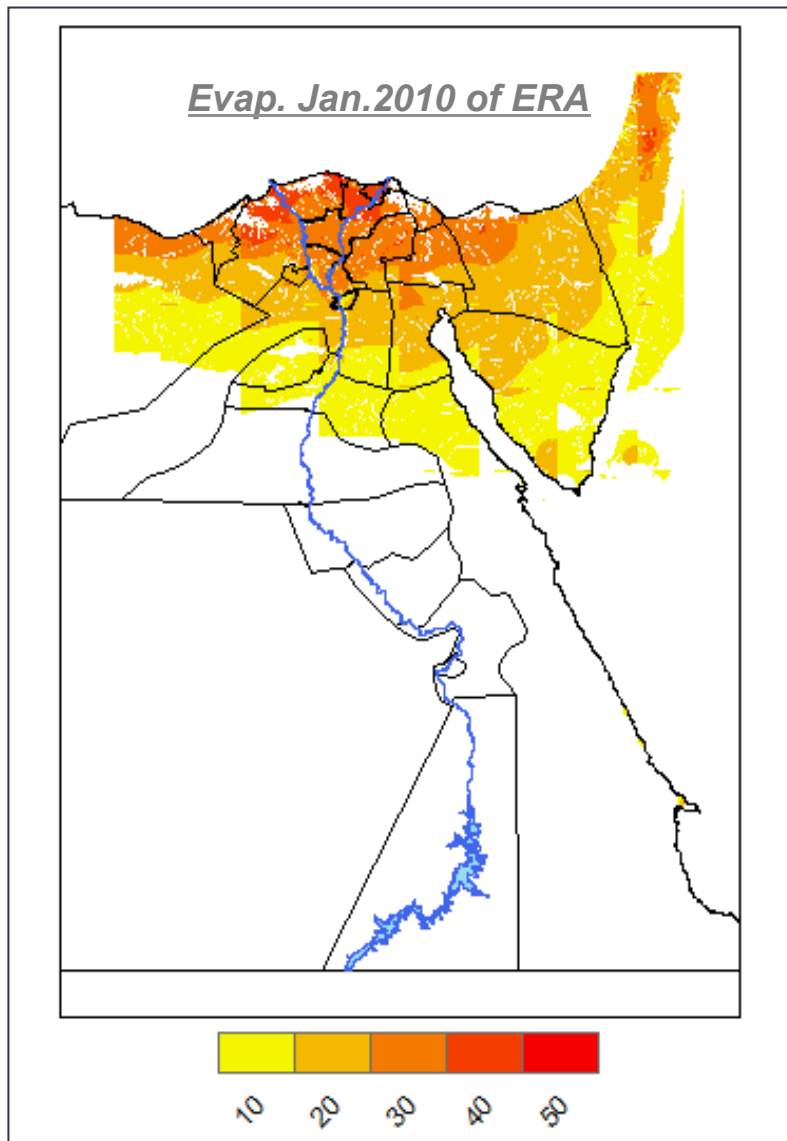# RegCM (MPI-ESM-MR of rcp8.5) Results

Cont. RegCM Results

Evap. Jan.2010 of ERA

Evap. Jan.2010 of RegCM
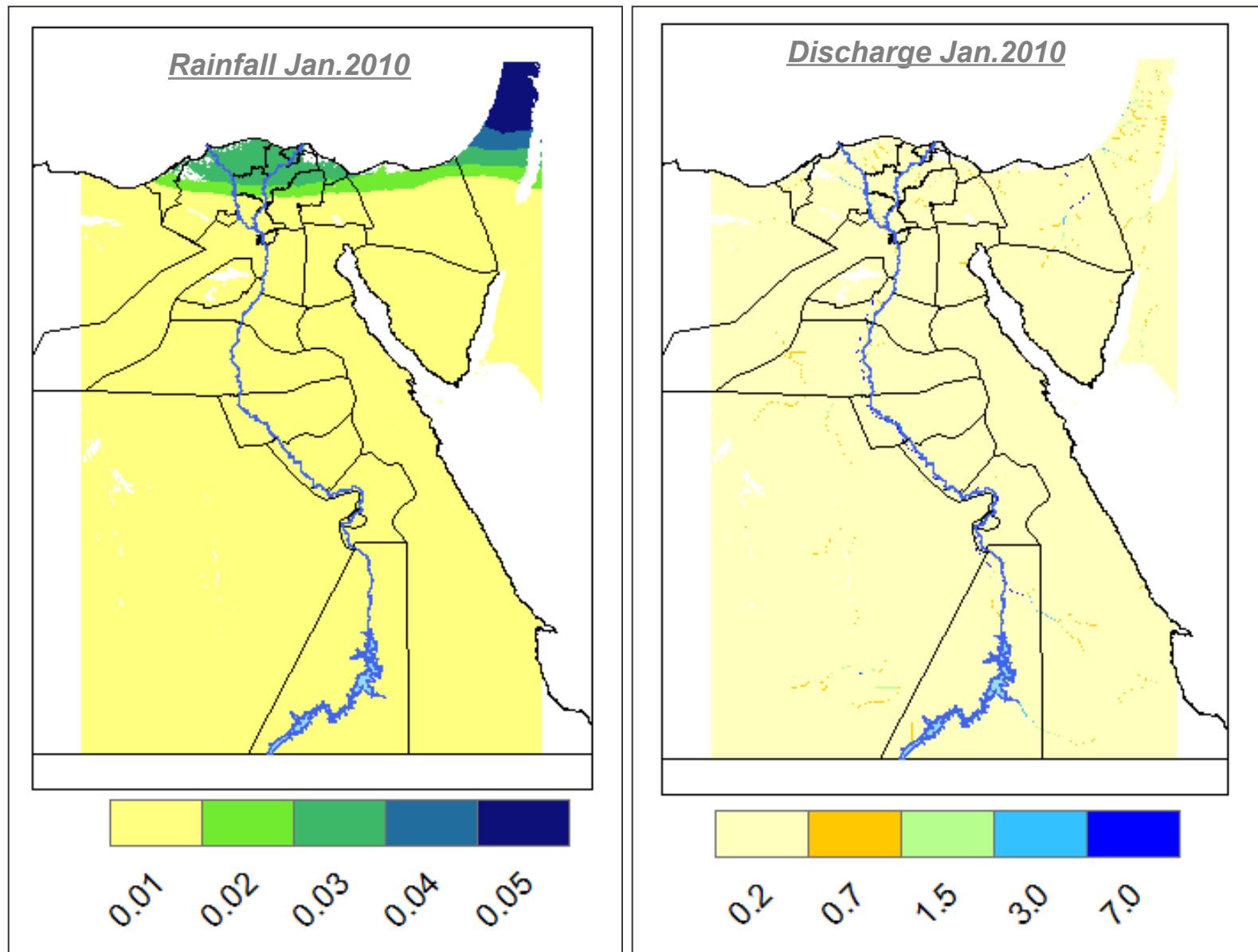
Thank you for your attention