

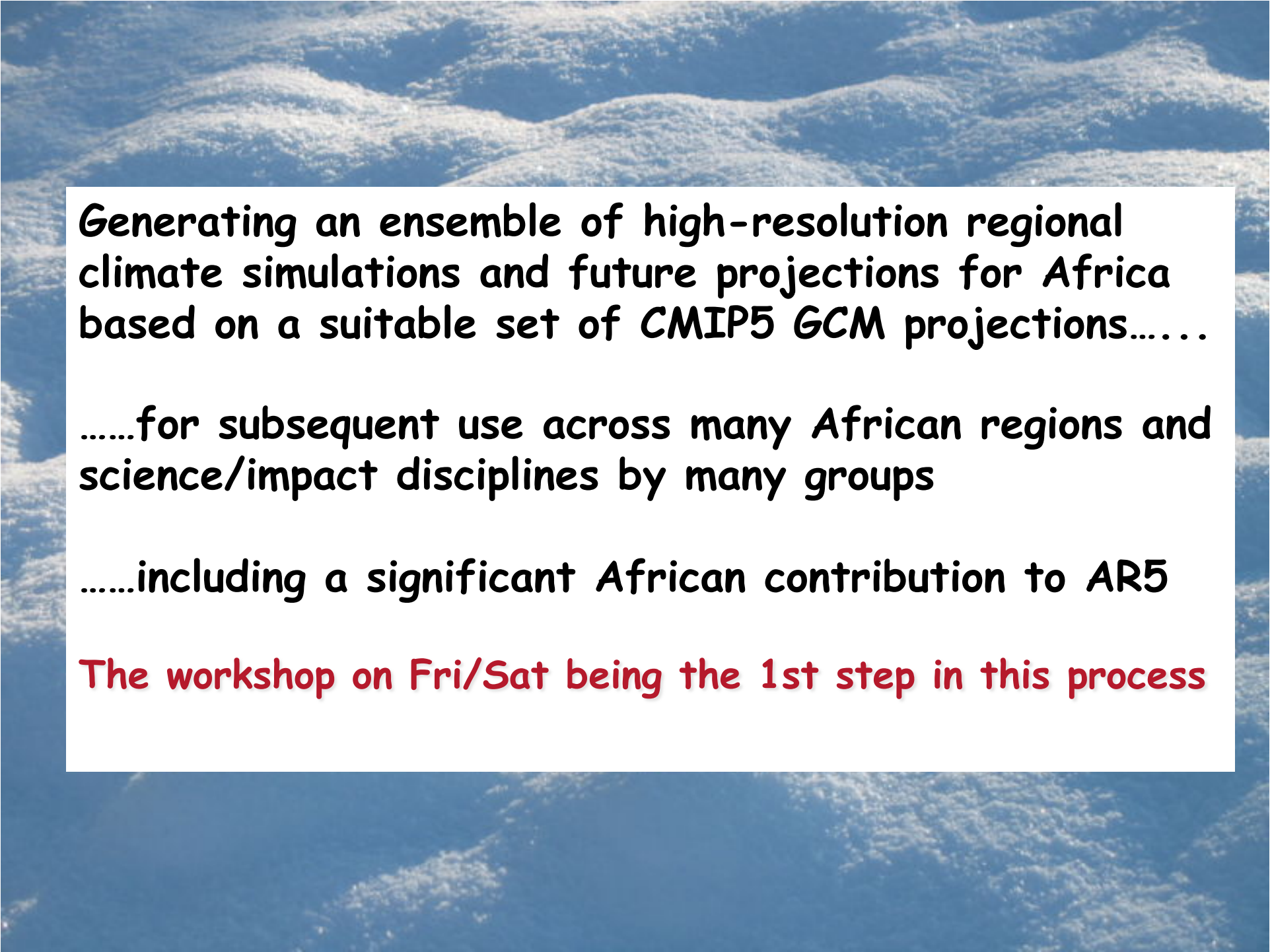
CORDEX-Africa

The first target area for a
coordinated Regional Downscaling Exercise

Results from the ERA-interim ensemble

Colin Jones & Grigory Nikulin
Rossby Centre, SMHI
and CORDEX modelling groups

Results to be used in the 1st START/WCRP sponsored
Africa-CORDEX analysis workshop: March 25-26 2011, ICTP



Generating an ensemble of high-resolution regional climate simulations and future projections for Africa based on a suitable set of CMIP5 GCM projections.....

.....for subsequent use across many African regions and science/impact disciplines by many groups

.....including a significant African contribution to AR5

The workshop on Fri/Sat being the 1st step in this process

CORDEX Phase I experiment design

Model Evaluation
Framework

Climate Projection
Framework

Multiple regions (Initial focus on Africa)
50km resolution (higher in some regions, Europe: 10km)

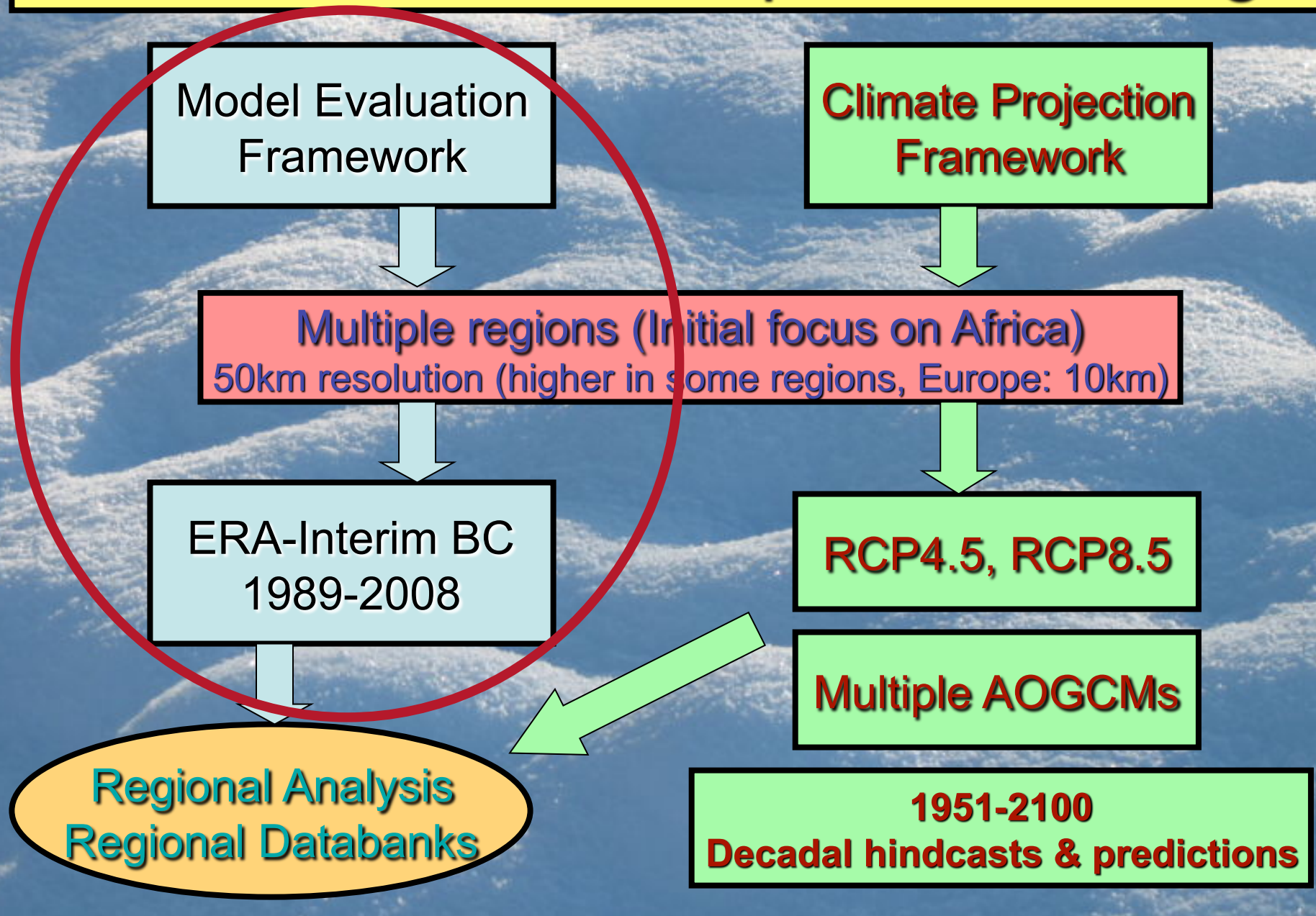
ERA-Interim BC
1989-2008

RCP4.5, RCP8.5

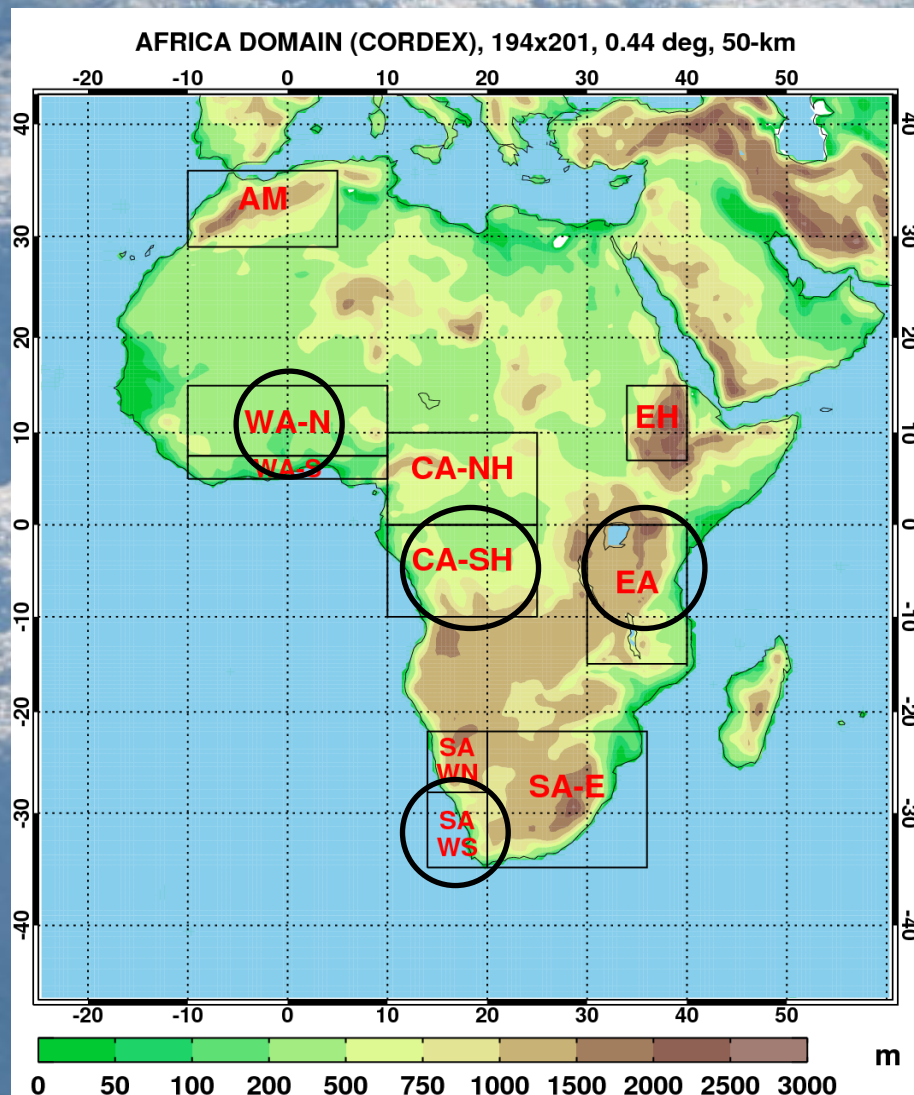
Multiple AOGCMs

Regional Analysis
Regional Databanks

1951-2100
Decadal hindcasts & predictions



Initial Results from 10 RCMs run for 1989-2008 at
50km forced by ERA-interim boundary conditions



RCM contributions

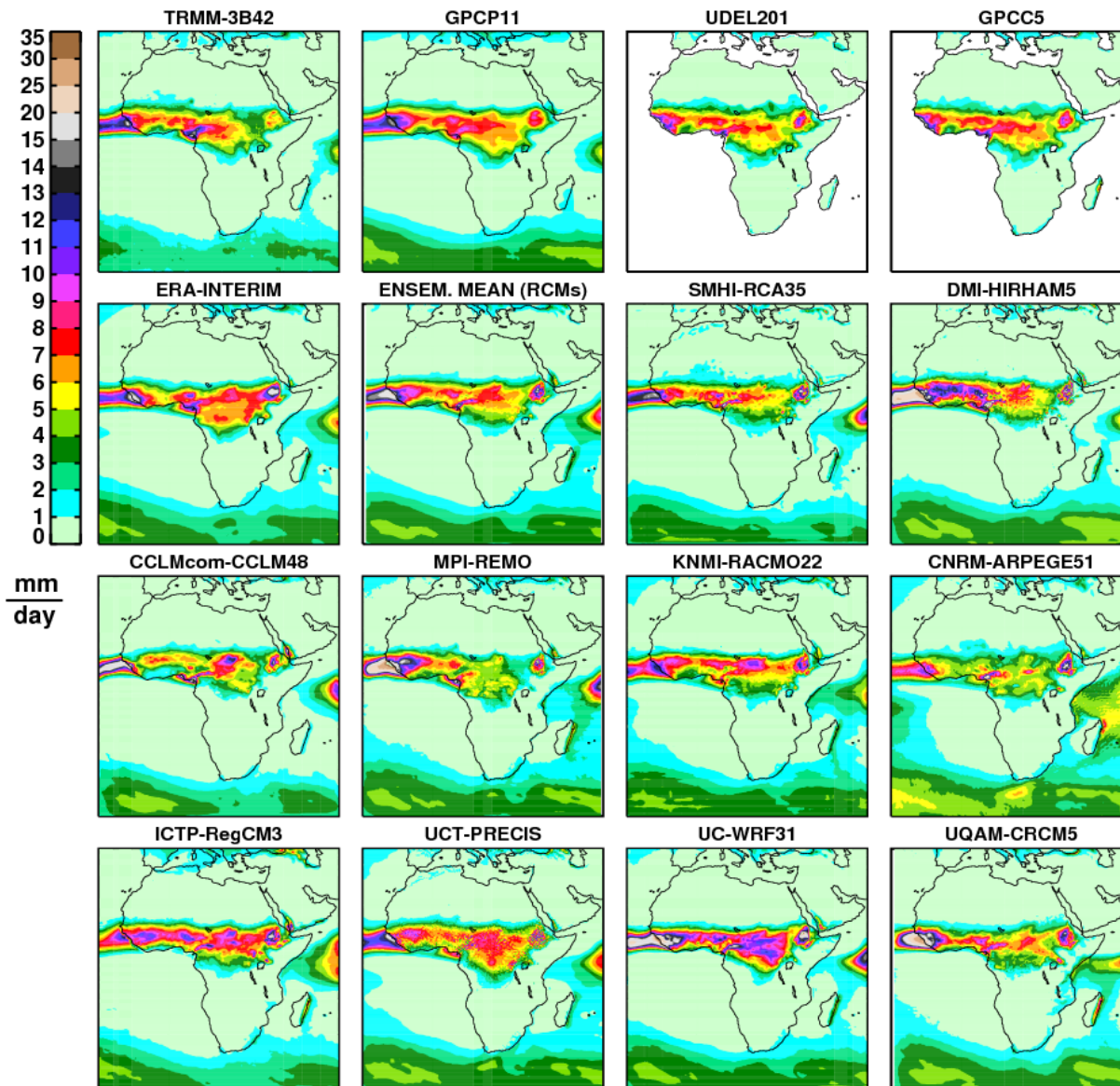
UCT/UK Met. : PRECIS
Santander/Bergen/LMD: WRF
ICTP : RegCM3
UQAM : CRCM5
Meteo France : ARPEGE
KNMI : RACMO
JRC : COSMO-CLM
MPI : REMO
DMI : HIRHAM
SMHI : RCA

