Spatial and temporal climate change analysis using CORDEX regional climate models over Bangladesh

Date & Venue: 07–11 March 2022 | Dhaka, Bangladesh

Ten Participants from BMD

&

Three Participants from IWM

TRAINING ON

Spatial and temporal climate change analysis using CORDEX regional climate models over Bangladesh

7-11 March 2022| Dhaka, Bangladesh

List of Participants

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Speaker from BMD

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Resource Persons

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Day-1 and Day-2

Day 1 is focused on creating the required files for the analysis.

Once, the global data has been downloaded from the Earth System Grid Federation (ESGF), codes can be run in Climate Data Operator (CDO) to prepare in the required format. To clip it to the smaller size.

Day 2: Understanding the baseline

On Day 2 we prepared and plot the baseline data (1976-2005) using the CORDEX datasets and the reference datasets (APHRODITE) for Bangladesh.
To plot baseline for **ENACTS-BD** dataset for time period of **1981-2010** and compare it with APHRODITE for **BANGLADESH**.

Software Installation & Lectures delivered

- Installation of R, RSTUDIO and CDO – ICMOD Team
- Extracting, Clipping and preparation of CORDEX data for Visualization
- Climate Services in the HKH region- Dr. Mandira Singh Shrestha, ICMOD
- Climate Modeling, Downscalling- Joseph Daron, UKMO
- Introduction of CORDEX data over SA – J. Sanjay, IITM

Shell Script with CDO for data conversion

- #!/bin/bash
- FILE=pr_WAS-44_CCCma-CanESM2_rcp45_r1i1p1_IITM-RegCM4-4_v5
- for P in 20060101-20101231 20110101-20151231 20160101-20201231 20210101-20251231 20260101-20301231
- do
- cdo sellonlatbox,60,120,10,70 ${FILE}_day_${P}.nc SA_${FILE}_day_${P}.nc
- cdo remapbil,mygrid SA_${FILE}_day_${P}.nc Rmap_${FILE}_day_${P}.nc
- cdo sellonlatbox,86,95,20,28 Rmap_${FILE}_day_${P}.nc BD_${FILE}_day_${P}.nc
- cdo mulc,86400 BD_${FILE}_day_${P}.nc BD_Runit_${FILE}_day_${P}.nc
- cdo setcalendar,standard BD_Runit_${FILE}_day_${P}.nc BD_fix_${FILE}_day_${P}.nc
- cdo monsum BD_fix_${FILE}_day_${P}.nc pr_BD_${FILE}_mon_${P}.nc
- done

Day-3

Data Extraction

1. Day 3 is focused on reading the CORDEX file for Bangladesh for both RCP 4.5 and RCP 8.5
2. Plotting Climatology (Monthly precipitation and monthly Temperature) of 17 CORDEX models for Bangladesh and Rangpur, Khulna & Sylhet.

3. Plotting Climatology (Monthly precipitation and monthly Temperature) of best ranked 8 and later 4 CORDEX models over Bangladesh and Rangpur, Khulna & Sylhet respectively.

Day-4

Seasonal and annual change

1. Day 4 is focused on the analysis of the selected models for Bangladesh for both RCP 4.5 and RCP 8.5 with reference data.
2. Running all selected models over Bangladesh and three regions Rangpur, Khulna & Sylhet.
3. Running Annual data for all CORDEX models and selected CORDEX models over Bangladesh and three regions Rangpur, Khulna & Sylhet.
4.
5. Plotting Change in Annual Temperature and Annual precipitation for Bangladesh three regions Rangpur, Khulna & Sylhet.

Day-5

Analysis the Delta change

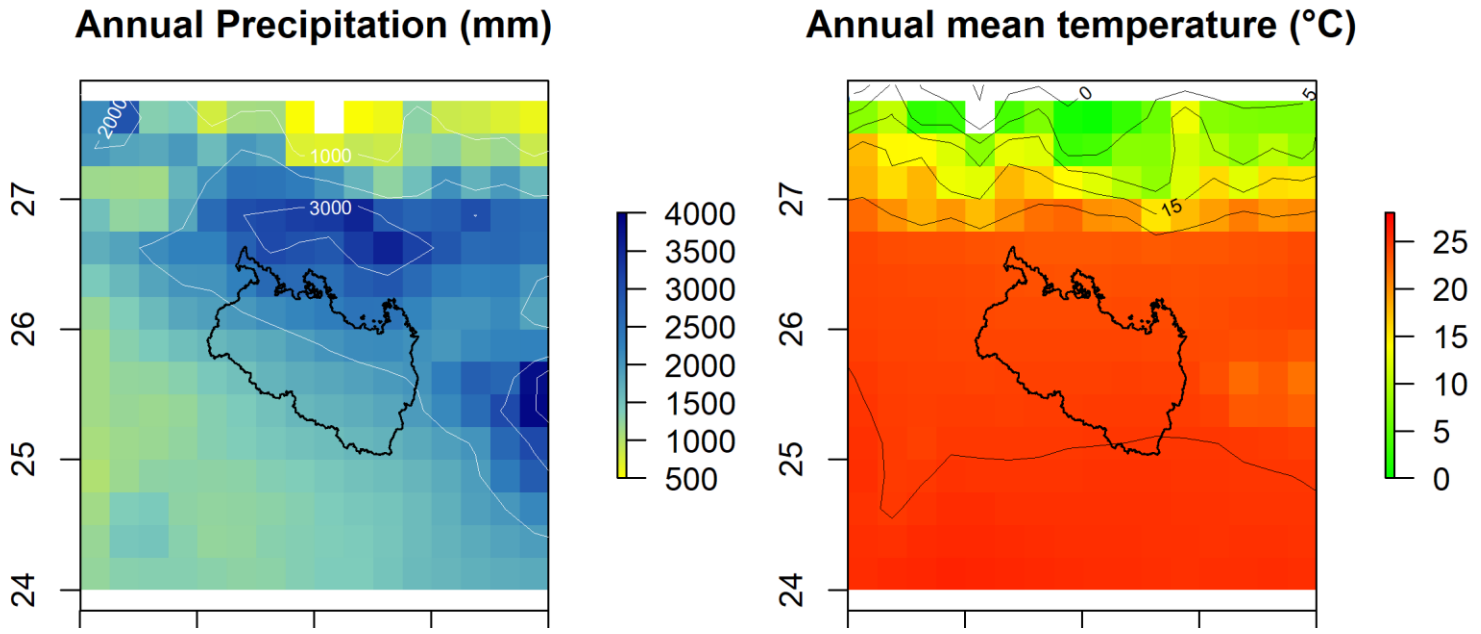
1. Day 5 is focused on calculating delta change of all models for precipitation and Temperature over Bangladesh for both RCP 4.5 and RCP 8.5
2. Plotting scatter plot with max-min error bars for both RCP 4.5 and RCP 8.5

