A global overview of present and future climate over CORDEX domains by RegCM4

The Abdus Salam International Centre for Theoretical Physics

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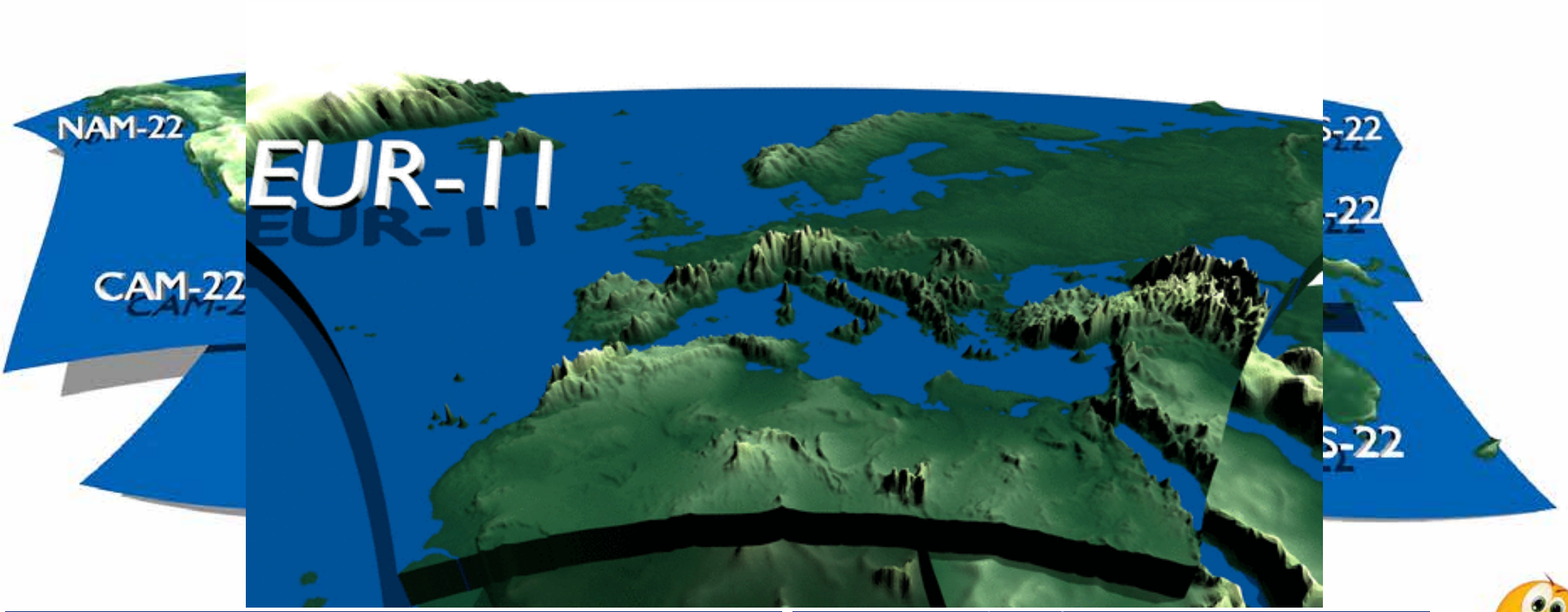
ICRC-CORDEX 2019, 14-18 October Beijing, China

Simulation domains

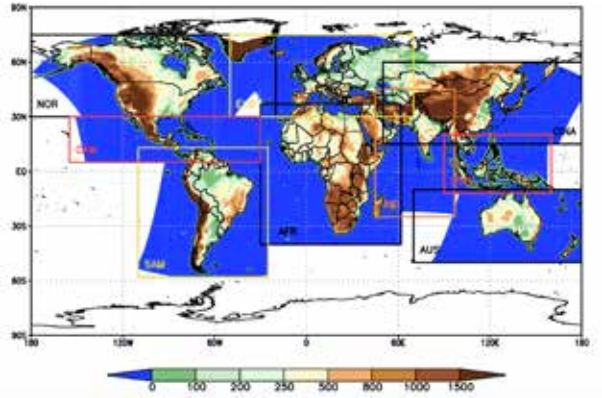


- Erika Coppola (PI)
- 10 Post-Docs from 7 countries
- 2 ICTP technical support staff

- 23 TB Input dataset for RegCM
- 371 TB temporary ICBC
- 1.5PB model output
- 370 TB post-processd

RegCM4-Atlas 25 km

Reference: 1995-2014 Near Future: 2041-2060 Far Future: 2080-2099



CREMA RegCM

	Africa	C America	India	Med	S. America
HAD-CLM-GE	2			1	
HAD-CLM-E		2			2
HAD-BATS-G		2			
HAD-BATS-GE				1	2
MPI-CLM-E		1	1		1
MPI-BATS-G	1	1			
MPI-BATS-GE				1	
MPI-CLM-GE				1	
GFDL-CLM-E			2		1
GFDL-CLM-EG			2		

Region	Driving GCMs	RCP
North America	HadGEM2-ES, MPI-M-MPI-ESM-MR, NOAA-GFDL-ESM2M	8.5
Central America	HadGEM2-ES, MPI-M-MPI-ESM-MR, NOAA-GFDL-ESM2M	2.6 8.5
South America	HadGEM2-ES, MPI-M-MPI-ESM-MR, NCC-NorESM1-M	2.6 8.5
Europe	HadGEM2-ES, MPI-M-MPI-ESM-MR	2.6 8.5
Africa	HadGEM2-ES, MPI-M-MPI-ESM-MR, NCC-NorESM1-M	2.6 8.5
Australasia	HadGEM2-ES, MPI-M-MPI-ESM-MR, NCC-NorESM1-M	2.6 8.5
East Asia	HadGEM2-ES , MPI-M-MPI-ESM-MR, NCC-NorESM1-M	2.6 8.5
Southern Asia	MIROC5, MPI-M-MPI-ESM-MR, NCC-NorESM1-M	2.6 8.5
South East Asia	HadGEM2-ES, MPI-M-MPI-ESM-MR, NCC-NorESM1-M	2.6 8.5

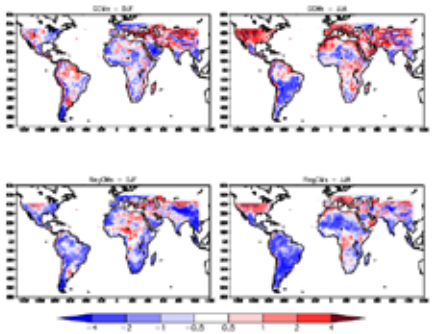
Region	Physics Scheme	Namelist Option	Reference
Africa	Boundary Layer	Holtslag	Holtslag, 1990
(25km)	Cumulus (Land)	Tiedtke	Tiedtke,1996
	Cumulus (Ocean)	Kain-Fritsch	Kain-Fritsch, 1990, 2004
	Microphysics	SUBEX	Pal et al,2000
	Ocean Flux	Zeng et al	Zang et al 1998
Australasia	Boundary Layer	Holtslag	
338x416 (25km)	Cumulus (Land)	Tiedtke	
	Cumulus (Ocean)	Tiedtke	
	Microphysics	SUBEX	
	Ocean Flux	Zeng et al	
Central America	Boundary Layer	Holtslag	
573x373 (25km)	Cumulus (Land)	Emanuel	Emanuel,1991
	Cumulus (Ocean)	Kain-Fritsch	
	Microphysics	SUBEX	
	Ocean Flux	Zeng et al	
Europe	Boundary Layer	UW PBL	Bretherton and McCaa, 2004
527x527 (12km)	Cumulus (Land)	Tiedtke	
	Cumulus (Ocean)	Tiedtke	
	Microphysics	SUBEX	
	Ocean Flux	Zeng et al	
South America	Boundary Layer	Holtslag	
363x333 (25km)	Cumulus (Land)	Tiedtke	
	Cumulus (Ocean)	Kain-Fritsch	
	Microphysics	SUBEX	
	Ocean Flux	Zeng et al	
South Asia (India)	Boundary Layer	UW PBL (2)	
429x337 (25km)	Cumulus (Land)	Emanuel	
	Cumulus (Ocean)	Tiedtke	
	Microphysics	SUBEX	
	Ocean Flux	Zeng et al	

