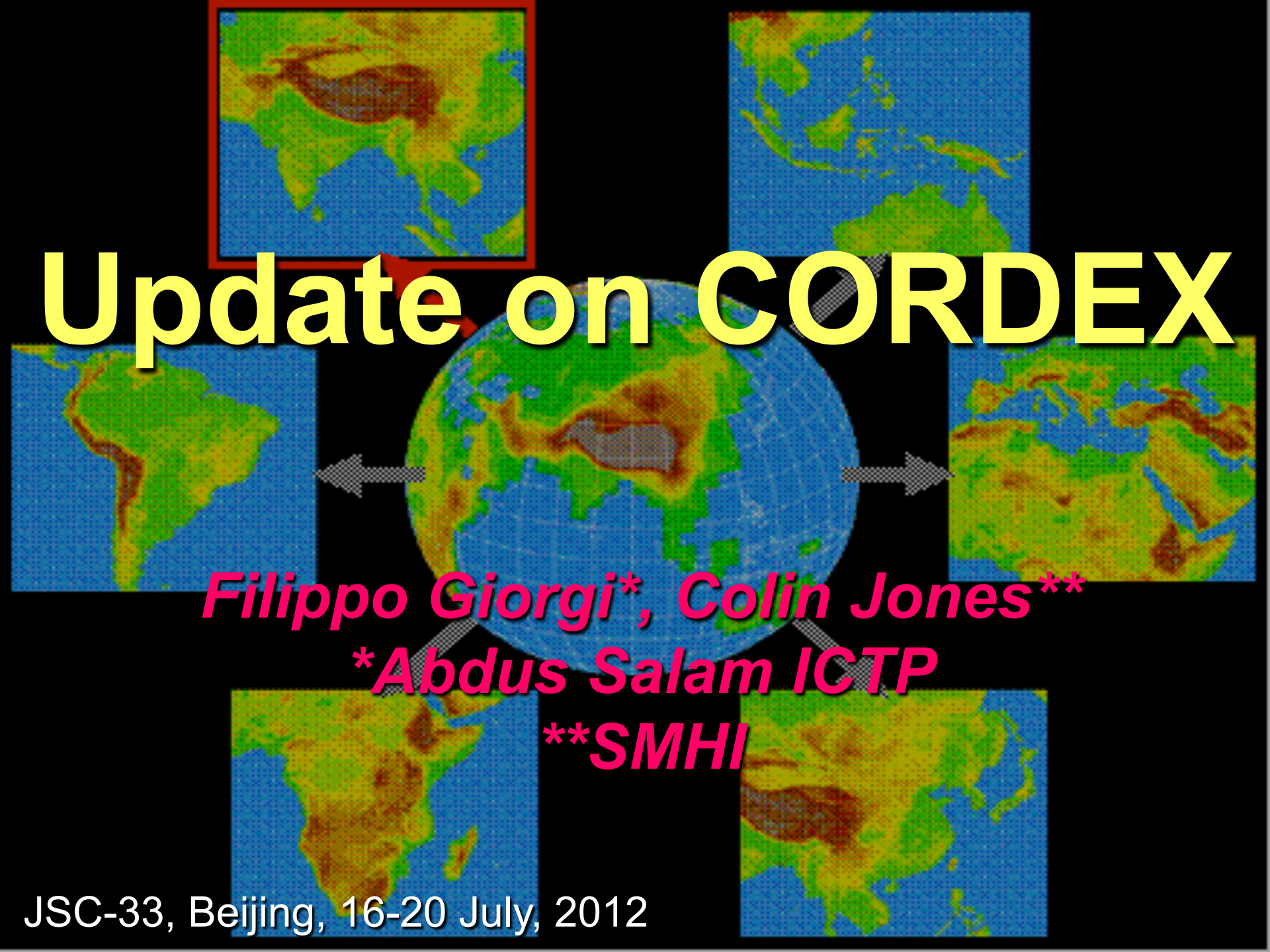


Update on CORDEX

Filippo Giorgi, Colin Jones***
**Abdus Salam ICTP*
***SMHI*

JSC-33, Beijing, 16-20 July, 2012

COordinated Regional Downscaling EXperiment CORDEX

- Modeling framework designed to:
  - Evaluate and improve RCD models and techniques
  - Provide a coordinated set of RCD-based projections/predictions for regions worldwide
  - Facilitate the communication with the IAV community and the involvement of the research community from developing countries