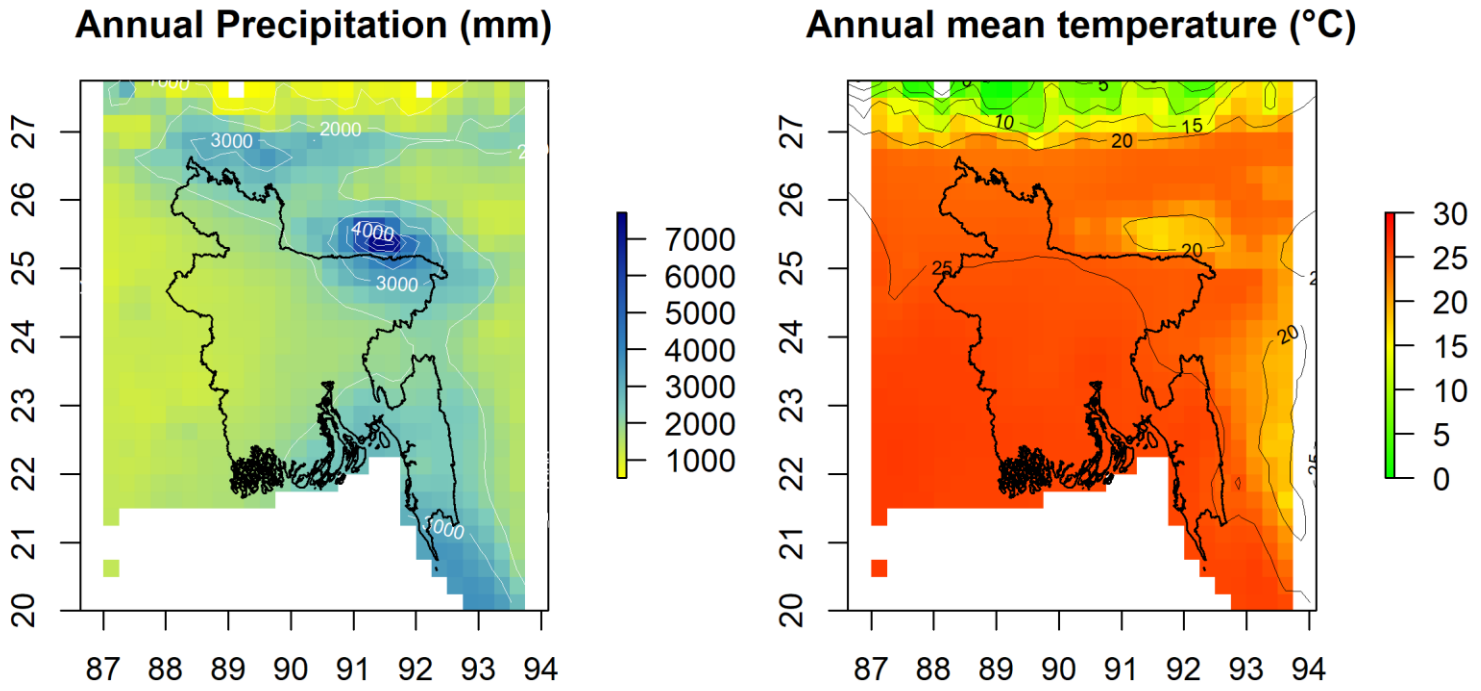
For Example

Case study :Rangpur

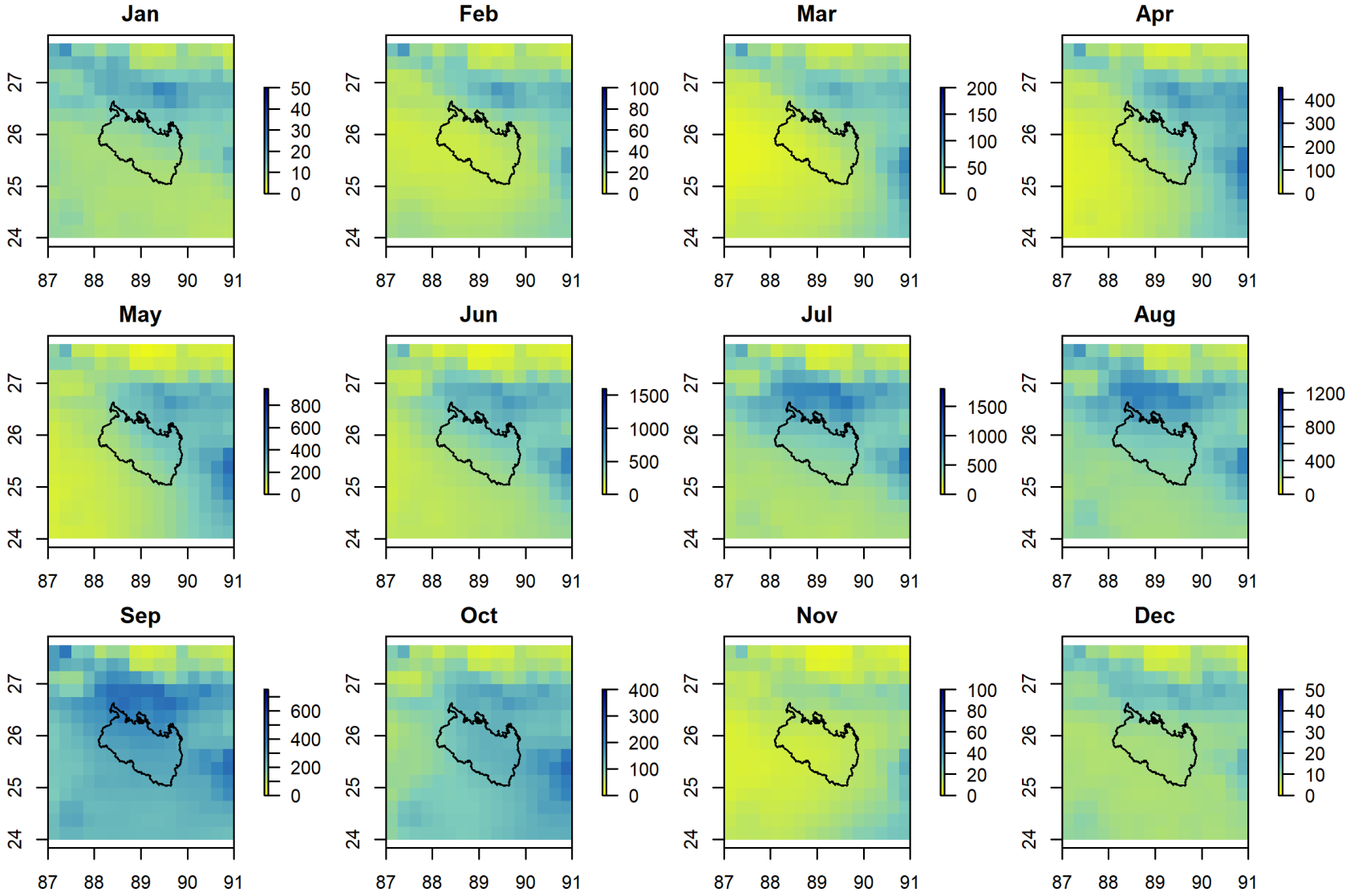
Study Area: Rangpur Division

Aphrodite Data

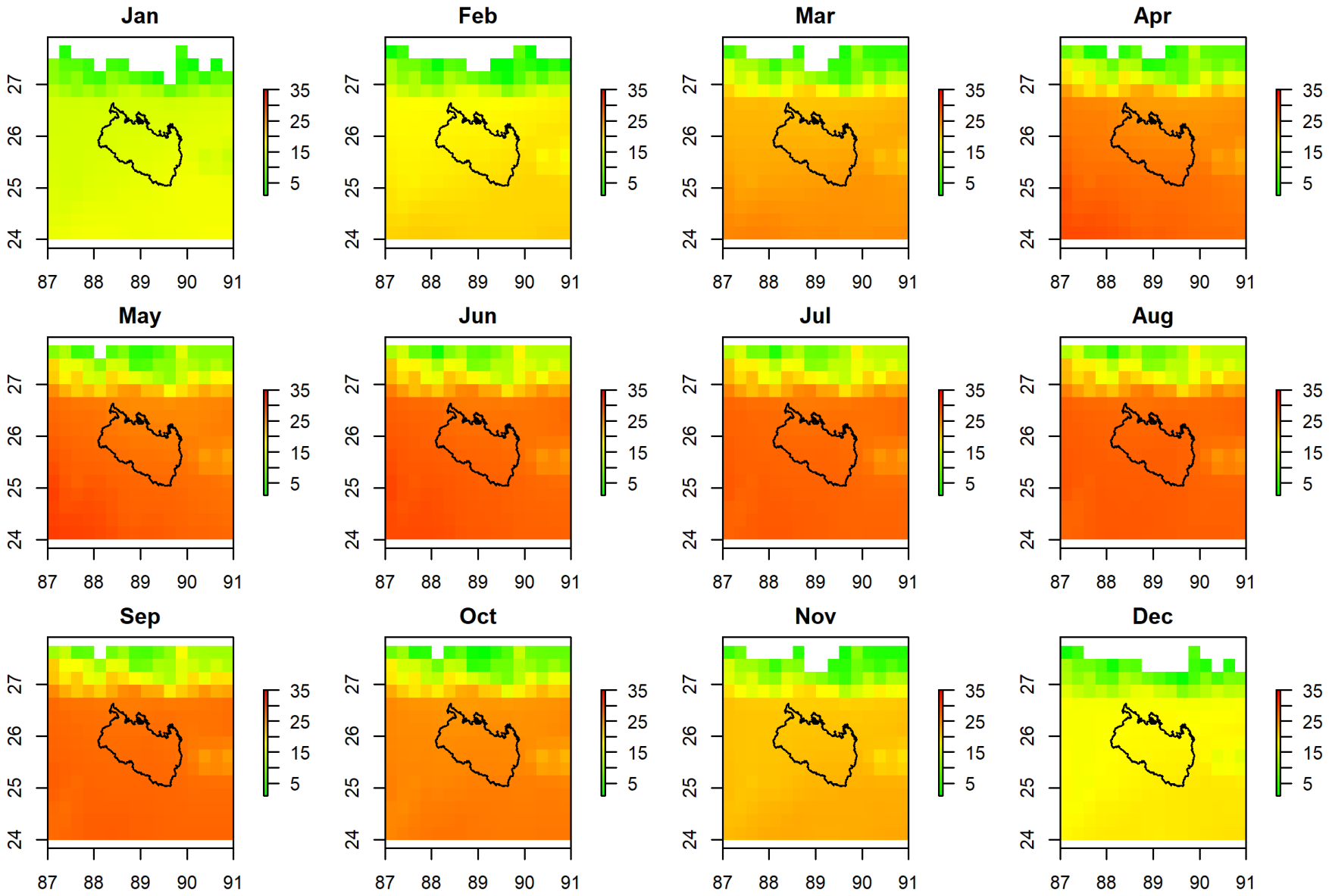




Monthly Aphrodite data for Precipitation (Rangpur Division)