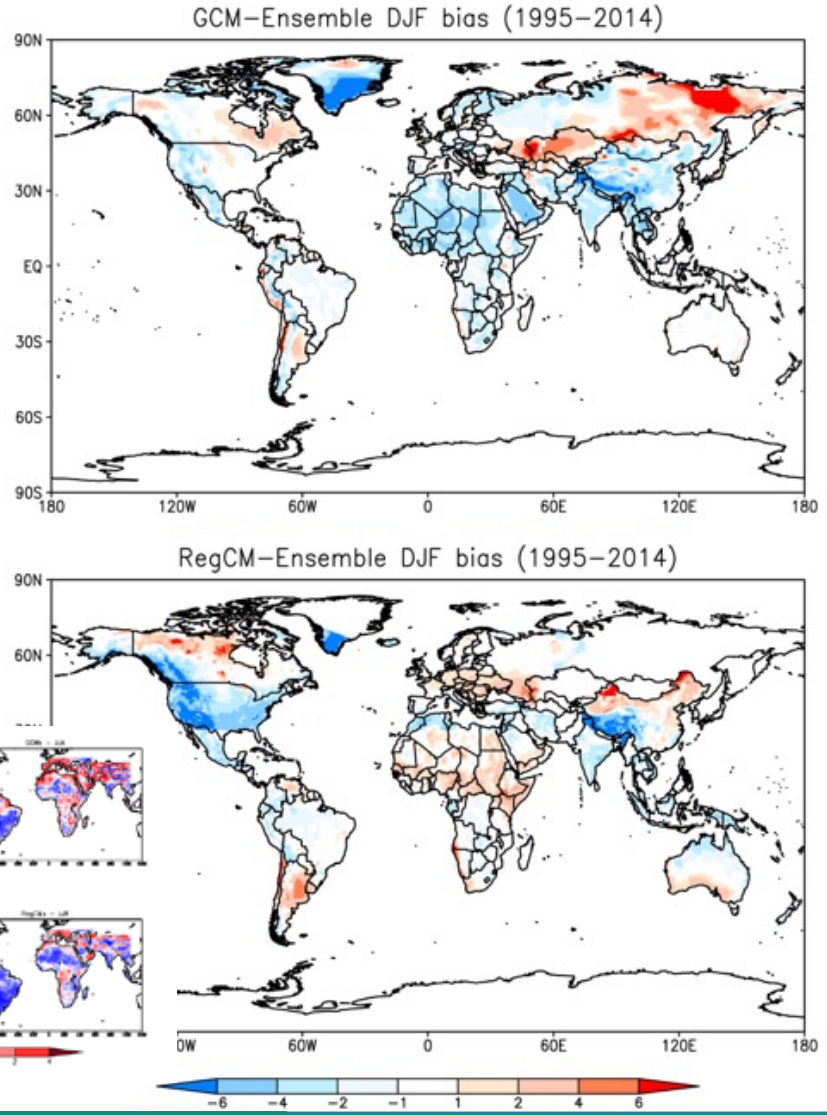
Temperature bias

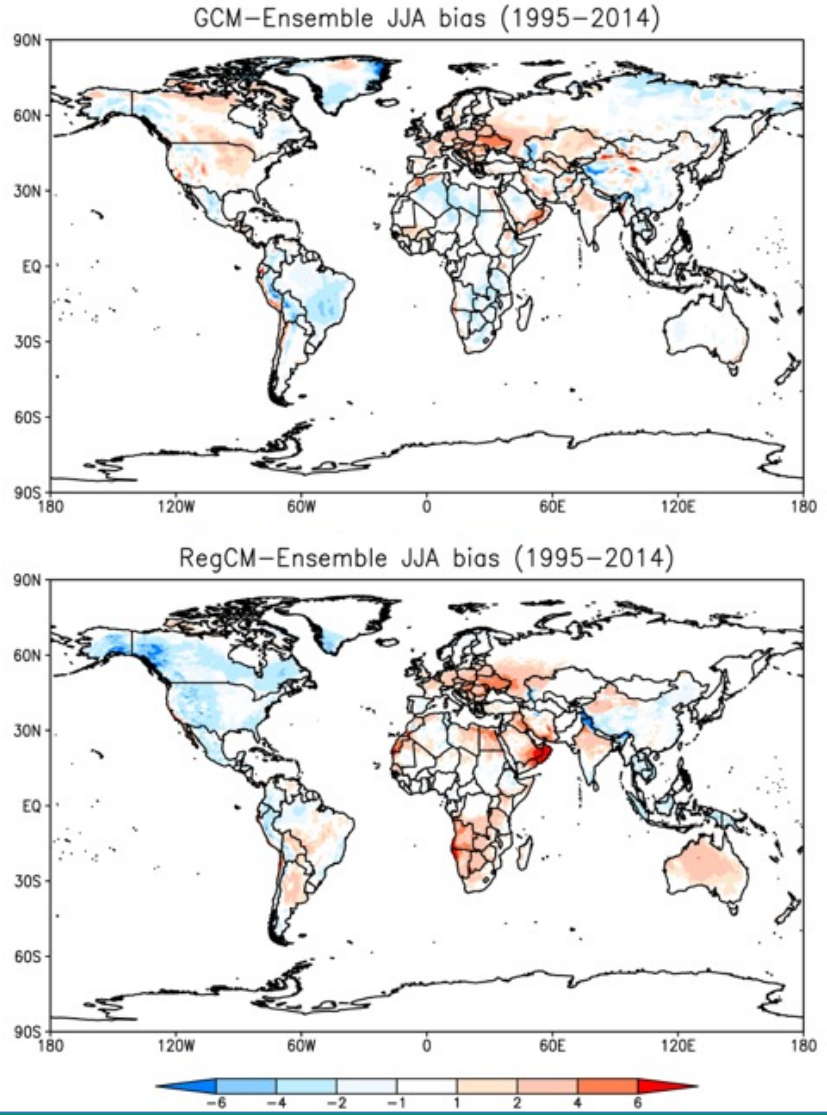
Evaluation:
Temperature bias

1995-2014

CRU Obs. data





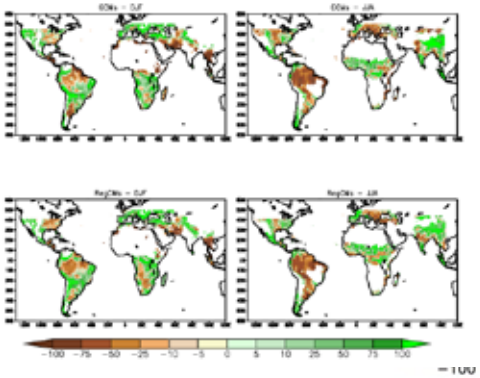


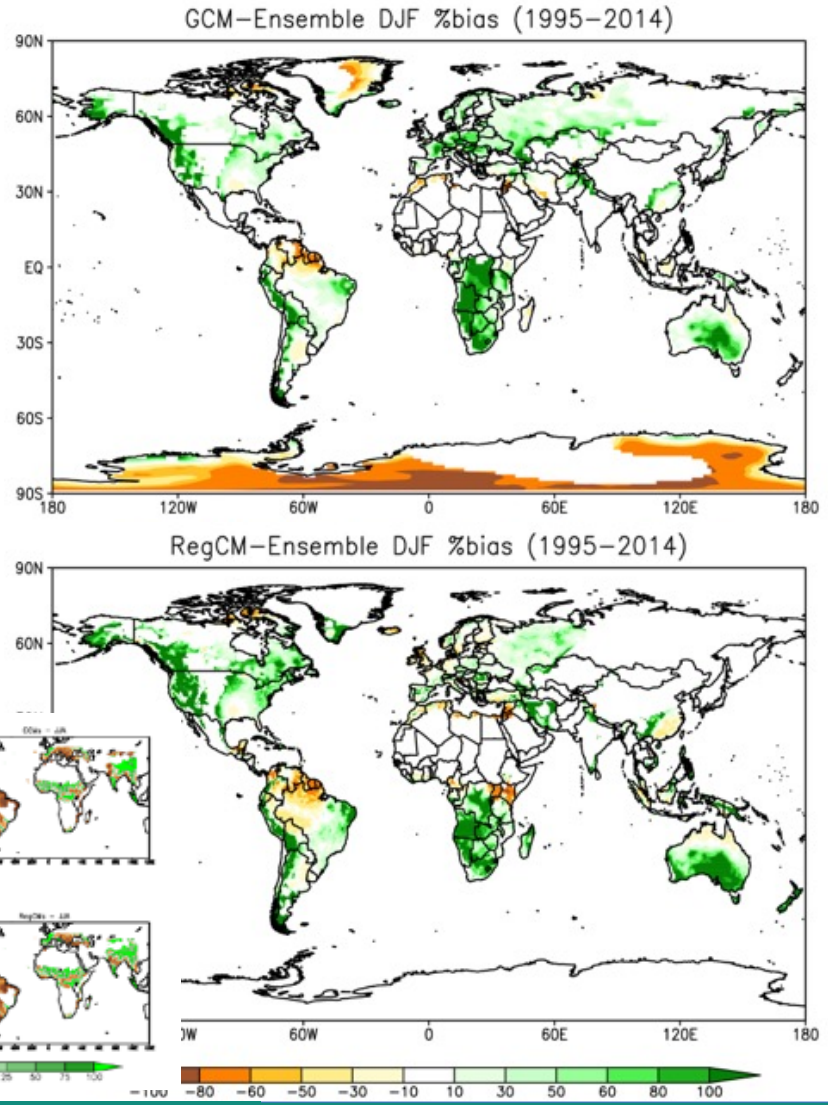
Precipitation bias

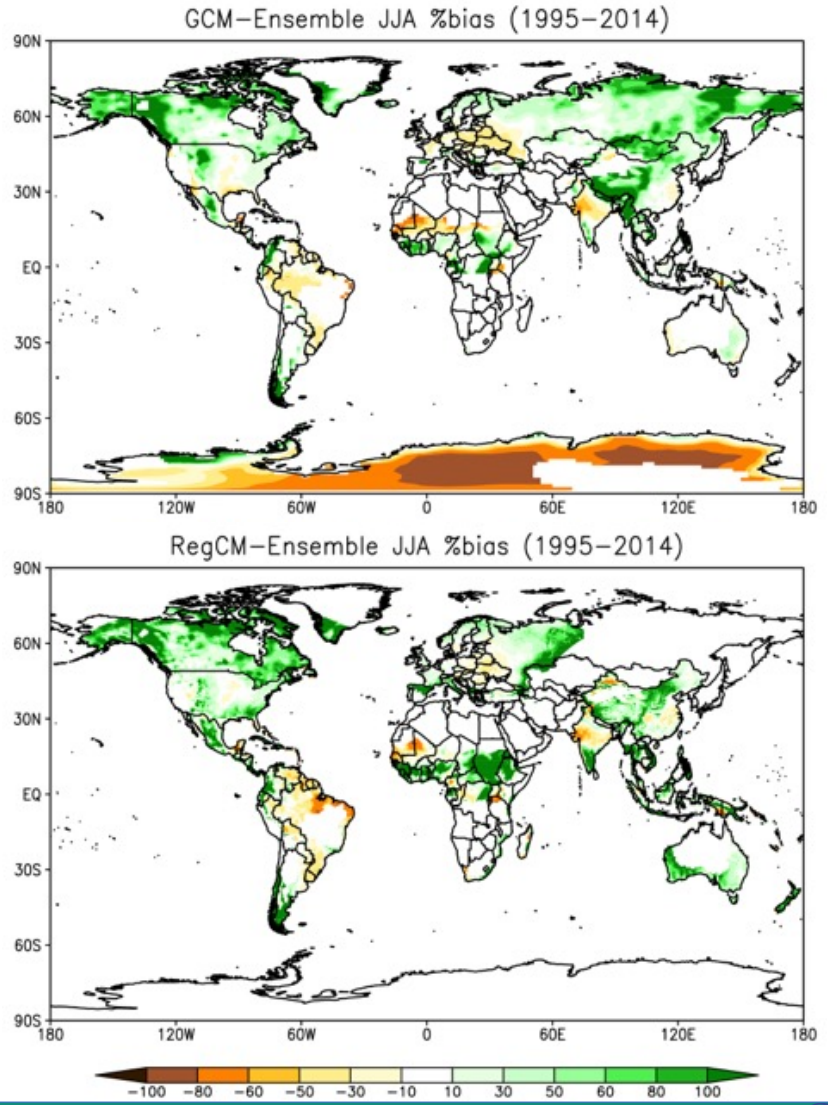
Evaluation:
Precipitation bias %

1995-2014

CPC Obs. data



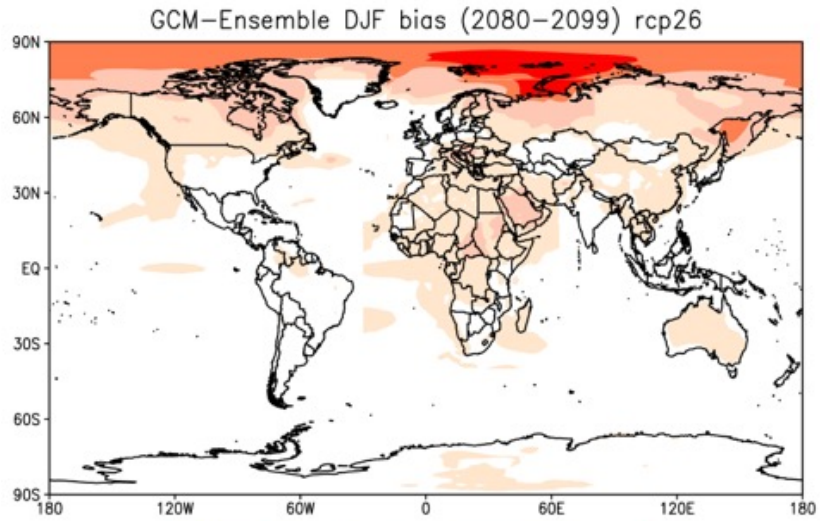


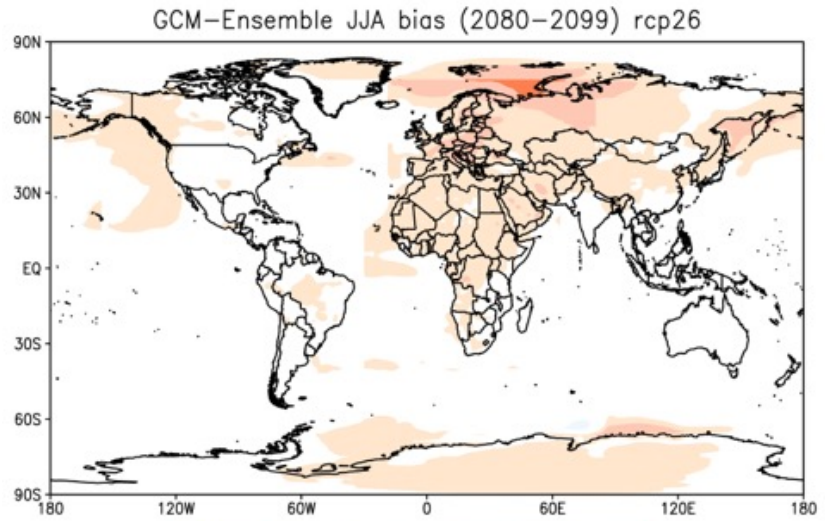


