CORDEX

A Coordinated Regional Downscaling Experiment

Colin Jones, Filippo Giorgi & Ghassem Asrar

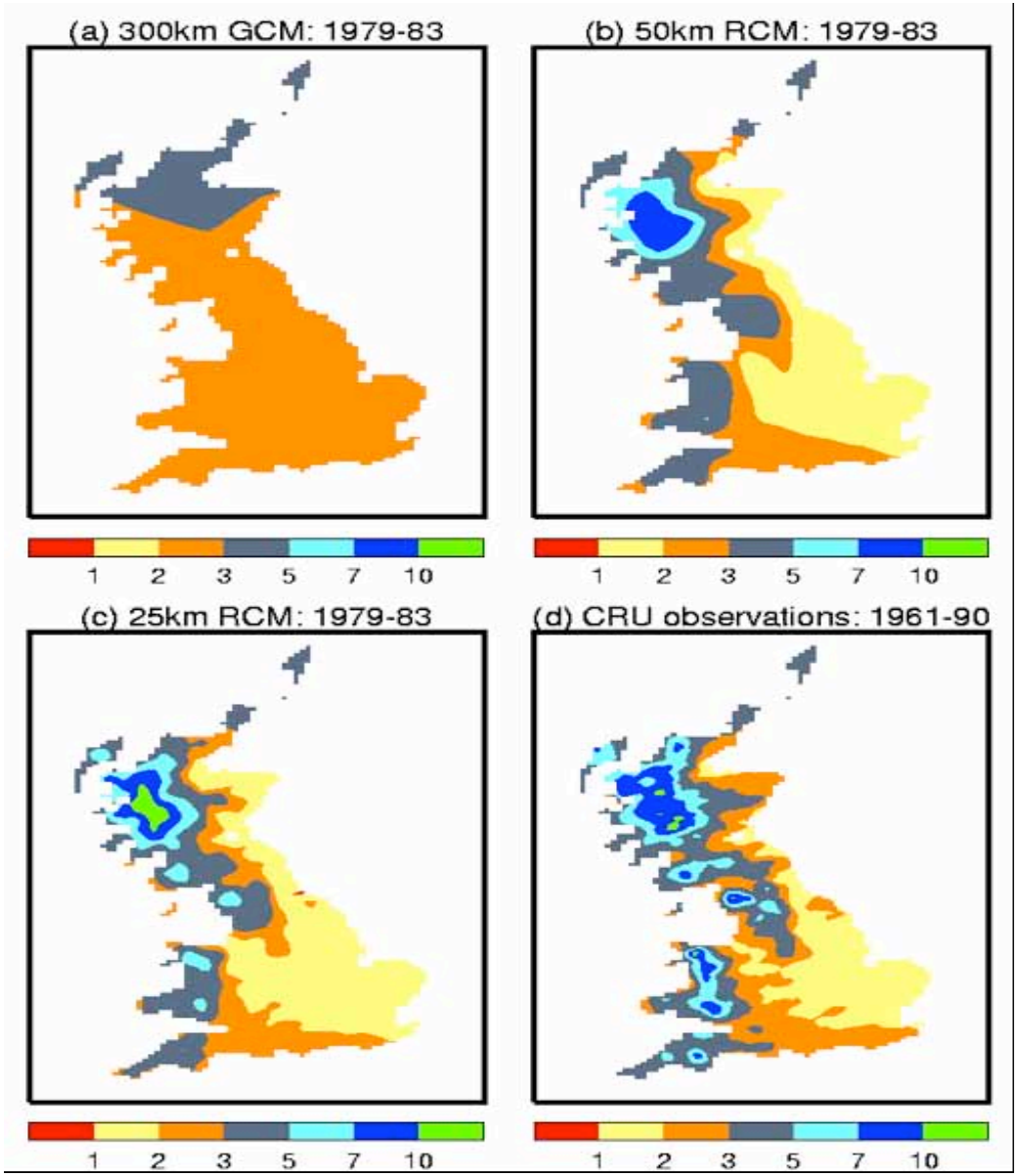
Thanks to : Bill Gutowski, Richard Jones, Ray Arrit,
Jens H Christensen, Claudio Menendez,
Grigory Nikulin, Erik Kjellström