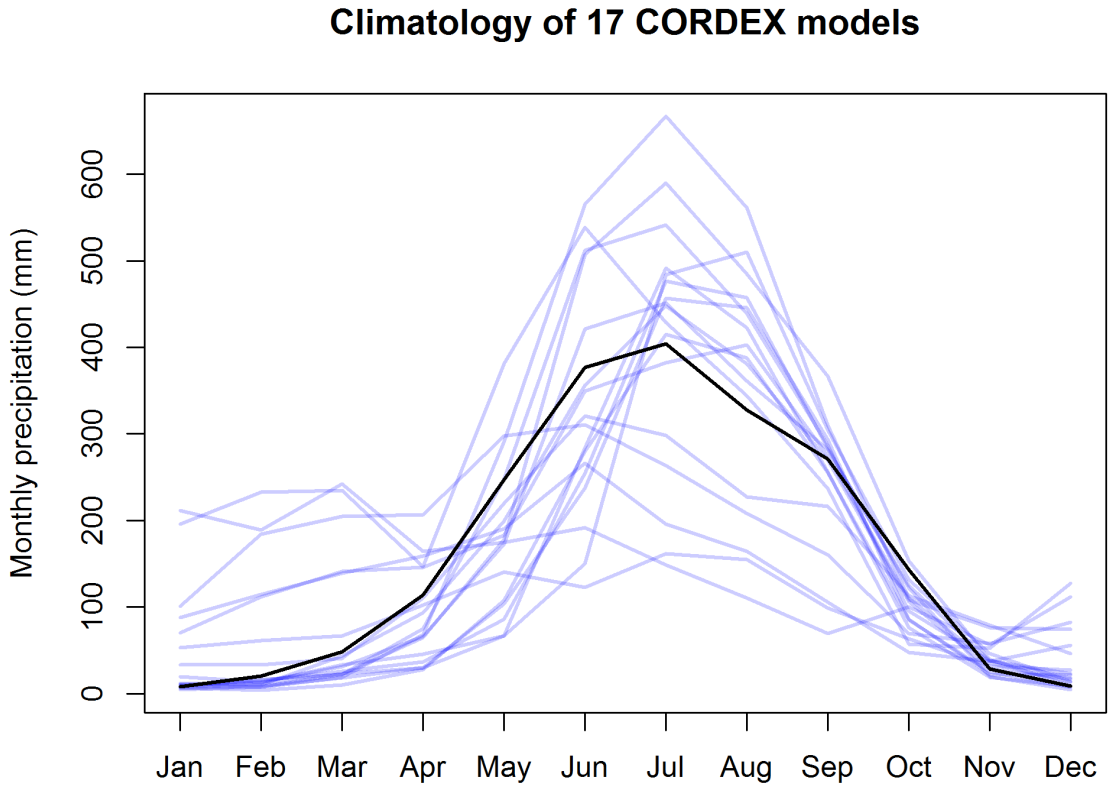


Monthly Aphrodite data for Temperature(Rangpur Division)

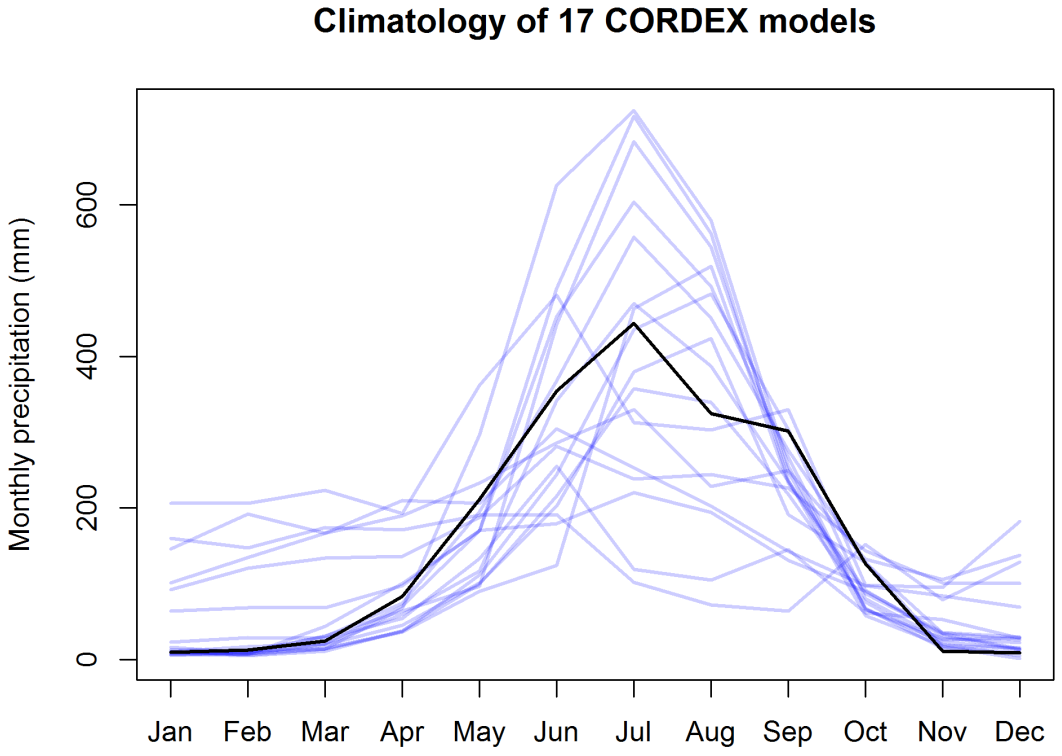


Calculation and Comparison of monthly Precipitation

- CORDEX Datasets
- Historical value (1976-2005)