CORDEX Phase I experiment design

Model Evaluation Framework

Climate Projection Framework

AMIP like

Multiple regions (Initial focus on Africa)
50 km grid spacing

CMIP like

ERA-Interim LBC
1989-2007

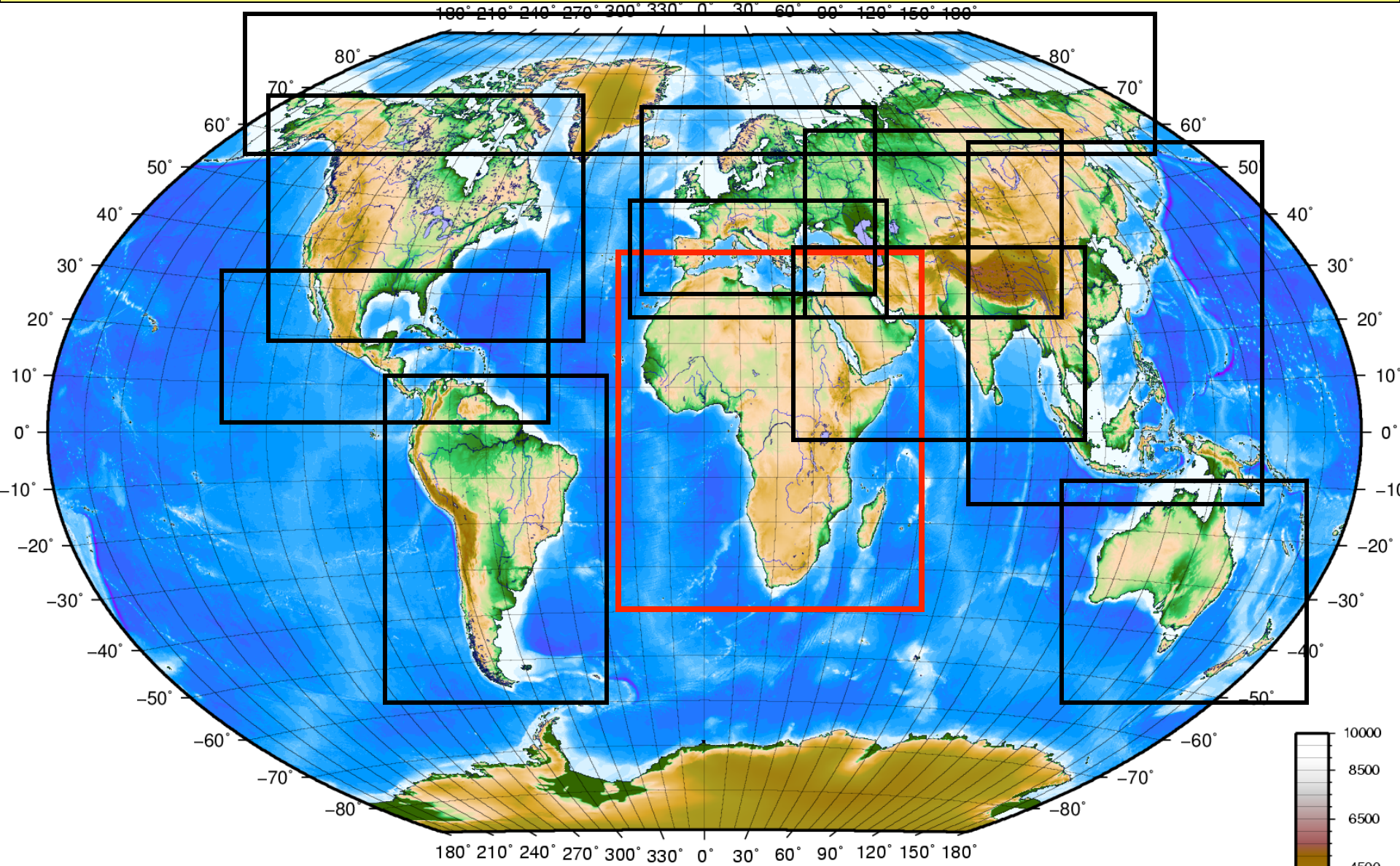
RCP4.5, RCP8.5
1951-2100 or 1980-2050

Decadal predictions
1980-2010, 1990-2000, 2005-2035

Regional Analysis
Regional Databanks

Multiple AOGCMs

CORDEX domains



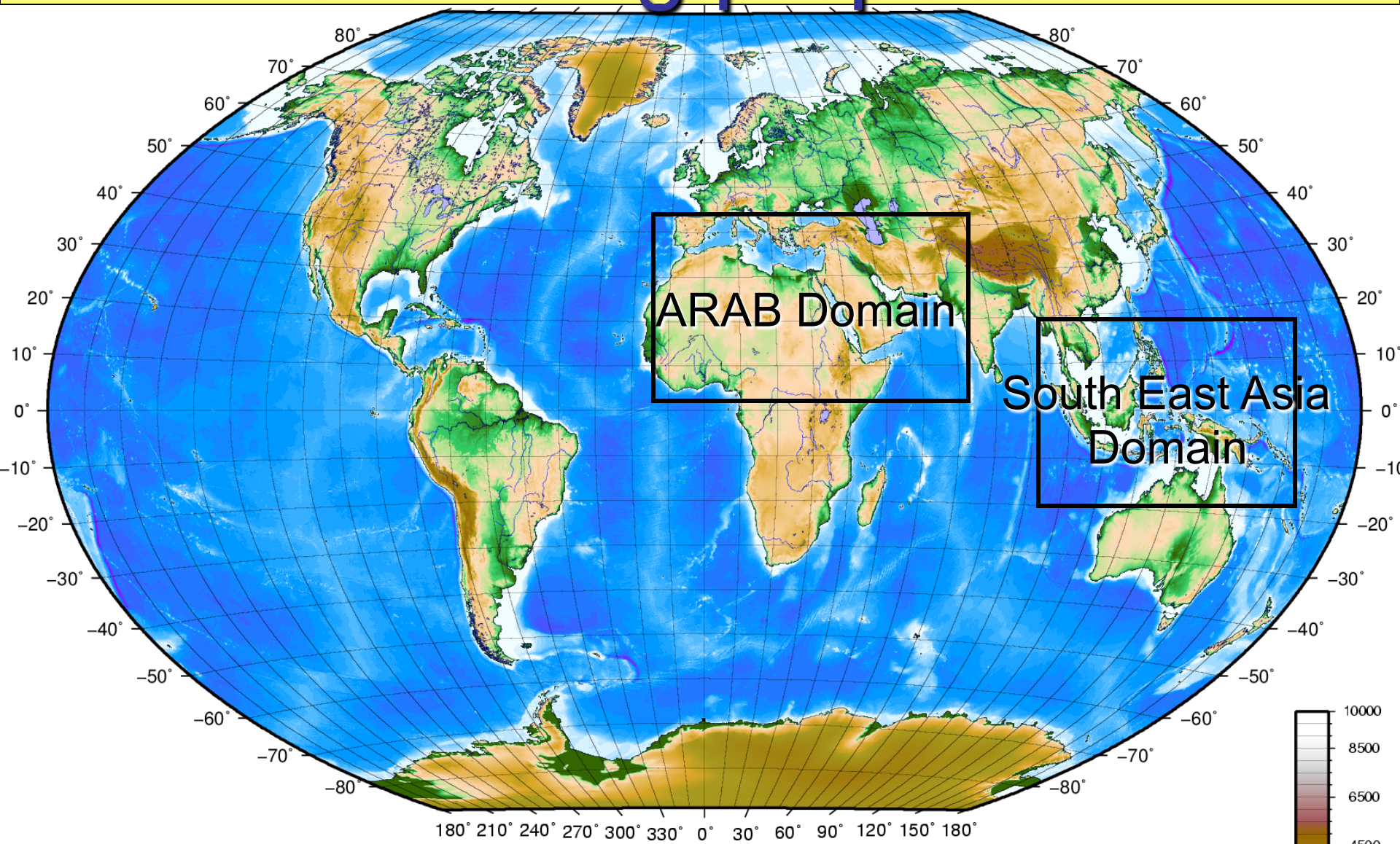
Change in the management of CORDEX

- The original Task Force on Regional Climate Downscaling (TFRCD) was terminated after successfully ending its mandate
- CORDEX will be a project within the newly formed Working Group on Regional Climate (WGRC)
- M. Rixen from WCRP assuming a coordinating/ promoting role
- Science Advisory Team (SAT) was formed
  - F. Giorgi, C. Jones, C. Goodess, W. Gutowski, B. Hewitson, K. Krishnan, W.T. Kwon, S. Solman
  - Possible additions from other CORDEX regions (Australia, Arctic, Arab, C. America)

CORDEX: Progress in the last year

- Numerous CORDEX presentations at major meetings
  - EGU regional modeling session largest in the CL area (84 abstracts vs. 48 in the second largest)
  - Regional modeling session at AGU
  - CORDEX poster session at the OSC
- CORDEX meetings/workshops organized
  - Med-CORDEX: Toulouse, France, 28-30 March 2012
  - Euro-Cordex: Hamburg, Germany, November 2011
  - EA-Cordex: Jeju, Korea, 22-23 September 2011
  - SA-Cordex: Pune, India, 25-26 February 2012,17-20 October 2012
- Papers appearing with explicit use of CORDEX framework (JC, CD, JGR, CR, etc.)

Two new CORDEX domains are being proposed



Change in the data management of CORDEX

- CORDEX data will be saved and distributed through the Earth System Grid (ESG) as for CMIP5
- The system will include a file/format compliancy checker prior to the data upload
- CORDEX nodes planned at BADC, DKRZ, DMI, SMHI, ENEA (MedCORDEX), UCT, IITN, KMA
- Current testing of the system by SMHI

CORDEX: Progress to date
Africa - CORDEX

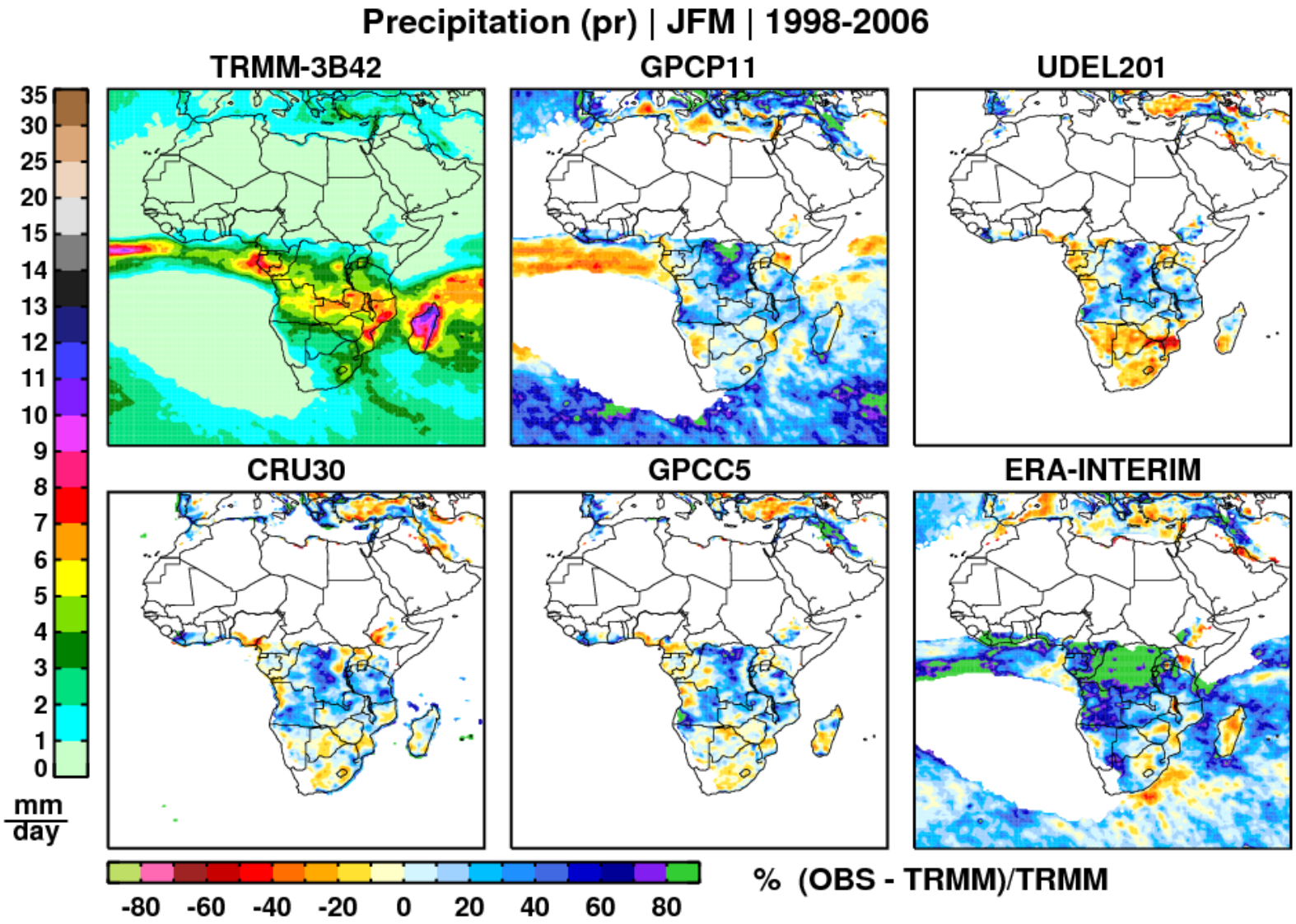
- Africa diagnostic team/metrics formed under the leadership of B. Hewitson (UCT)
  - Sponsorship by START, SMHI, ICTP
  - Meeting in Cape Town, April 2010
  - Training workshop in Trieste, March 2011
  - Training workshop in Cape Town, November 2011
  - Paper writing workshop in Trieste, April 2012
- 10 groups completed the first ERA-Interim driven runs
  - Paper to appear in J. Climate
- 14 groups completing different scenario runs