All the above have promised
(at least) 1 GCM forced run

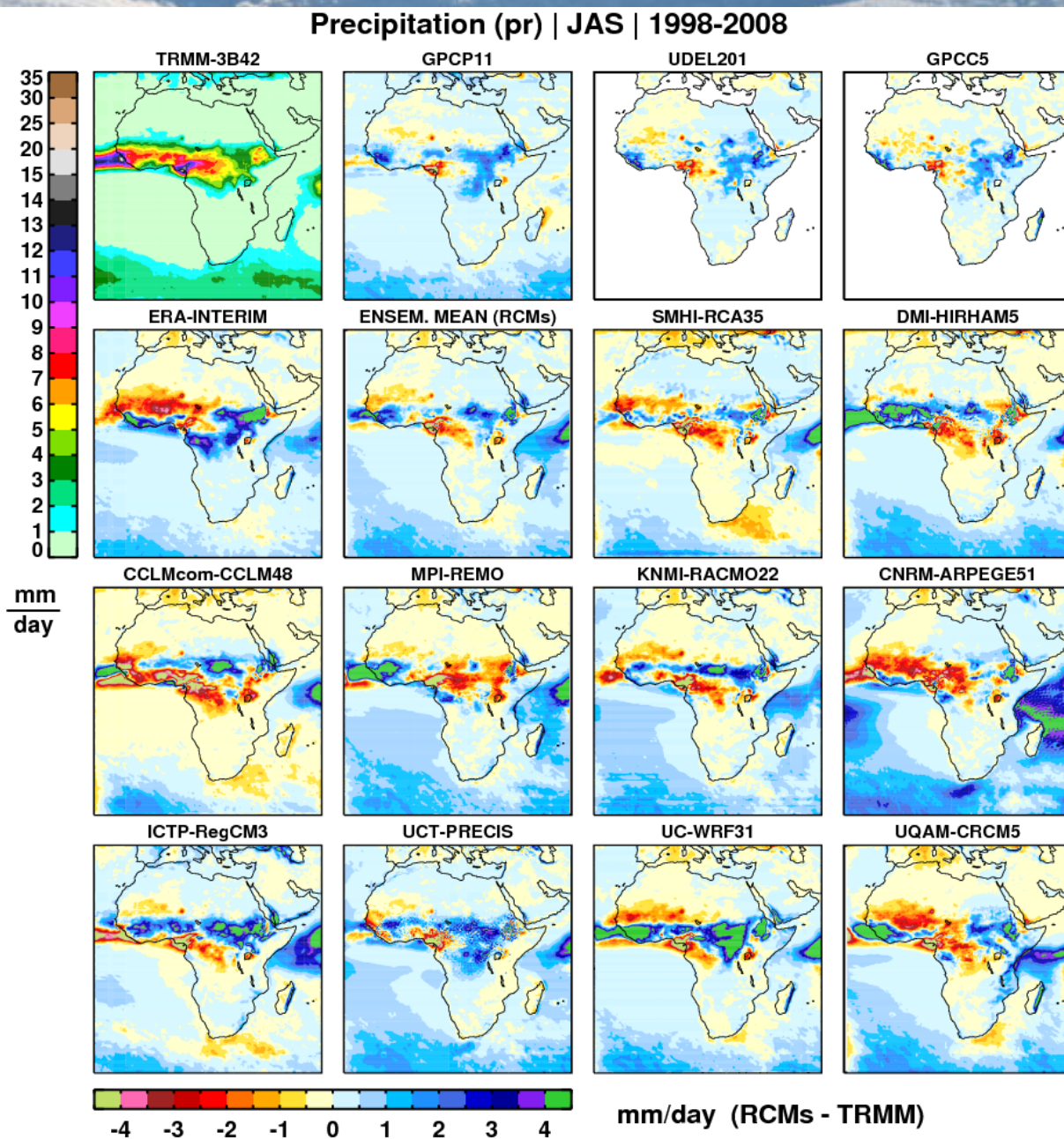
CORDEX BAMS review article summer 2011

Seasonal Mean Precipitation

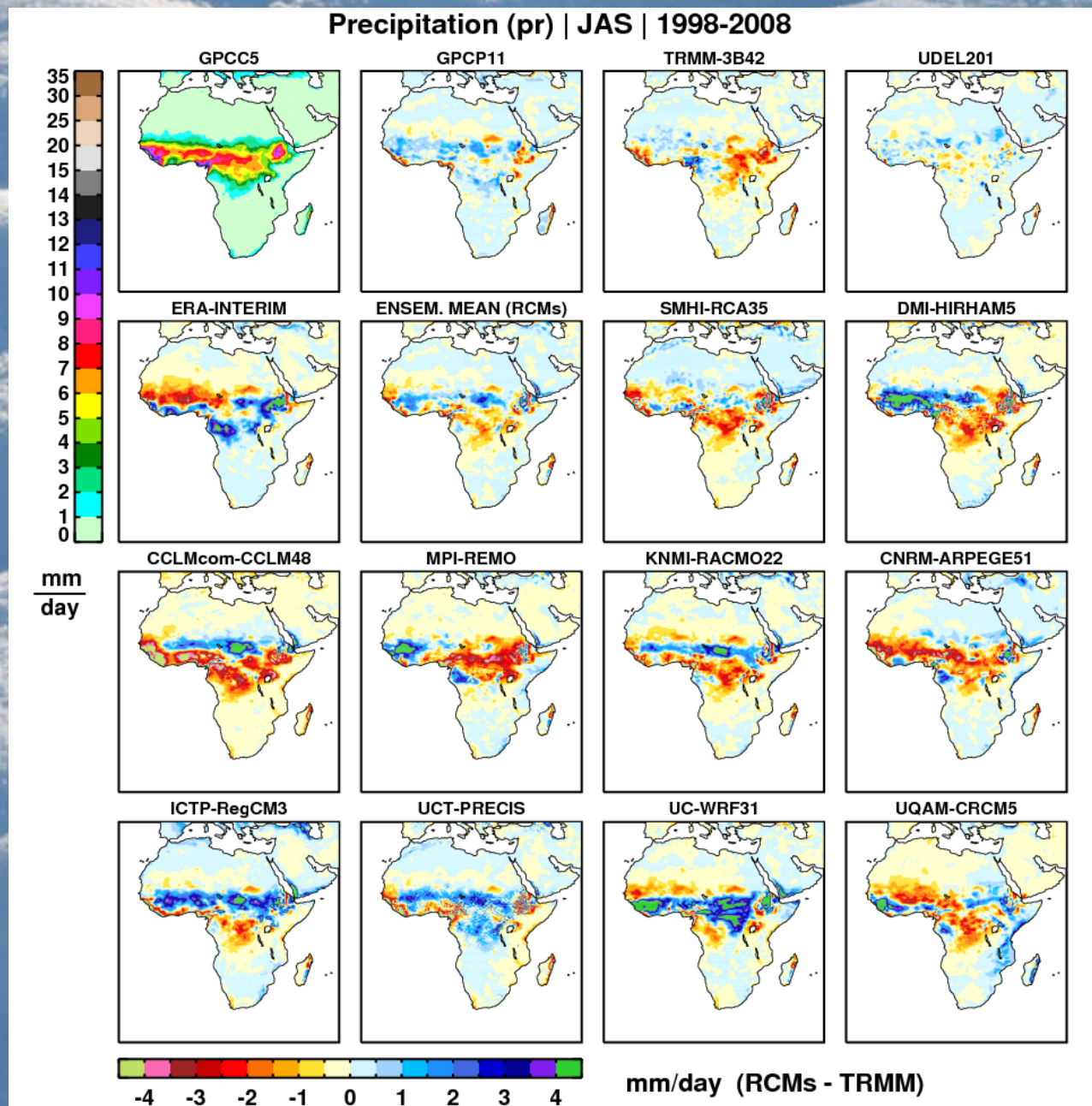
Precipitation (pr) | JAS | 1998-2008



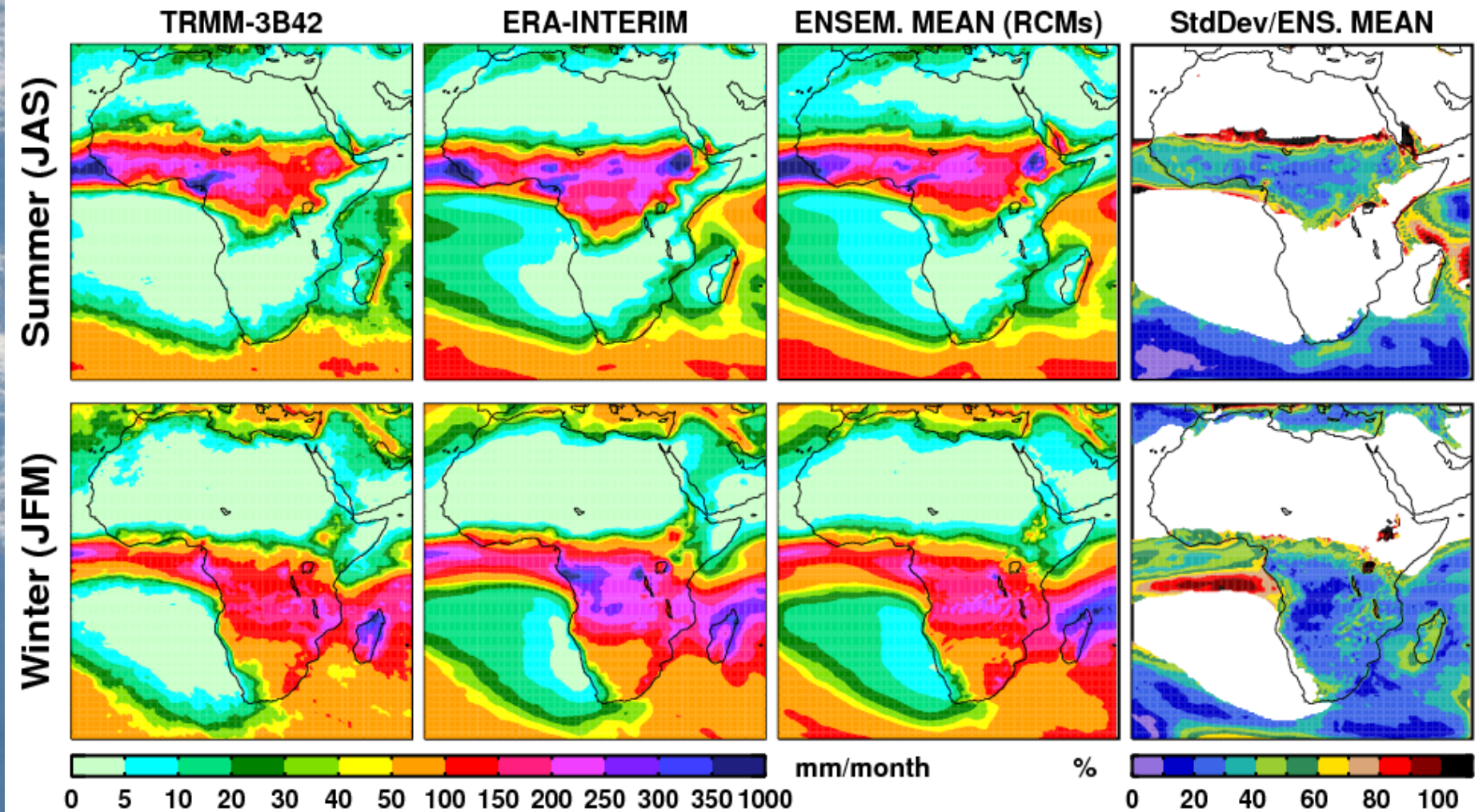
Seasonal Mean Precipitation Bias



Seasonal Mean Precipitation Bias: Land Only GPCC

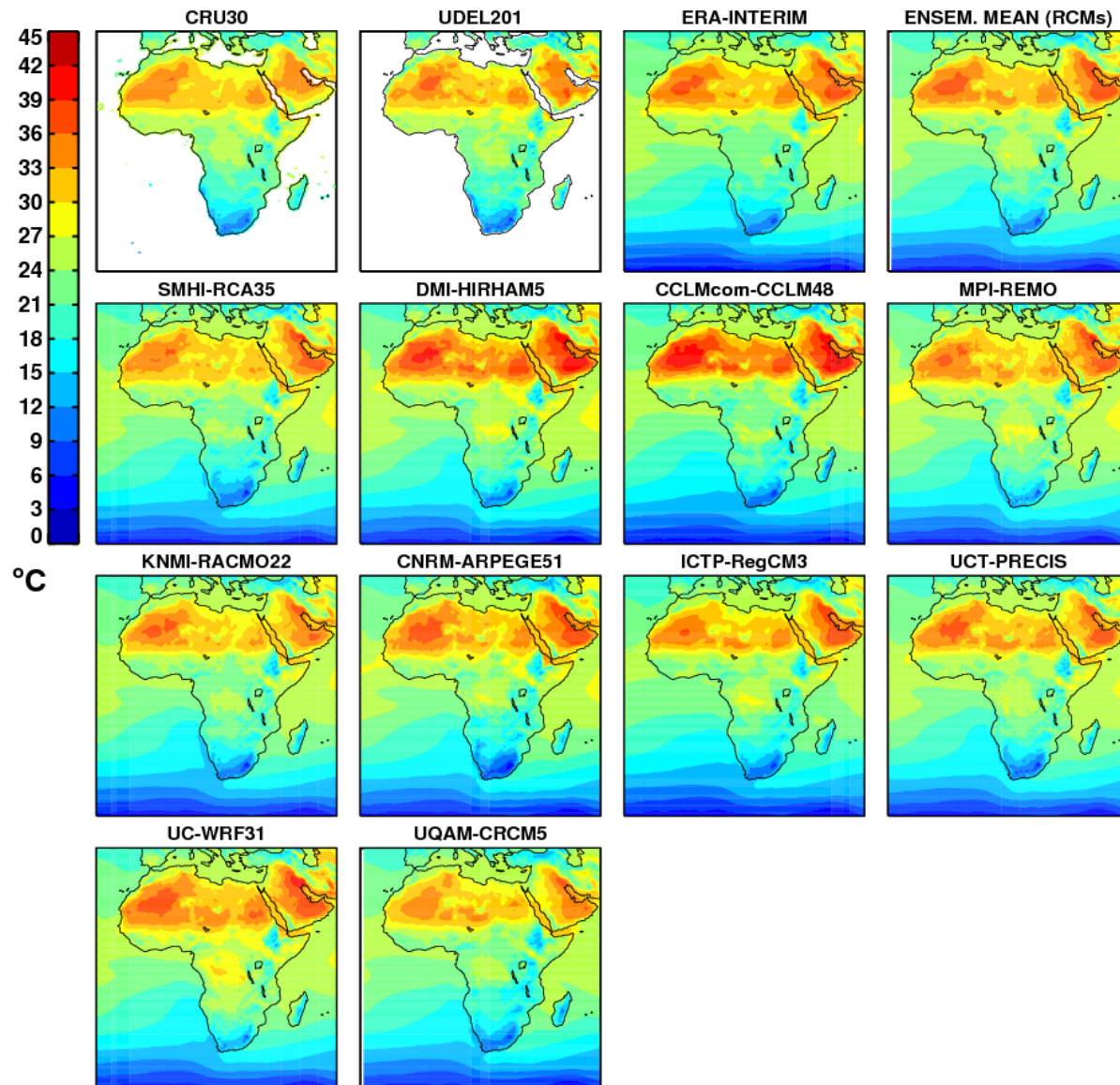


JAS mean precipitation 1998-2000 : Ensemble Mean



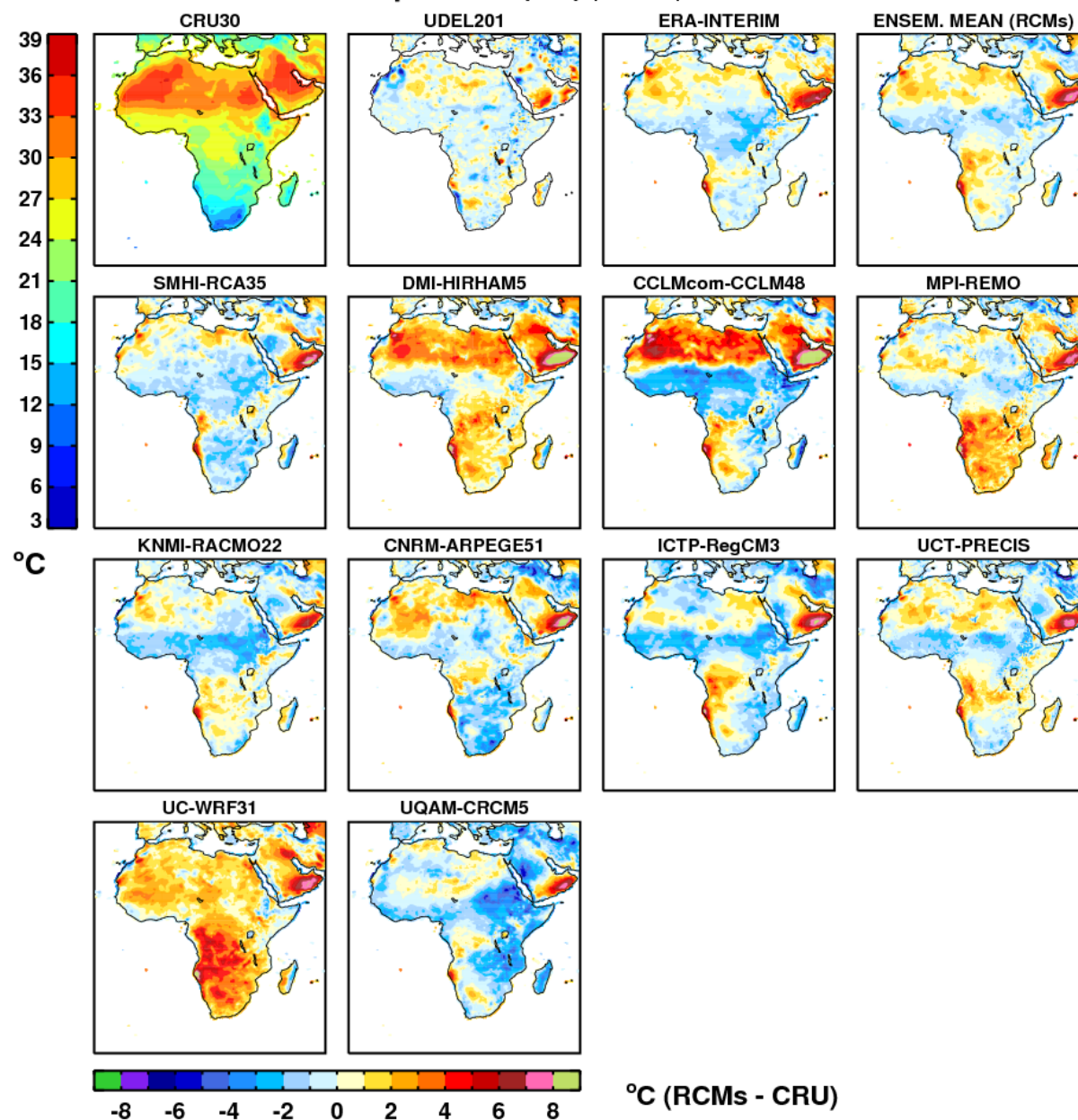
Seasonal Mean Temperature

2m Temperature (tas) | JAS | 1992-2006