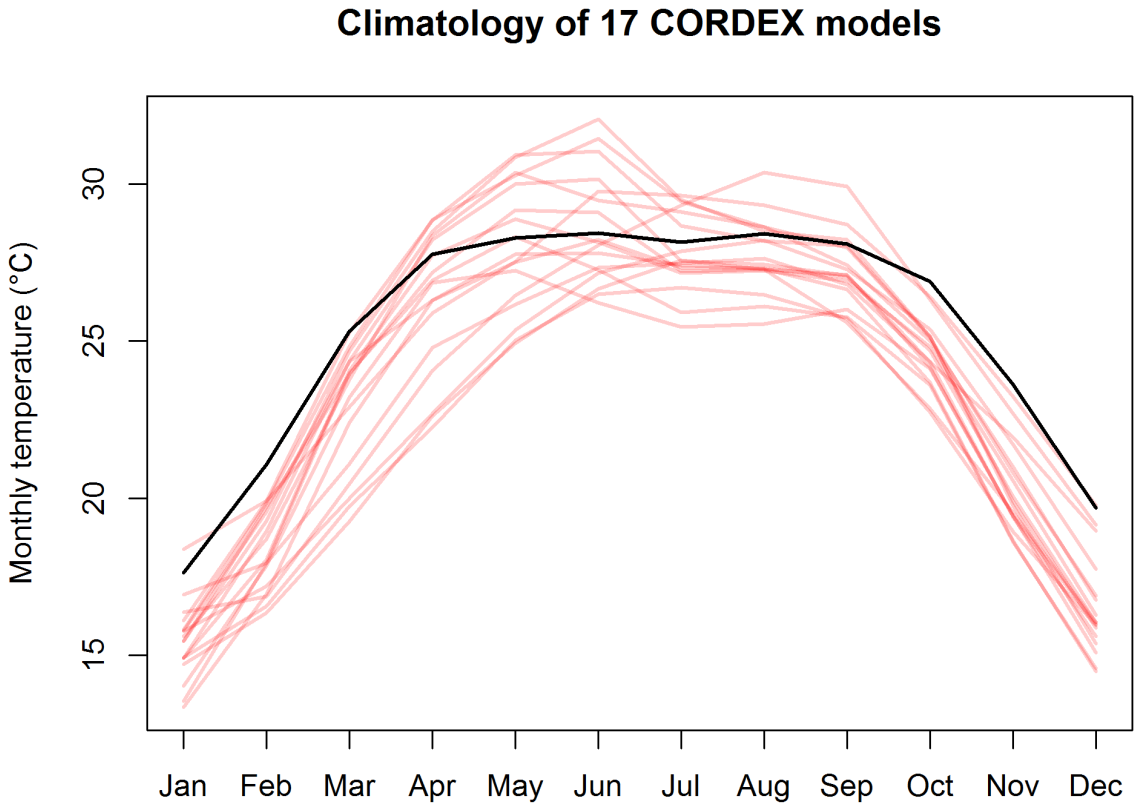


Bangladesh

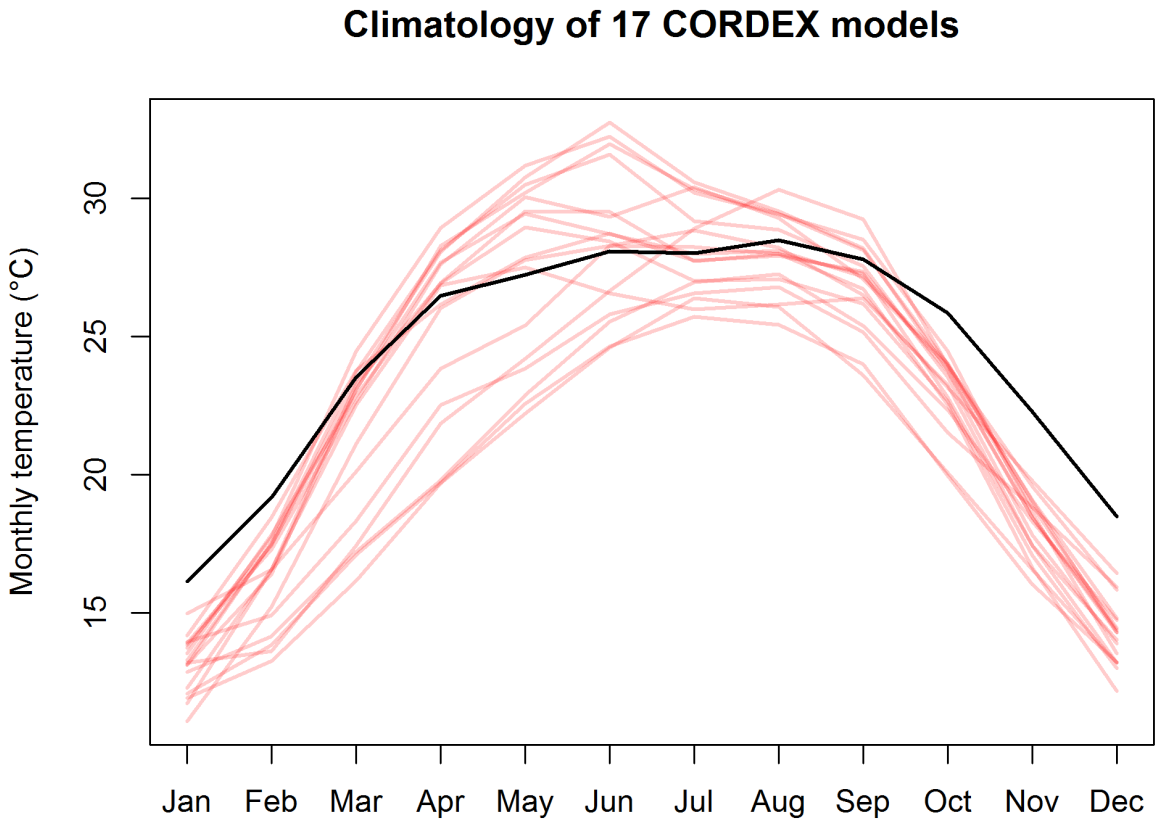


Rangpur

Calculation and Comparison of monthly Temperature

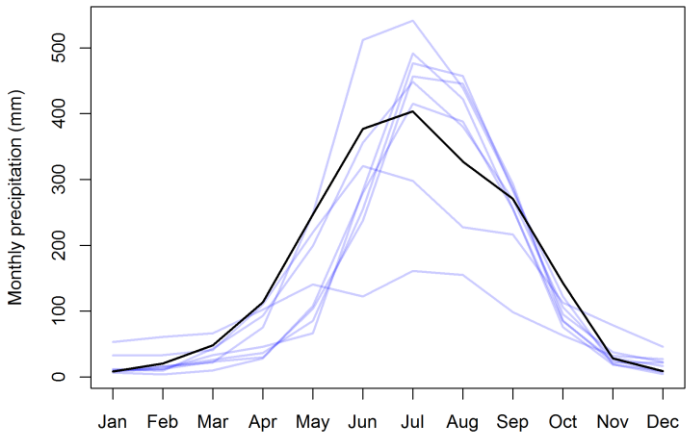


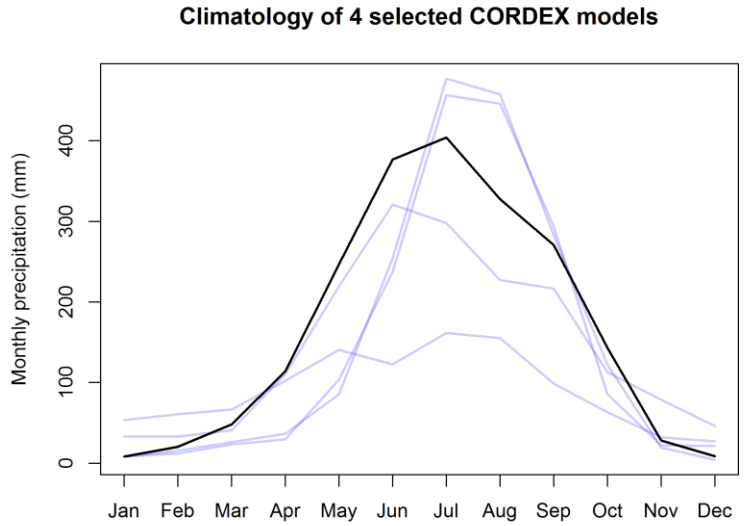
Bangladesh



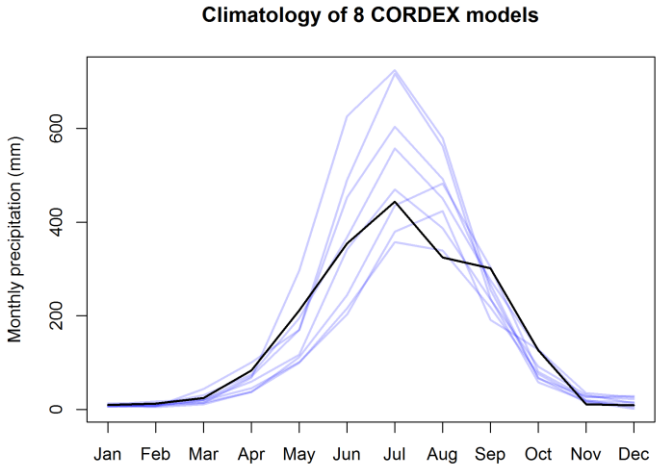
Rangpur

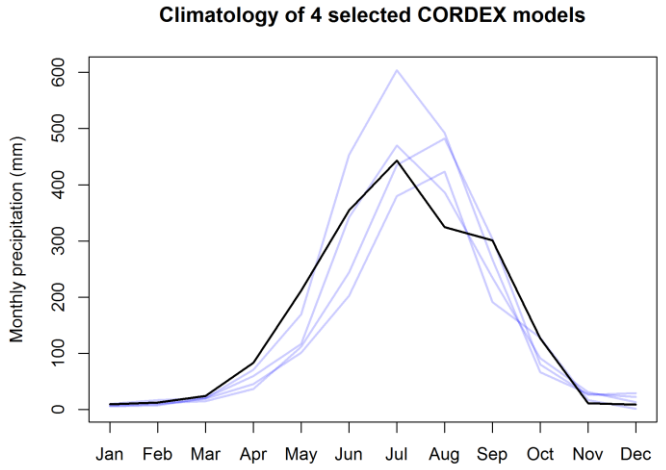