http://wcrp.ipsl.jussieu.fr/RCD_Projects/CORDEX/CORDEX.html

Motivating High resolution and Regional Downscaling

Location and intensity of precipitation improves at higher resolution

300km Global Model



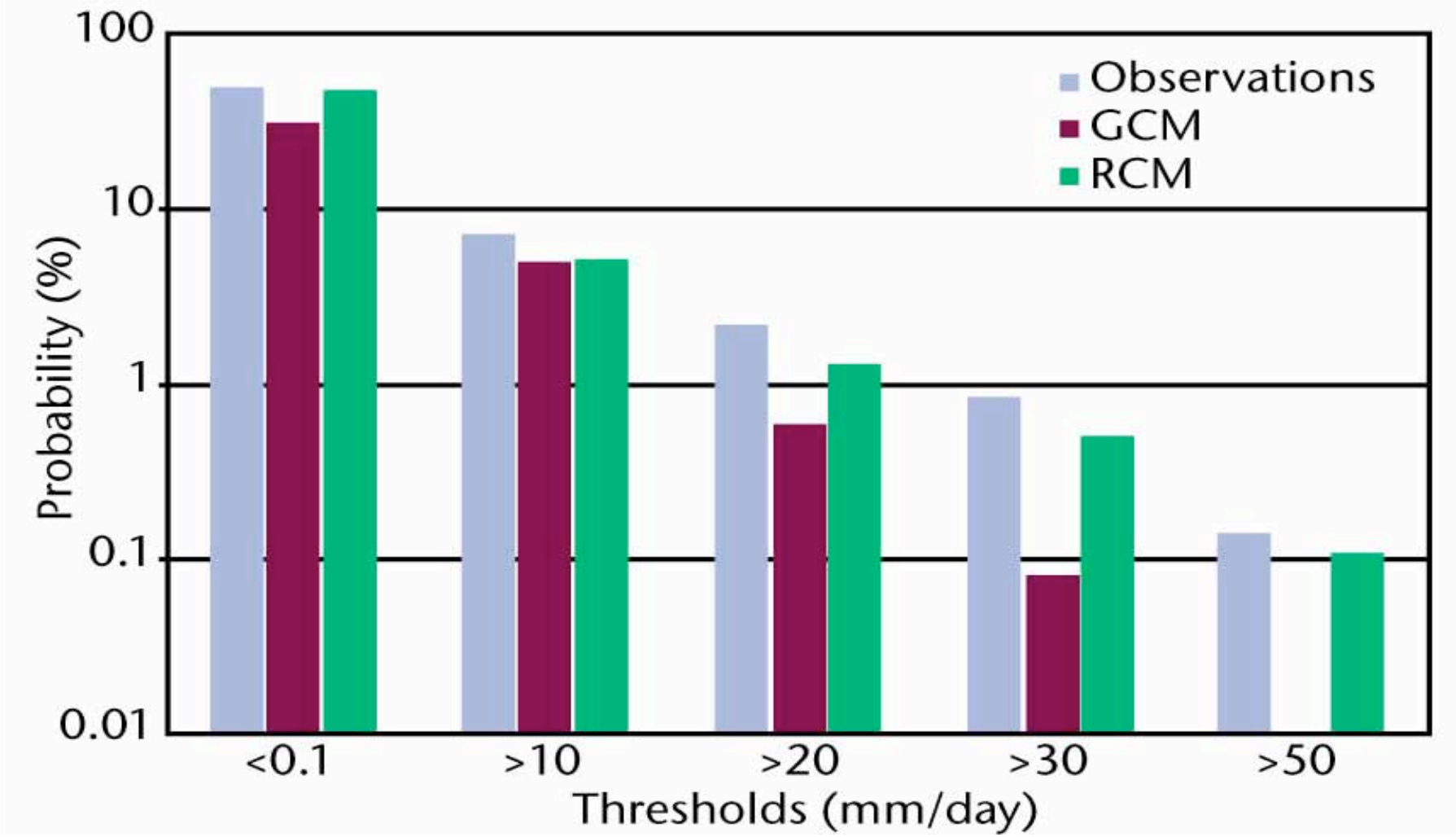
50km Regional Model

25km Regional Model

Observed

R. Jones : UKMO

DAILY RAINFALL INTENSITY OVER THE ALPS