Seasonal Mean Temperature Bias

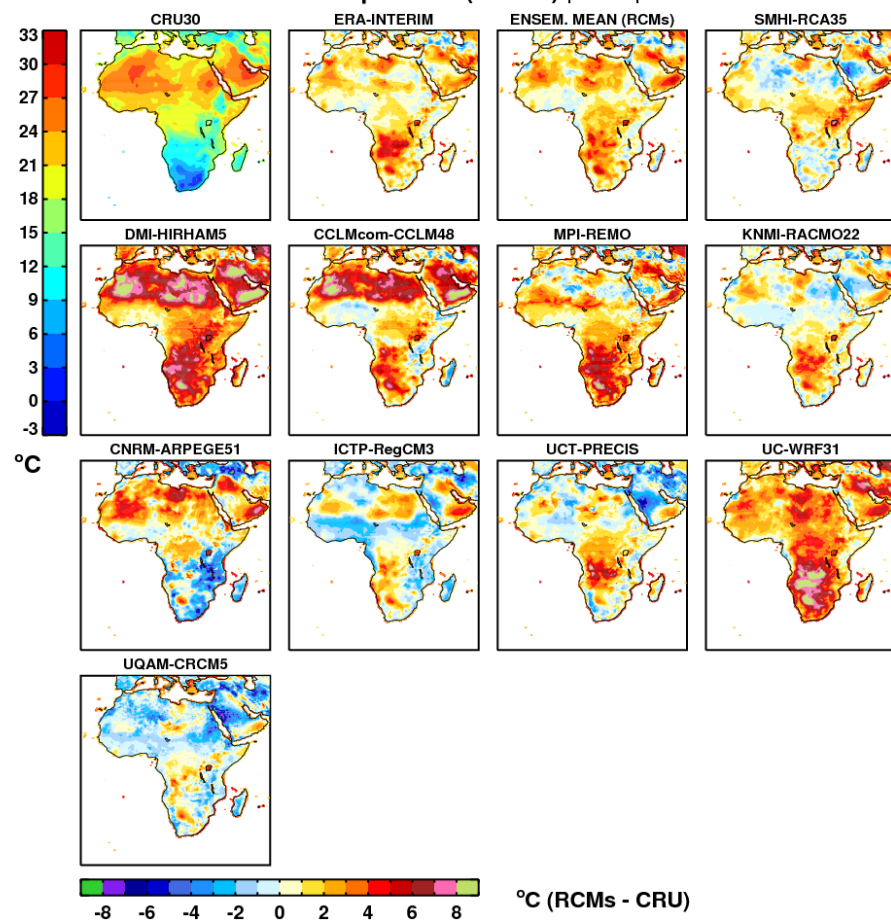
2m Temperature (tas) | JAS | 1992-2006



Seasonal Mean Temperature Bias (JAS)

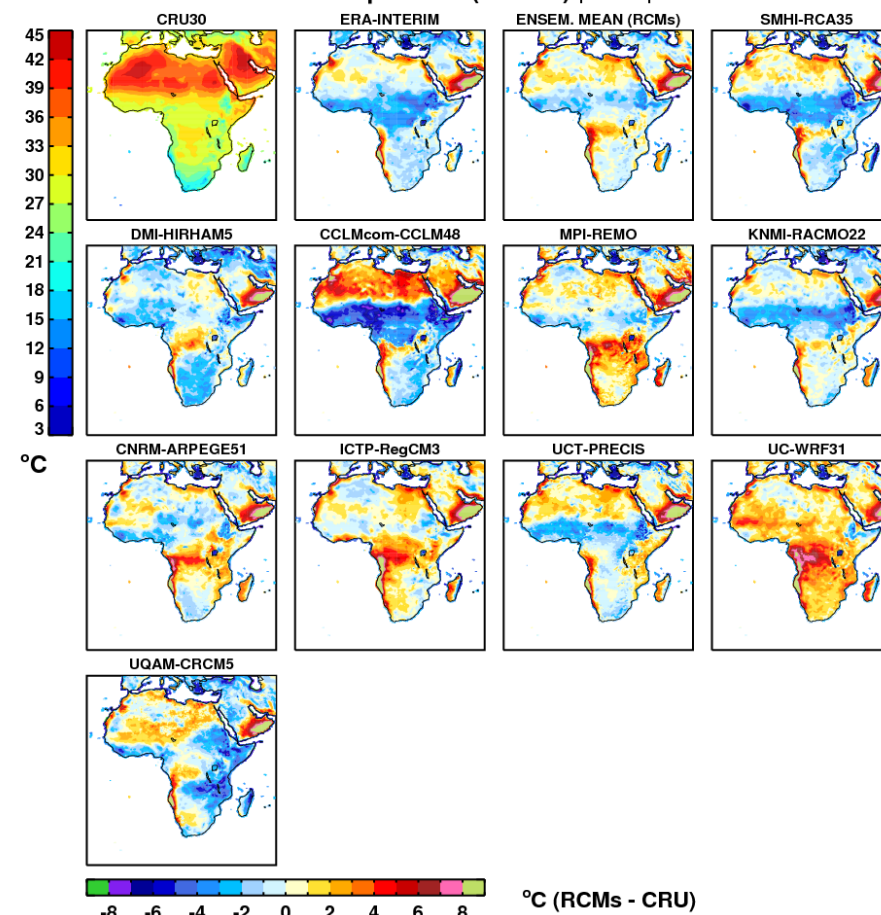
Minimum Temperature

2m Minimum Temperature (tasmin) | JAS | 1992-2006

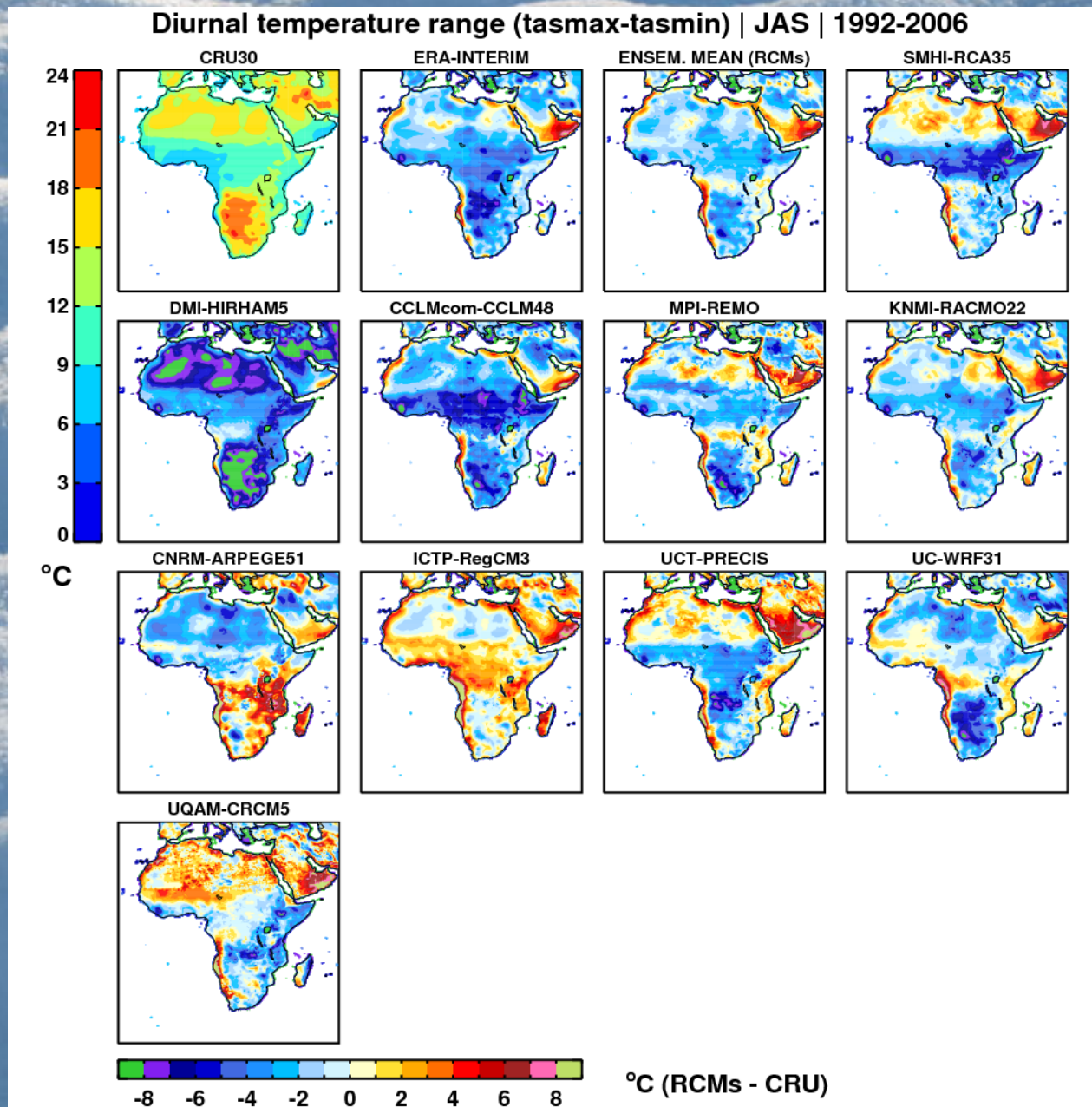


Maximum Temperature

2m Maximum Temperature (tasmax) | JAS | 1992-2006

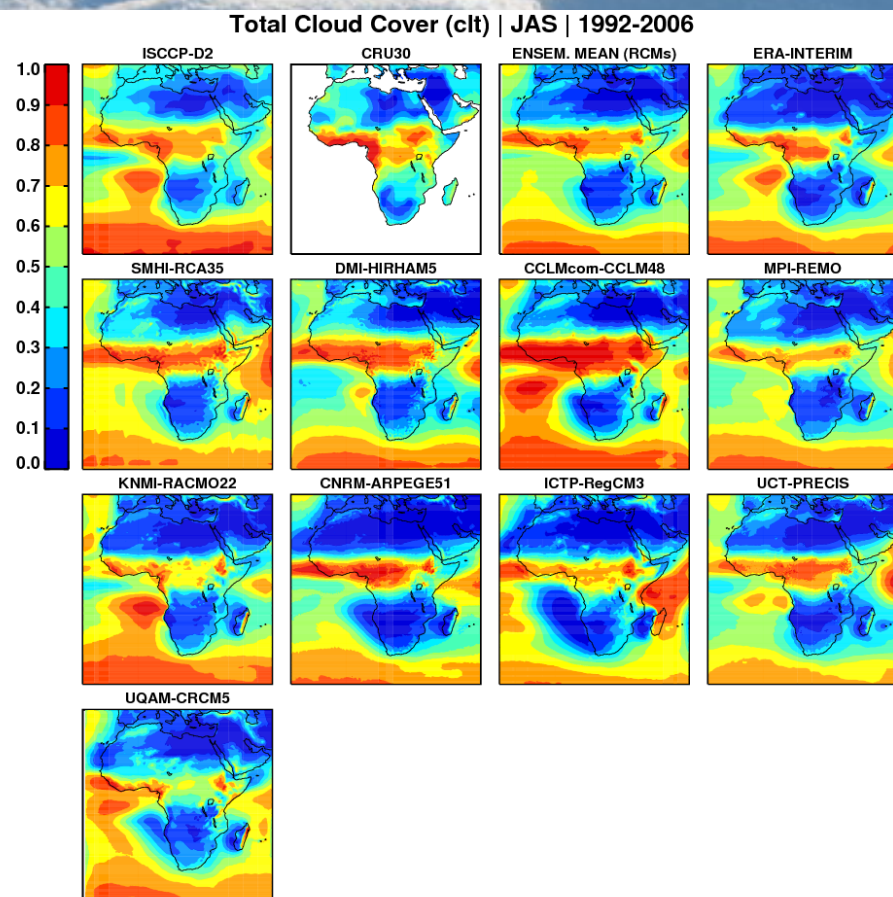


Seasonal Mean Bias in Diurnal Temperature range (JAS)

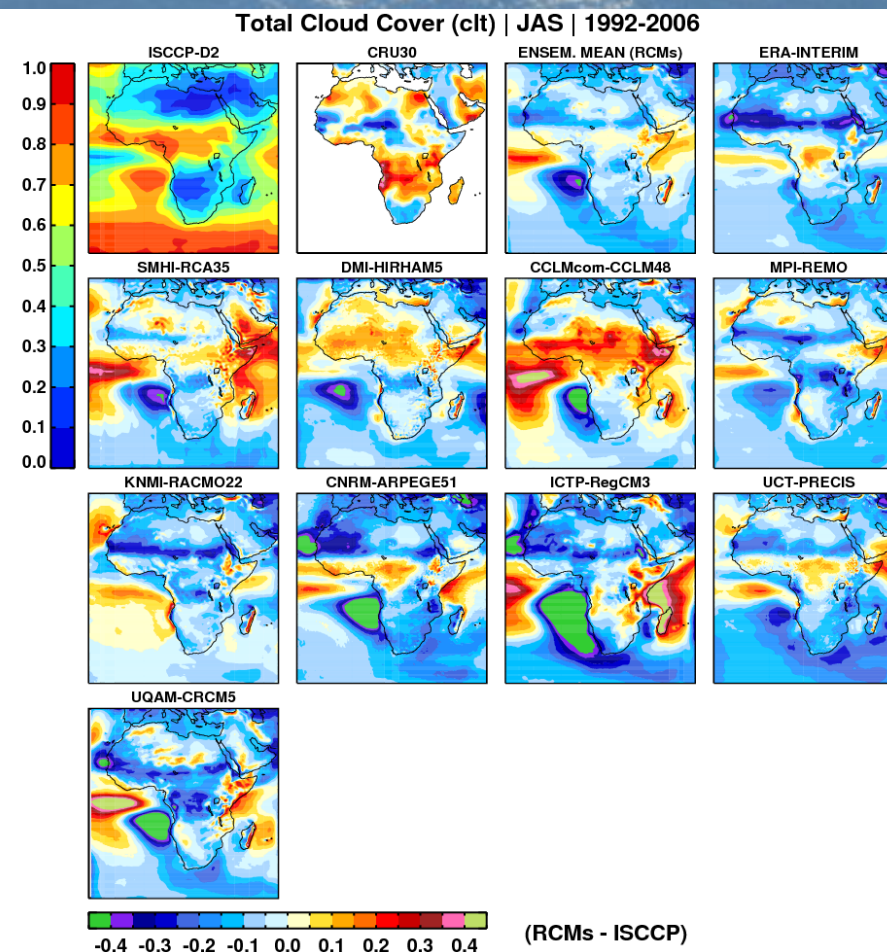


Seasonal Mean Cloud Cover (JAS)