Calculation of Annual Bias





Precipitation for Bangladesh





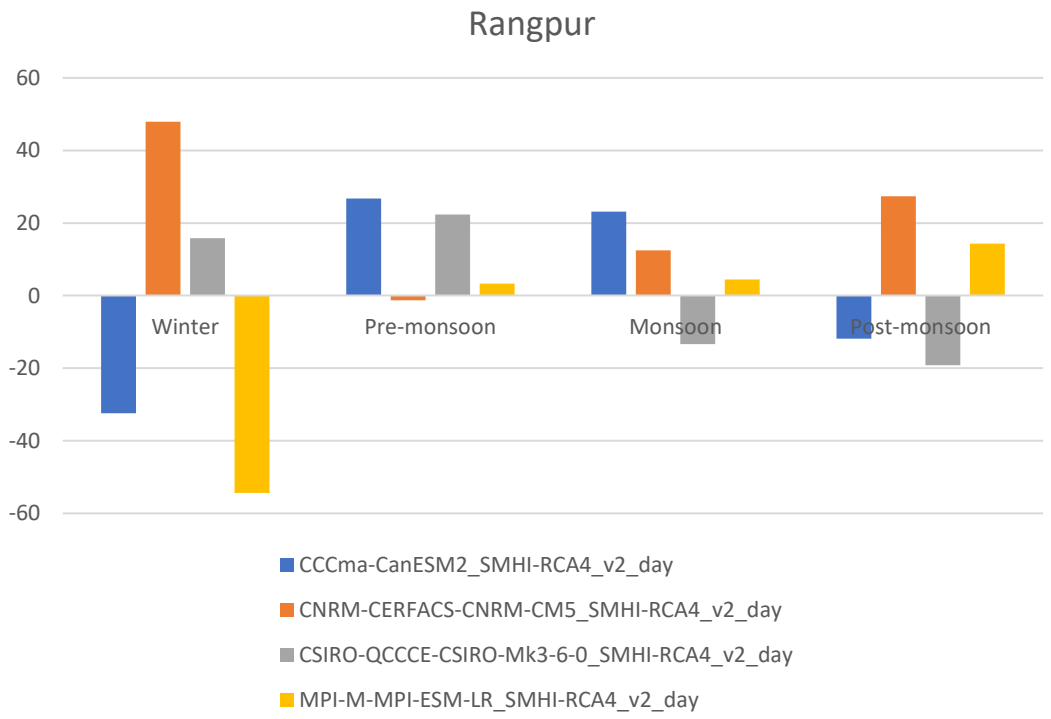
Precipitation for Rangpur

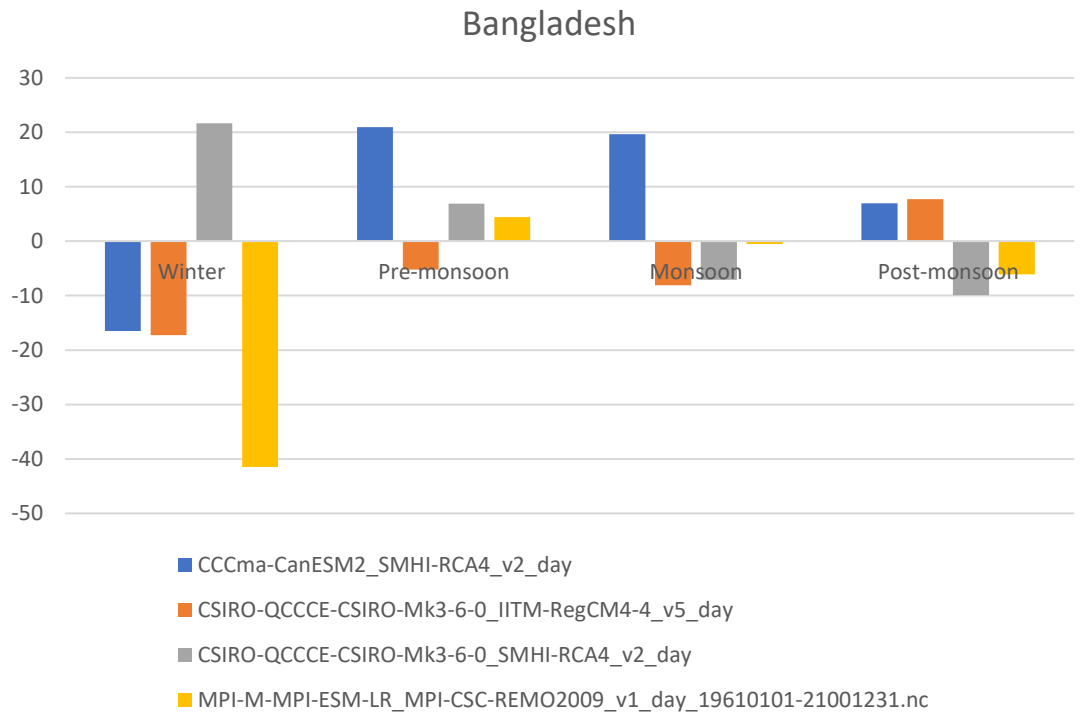
Selection of final model based on ranking method

- Individual ranking based on precipitation & temperature
- Average of ranking for final selection of model