ERA-interim simulations

Nikulin et al., J. Clim, in press

HIRHAM5	(DMI, Denmark)
CCLM48	(CCLMcom consortium)
REMO	(MPI, Germany)
RACMO22	(KNMI, Netherlands)
ARPEGE51	(CNRM, France)
RegCM3	(ICTP, Italy)
PRECIS	(University of Cape Town, South Africa)
WRF311	(University of Cantabria, Spain)
MM5	(University of Murcia, Spain)
CRCM5	(Université du Québec à Montréal, Canada)

Gridded precipitation products



Relative difference can locally reach 50% and more

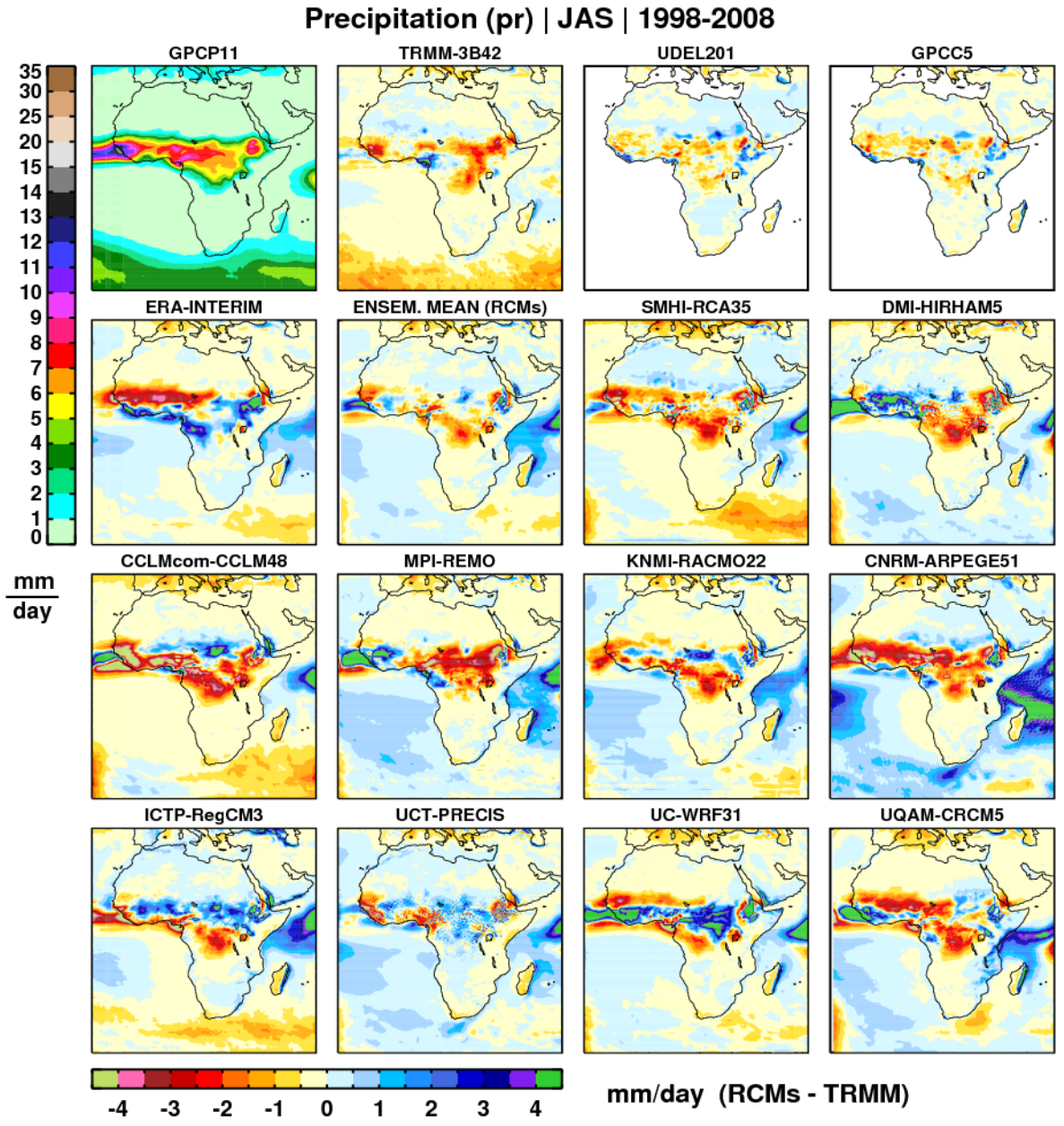
Seasonal mean precipitation biases (JAS)

spatial patterns of biases are different

many RCMs show smaller biases than ERA-Interim

common feature is overestimation in eastern part of domain (quality of satellite products ?)

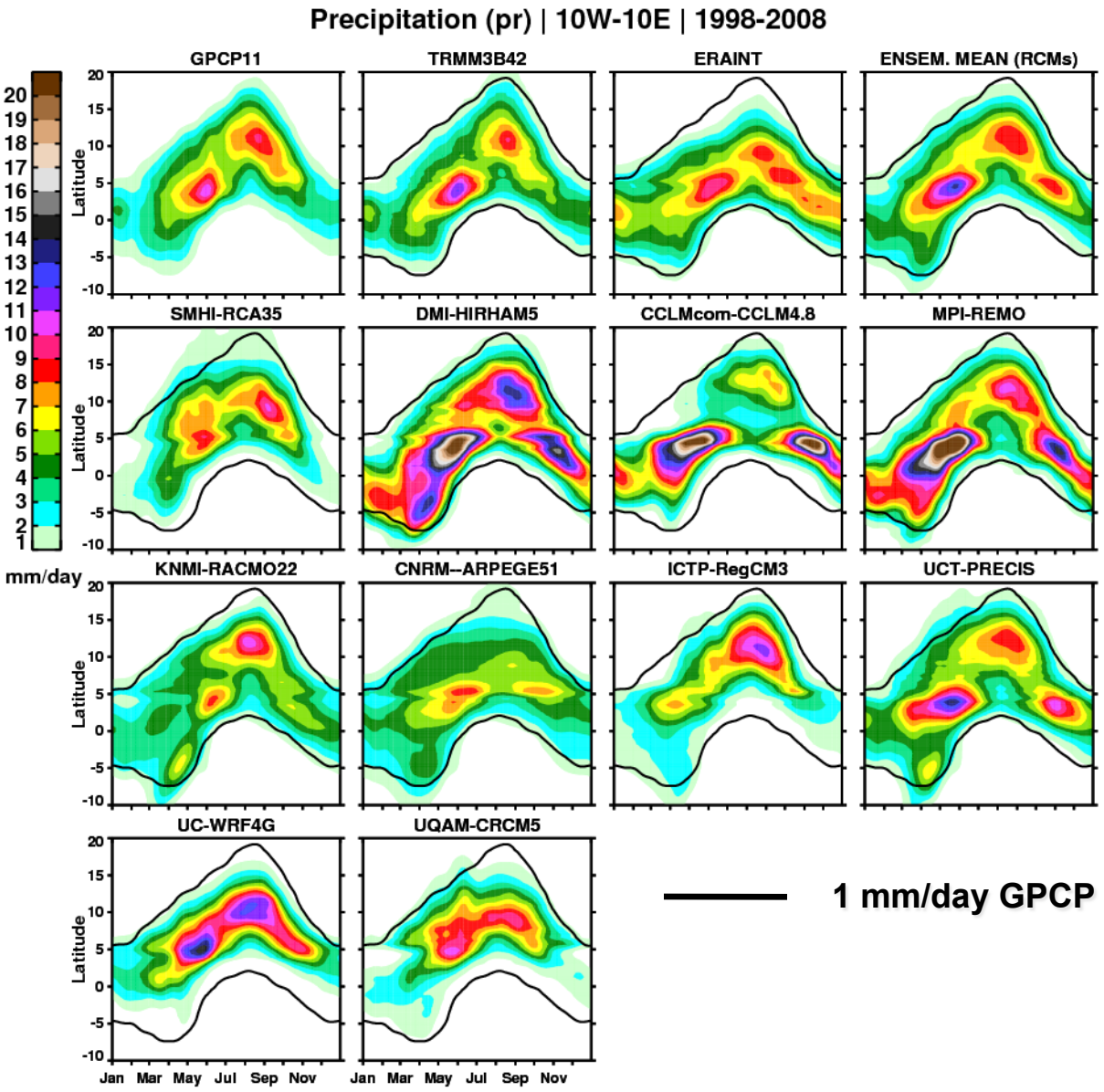
ensemble mean outperforms RCMs (cancelation of biases of opposite sign)