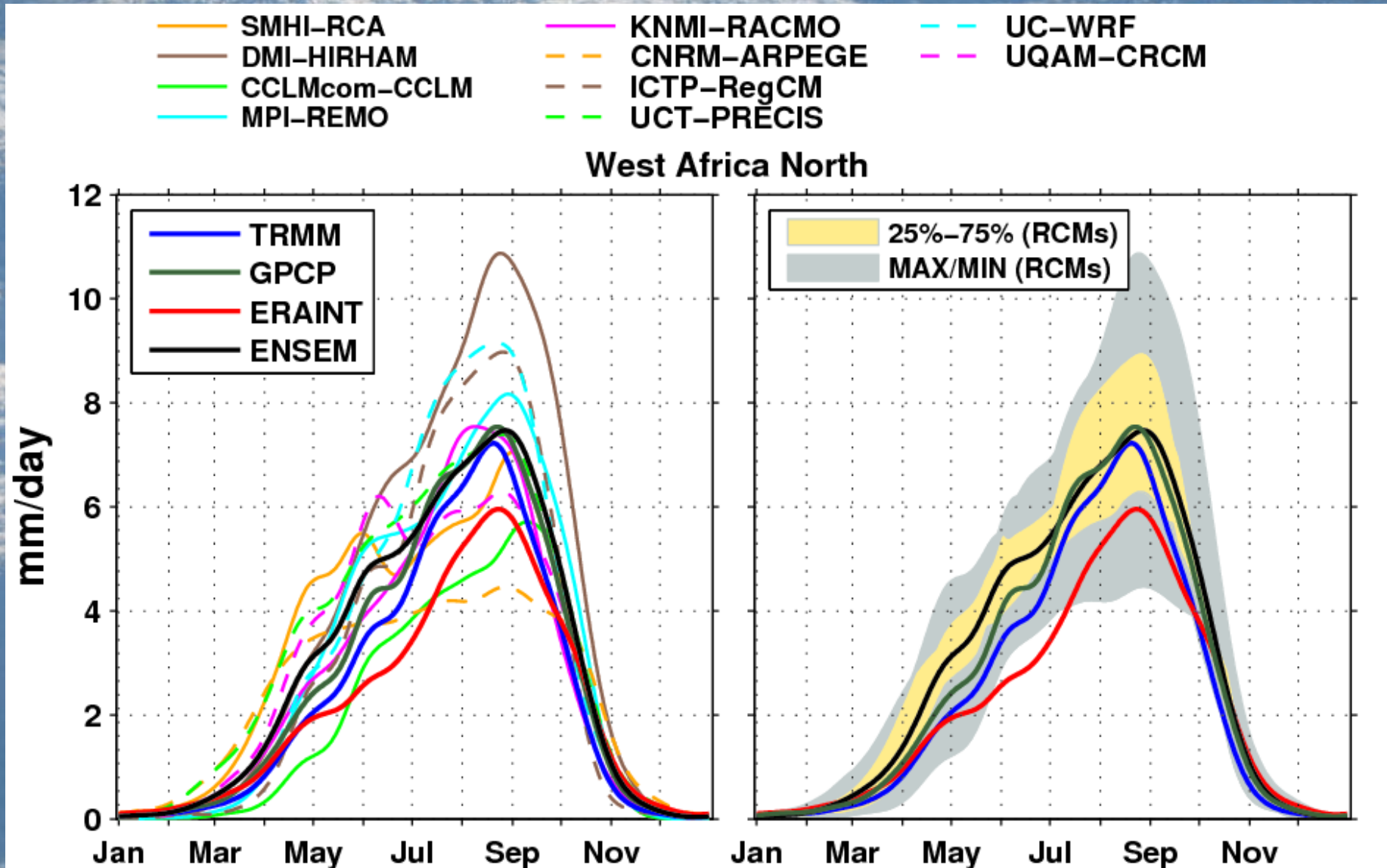
Absolute Cloud Cover



Bias in Cloud Cover

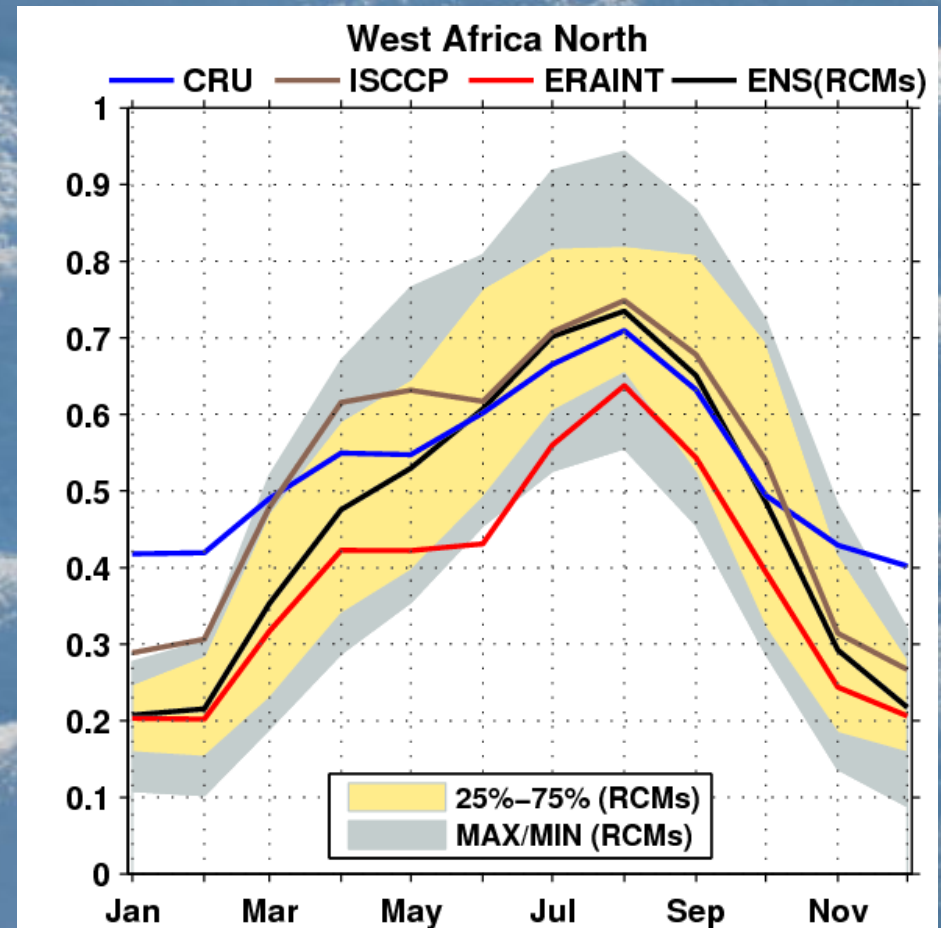
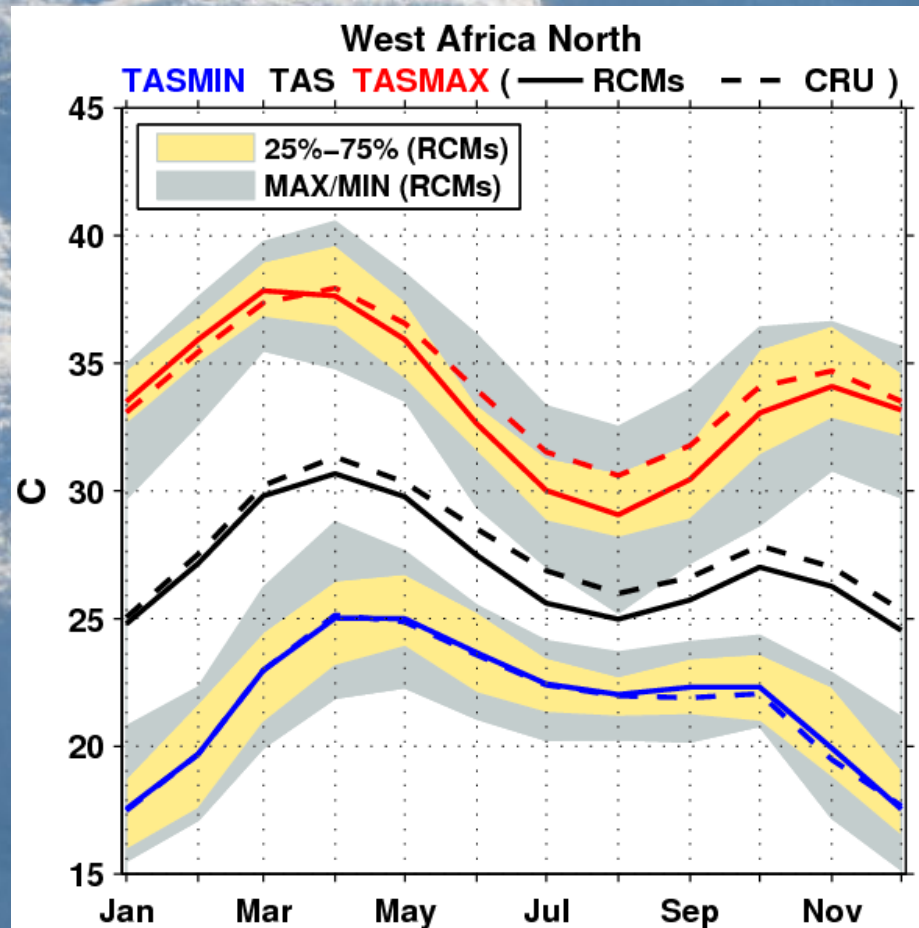


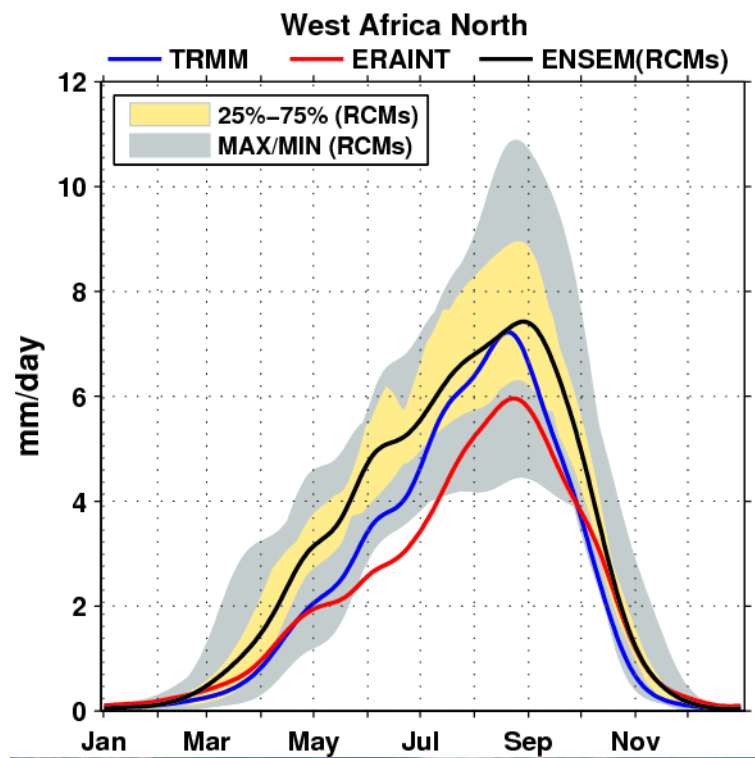
Annual Cycle spatially averaged precipitation



Mean annual cycle Tmax, Tmean, Tmin, Cloud cover

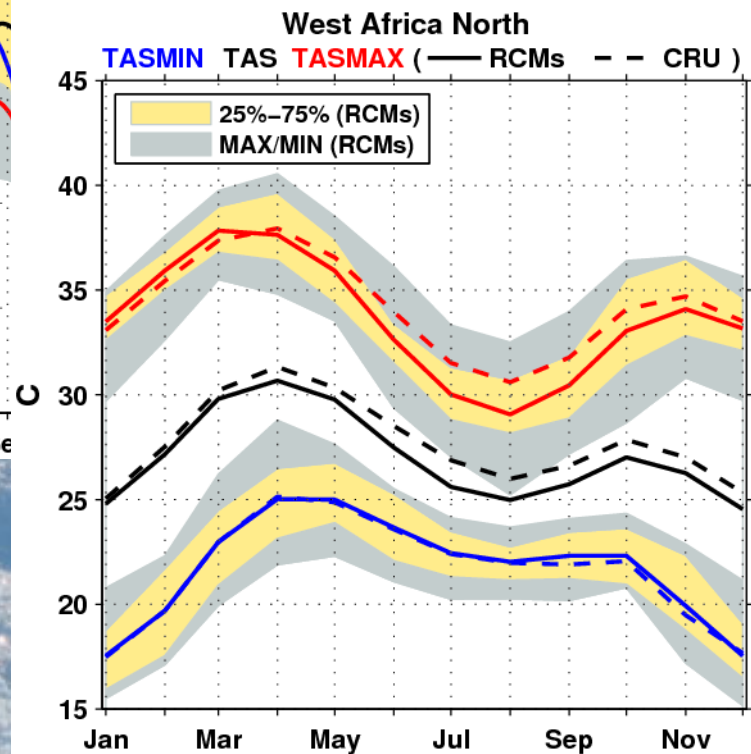
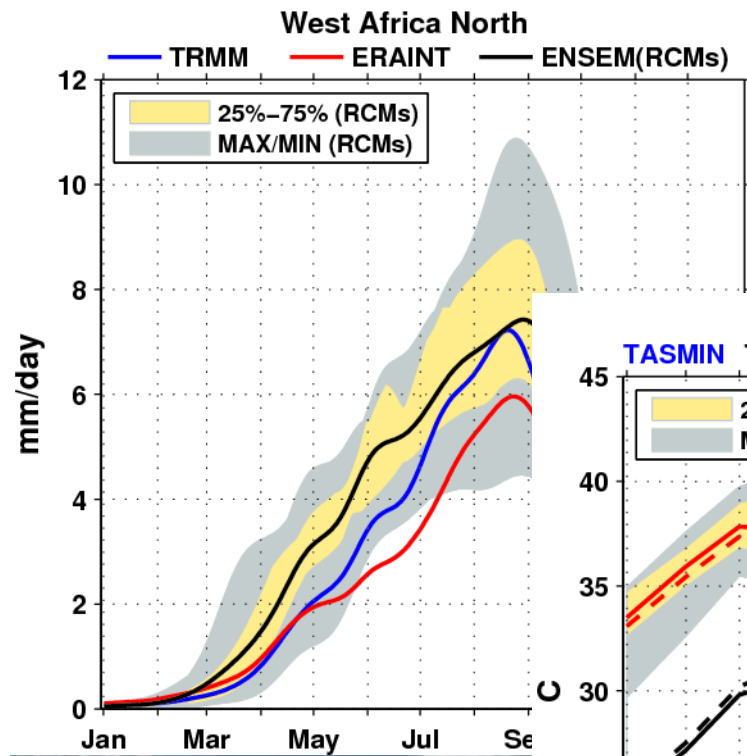
West Africa North : 1989-2008