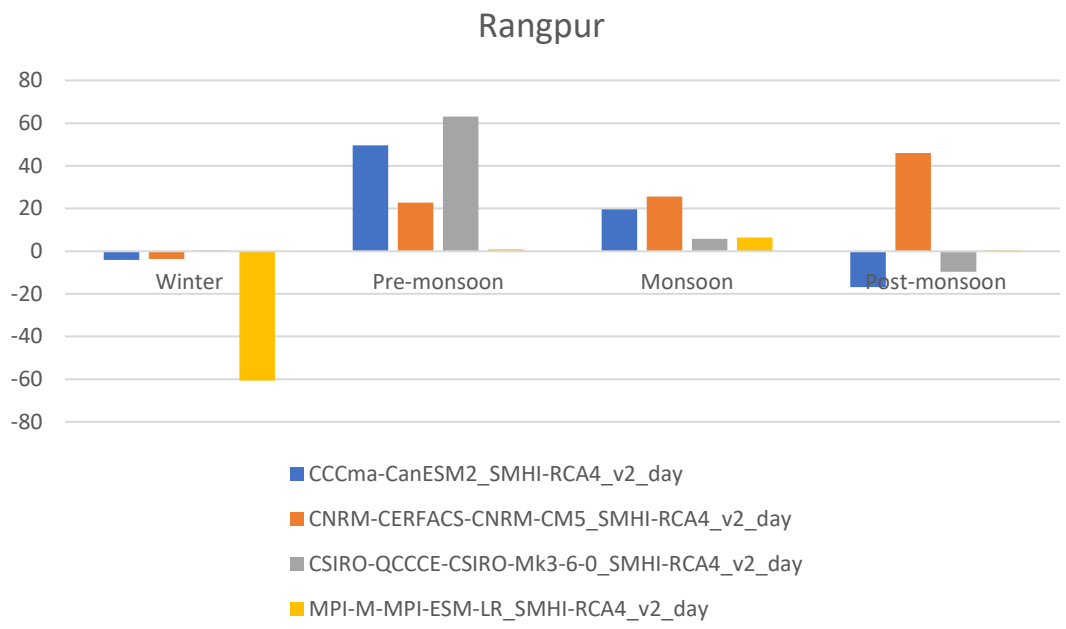
	Average	pr_bias	tas_bias	pr_rank	tas_rank
Aphrodite	0.0	0.0	0.00	0	0
CCCma-CanESM2_SMHI-RCA4_v2_day	2.5	12.8	0.29	3	2
CSIRO-QCCCE-CSIRO-Mk3-6-0_SMHI-RCA4_v2_day	2.5	10.3	0.51	2	3
MPI-M-MPI-ESM-LR_MPI-CSC-REMO2009_v1_day_1961...	4.0	12.9	0.77	4	4
CSIRO-QCCCE-CSIRO-Mk3-6-0_IITM-RegCM4-4_v5_day	4.5	45.7	0.16	8	1
MIROC-MIROC5_SMHI-RCA4_v2_day	4.5	1.6	1.59	1	8
NCC-NorESM1-M_SMHI-RCA4_v2_day	5.5	13.5	1.47	5	6
MOHC-HadGEM2-ES_SMHI-RCA4_v2_day	6.0	19.2	1.28	7	5
MPI-M-MPI-ESM-LR_SMHI-RCA4_v2_day	6.5	15.5	1.55	6	7

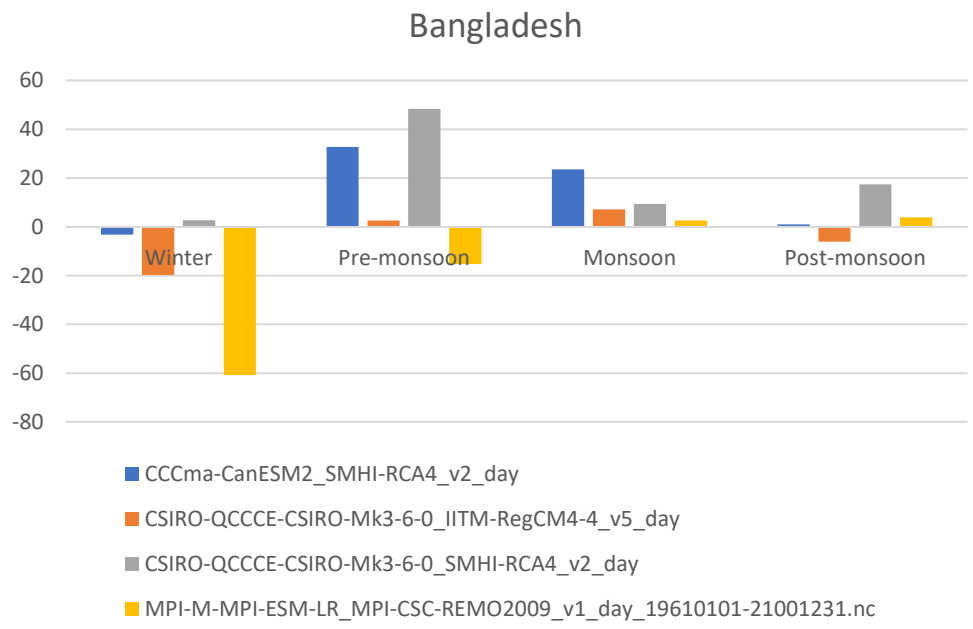
Seasonal Changes of Rangpur with respect to Bangladesh (Precipitation_RCP45)