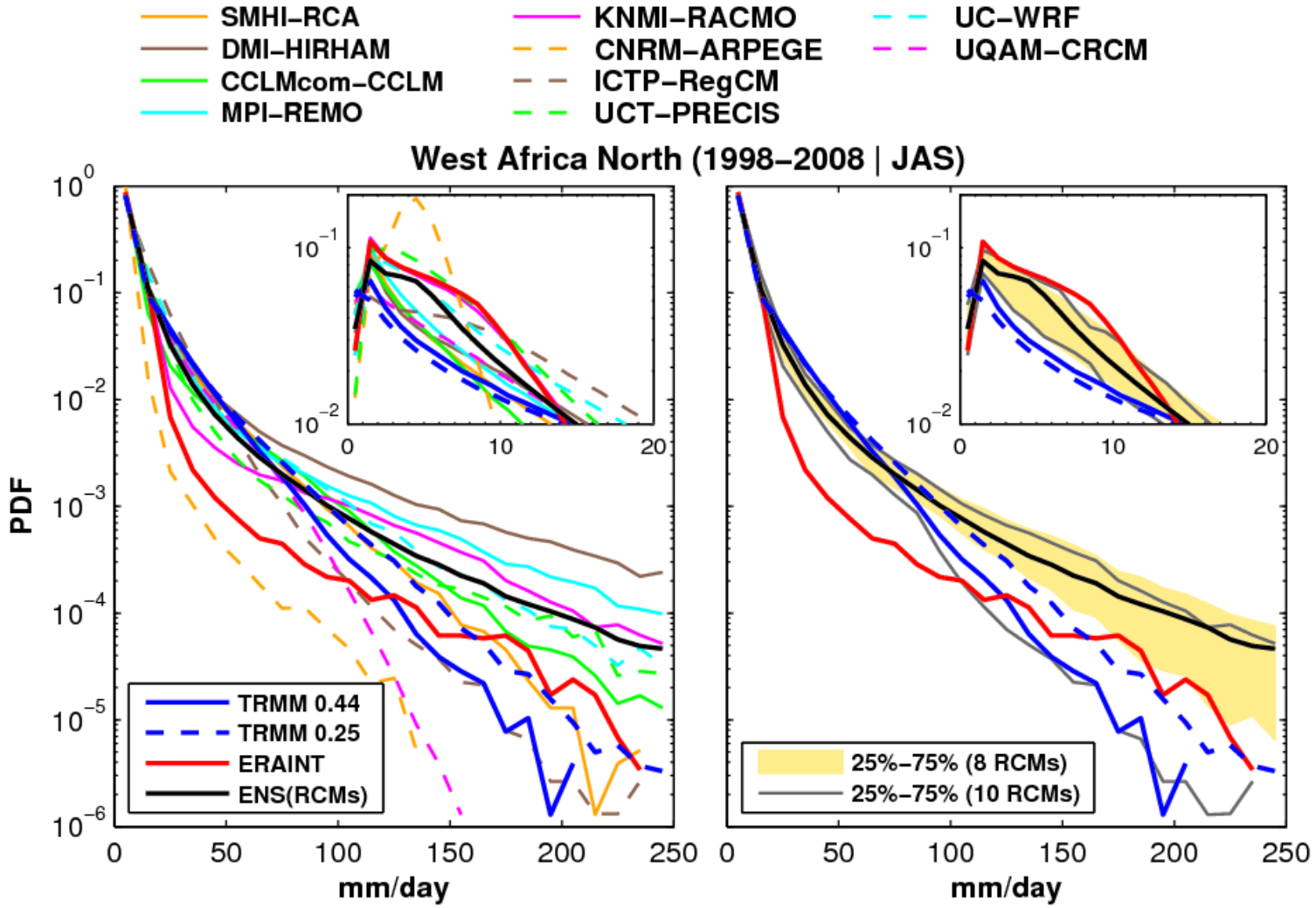
Annual cycle (10W-10E)

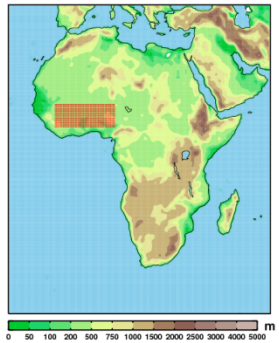
All RCMs produce a version of the WAM onset with different degree of distortion

Ensemble mean corrects individual biases



PDF (daily data)