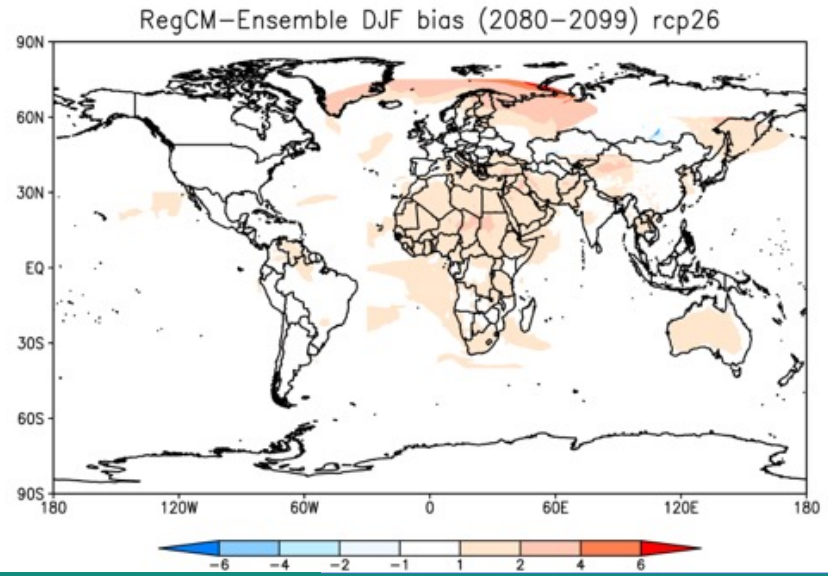
Temperature change 2.6

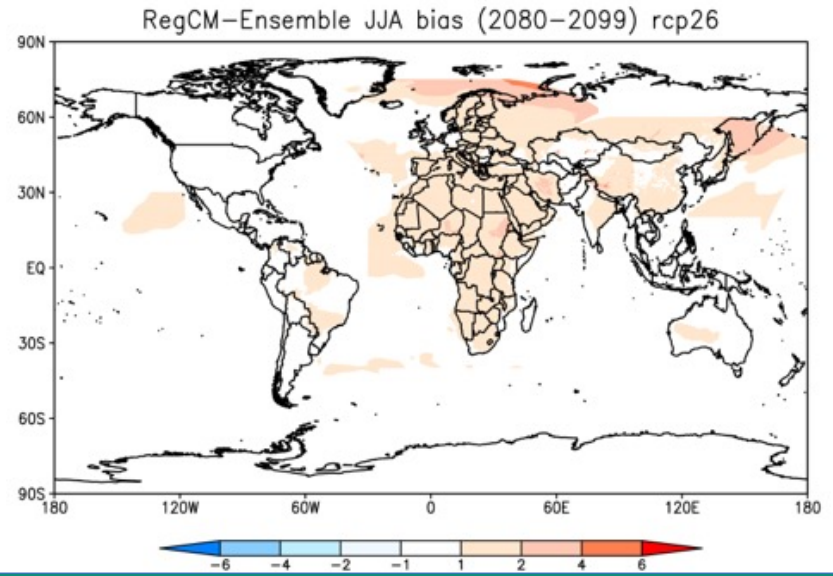
Change:
Temperature
rcp2.6

Reference
1995-2014
Far Future
2080-2099





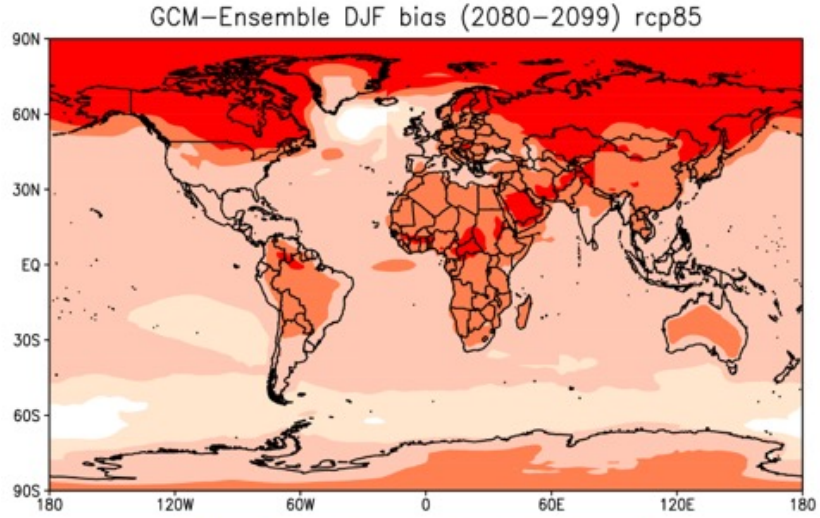


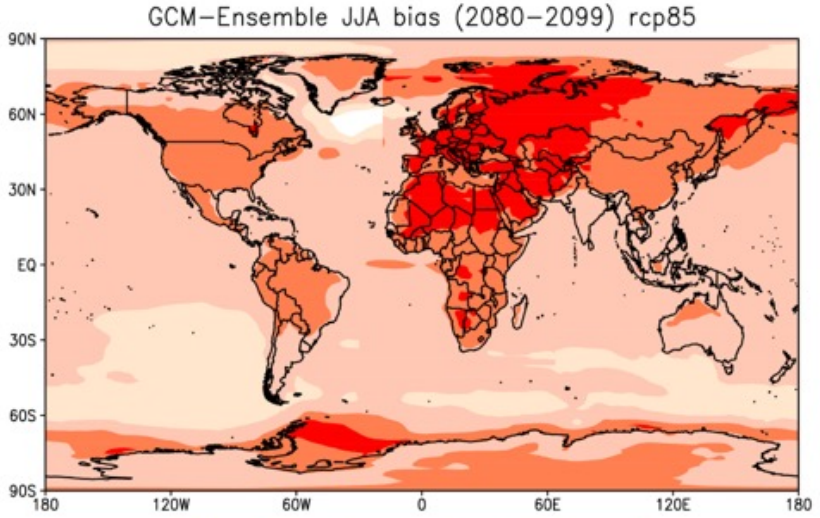


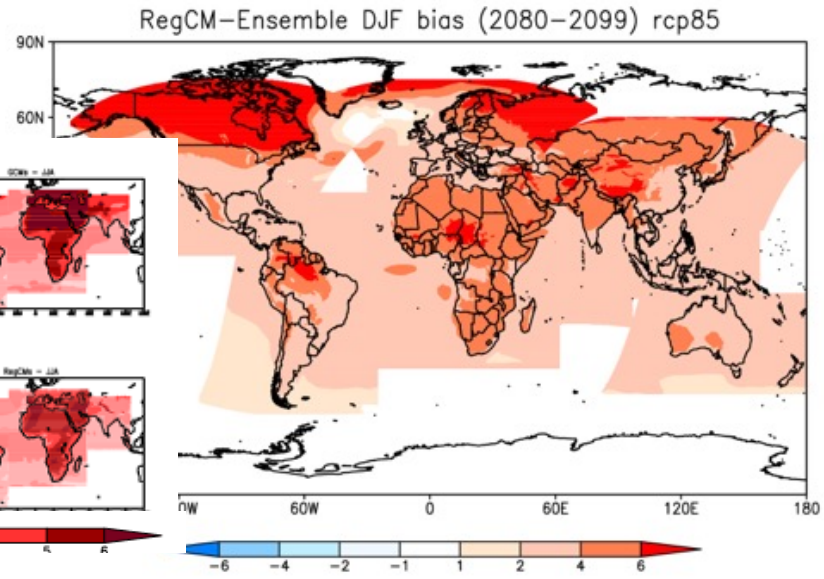
Temperature change 8.5

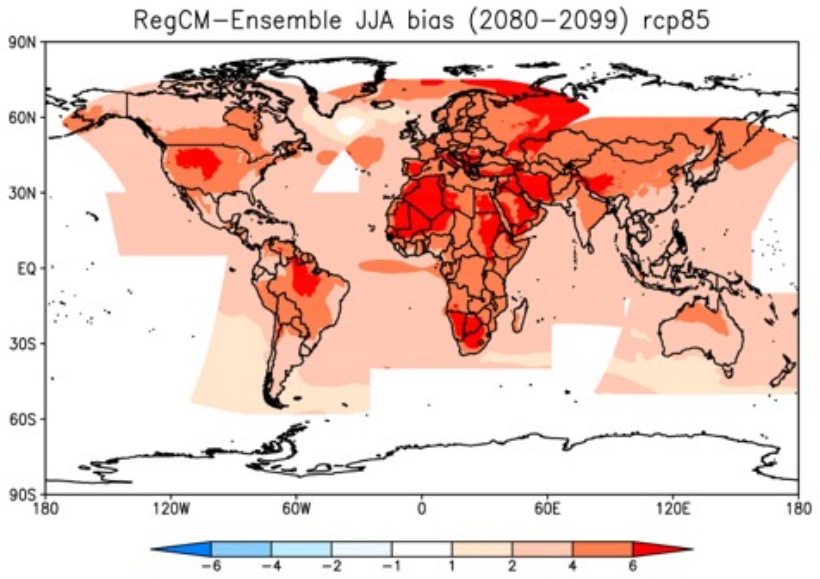
Change:
Temperature
rcp8.5

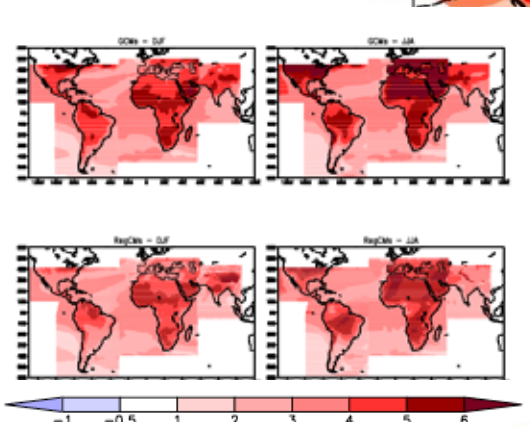
Reference
1995-2014
Far Future
2080-2099