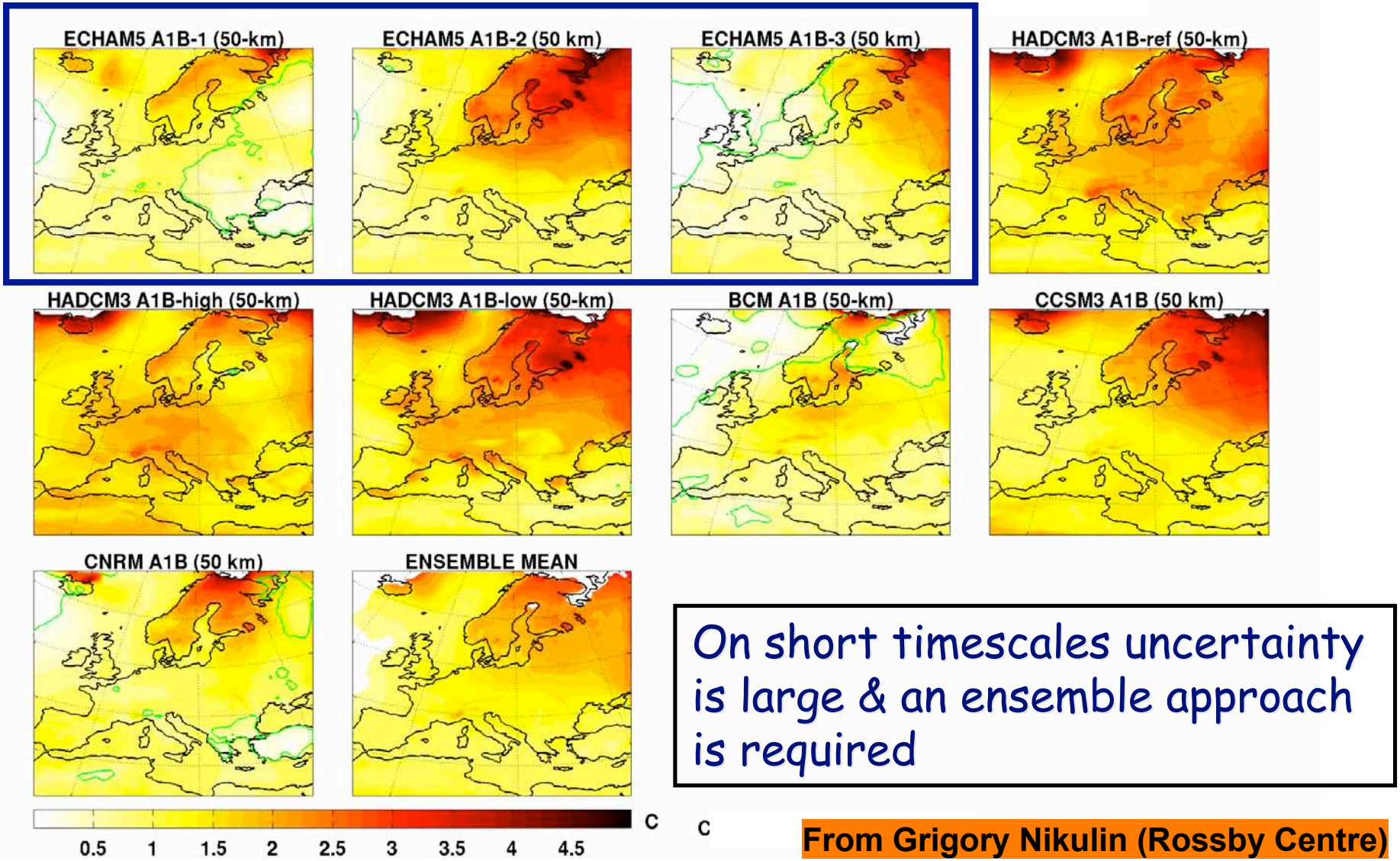


Higher resolution improves the simulation of precipitation extremes

30 yr mean DJF temperature change (2030)–(1975)

Large differences exist between simulated climate change signal.

Even between 3 members of the same GCM with same emission scenario (ECHAM5 A1B) but different initial conditions.