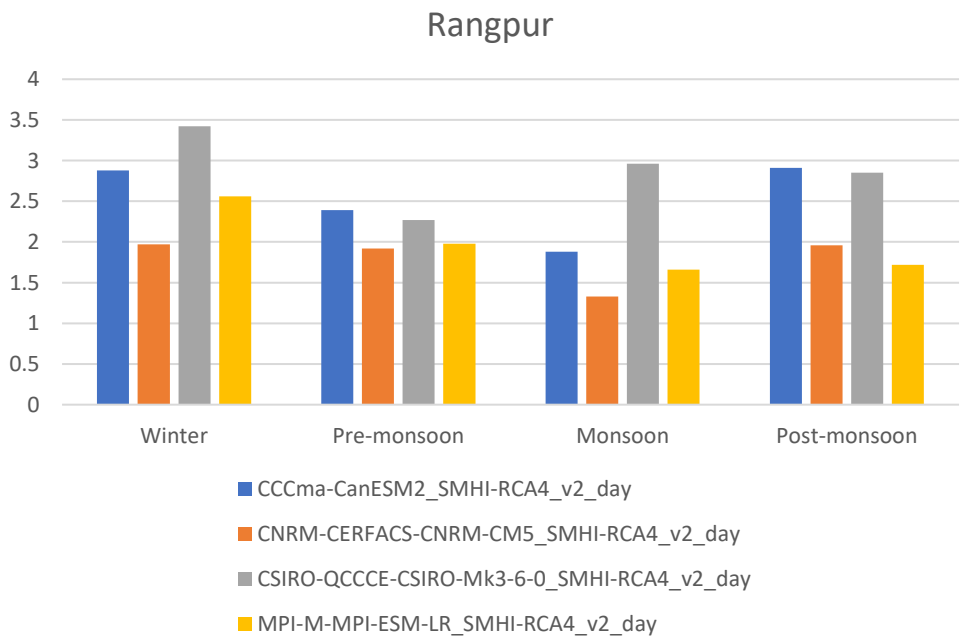


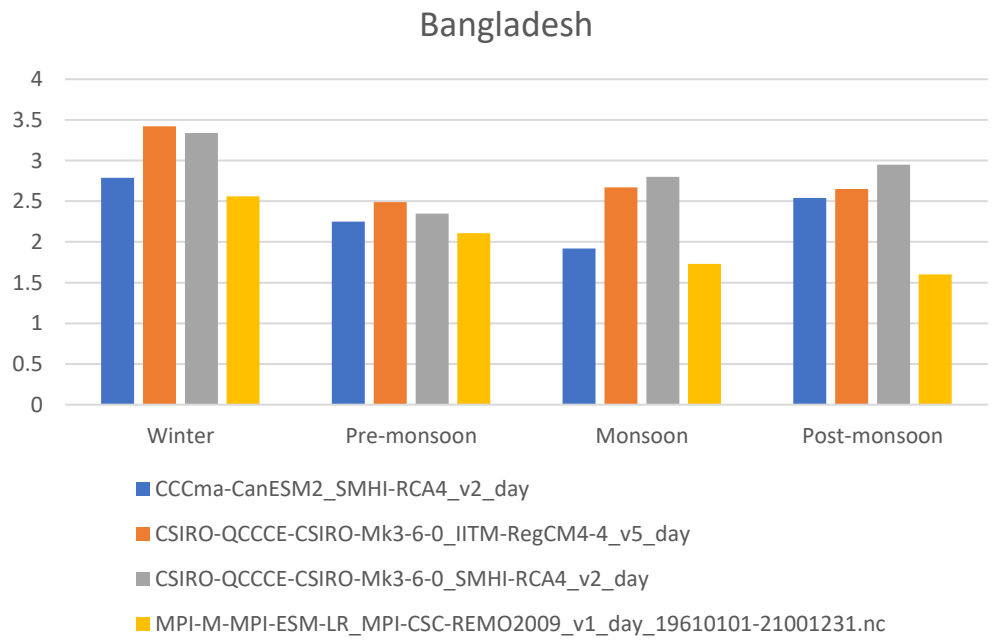
Seasonal Changes of Rangpur with respect to Bangladesh (Precipitation_RCP85)



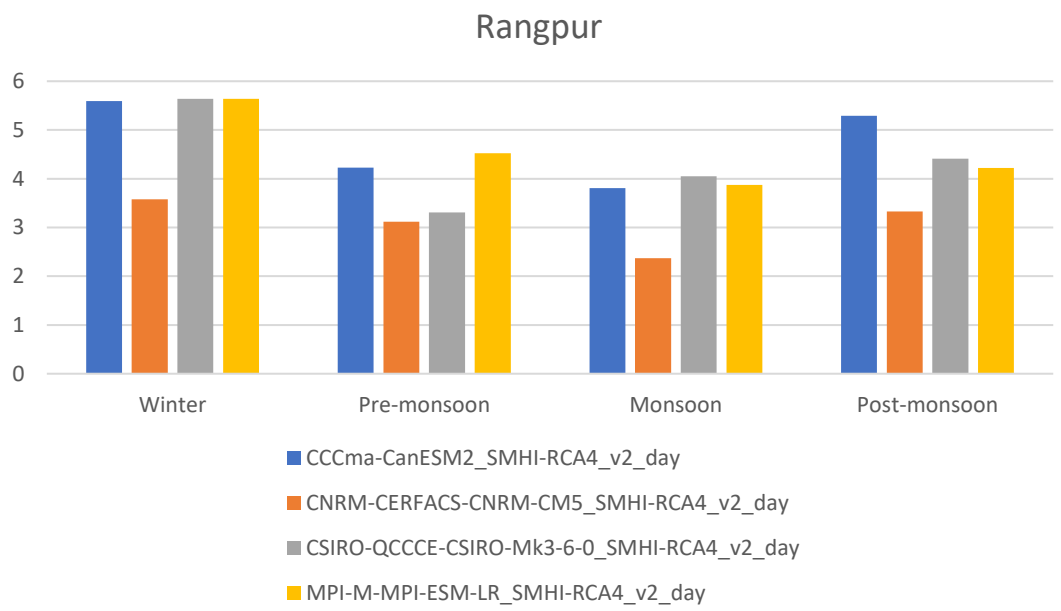


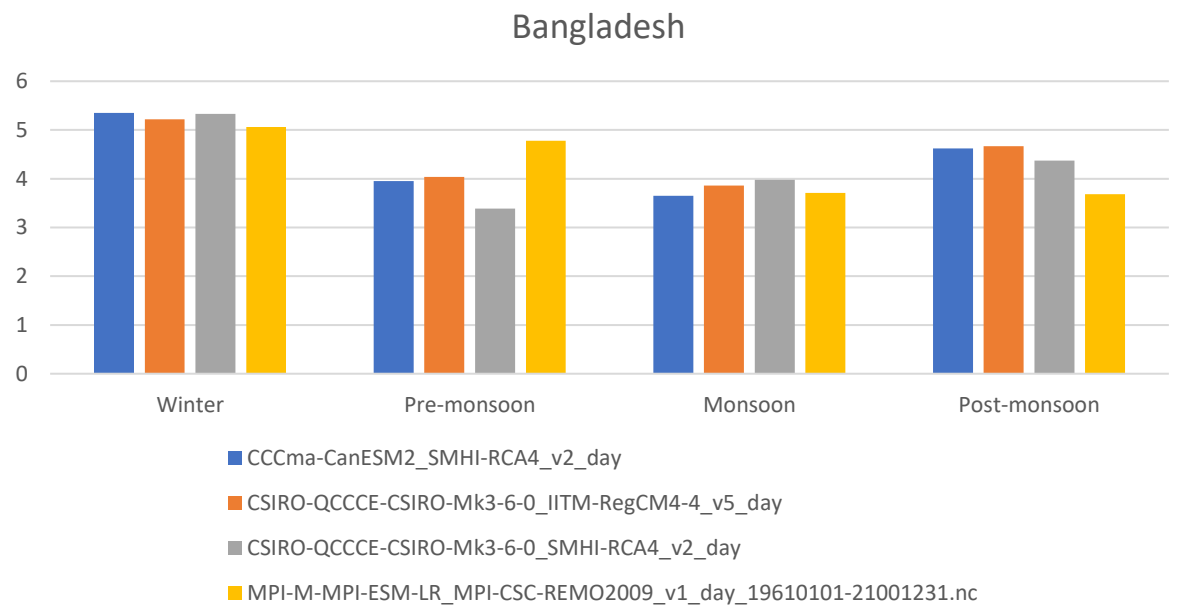
Seasonal Changes of Rangpur with respect to Bangladesh (Temperature_RCP45)