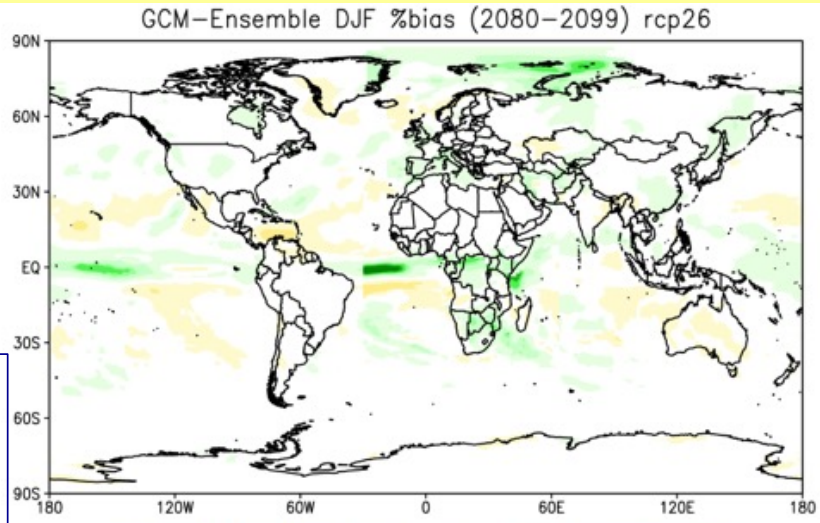


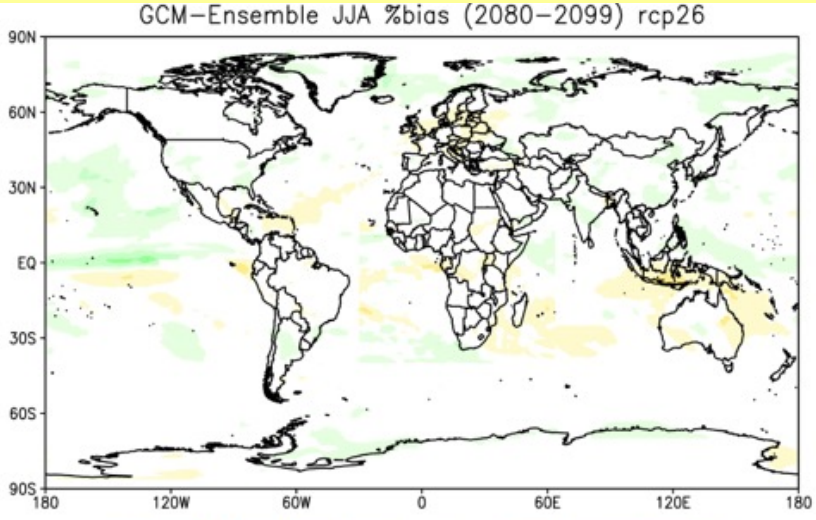


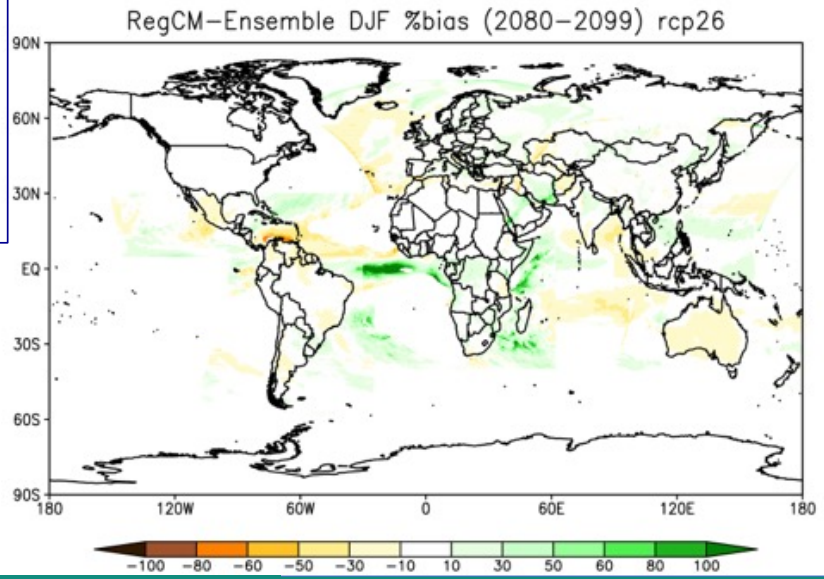
Precipitation change 2.6

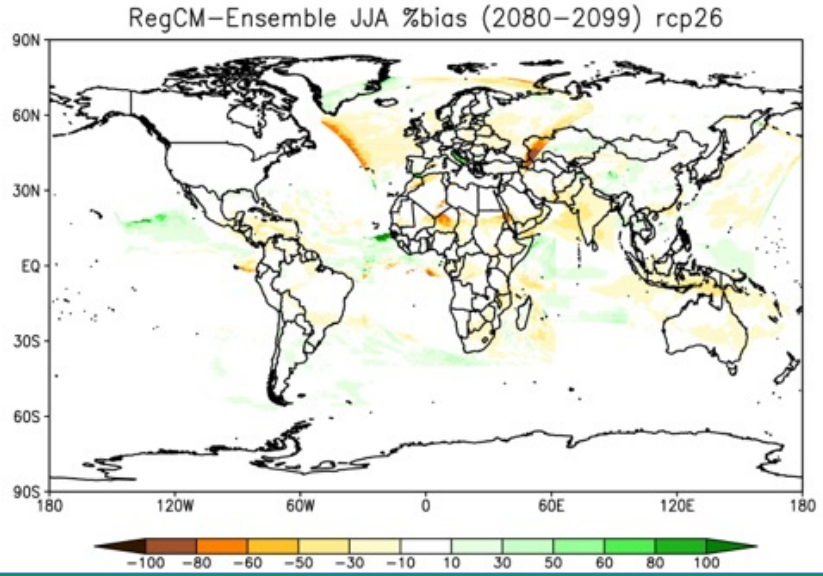
Change:
% Precipitation
rcp2.6

Reference
1995-2014
Far Future
2080-2099





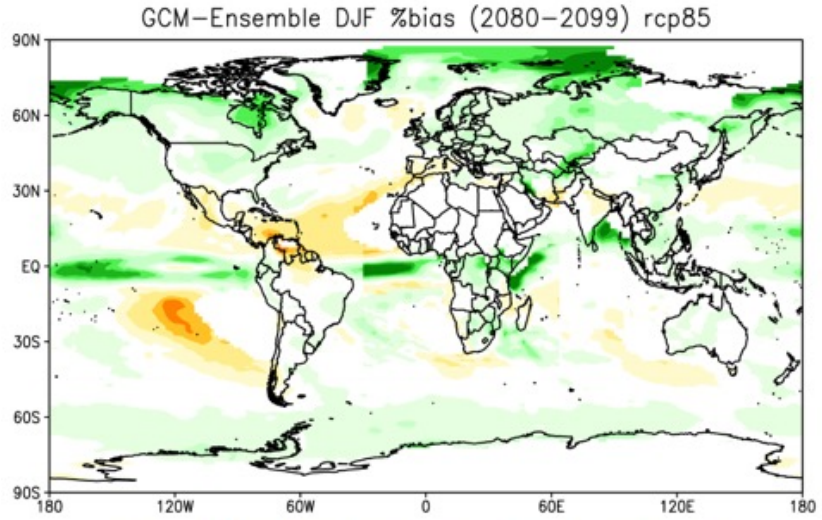


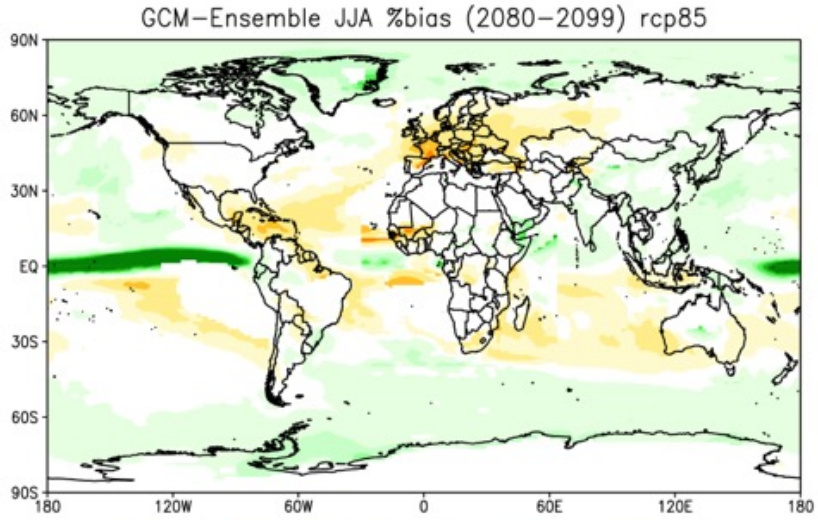


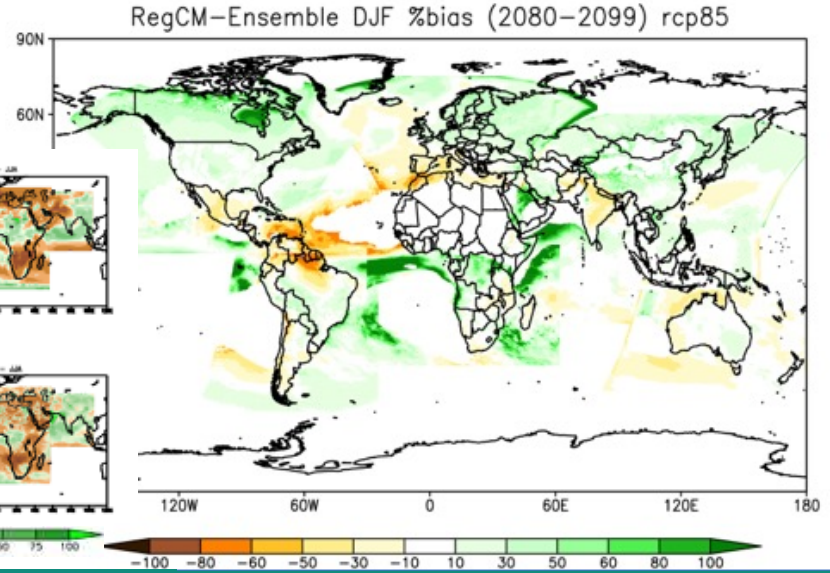
Precipitation change 8.5

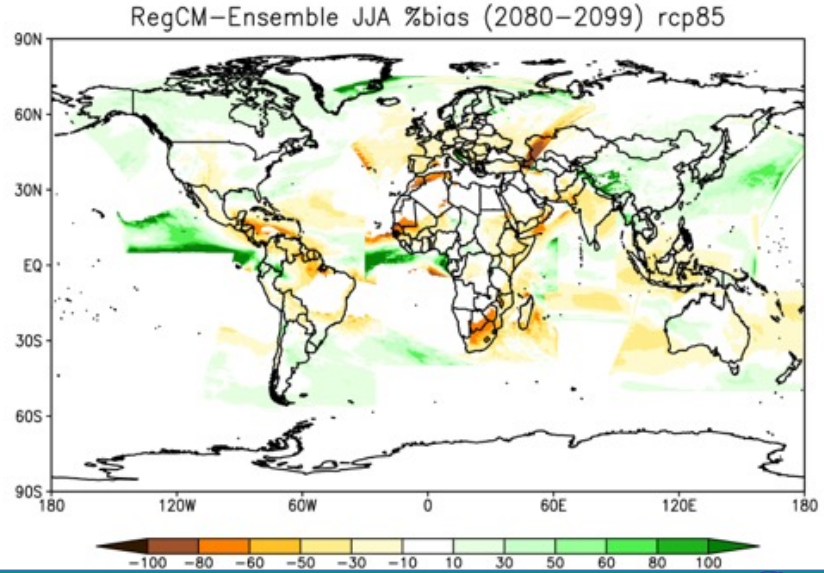
Change:
%Precipitation
rcp8.5

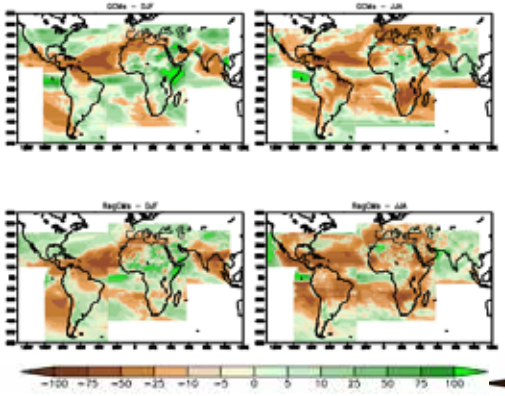
Reference
1995-2014
Far Future
2080-2099