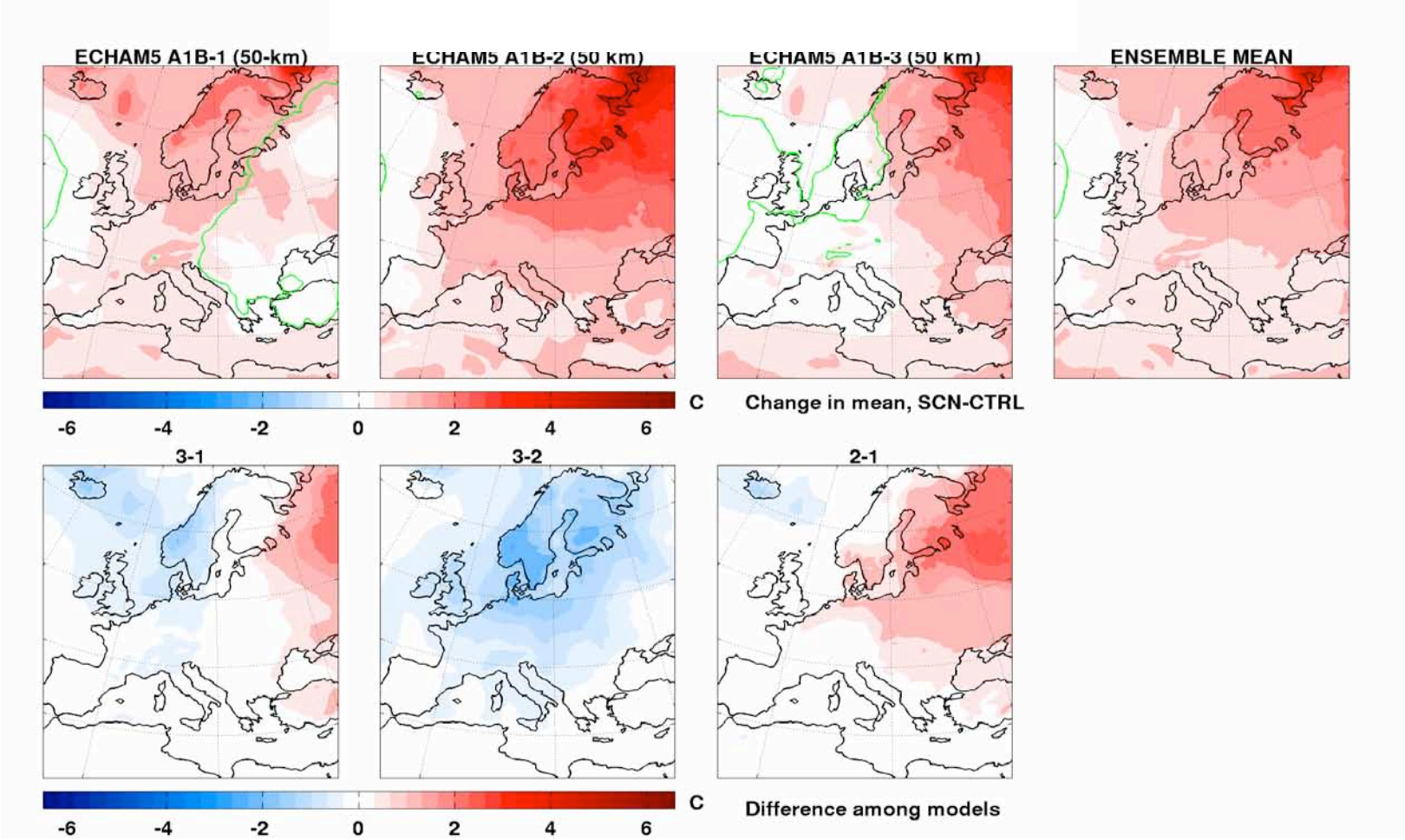


On short timescales uncertainty is large & an ensemble approach is required

From Grigory Nikulin (Rossby Centre)