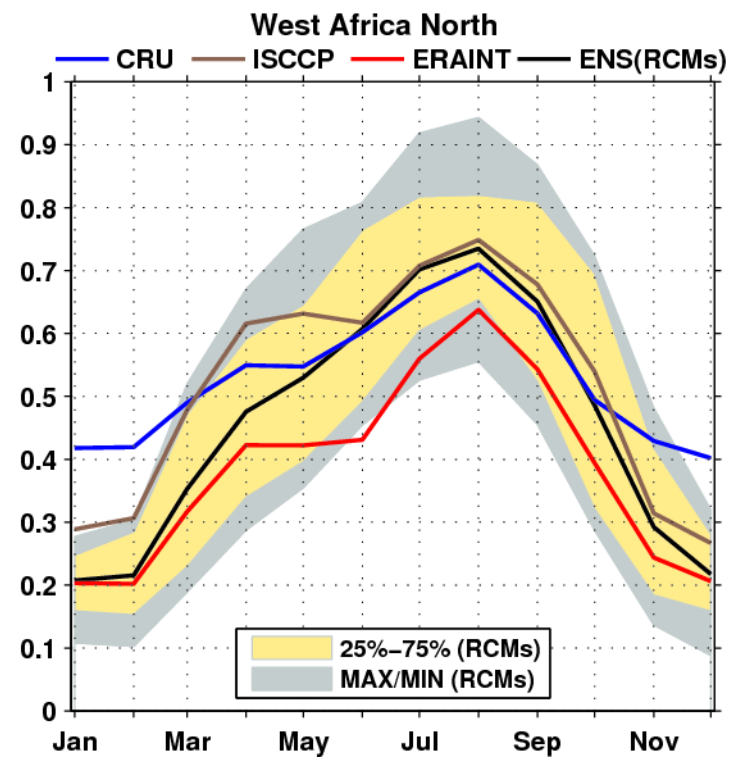
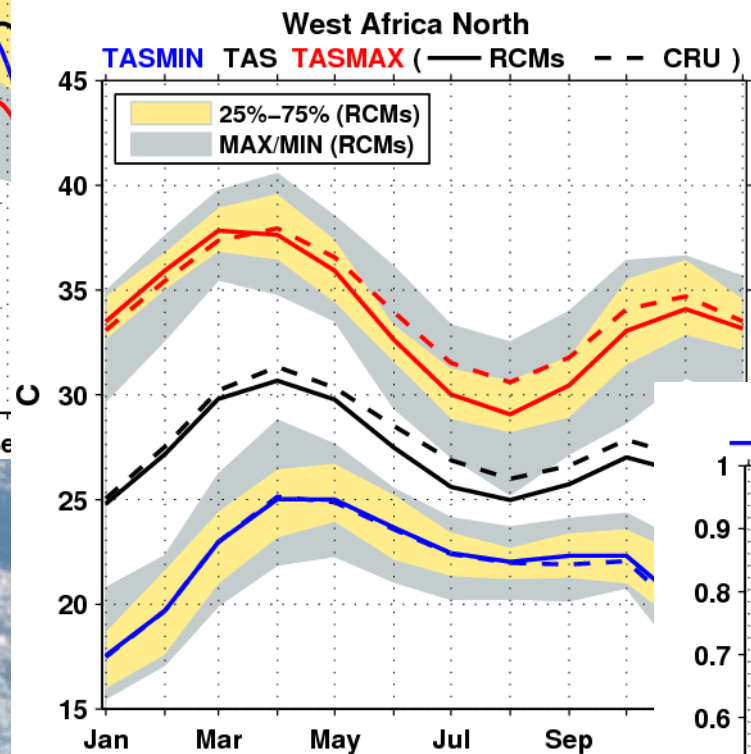
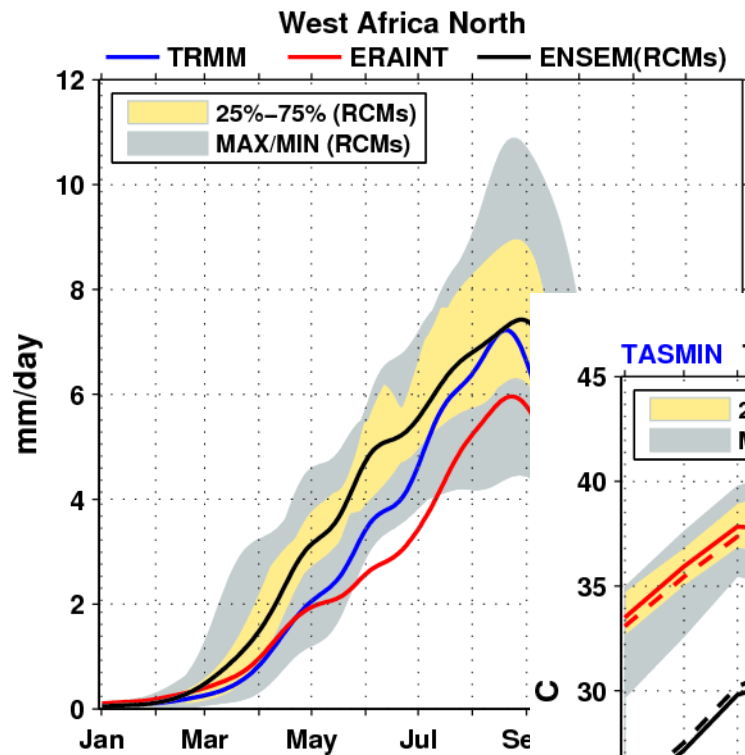


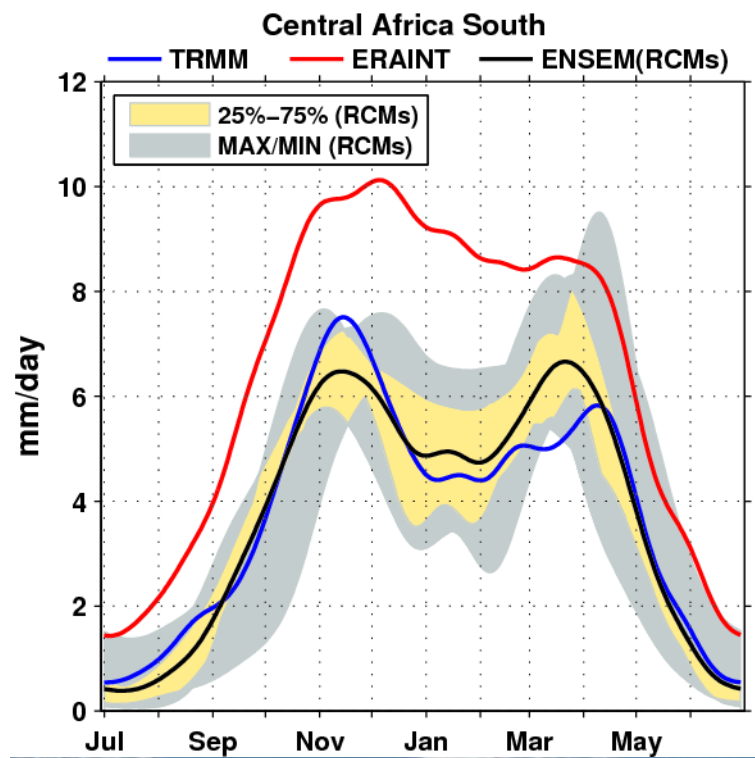
West Africa North

West Africa North



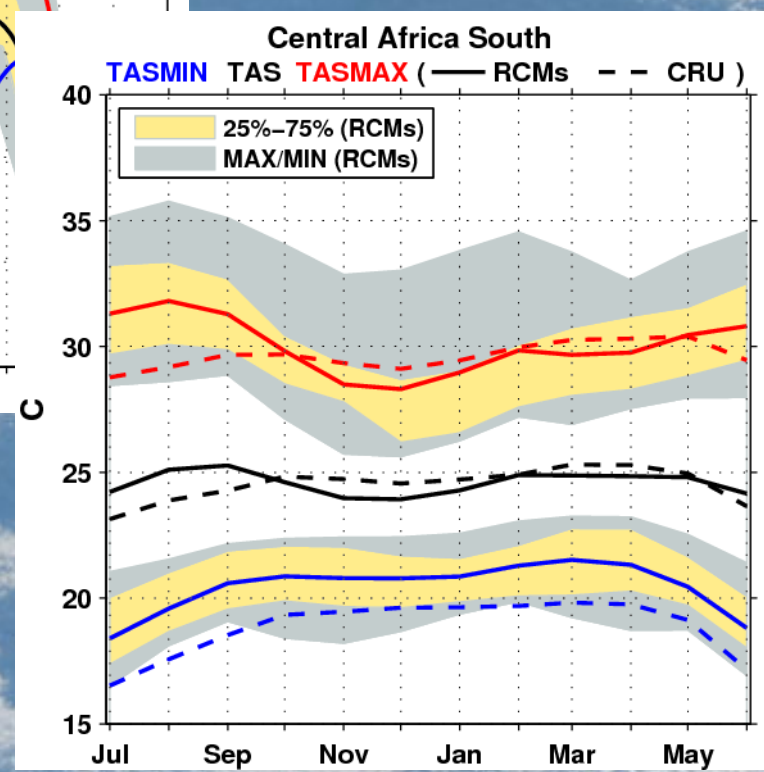
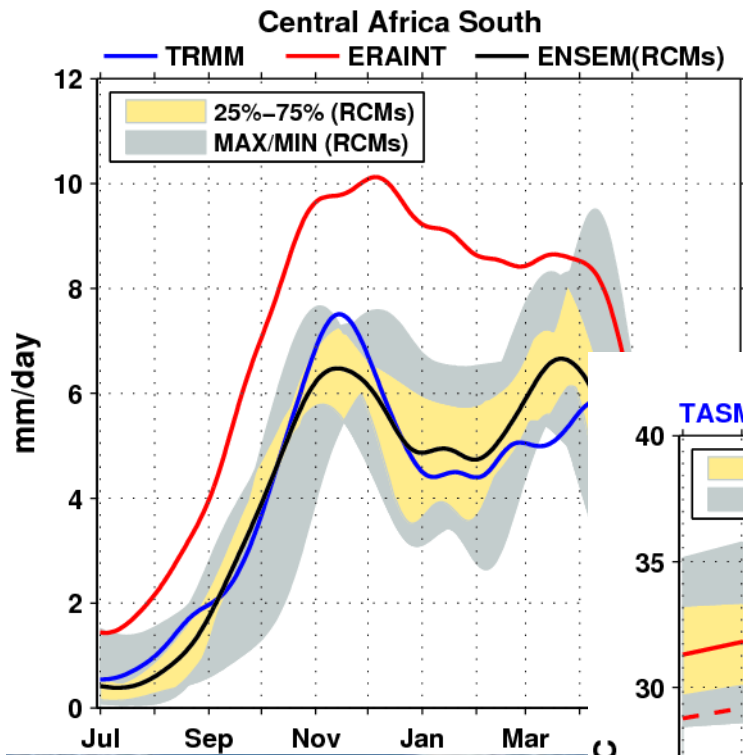
West Africa North



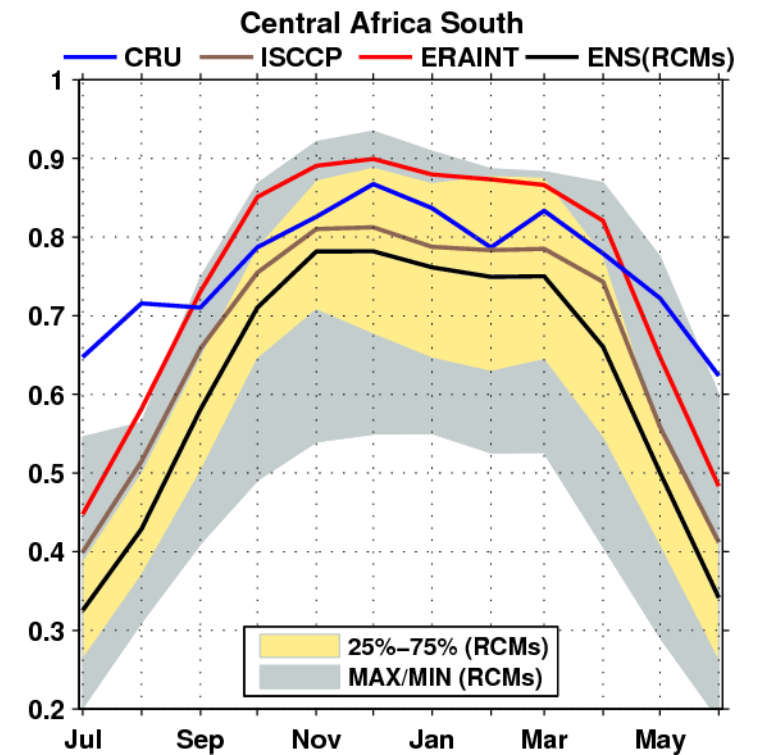
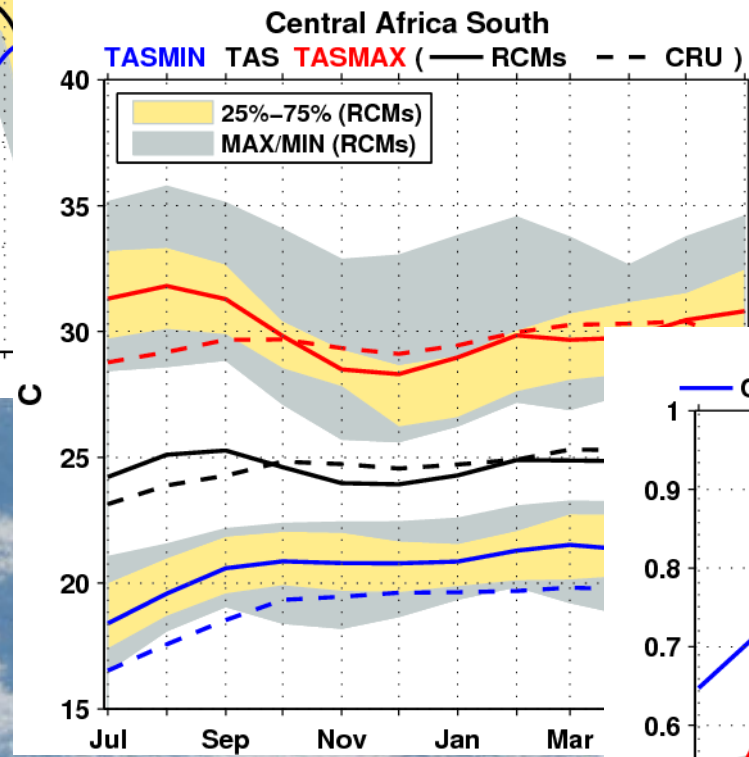
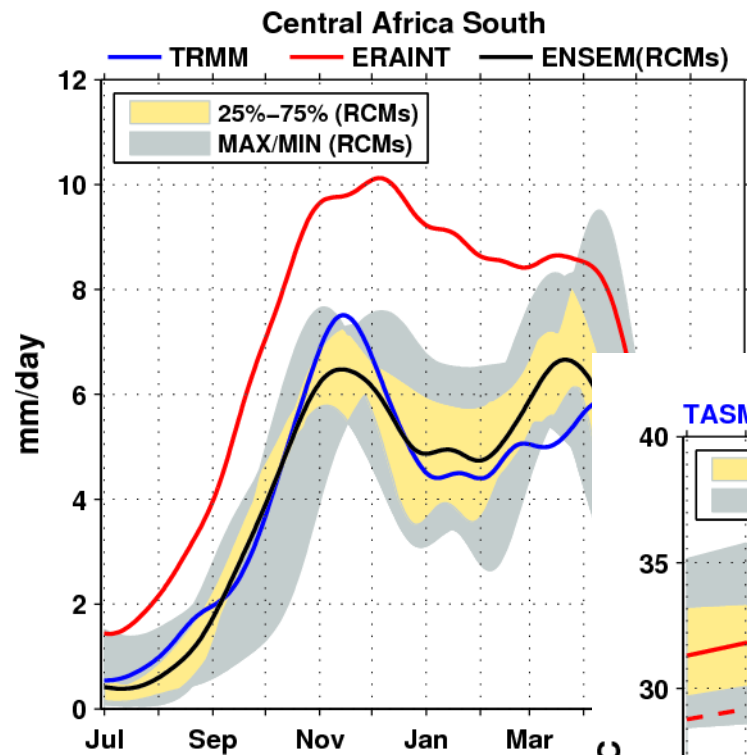