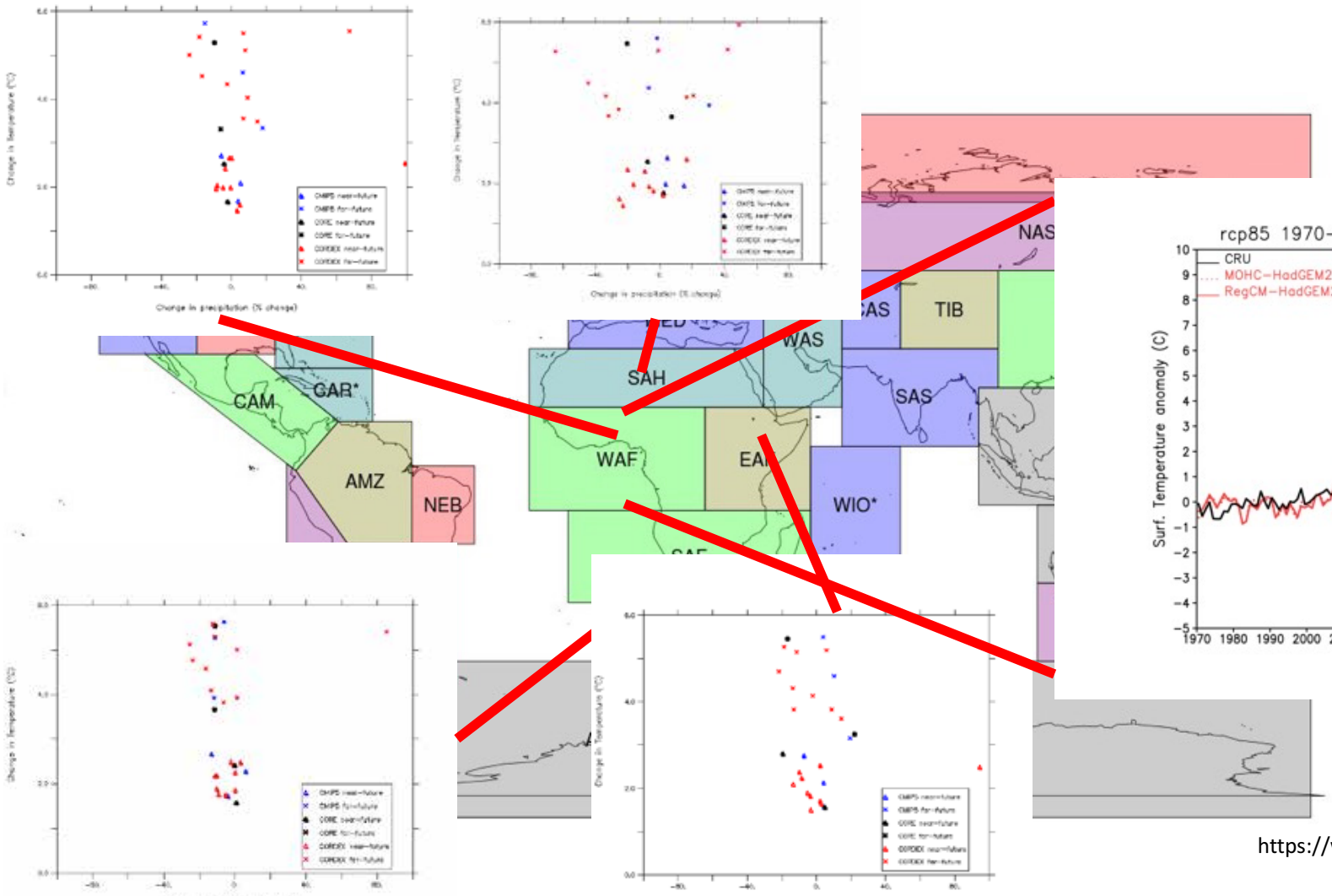


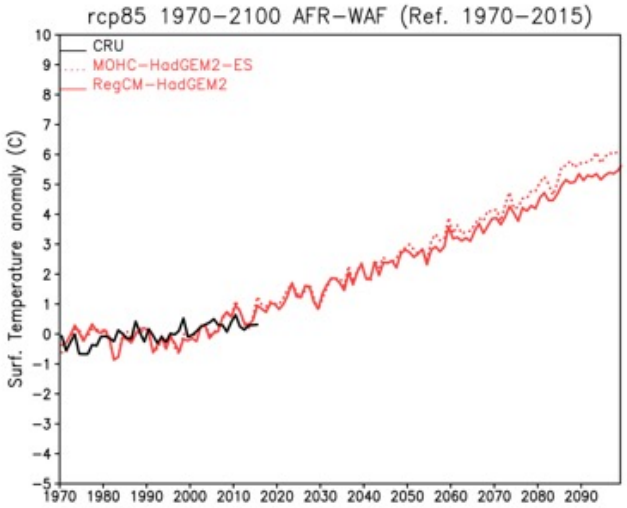






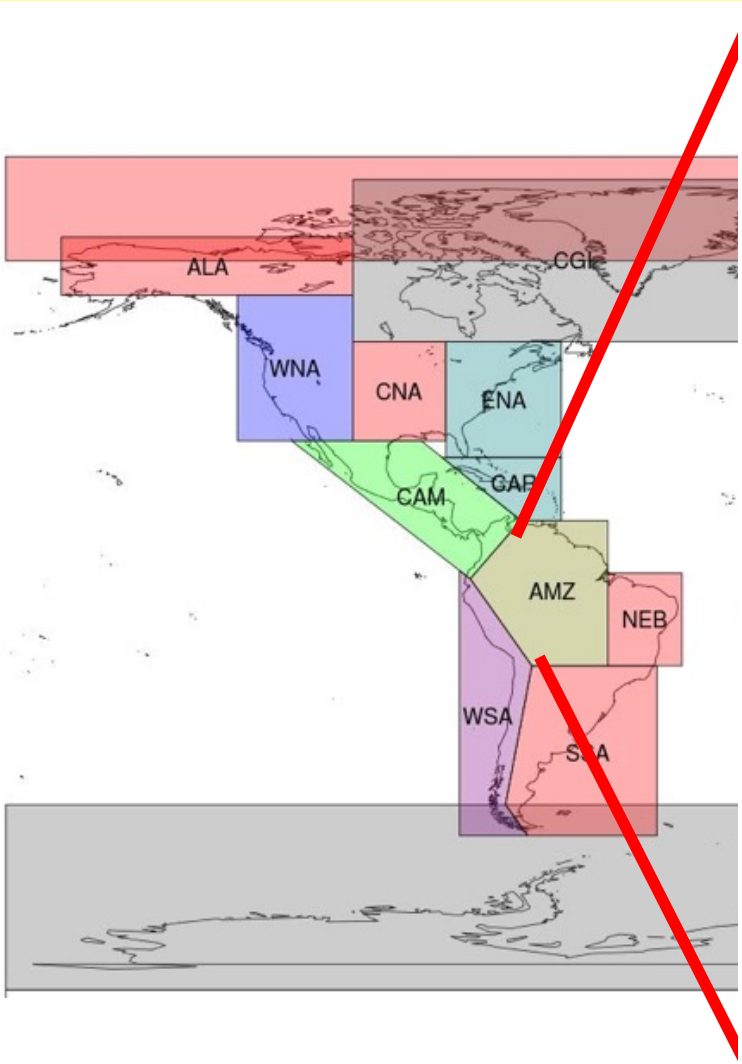
Projection uncertainty

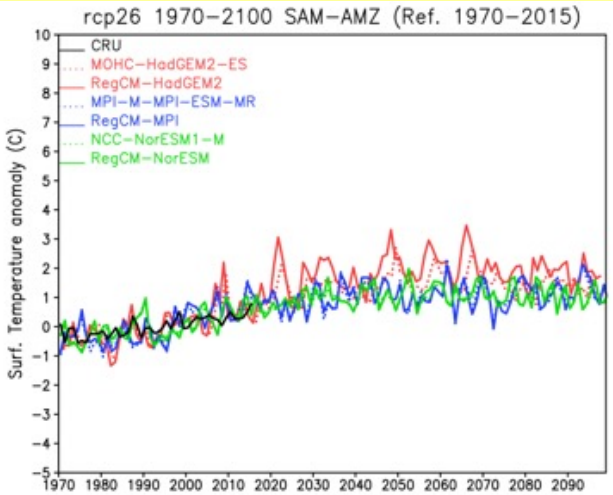


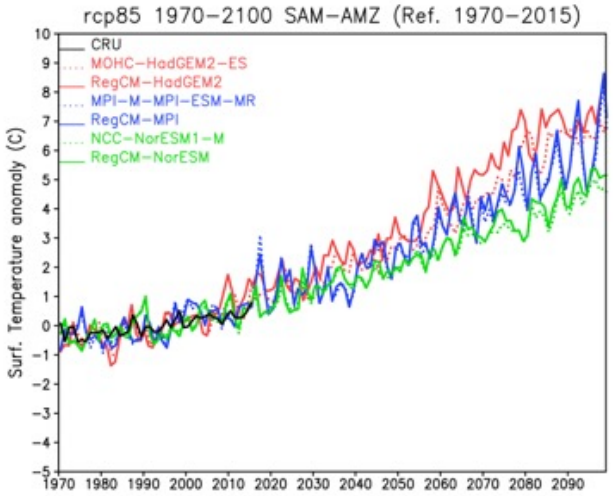


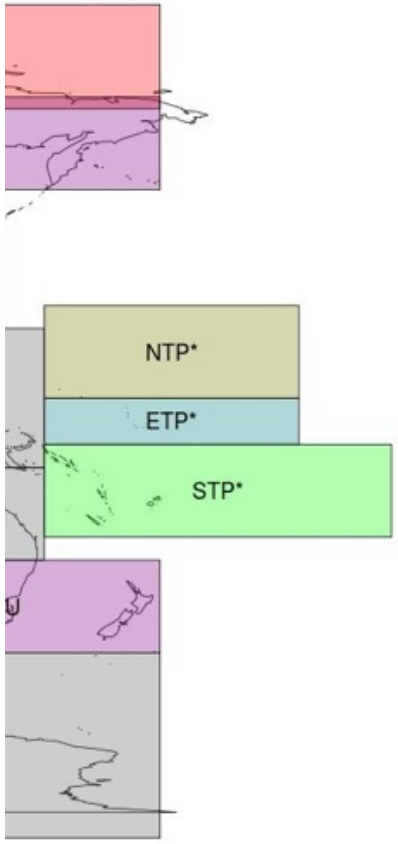
https://www.ipcc-data.org/guidelines/pages/ar5_regions.html

Projection uncertainty









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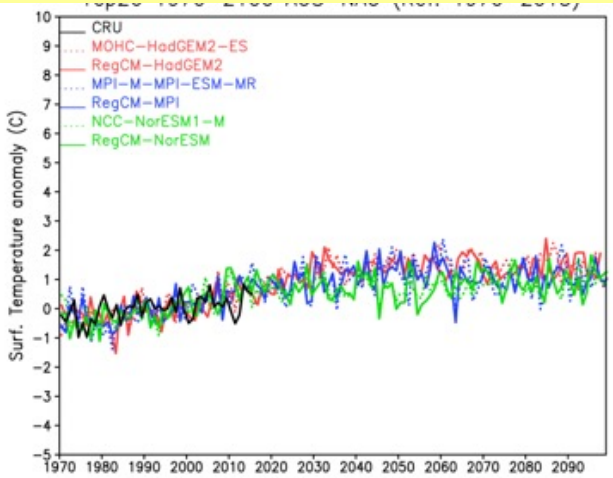