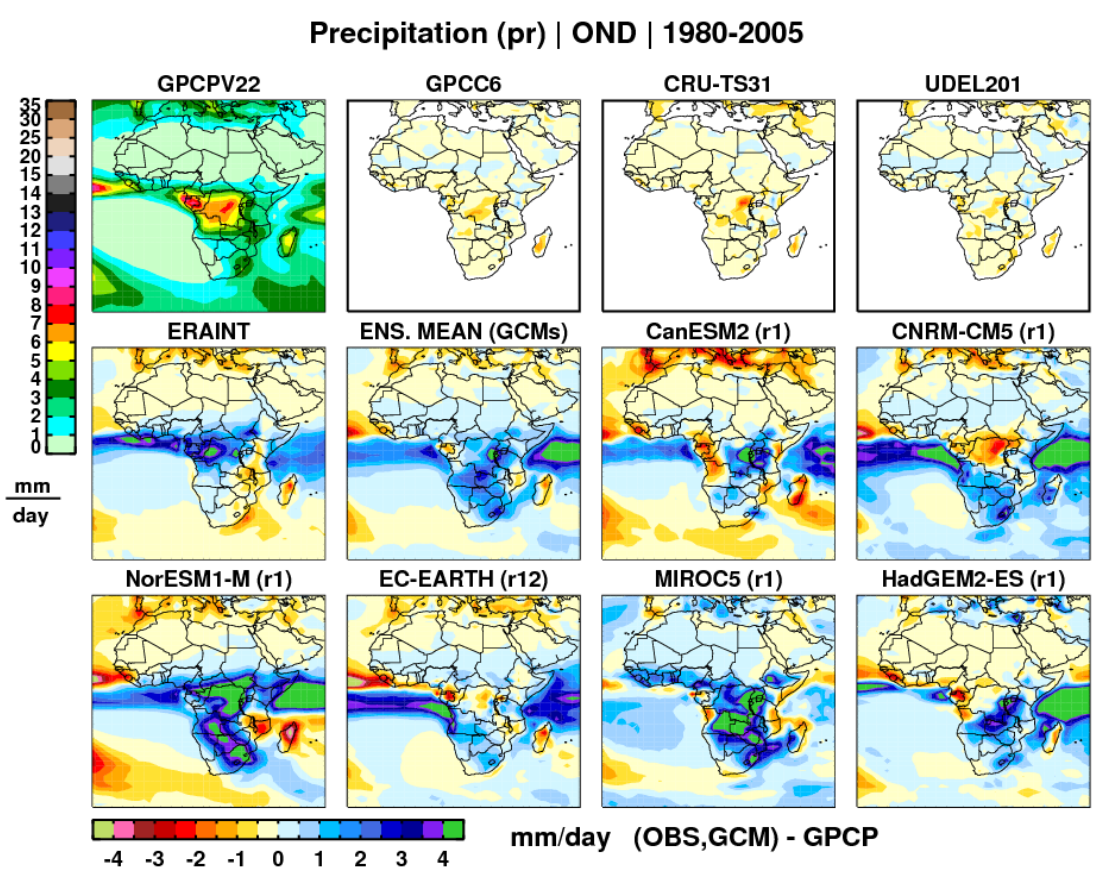


SMHI RCA4 Africa CORDEX 50km matrix

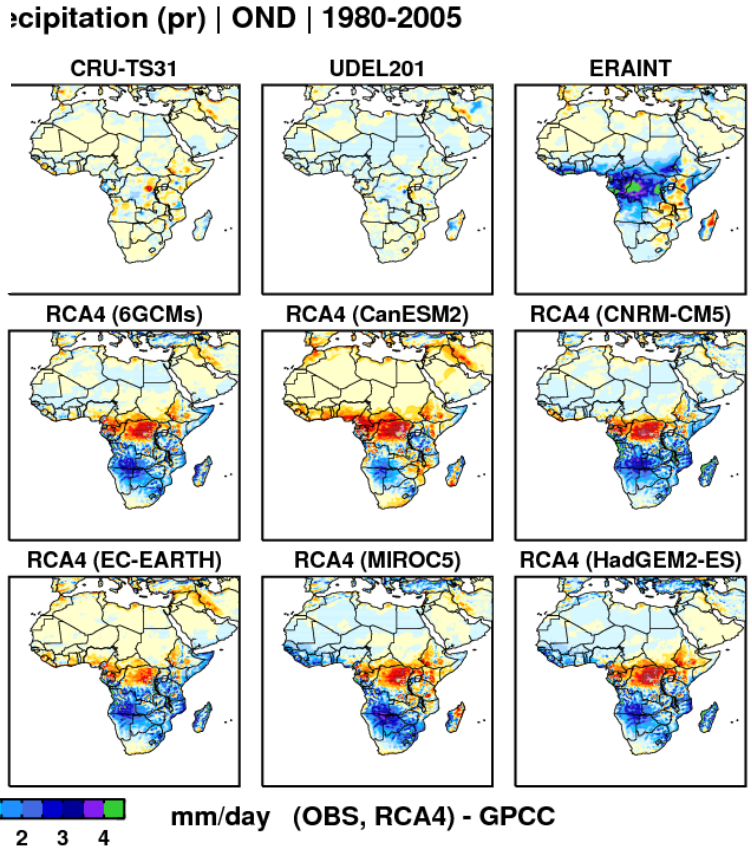
GCM	Historical 1950-2005	RCP8.5 2006-2100	RCP4.5 2006-2100	RCP2.6 2006-2100
EC-Earth	✔	✔	✔	✔
HadGEM	✔	✔	✔	✔
CNRM	✔	✔	✔	
MIROC5	✔	✔	✔	
NorESM	✔	✔	✔	
CanESM	✔	✔	✔	
GFDL-ESM	✔	✔	✔	
MPI-ESM	✔	✔	✔	✔
IPSL-CM	☑	☑	☑	
CSIRO	☑	☑	☑	
NCAR	?	?	?	