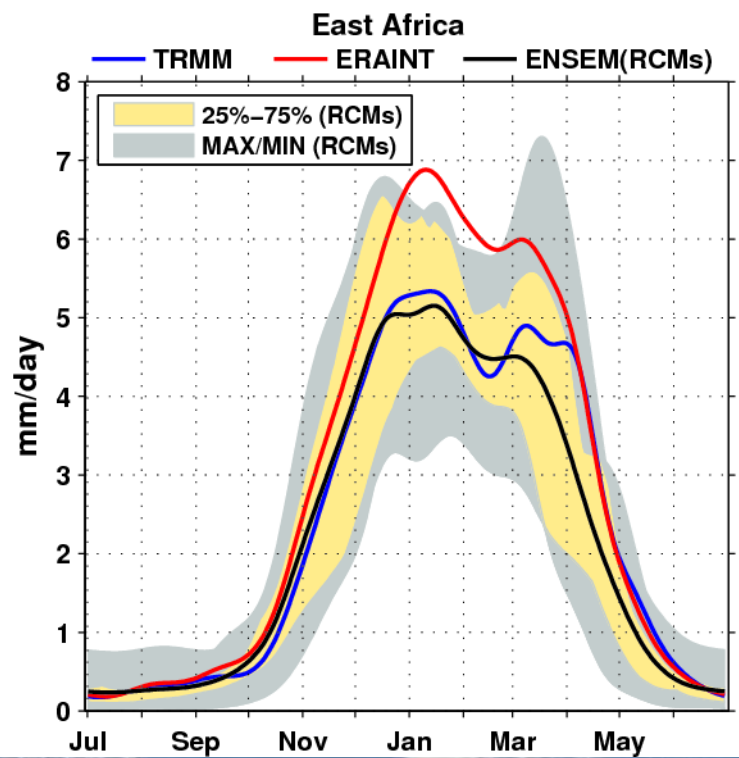
Central Africa South

Central Africa South



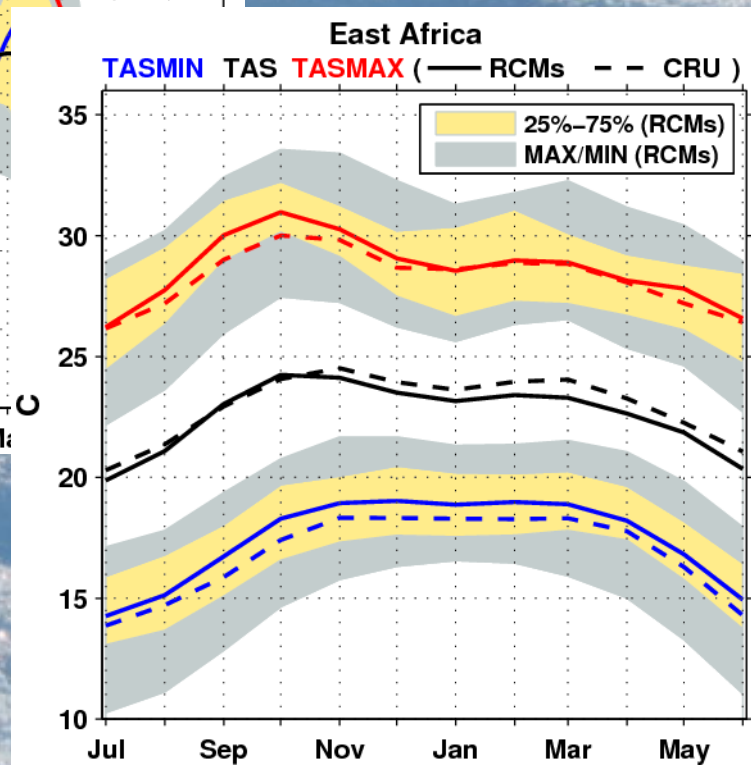
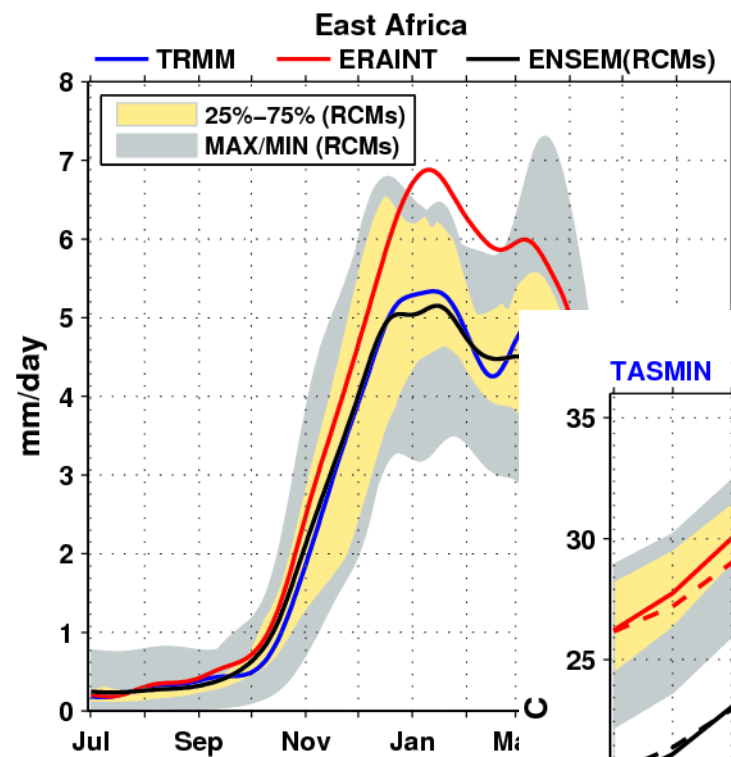
Central Africa South



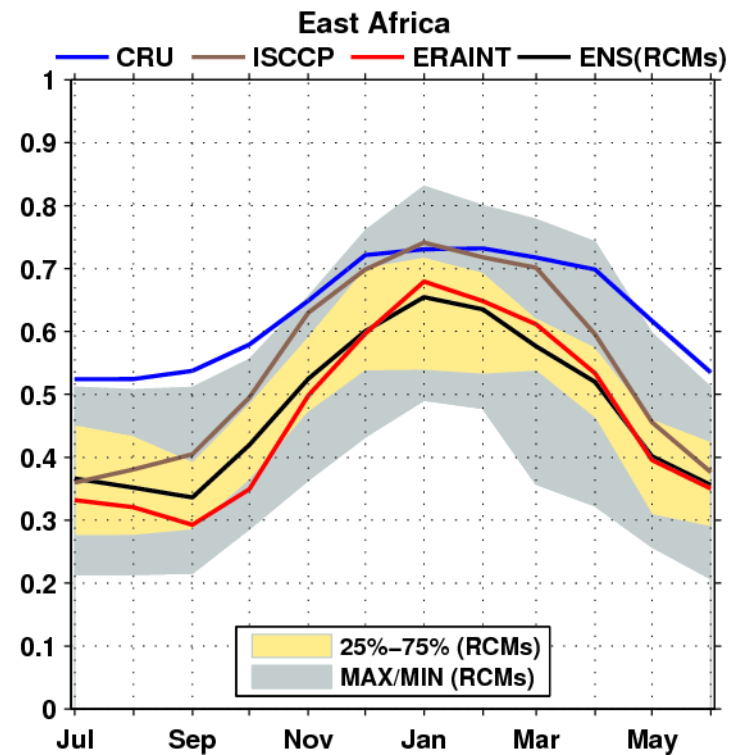
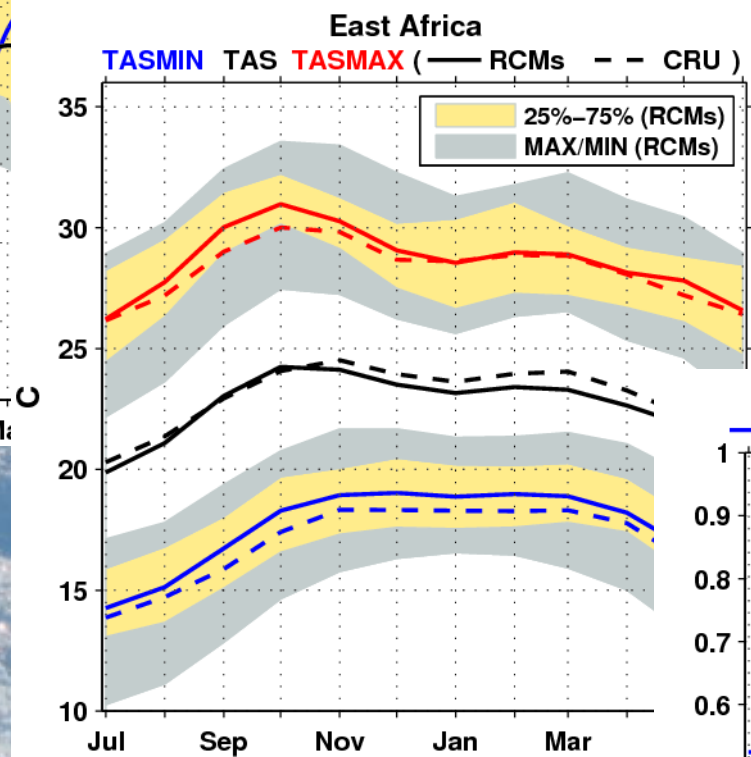
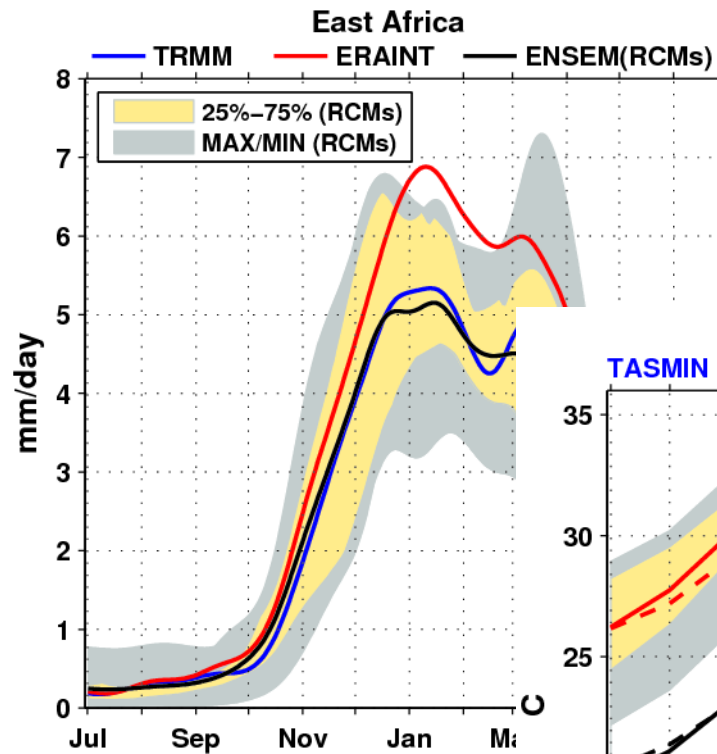


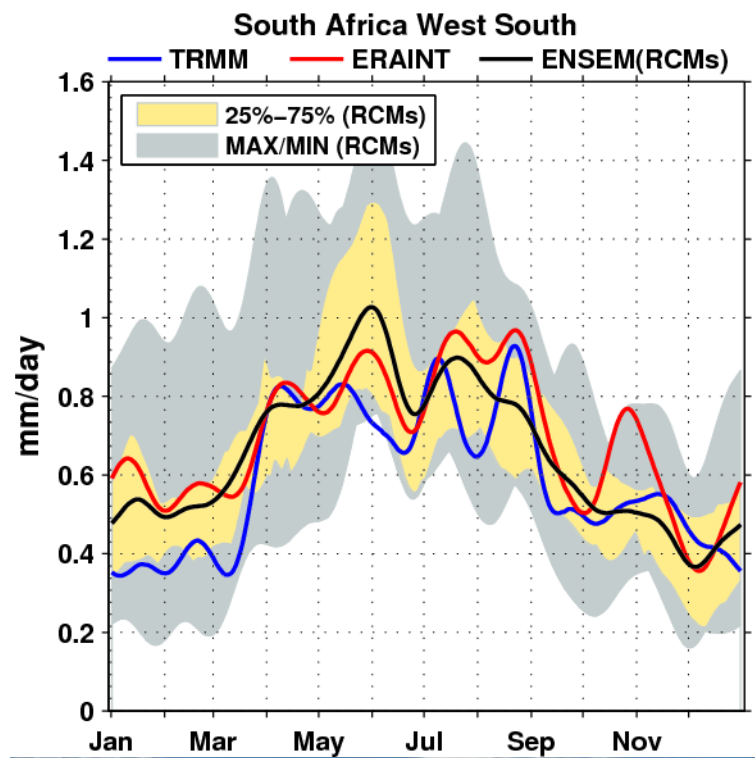
East Africa

East Africa



East Africa

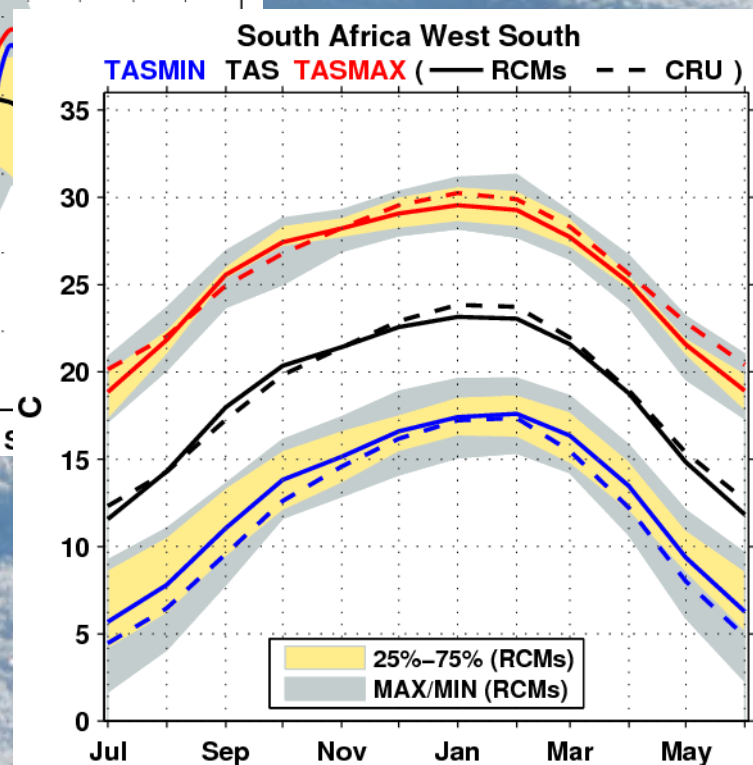
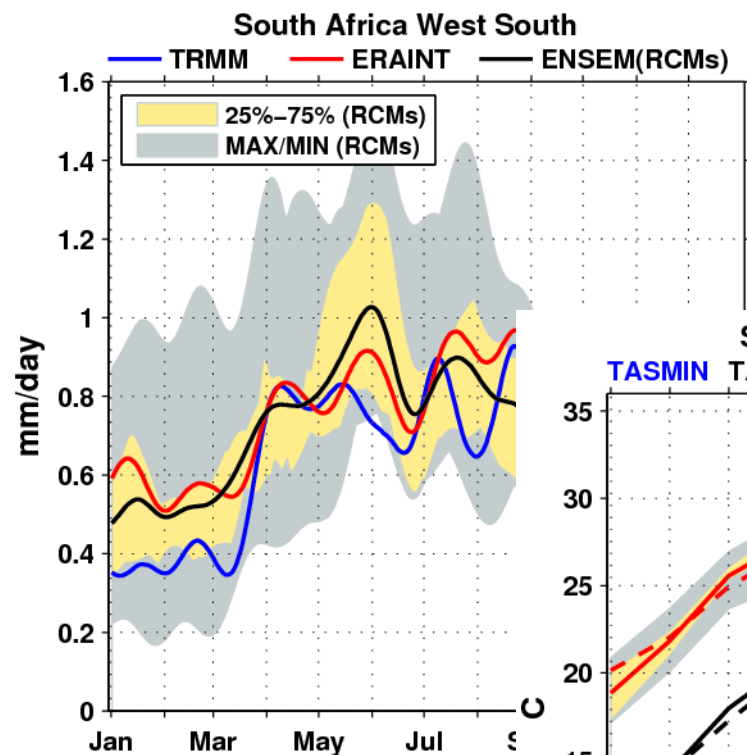