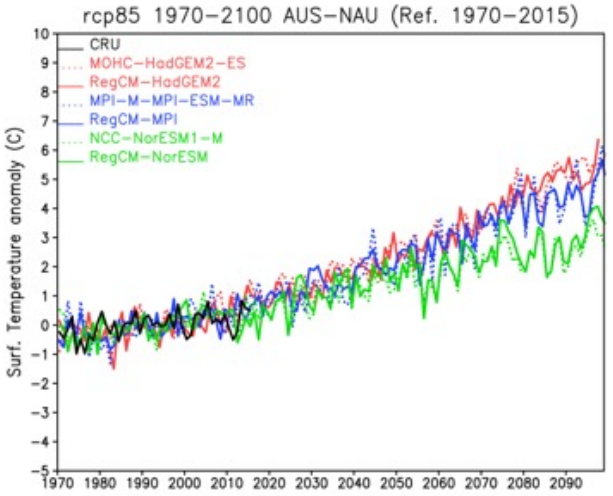

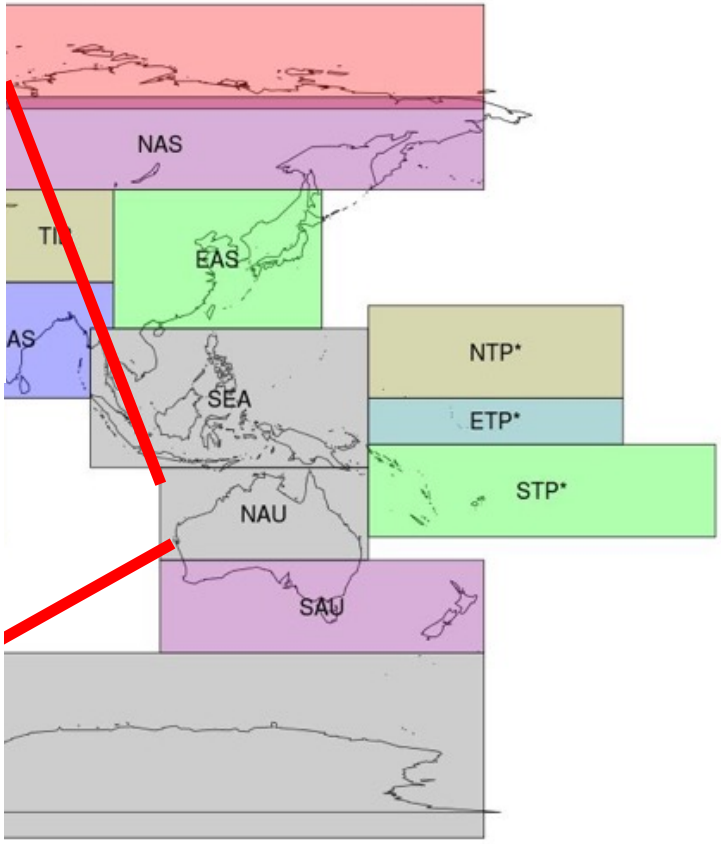

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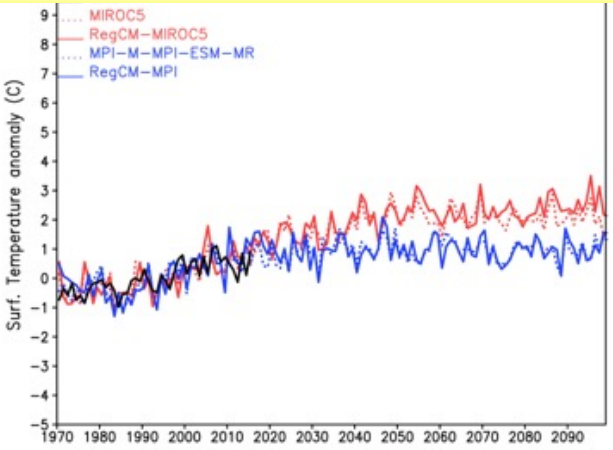
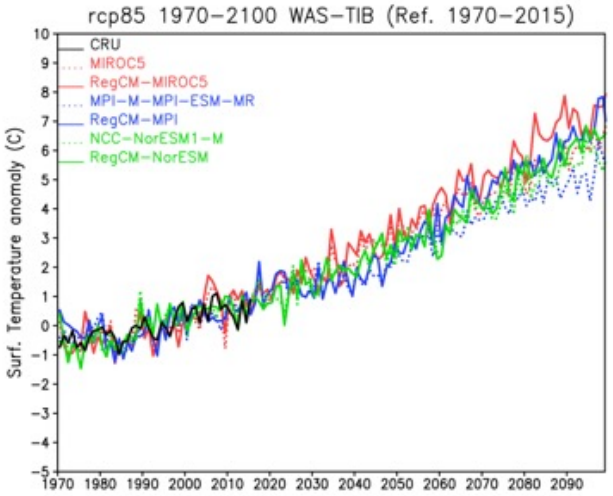
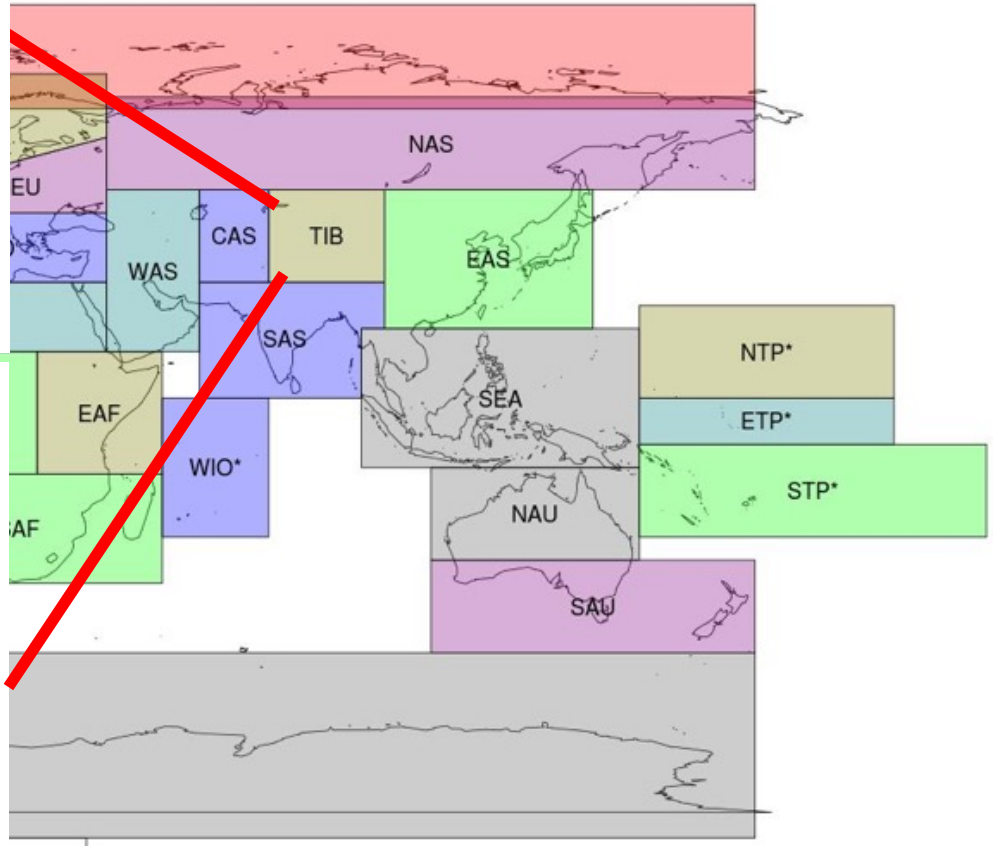
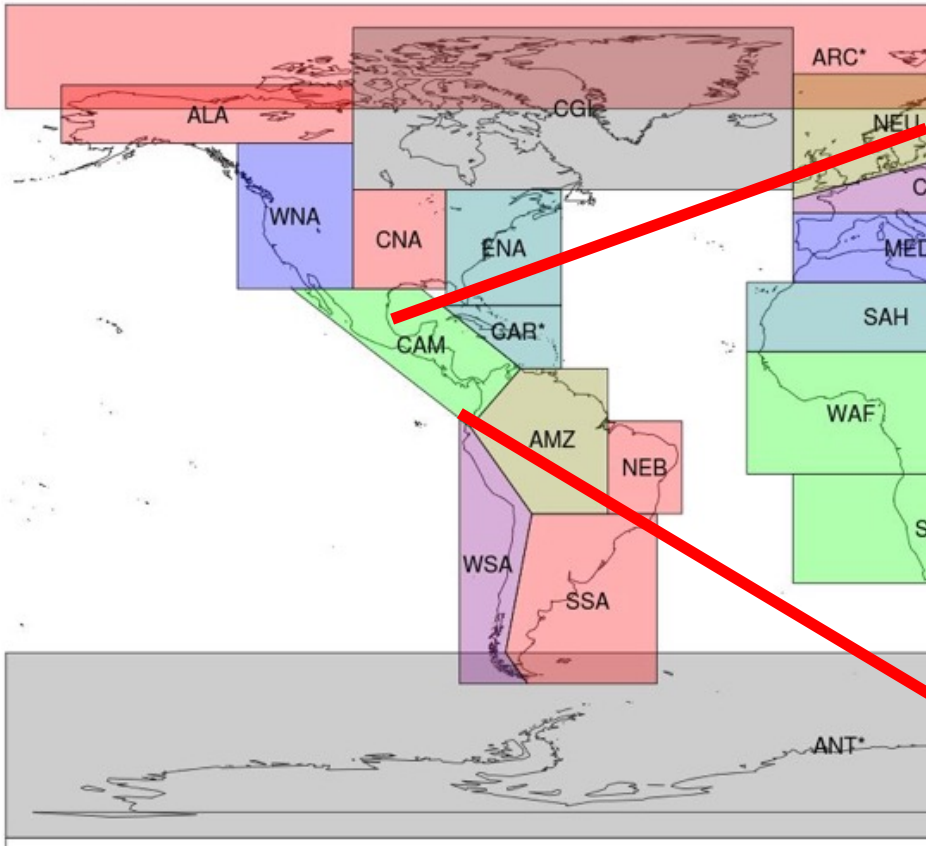
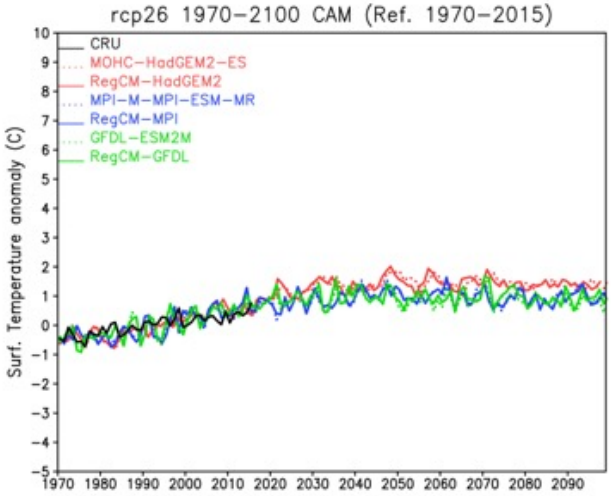


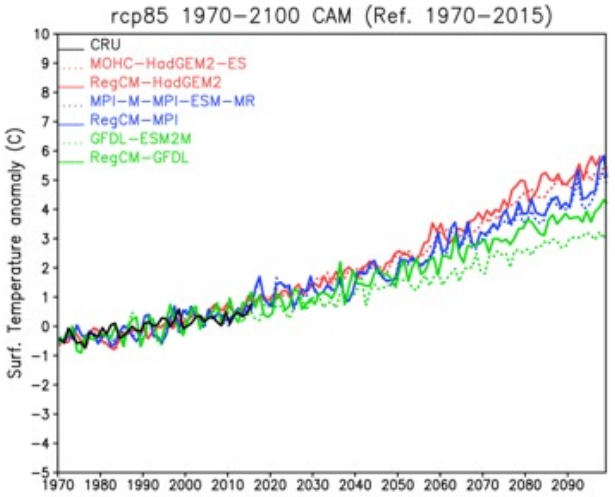


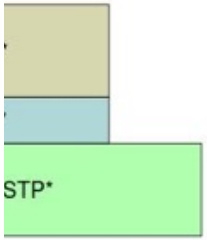


Projection uncertainty

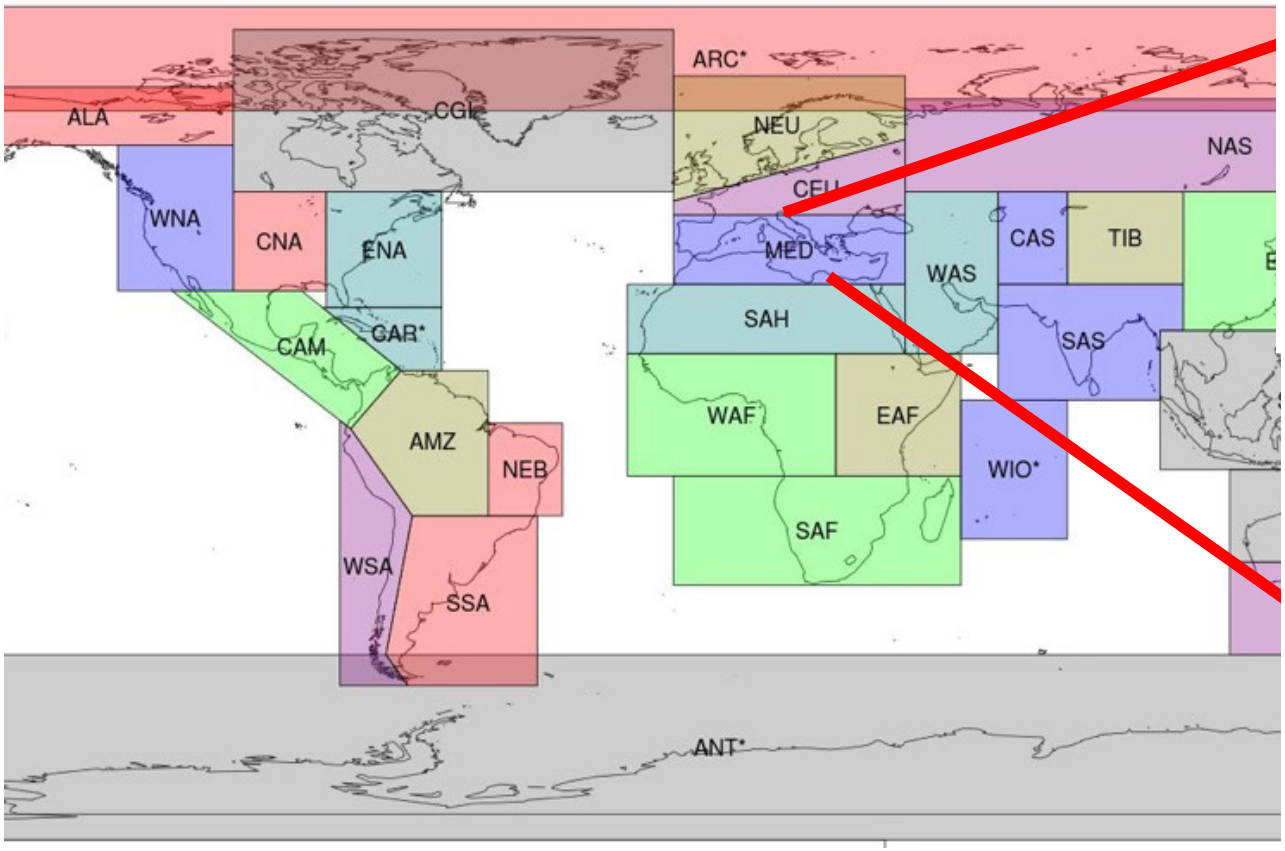


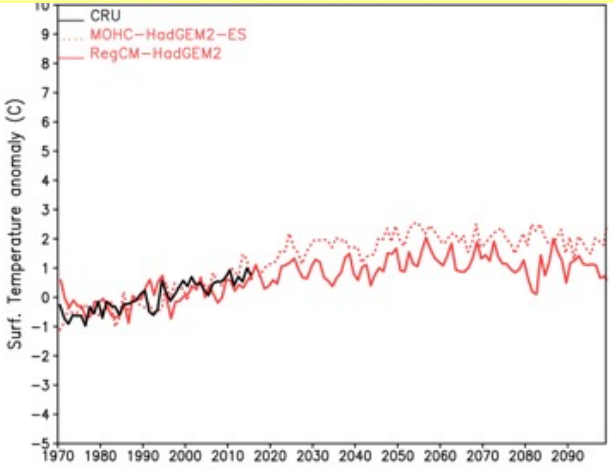


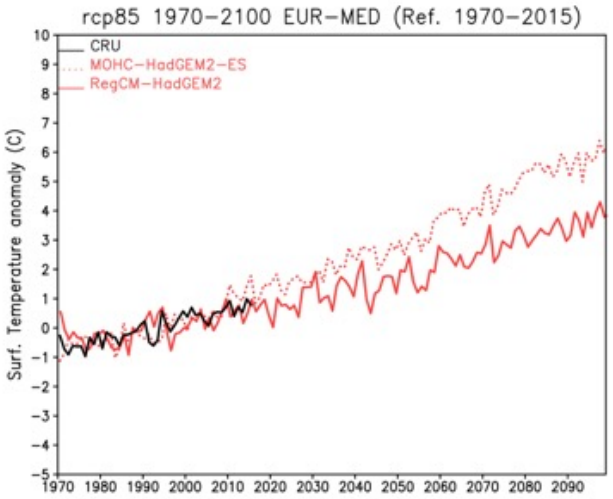




Projection uncertainty

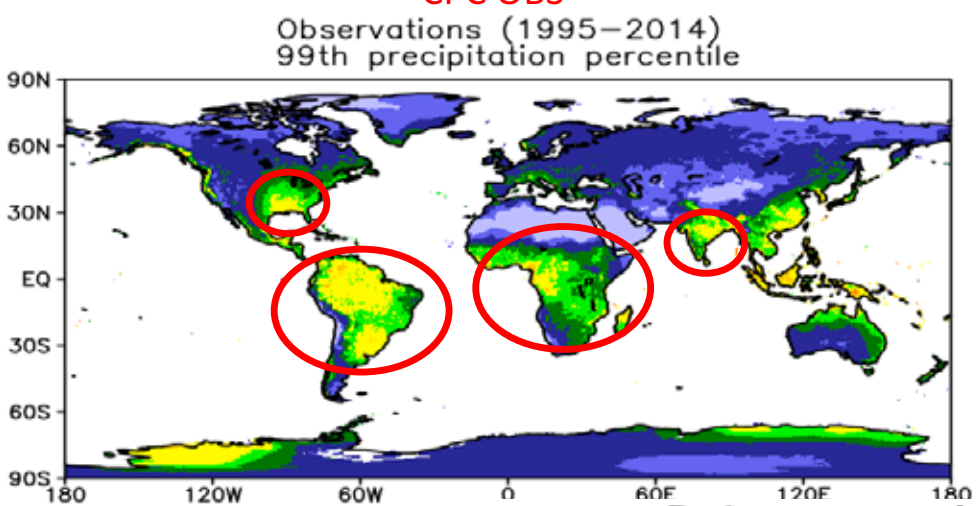




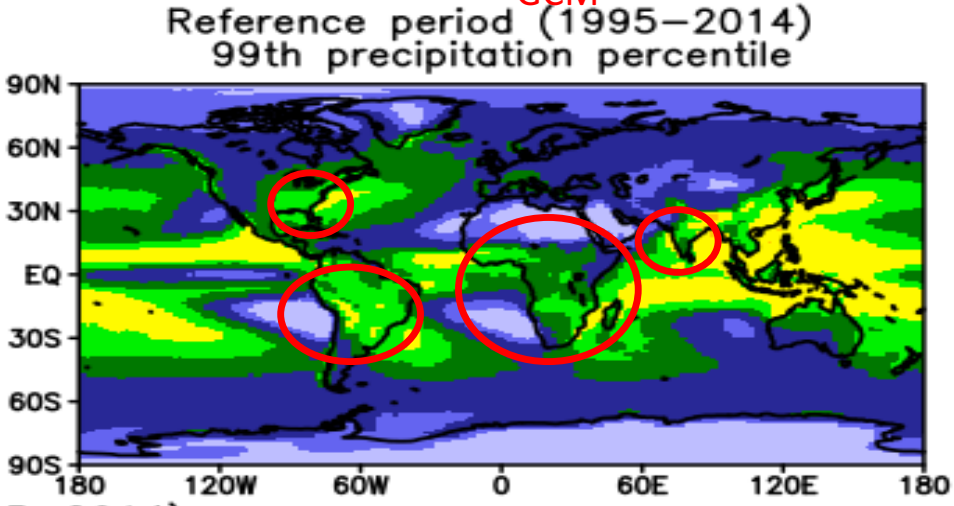


Extreme (P99 validation)