Courtesy of C. Jones

✔ Completed ✔ Running ✔ Planned ☑ Possible ? LBC status unknown

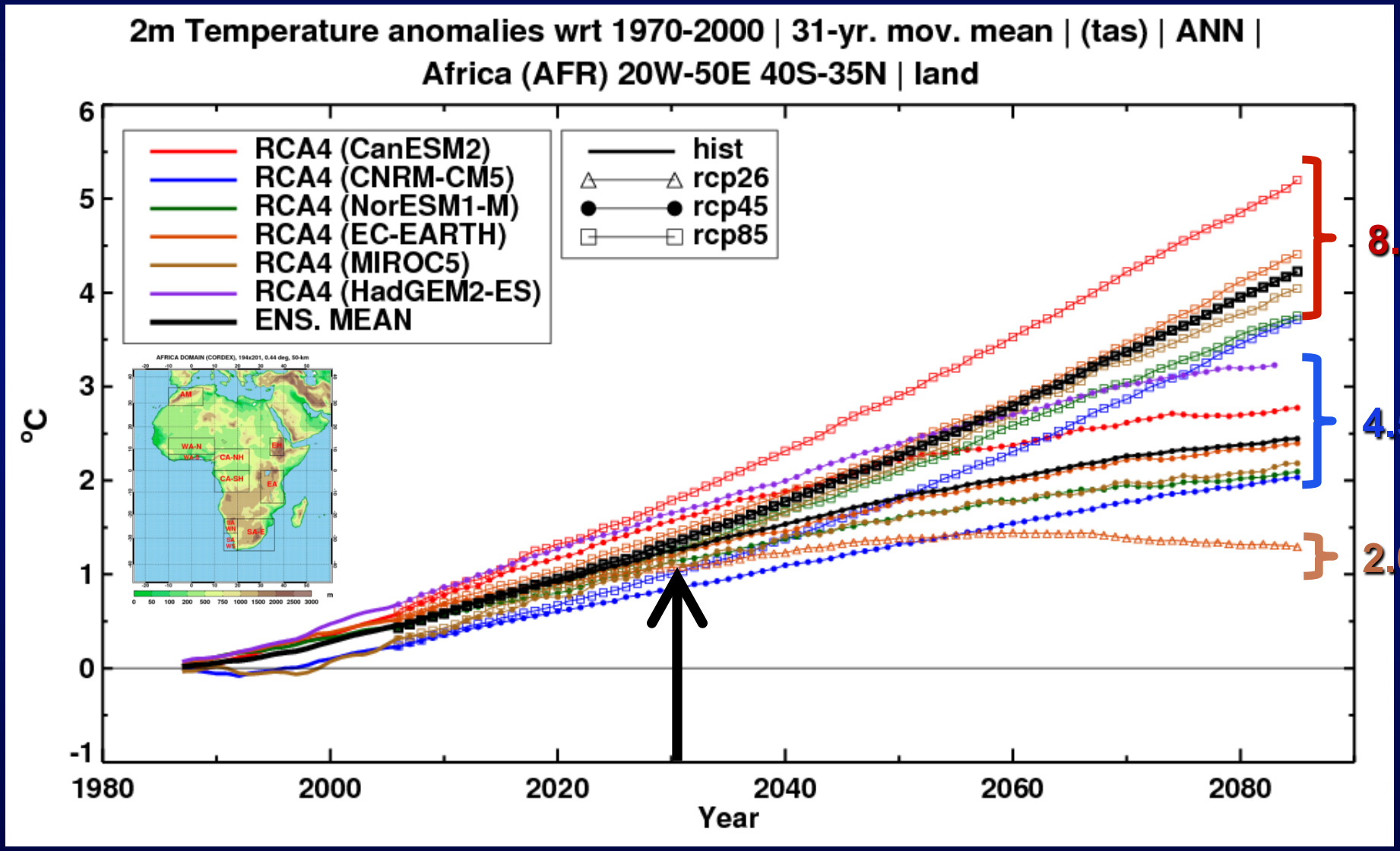


GCM precipitation
OND 1980-2005

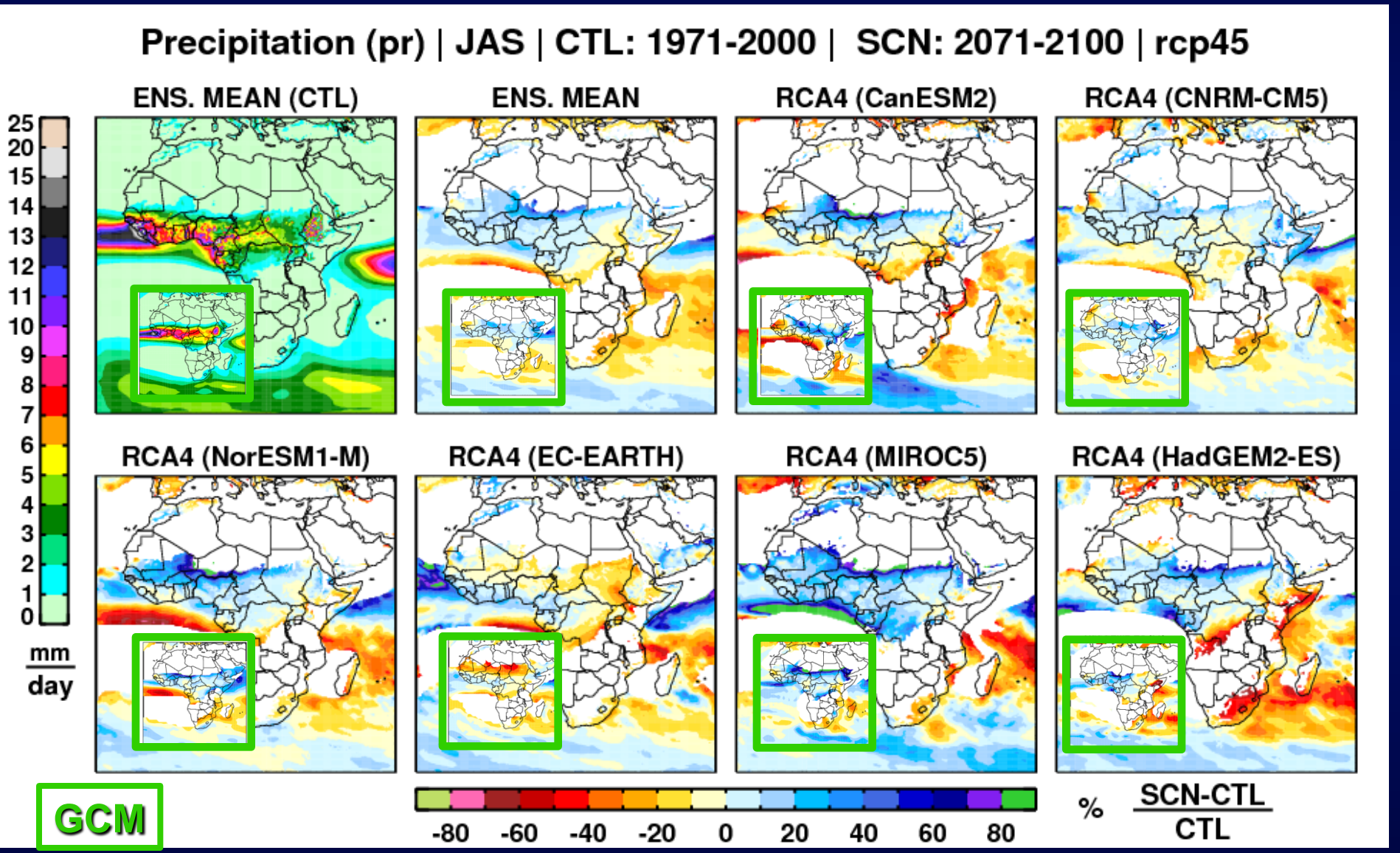


RCM downscaled
precipitation
OND 1980-2005

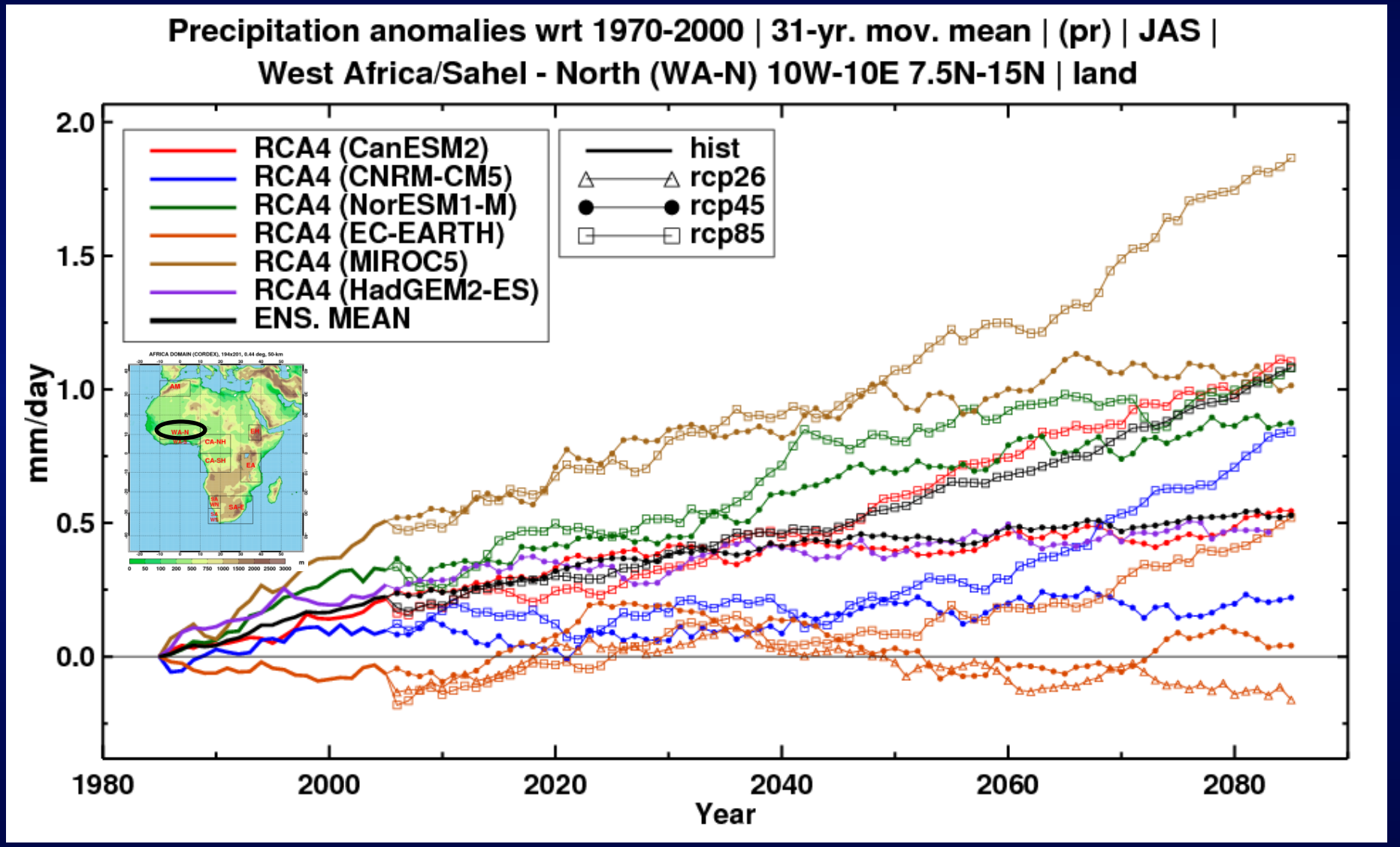
Trends on a continental scale



GCM uncertainty



Trends on a regional scale



Progress in other CORDEX regions
Euro-CORDEX

- Coordinator: A. Gobiet (U. Graz)
- http://www.euro-cordex.net
- 22 modeling groups participating
- Meetings in November 2011 (Hamburg) and at EGU 2012
- Simulations under way or planned at 50 km and 12 km horizontal grid spacing
- Data stored at DKRZ, SMHI, BADC, DMI

Progress in other CORDEX regions
MED-CORDEX

- Coordinator: S. Somot (MeteoFrance), P.Ruti (ENEA)
- 11 modeling groups participating
- Meeting in March 2012 (Toulouse)
- Couple A-O and A-only models
- Simulations under way or planned at 50 km, 25-30 km (coupled) and 12 km horizontal grid spacing
- Connections with HYMEX and MEDCLIVAR
- Data stored at ENEA

Progress in other CORDEX regions
East Asia-CORDEX

- Coordinator: W.T. Kwon (KMA)
- 9 modeling groups participating
- Meeting in September 2011 (Jeju)
- Simulations under way or planned at 50 km and 12 km horizontal (for some sub-regions) grid spacing
- Data stored at KMA

Progress in other CORDEX regions
South Asia-CORDEX

- Coordinator: K. Krishnan (IITN)
- 10 modeling groups participating
- Planning meeting in February 2012 (Pune) and training meeting in October 2012 (Pune)
- Simulations under way or planned at 50 km horizontal grid spacing
- Data stored at IITN

Progress in other CORDEX regions

South America

- Coordinator: S. Solman (CIMA)
- Several modeling groups participating
- Planning meeting being planned.

North America

- Activities ongoing, mostly related to NARCCAP, but no formal CORDEX coordination

Central America - Australia

- Activities ongoing but no formal CORDEX coordination

Arctic

- See CliC presentation

CORDEX as a capacity building program: the ICTP experience

- Mini-ensemble simulations with RegCM4 over different CORDEX domains in collaboration with local partners
  - Africa (U. Dhakar, U. Addis Abeba)
  - S. America (U. San Paolo)
  - C. America (CICESE)
  - S. Asia (IITN)
  - Mediterranean (Croatian Met Office)
- Analysis of GCMs to guide selection
- 2 model configurations (5 for Med.), 2 GCMs, 2 Scenarios
- Direct involvement of Ph.D. students in the running, testing (sometimes improving) and analysis of the RCM.

CORDEX outlook

- Consolidate regional CORDEX teams and activities
  - Africa , Med, Euro, S. Asia, E. Asia, S. America, Arctic in good shape
  - C. America, N. America, Australia need greater coordination
- Produce a set of publications with the first scenario simulations for input into the IPCC process
- Data provision for impact applications
- Greater involvement of the statistical downscaling community
- Extension to seasonal to decadal prediction experiments
- Possible contribution to GC 1, 2, 3(arctic domain), 5, 6
- Organization of a major Pan-CORDEX conference

Plan for a Pan-CORDEX conference in 2013

- Venue and time: Brussels, 3-4 days in November 2013 (between the releases of the WGI and WGII IPCC reports)
- Expected attendance of about 250-300 participants
- Plenary + Poster sessions (format similar to OSC) + side focused meetings
- SAT meeting
- Co-sponsorship sought from the EU Commission as well as other agencies
- Covering all CORDEX regions and including participation from the IAV community