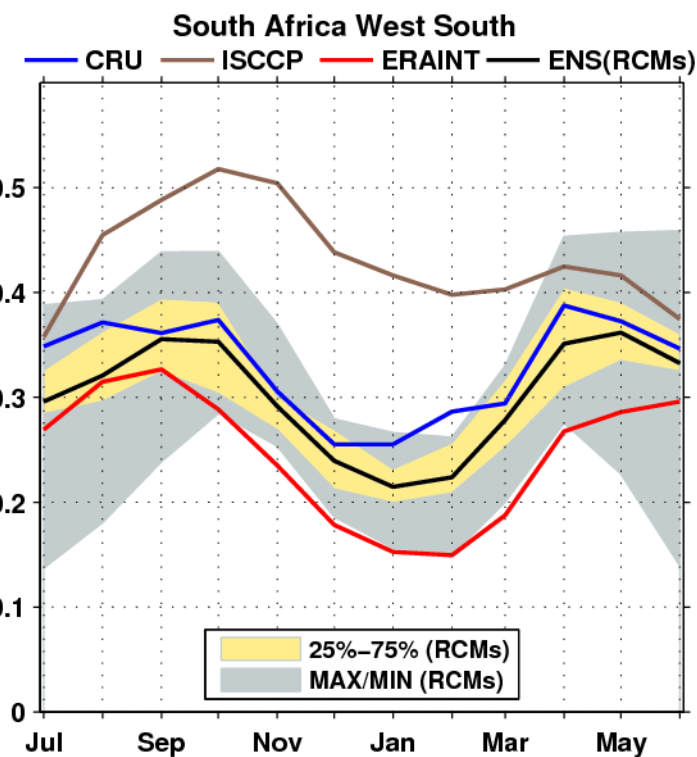
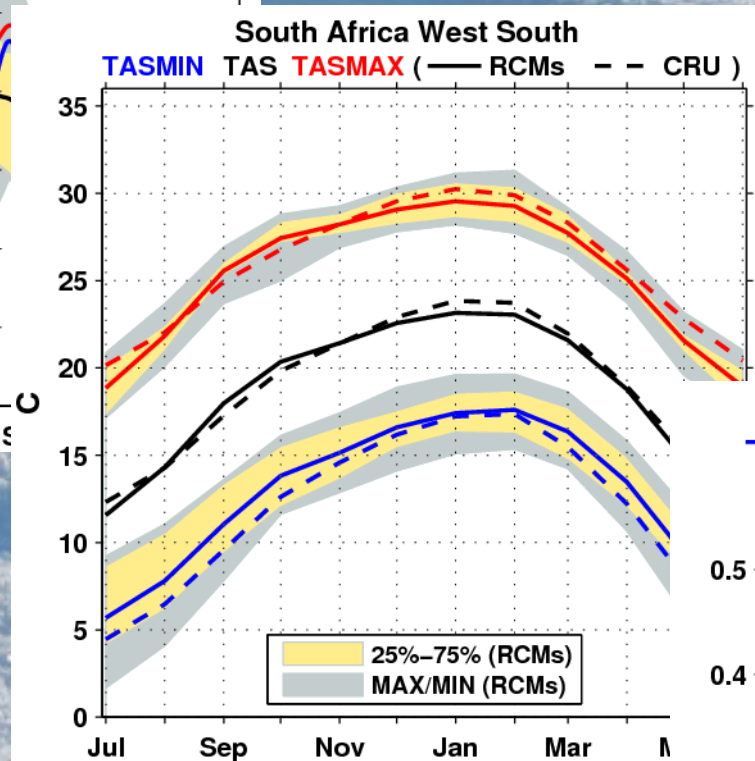
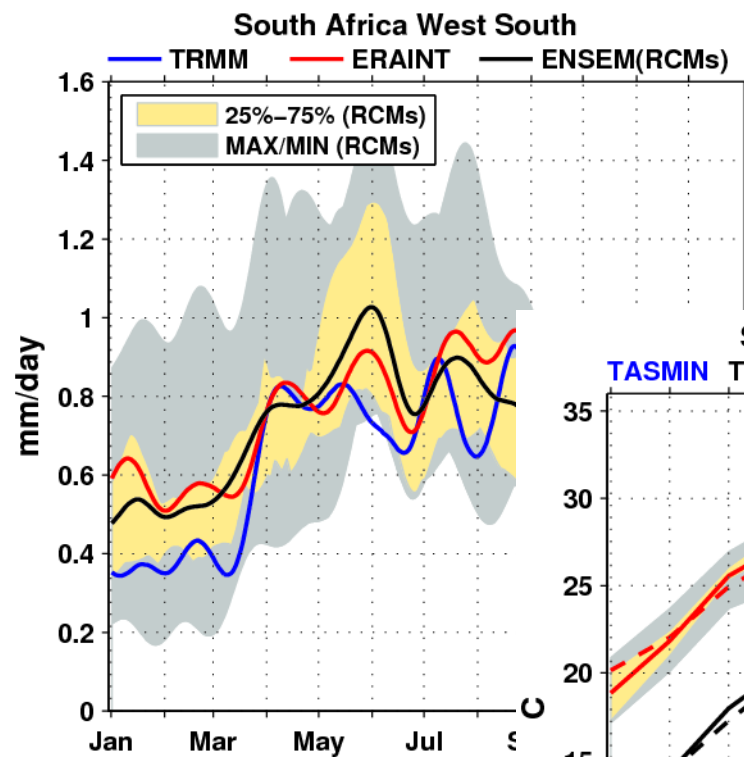
South West Africa

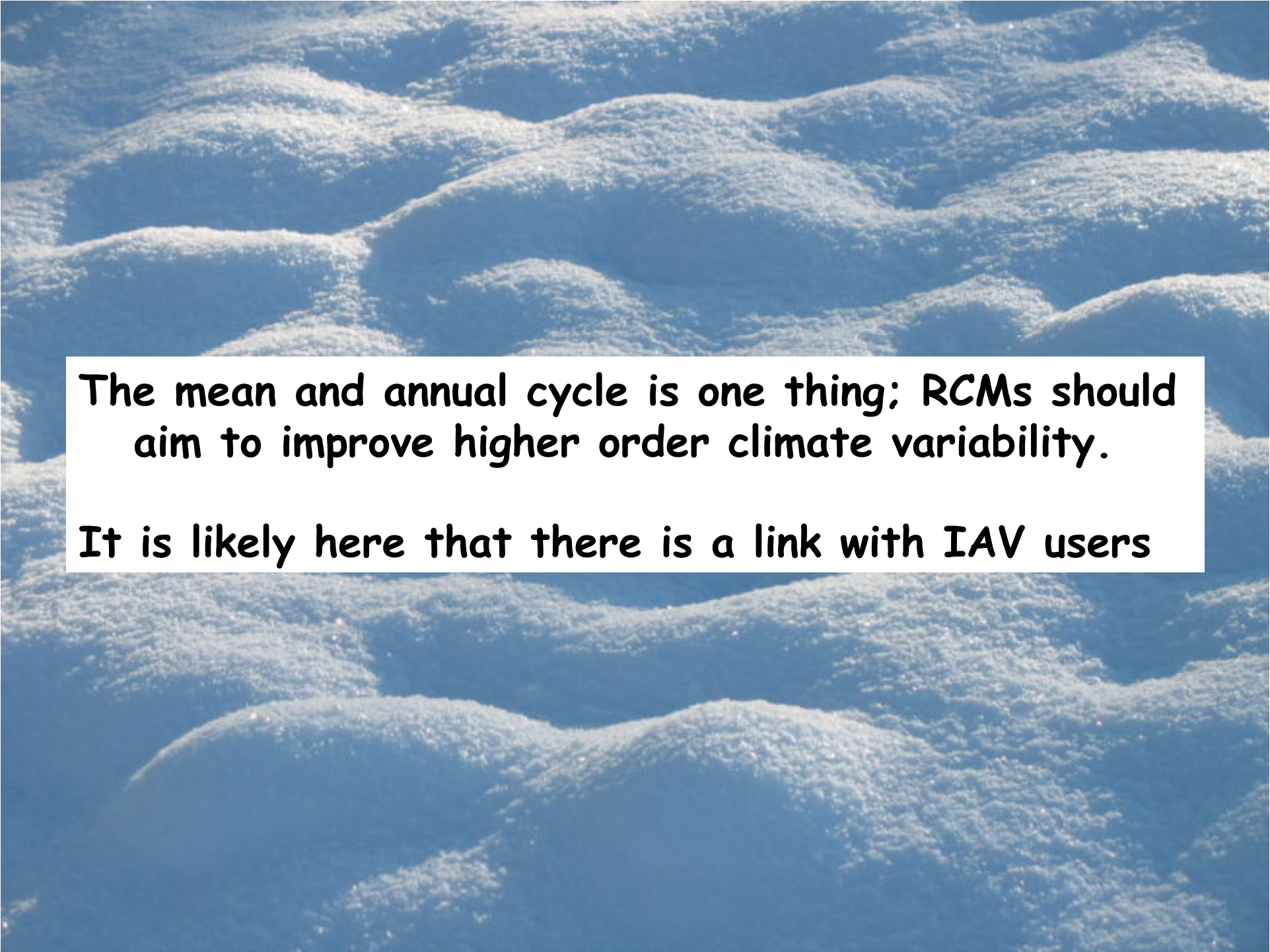


South West Africa



South West Africa

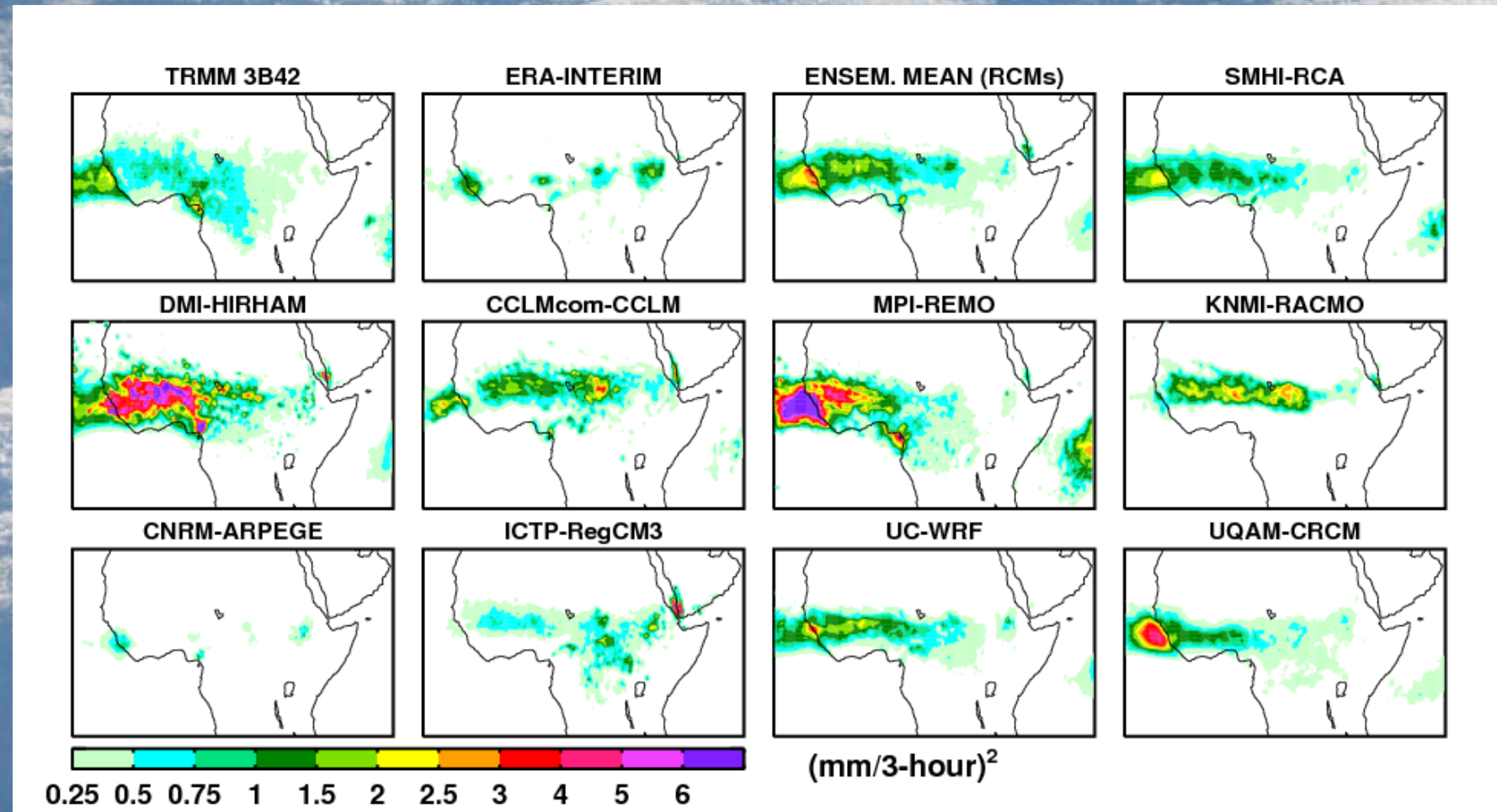


An aerial photograph of a dense forest. The tree canopy is not flat but exhibits a prominent, rhythmic, wavy pattern across the entire frame. The undulations create a series of light and dark blue-grey ridges and valleys, suggesting variations in tree height or density. The overall color palette is dominated by cool blues and greys, with some lighter, almost white, highlights on the peaks of the waves.

The mean and annual cycle is one thing; RCMs should aim to improve higher order climate variability.

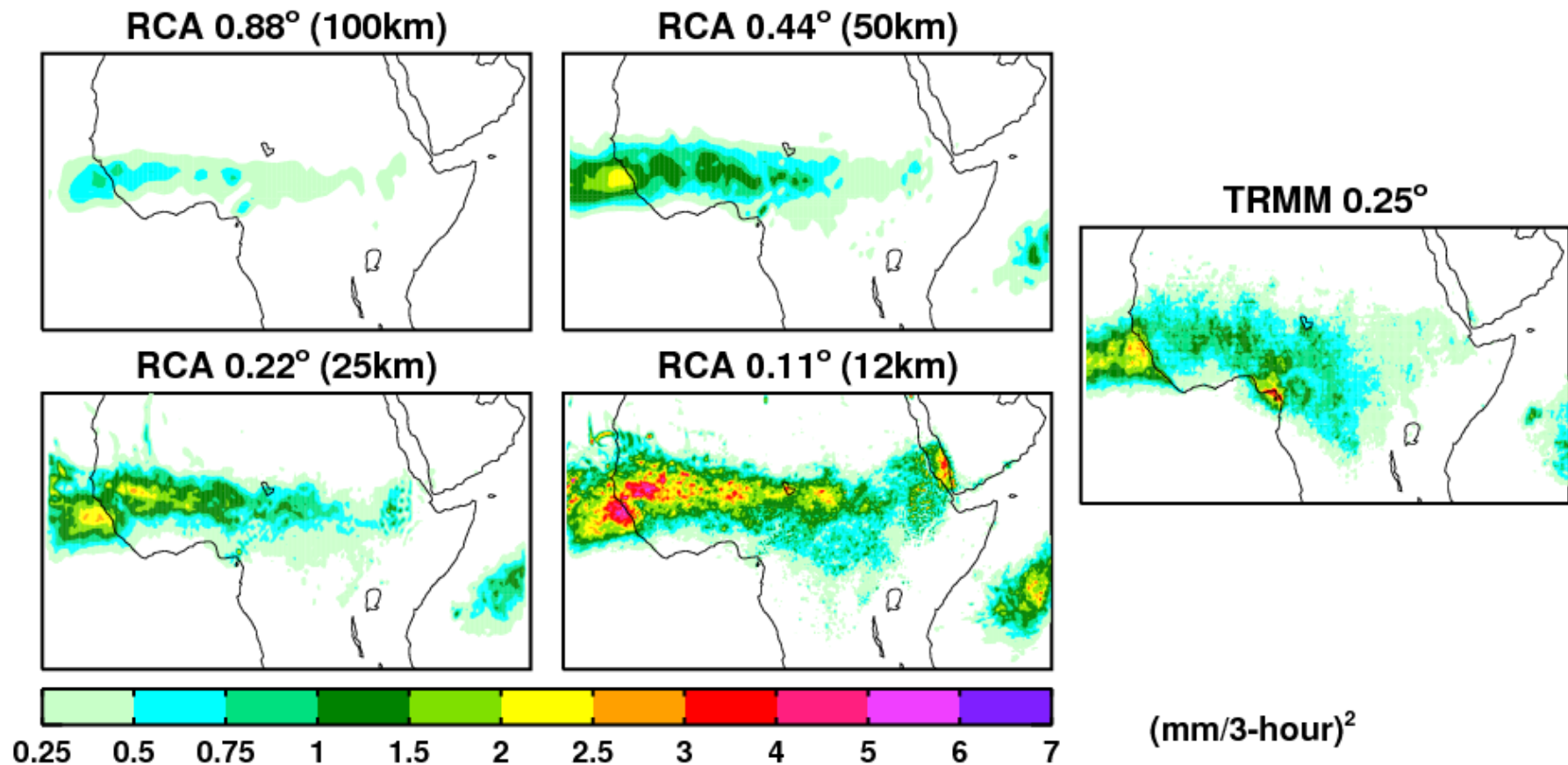
It is likely here that there is a link with IAV users

An ensemble can be used to investigate higher order climate variability of importance in impact assessment (e.g. agriculture)