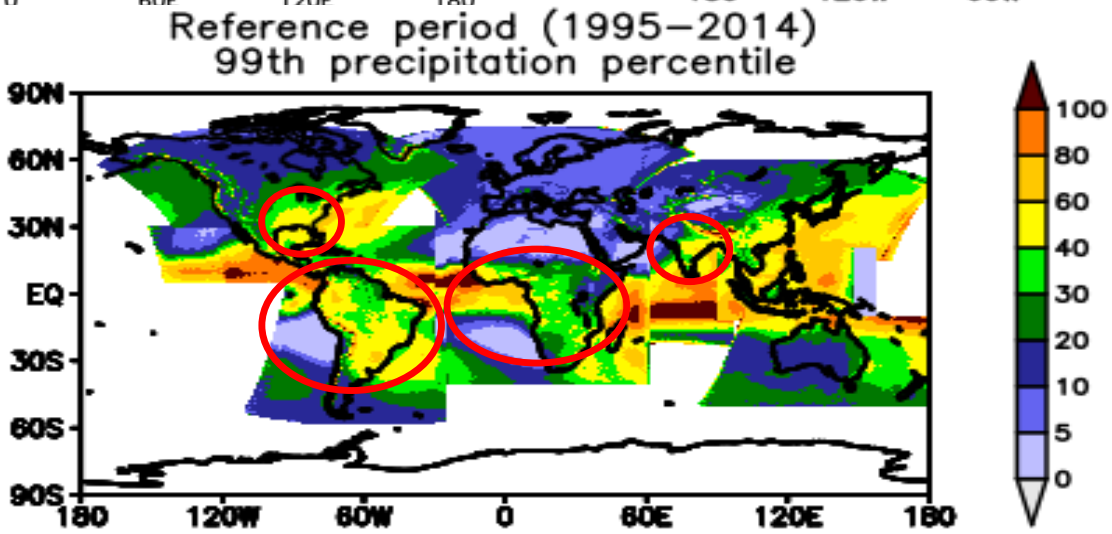
CPC OBS



GCM

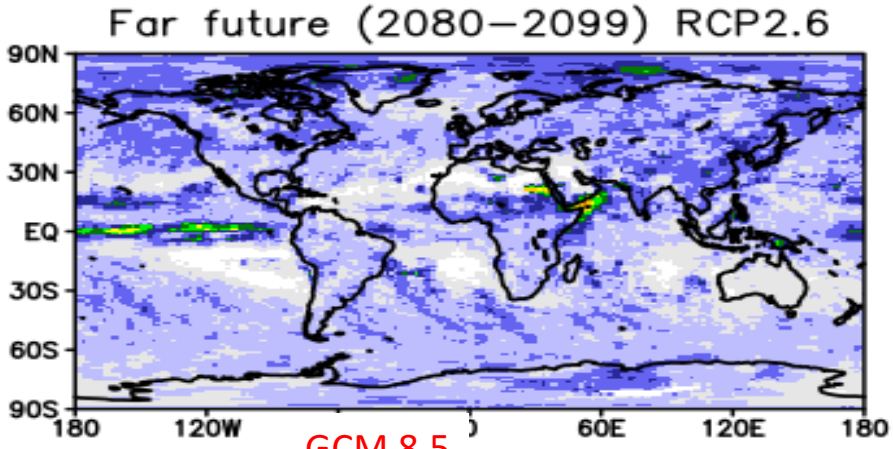


RCM

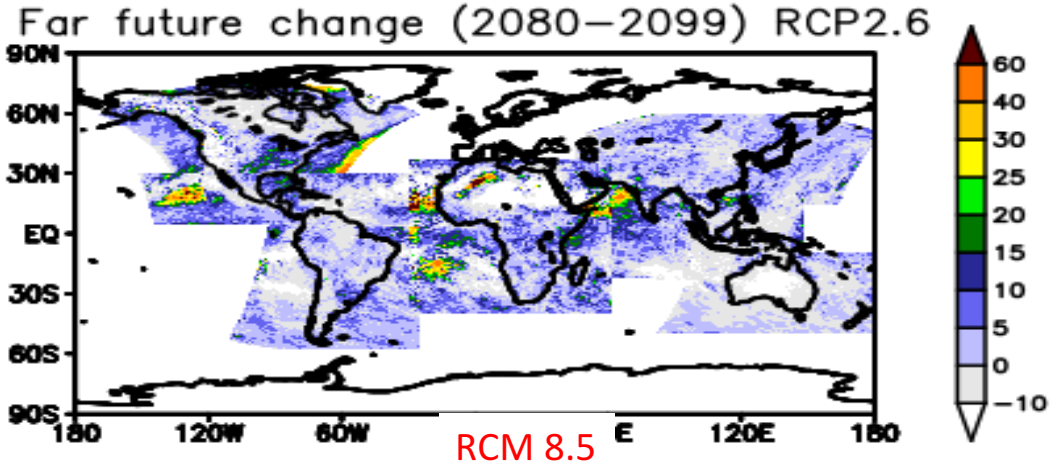


Extreme(P99 projections)

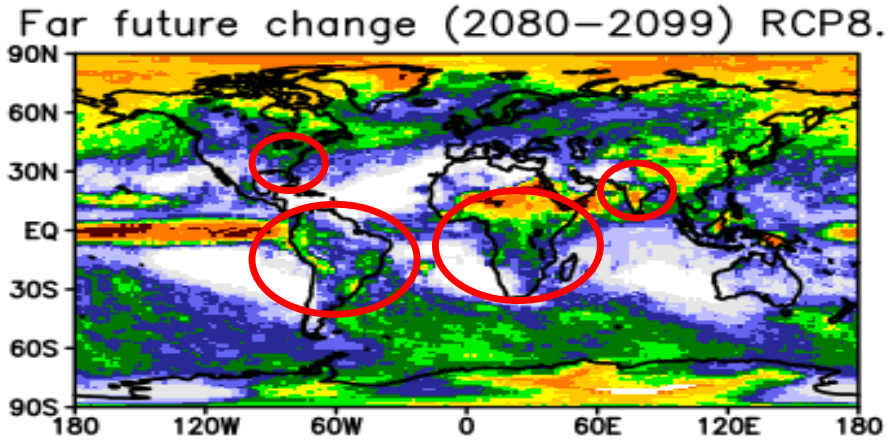
GCM 2.6



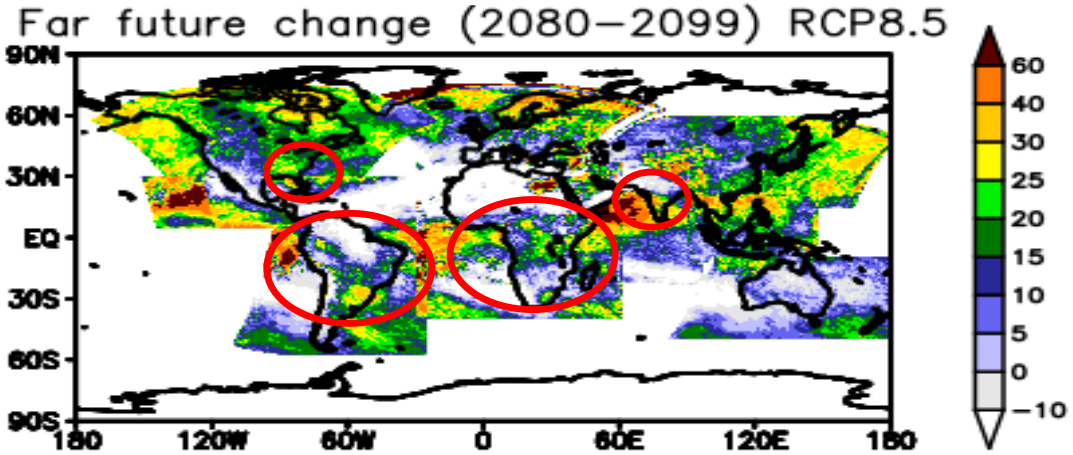
RCM 2.6



GCM 8.5

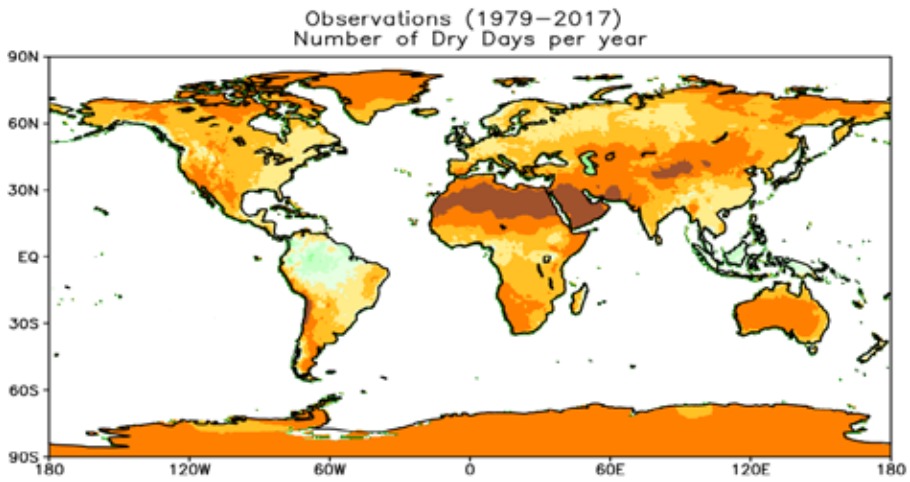


RCM 8.5

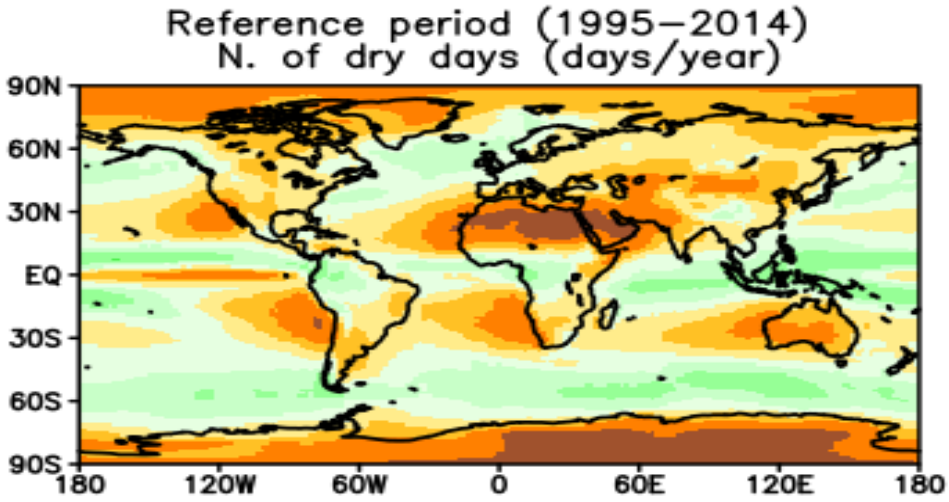


Extreme (NDD validation)