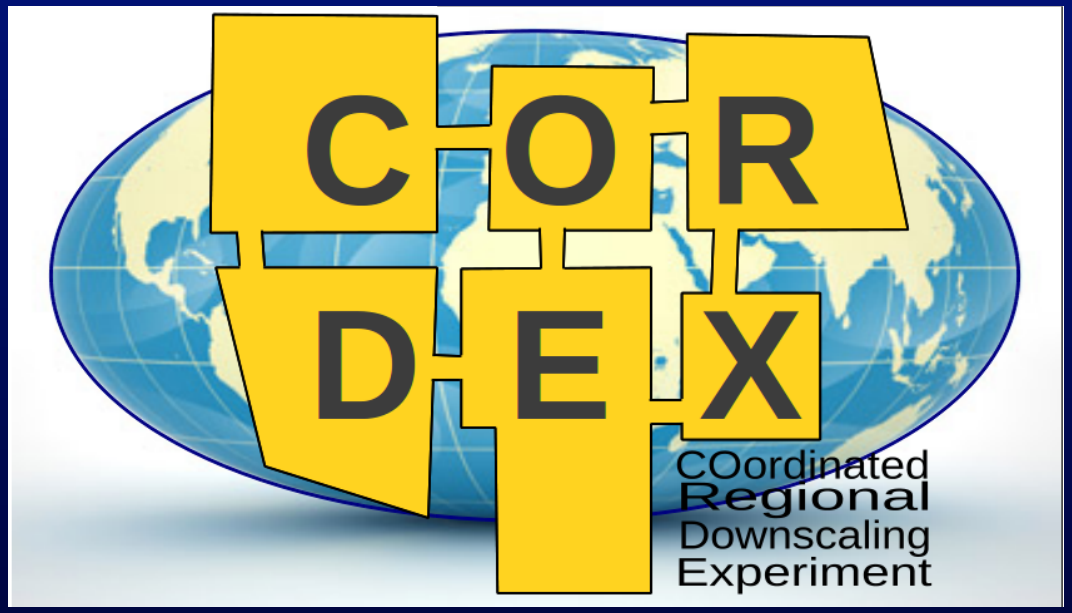
Some specific issues

- Need for a mechanism for better coordination across activities in the different CORDEX domains and more generally across the wider CORDEX community
- Improvement in the CORDEX web-site management
- Mechanism for approving new CORDEX domains and activities (SAT to discuss this)
- Search for some core funding (all CORDEX activities currently on voluntary basis)

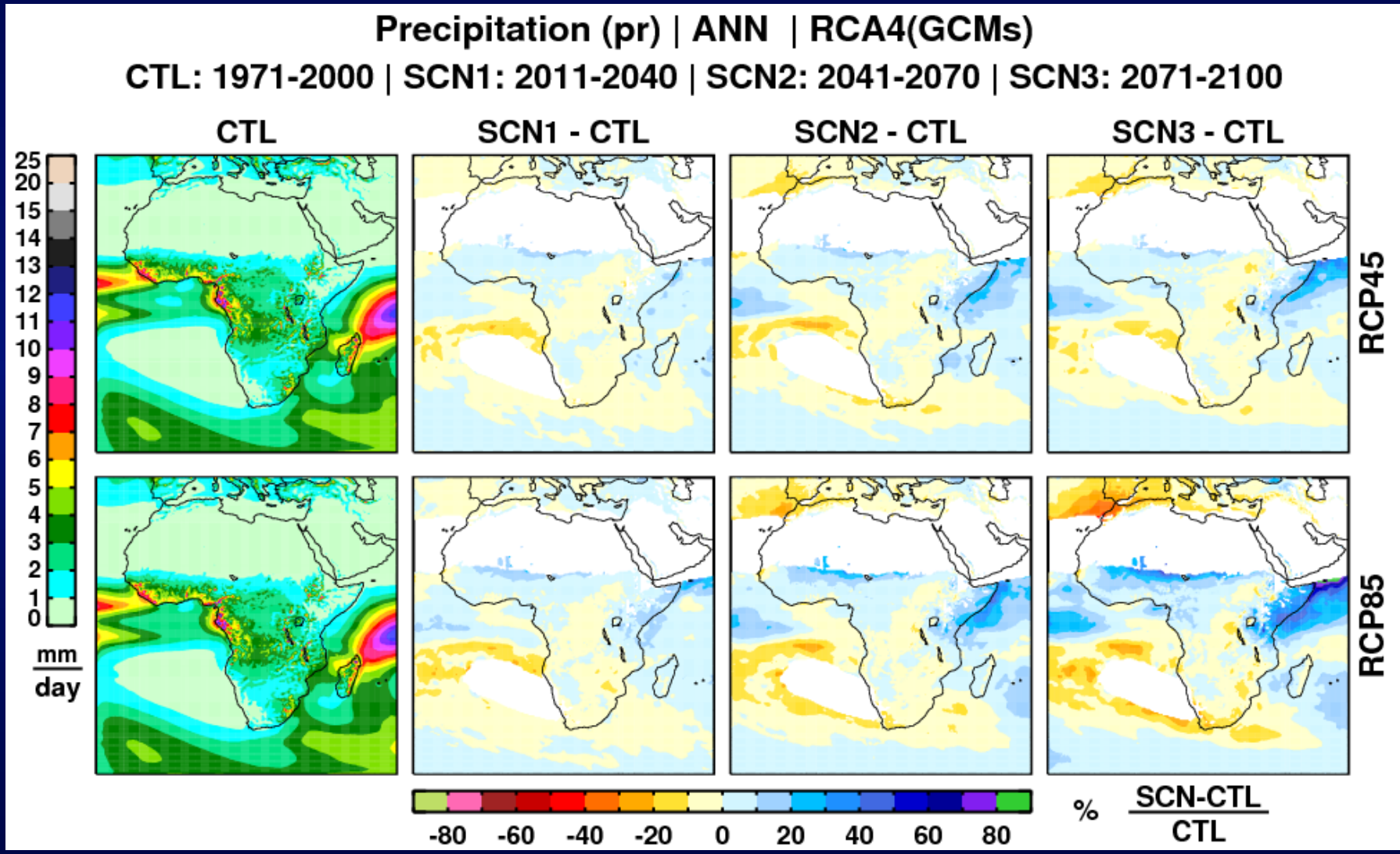
Search for a CORDEX logo


THANK YOU

Search for a CORDEX logo



Overview of the ensemble mean results



Simulations and observations

driven by ERA-Interim, Africa domain, 50 km, 1989-2008

RCM data: 3-hourly precipitation:

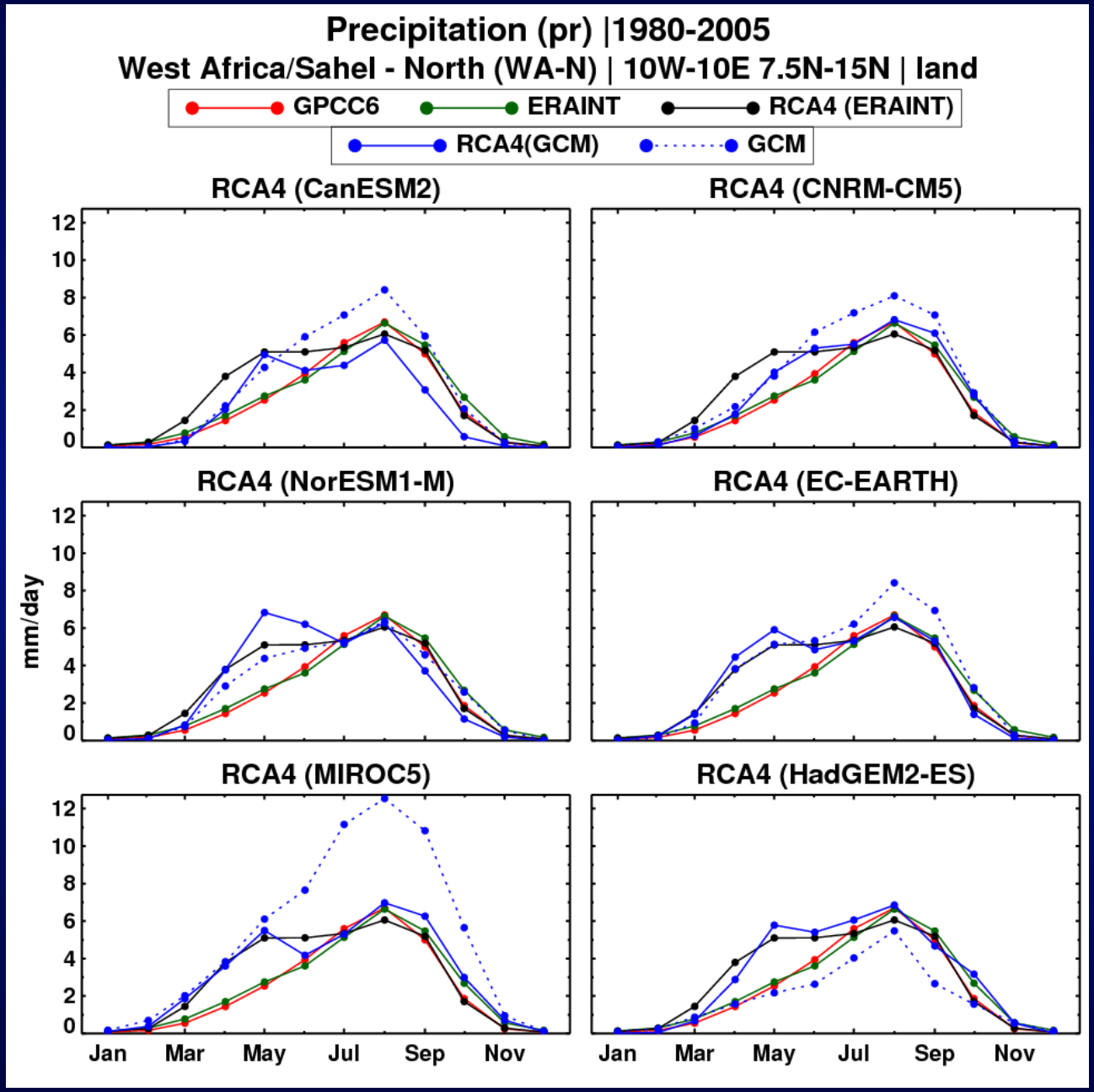
- ✓ seasonal mean
- ✓ annual cycle
- ✓ diurnal cycle