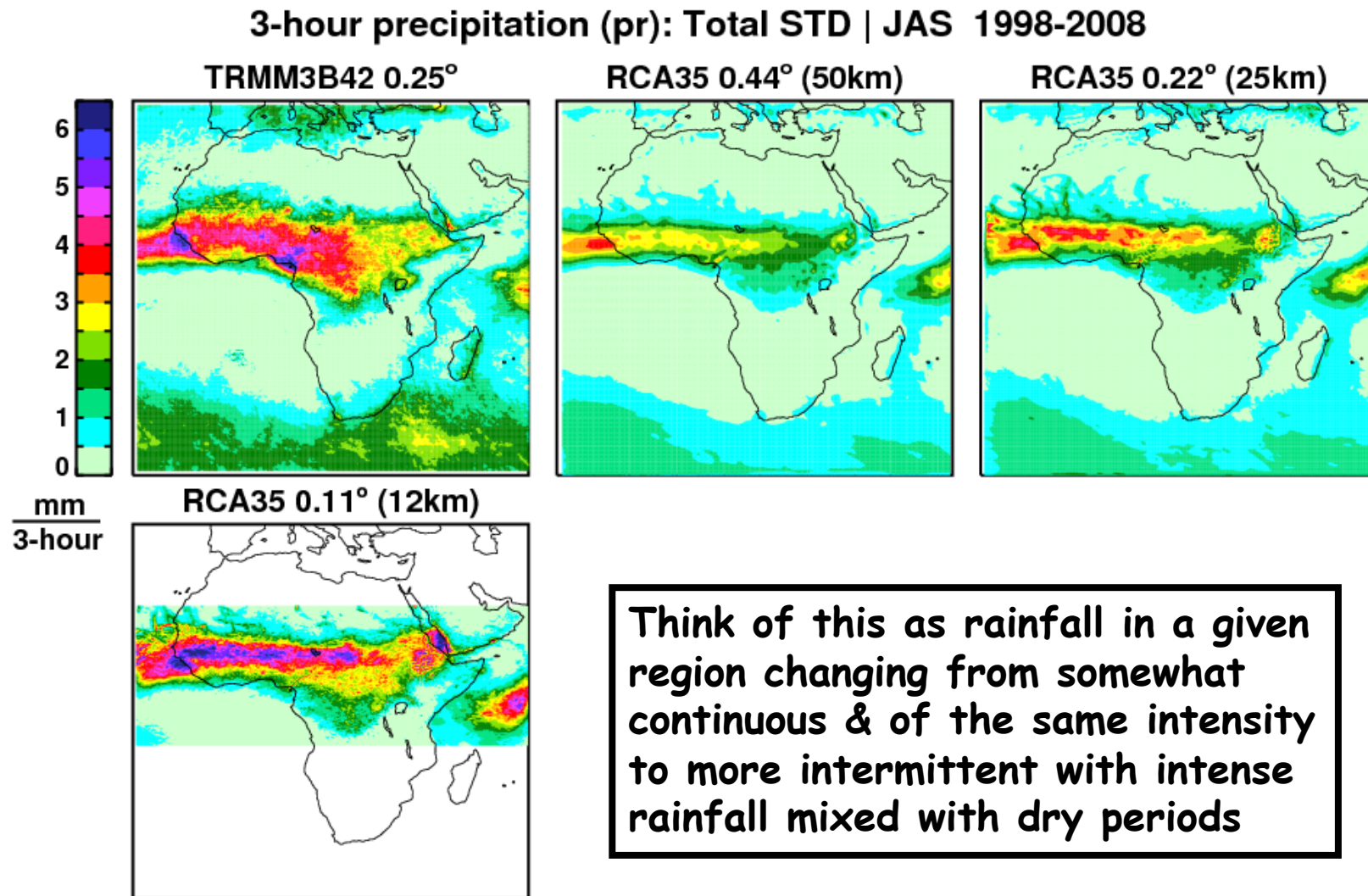
2-6 day band-passed precipitation variance highlights African Easterly Waves that deliver the majority of precipitation in the Sahel region

The intensity of such convectively-driven (precipitating) systems is sensitive to model resolution, often becoming more intense (realistic) at higher resolution



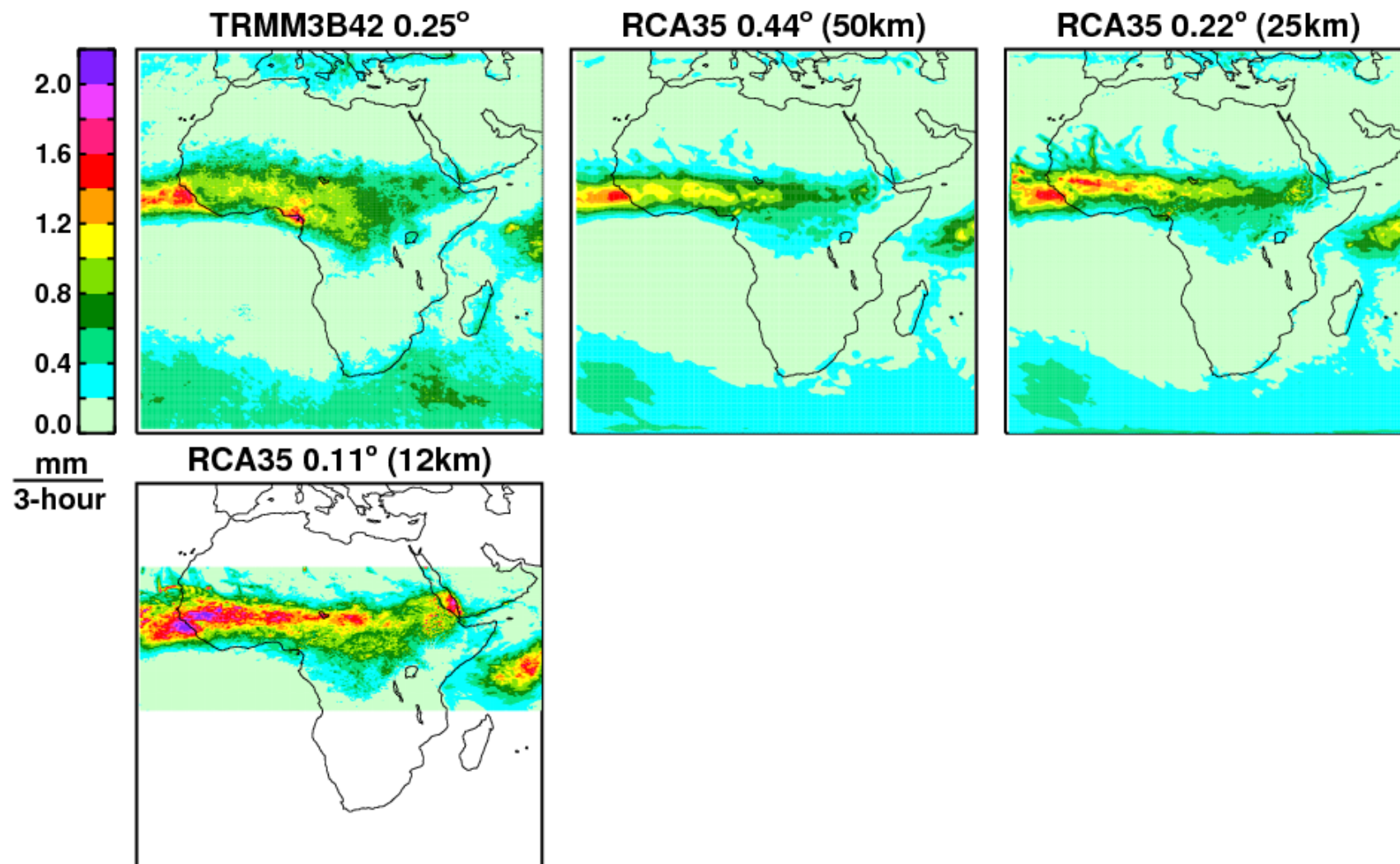
Evaluation of high resolution models may be limited by observations

Total Standard Deviation (variance^{1/2}) increases with model Resolution: Precipitating systems become more active (realistic)

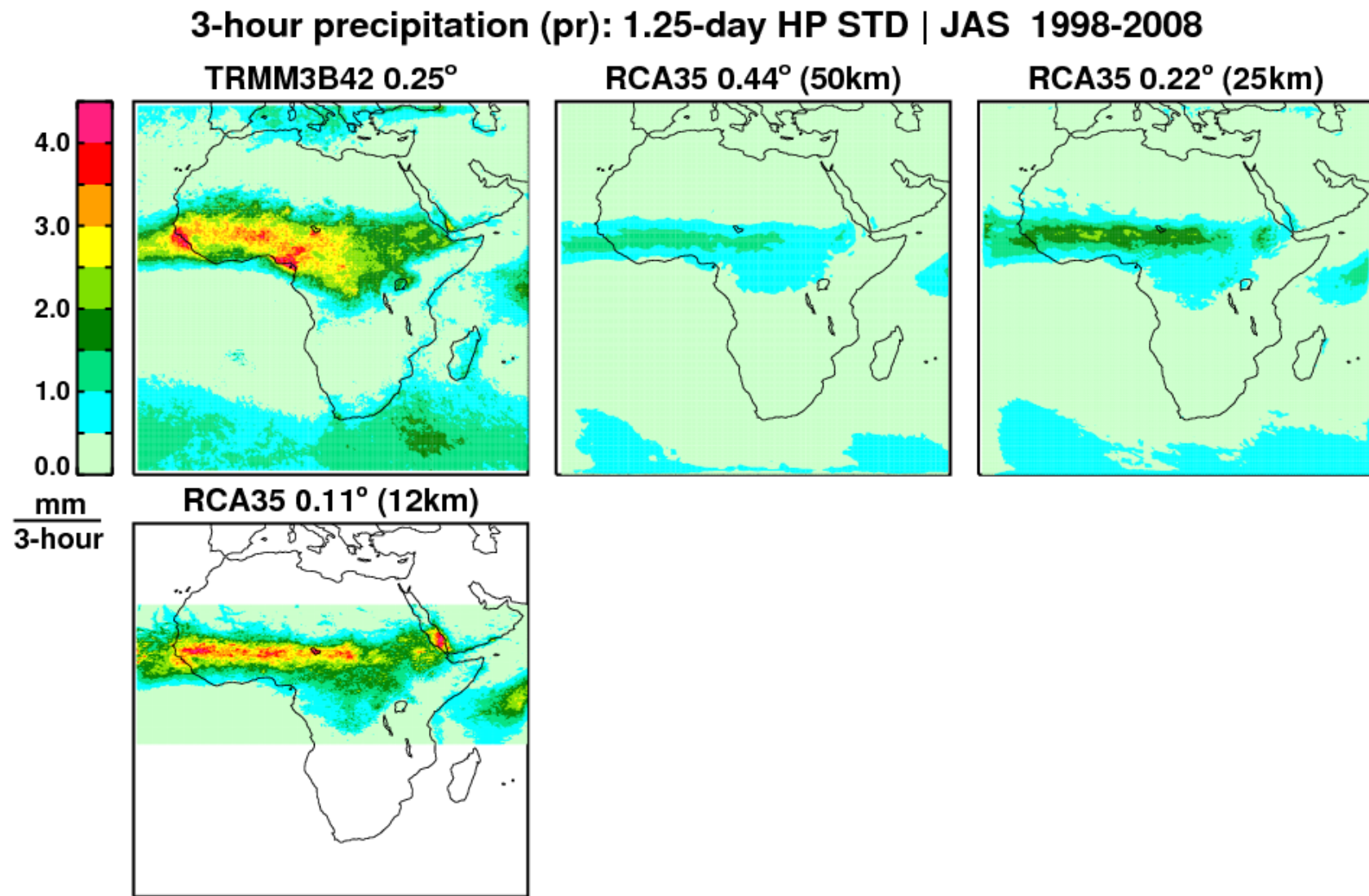


2-6 day band-passed Standard deviation precipitation (JAS)

3-hour precipitation (pr): 2-6 day BP STD | JAS 1998-2008



Standard Deviation within the diurnal cycle (diurnal cycle amplitude)



Summary

Africa-CORDEX is well underway, 10 groups have made ERA-interim runs 1989-2008 on a common 50km grid.

These 10 groups (plus at least 1 more I know of) will all make at least 1 GCM projection run. Some plan to sample >3 GCMs.

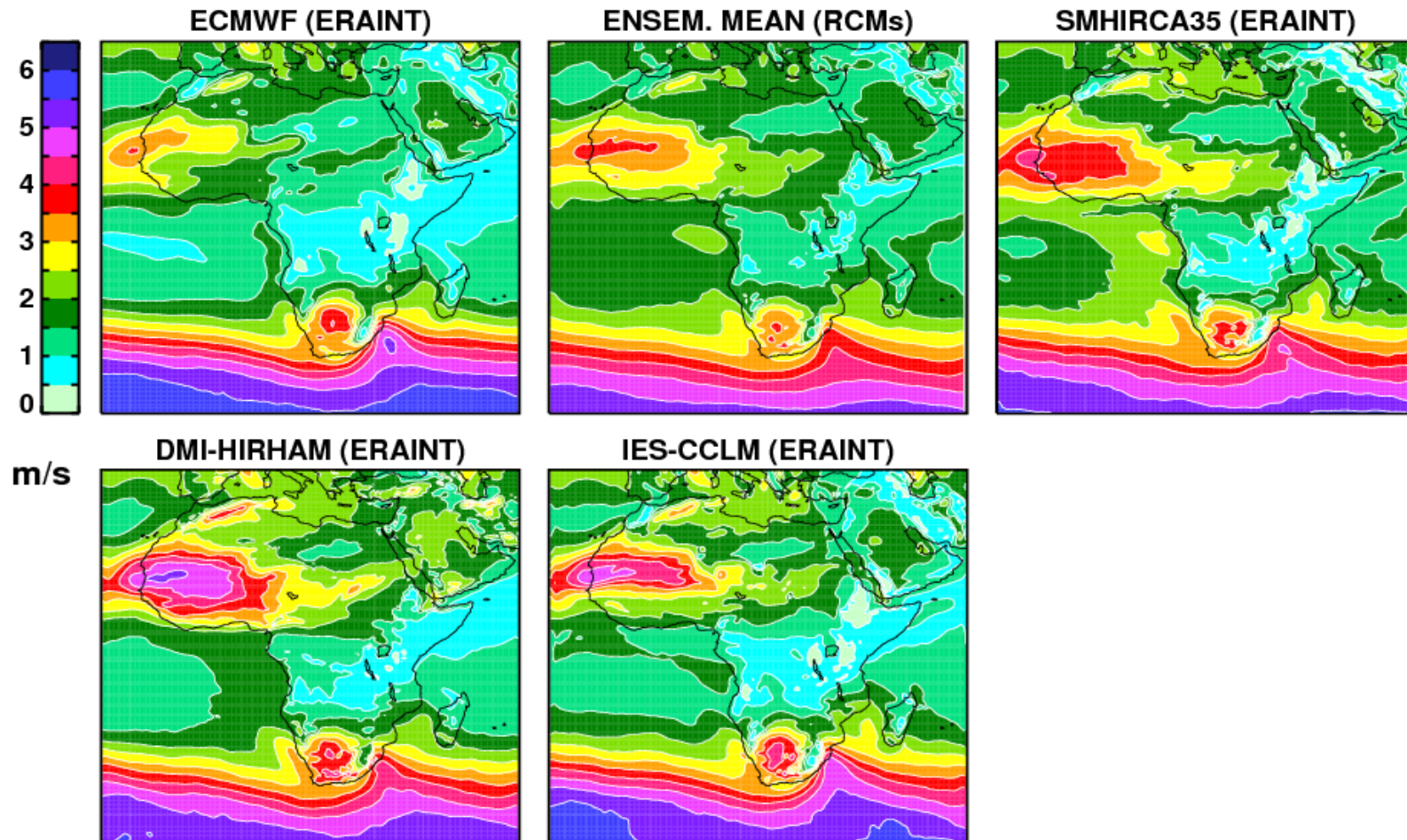
Some thought will be needed to best populate the GCM/RCM/RCP matrix in order to maximize potential benefits.

A CORDEX-Africa diagnostic & evaluation panel has been formed led by University of Cape Town.

First WCRP-START CORDEX-Africa analysis workshop occurs this Friday/Saturday in ICTP. Second workshop in Cape Town July 2011

This team will lead the analysis of CORDEX-Africa projections with a plan to have papers submitted by summer 2012 to influence the IPCC AR5 assessment.

2-6 day band-passed Standard deviation 850hpa meridional wind (JAS)



ERA-interim underestimates AEW StDEV in precipitation compared to TRMM which suggests that the StDEV in v850 may also be an underestimate in ERA-interim (e.g. RCMs may be more realistic)

Wind variance is much less sensitive to resolution than precipitation
OK. Diabatic heating affects dynamics on a larger spatial scale.

6-hour meridional wind at 850 mb (va850): 2-6 day BP STD | JAS 1998-2008