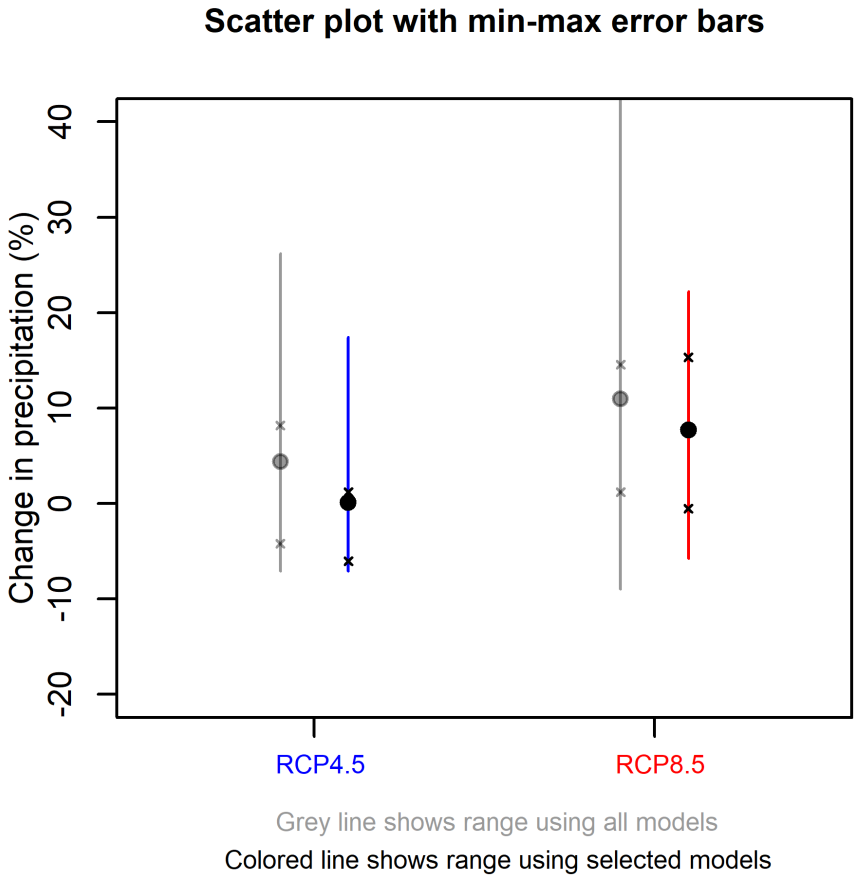




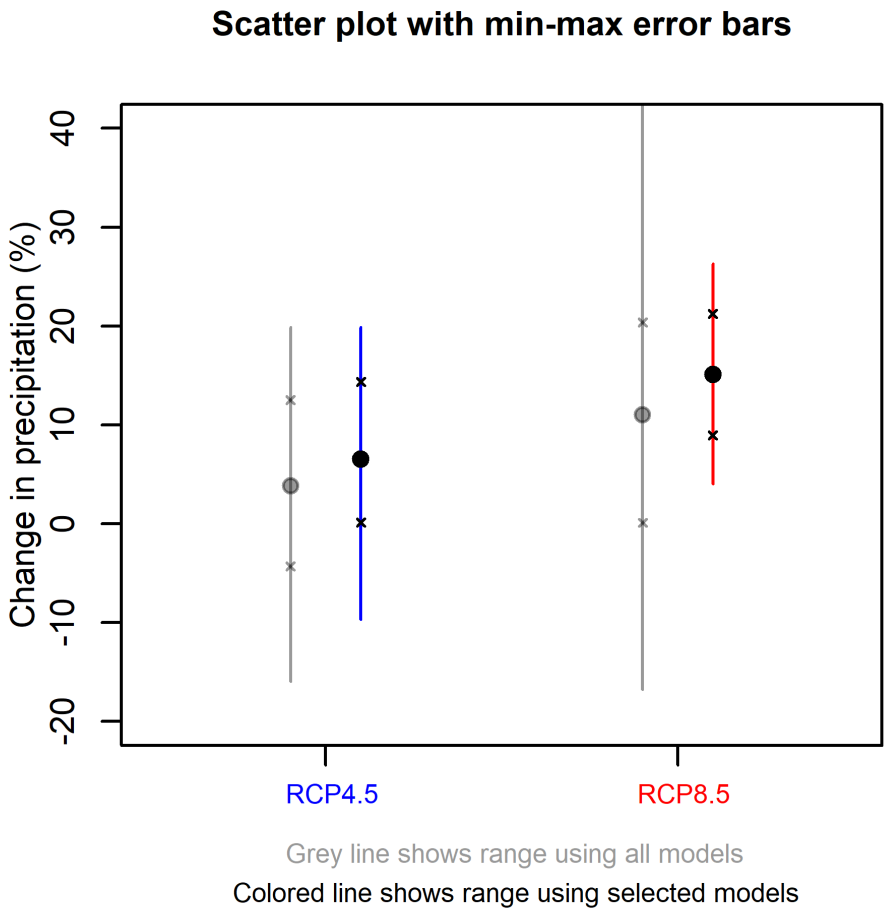
Seasonal Changes of Rangpur with respect to Bangladesh (Temperature_RCP85)



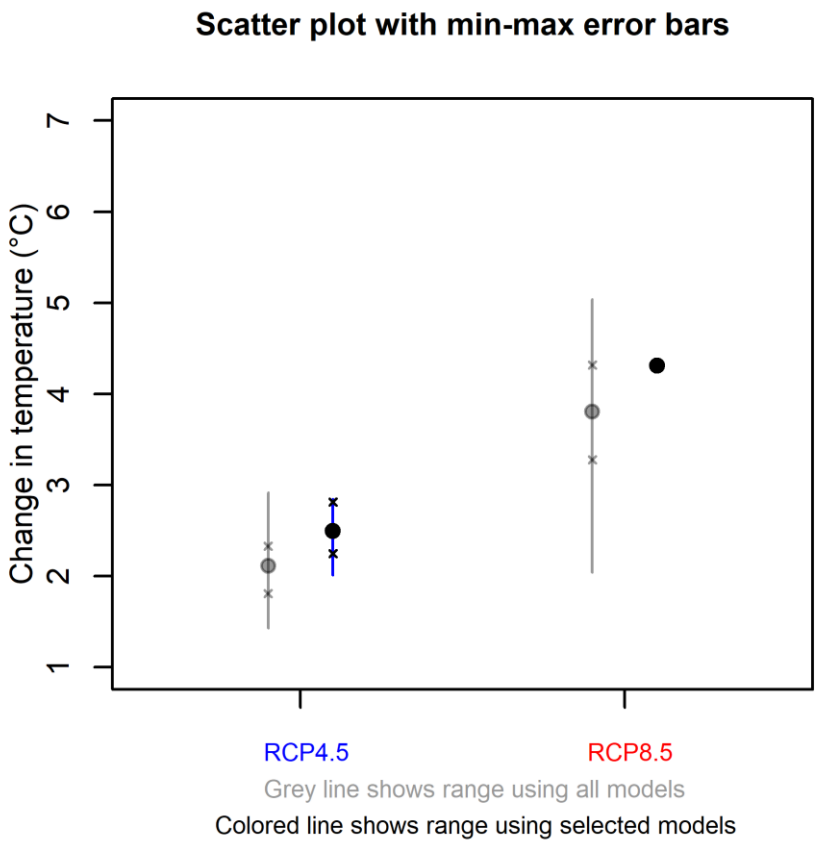




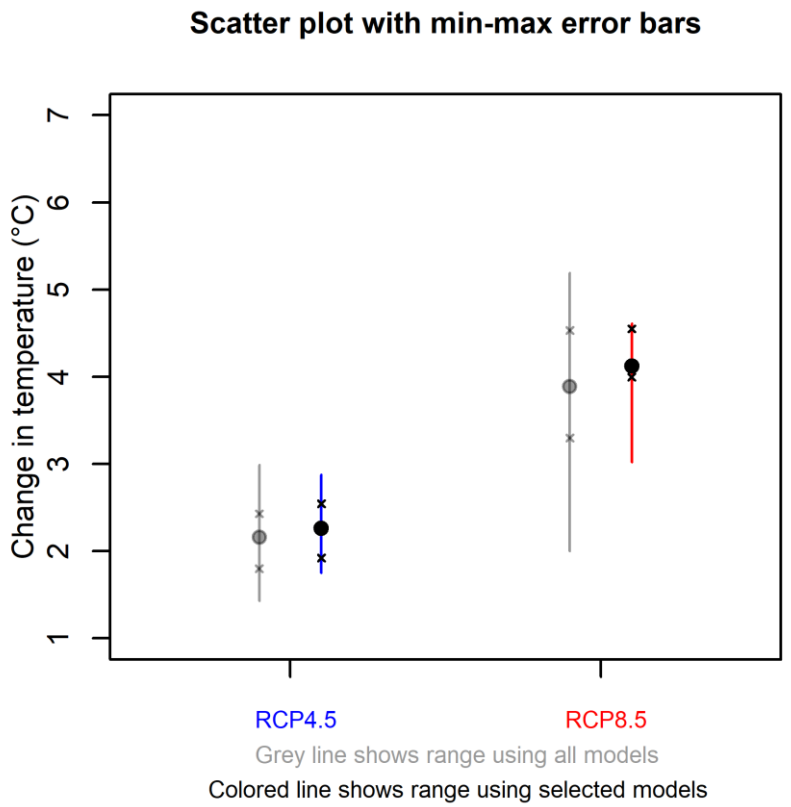
Bangladesh



Rangpur



Bangladesh



Rangpur

Thank you