Gridded precipitation products:

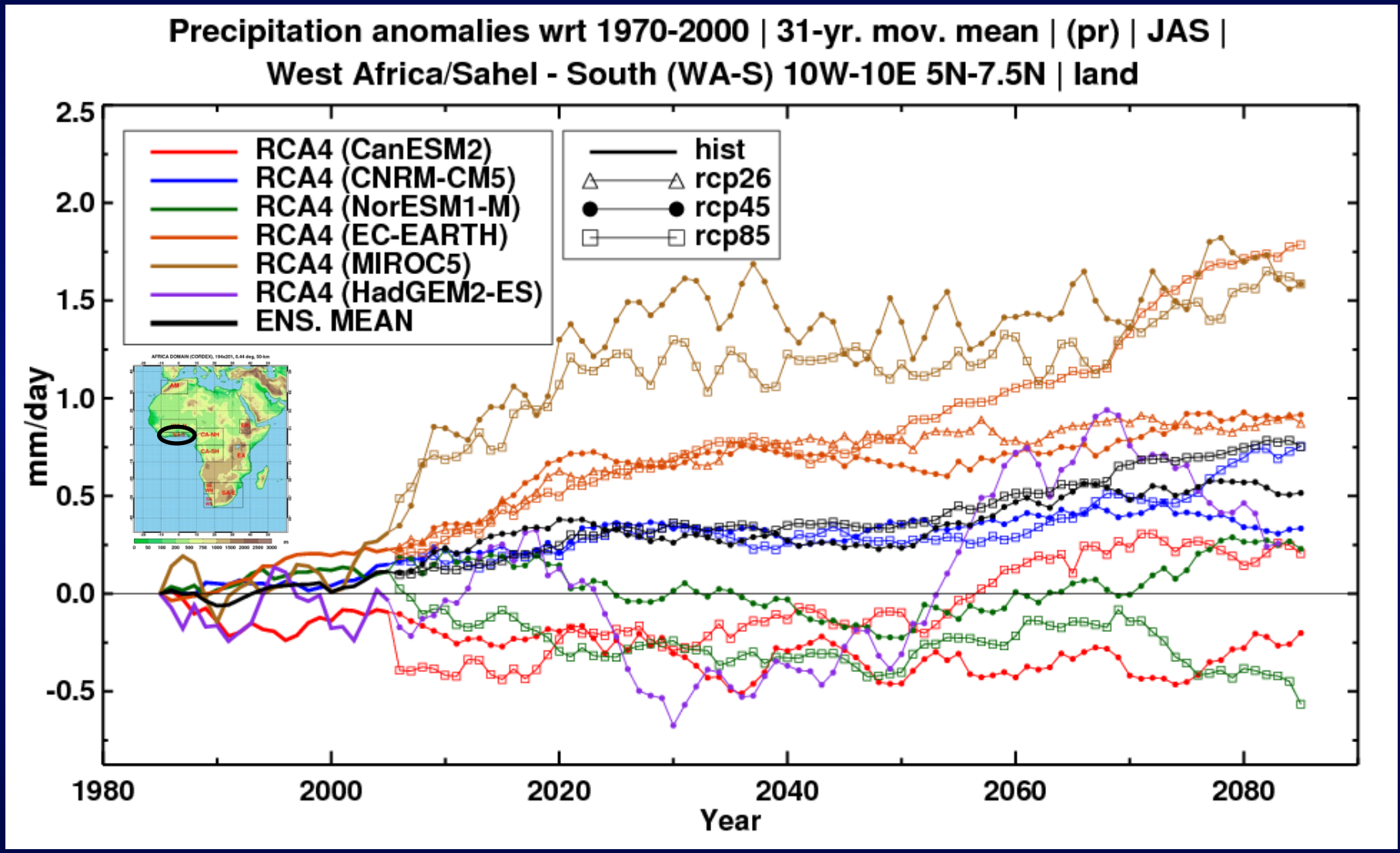
- ✓ TRMM-3B42 (3-hourly, 0.25°, 1998-2008)
- ✓ CMORPH (3-hourly,0.25°, 2003-2008)
- ✓ GPCP11 (daily, 1°, 1998-2008)
- ✓ GPCC5 (monthly, 0.5°, 1989-2008)
- ✓ CRU30 (monthly, 0.5°, 1989-2006)
- ✓ Univ. Delaware, v. 2.01 (monthly, 0.5°, 1989-2008)

all different grids remapped onto the same 0.44 rotated grid

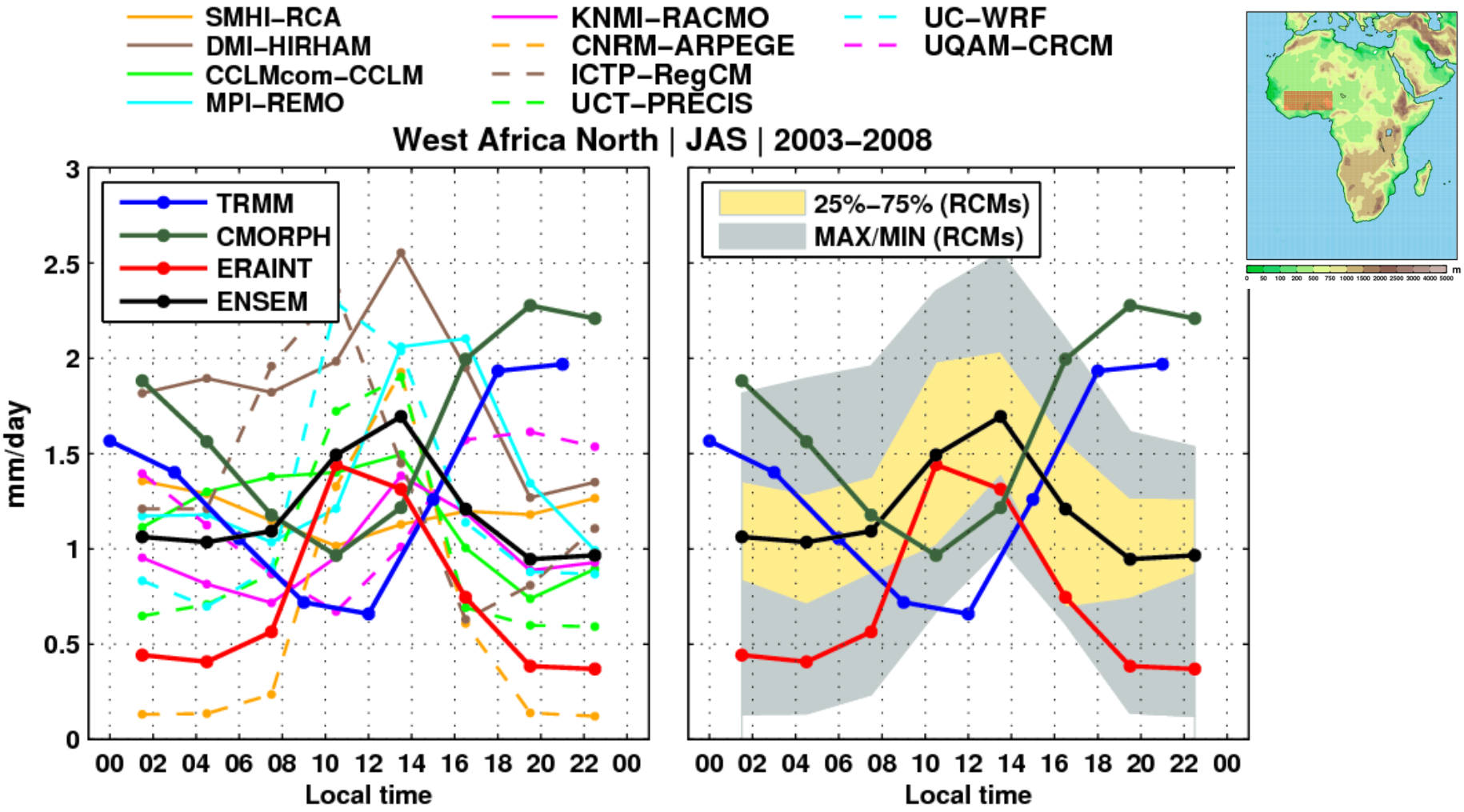
Mean Annual Cycle of precipitation: West Africa (North)



Trends on a regional scale



Diurnal cycle



RCA35 has too flat diurnal cycle
only CRCM5 can reproduce diurnal cycle here
ensemble mean cannot correct the phase of diurnal cycle