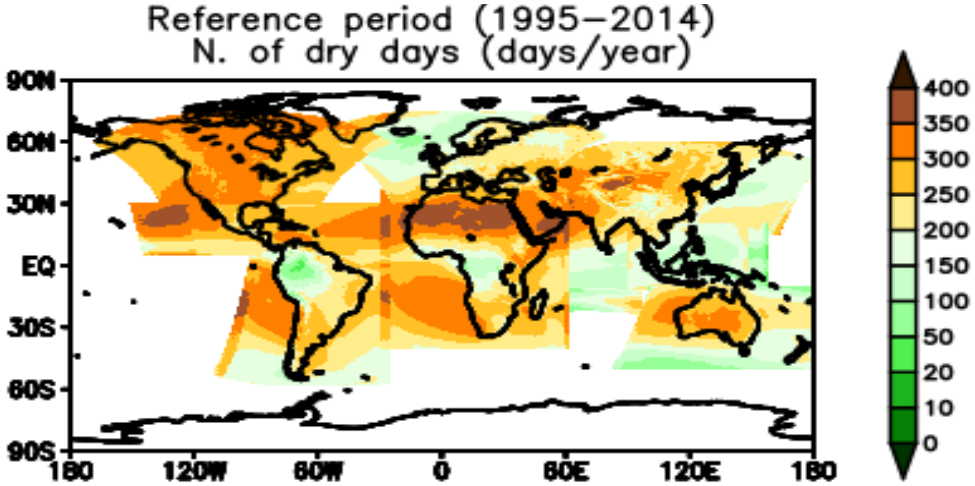
CPC OBS



GCM

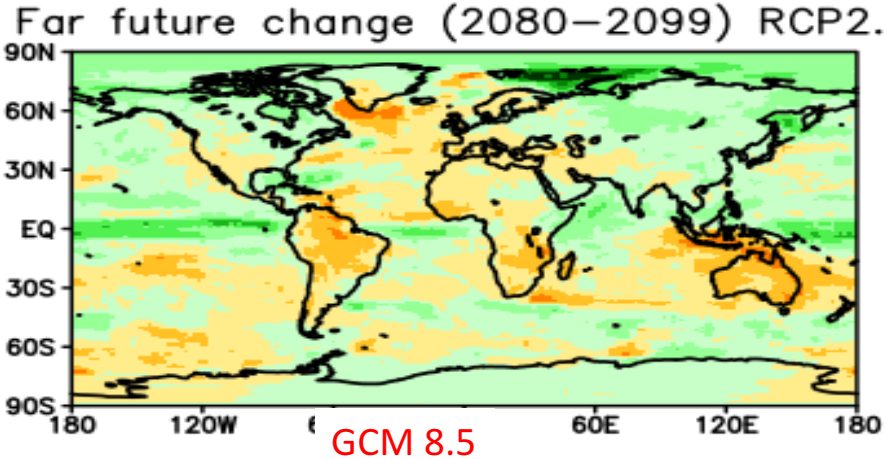


RCM

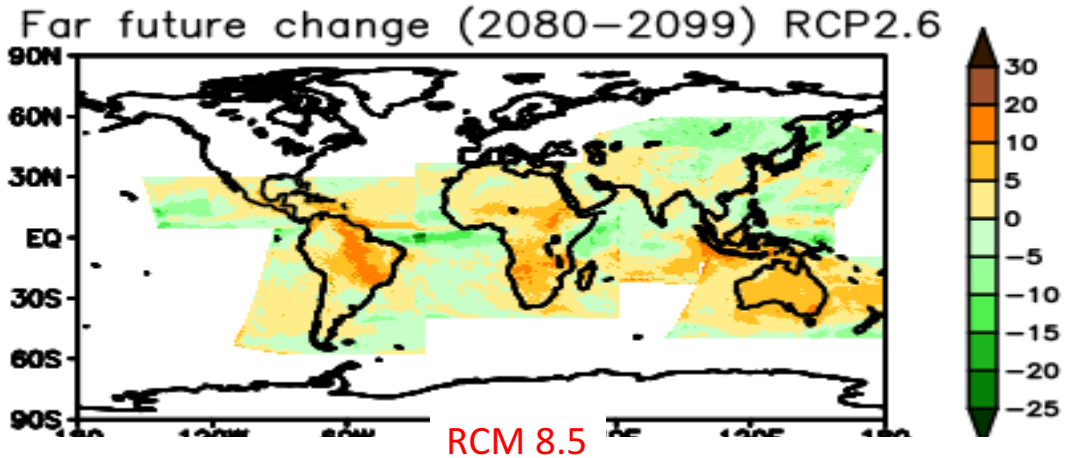


Extreme (NDD projections)

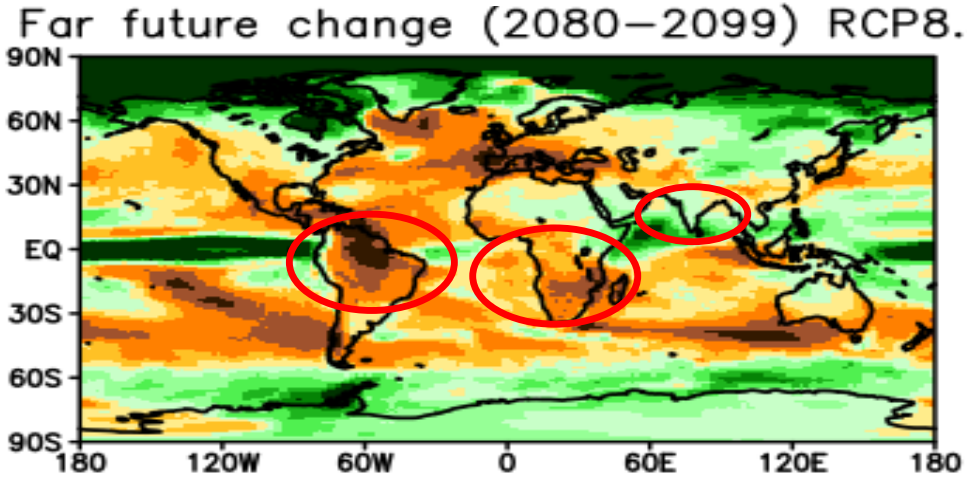
GCM 2.6



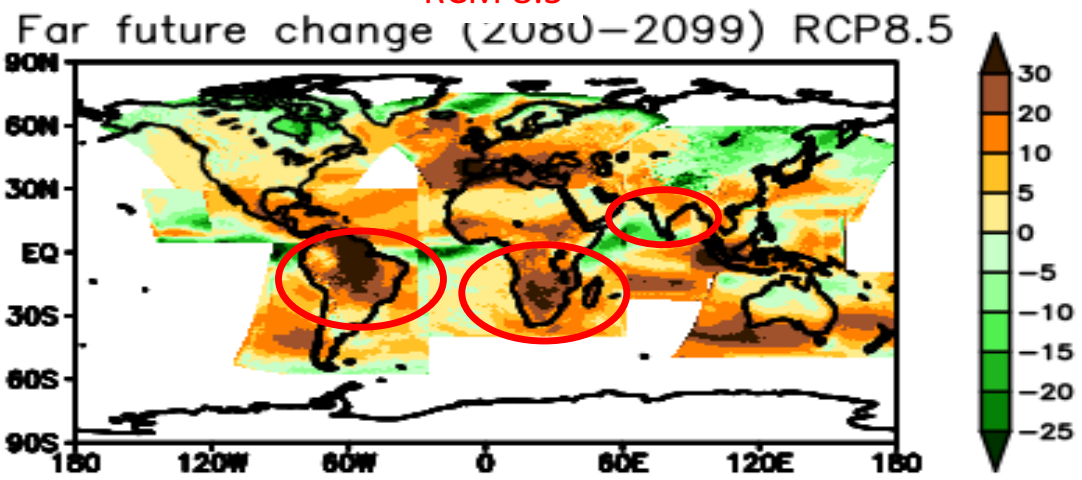
RCM 2.6



GCM 8.5



RCM 8.5



Data access information

http://users.ictp.it/~jciarlo/

RegCM4 CORDEX simulations

Simulations Completed

Domain	Contact	Acronym	RegCM	ERAINT	MPI-ESM	HadGEM	NORESM	GFDL	MIROC
Europe	jciarlo@ictp.it	EUR-11	4.6.1	e	h-8-2	h-8-2			
Africa	fraffael@ictp.it	AFR-22	4.7.0	e	h-8-2	h-8-2	h-8-2		
North America	rglazer@ictp.it	NAM-22	4.4	e	h-8	h-8		h-8	
Central America	jtorres@ictp.it	CAM-22	4.7.0	e	h-8-2	h-8-2		h-8-2	
South America	epichell@ictp.it	SAM-22	4.7.0	e	h-8-2	h-8-2	h-8-2		
East Asia	jciarlo@ictp.it	EAS-22	4.4	e	h-8-2	h-8-2	h-8-2		
Southeast Asia	jciarlo@ictp.it	SEA-22	4.7.0	e	h-8-2	h-8-2	h-8-2		
South Asia	sdas@ictp.it	WAS-22	4.7.0	e	h-8-2		h-8-2		h-8-2
Australasia	epichell@ictp.it	AUS-22	4.7.0	e	h-8-2	h-8-2	h-8-2		

{ e - evaluation ; h - historical ; 8 - rcp85 ; 2 - rcp26 }

Data access information

Variable Priority

Frequency	Variables
fx	**orog**, **sftlf**
mon	evspsbl, hus(p), huss, **hurs**, **mrro**, mrso, **pr**, **ps**, **rsds**, **sfcWind**, **sfcWindmax**, **snw**, sund, ta(p), **tas**, **tasmax**, **tasmin**, uas, vas, ua(p), va(p), zg(p)
day	evspsbl, hus(p), **hurs**, **mrro**, mrso, **pr**, **ps**, **rsds**, **sfcWind**, **sfcWindmax**, **snw**, ta(p), tas, tasmax, tasmin, uas, vas, ua(p), va(p)
6hr	hus(p), ta(p), uas, vas, ua(p), va(p), zg(p)
3hr	evspsbl, hurs, huss, pr, psl, mrro, mrros, snw, sfcWind, tas, ua100m, va100m, uas, vas
1hr*	**pr**

NOTE: Variables marked in **bold** are the first priority to be processed and uploaded as soon as possible;
variables marked with a "(p)" include a vertical profile with the following levels: 200, 300, 400, 500, 600, 700, 850, & 925.

The ICTP is currently giving priority to variables in the following order:

1. Variables marked in **bold** for fx, mon, day & 1hr;
2. Remaining day & mon variables;
3. Variables marked in **bold** for 6hr & 3hr;
4. Remaining 6hr & 3hr variables;
5. Any remaining RegCM variables not included in the table above.

* - Please note that some of the simulations do not contain this data. These include the following:
EUR-11 [HadGEM & ERAINT]; SAM-22 (most); AUS-22, EAS-22, SEA-22, & WAS-22 (all)

Data access information

Data Access

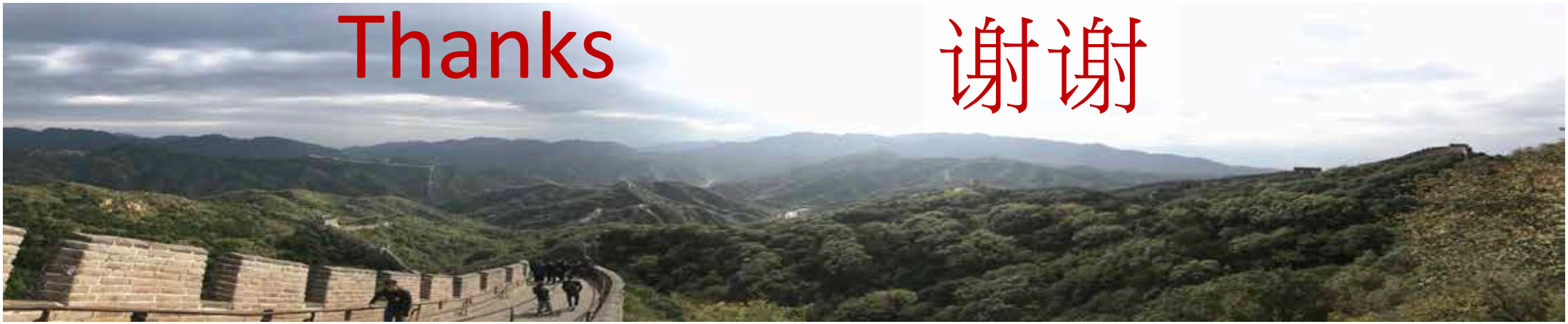
Data for EUR-11, AFR-22, CAM-22, SAM-22, WAS-22, and AUS-22 will be available on the ESGF [backup links: link-1, link-2].
Completed uploads: EUR-11 (MPI rcp26 only up to 2060); SAM-22 (day, mon, fx); AUS-22 [except ERAINT] (day, mon, fx); CAM-22, AFR-22 (1hr, day, mon, fx).

Part of the data for NAM-22 is accessible from here.
Any other available data will be accessible from here.

The SEA-22 data is accessible from here.
Please note that more variables will become available shortly.

The EAS-22 data is accessible from here.
Please note that more variables will become available shortly, and some of the data is incomplete.

NOTE: the 'mrso' data found in the links above does not contain model levels.
The data that includes the model levels has been made available here
(AFR MPI[rcp85, rcp26], NorESM[rcp26] are currently incomplete).



Concluding remarks

- Preliminary results highlight same tendencies over the evaluation time window

- Climate change future signal shows a tendency of the regional climate ensemble to be hotter and drier respect with GCMs one especially for rcp8.5 scenario and over some ”hot-spot” are like Amazon and Tibetan Plateau.
- More in depth analysis needed to draw stronger conclusions about RegCM ensemble behaviour