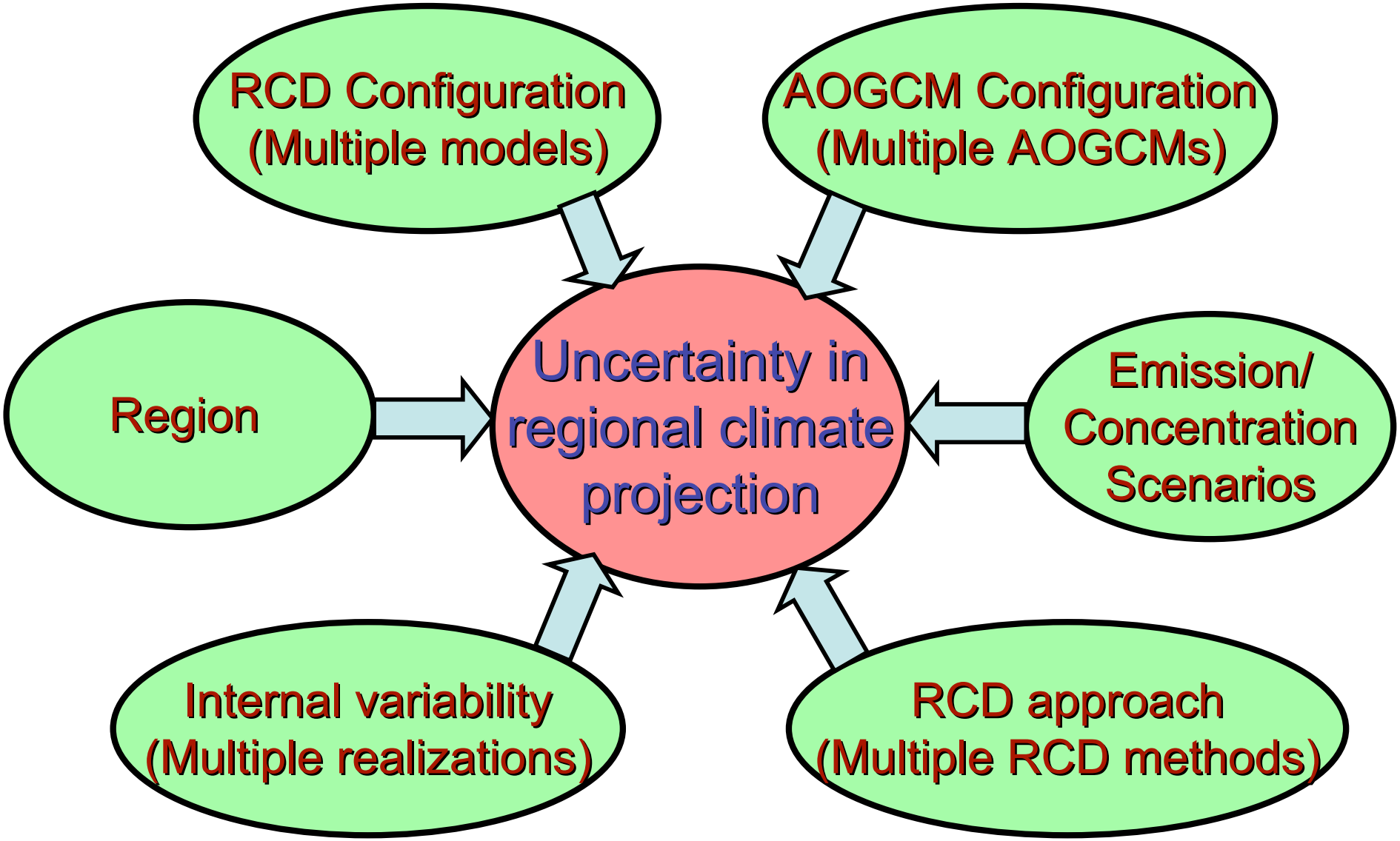
30yr DJF temperature change from 3 runs of the same ECHAM5 GCM (2016-2045) minus (1961-1990).

Differences due to using different initial conditions can be of the same magntidue as the simulated climate change signal.



Differences result from different circulation responses in each GCM member

Sources of uncertainty in RCD-based Regional climate projections



General Aims and Plans for CORDEX

Provide a set of Regional Climate Scenarios covering 1950-2100, for the majority of populated land-regions of the globe.

Downscaled Scenarios will derive boundary conditions from the new CMIP5 GCM scenario and decadal prediction runs

The RCD data will be made readily available and useable to the impact and adaptation communities.

Provide a generalized framework for testing, applying and evaluating Regional Climate Models and Downscaling techniques, for both the recent past and future scenarios.

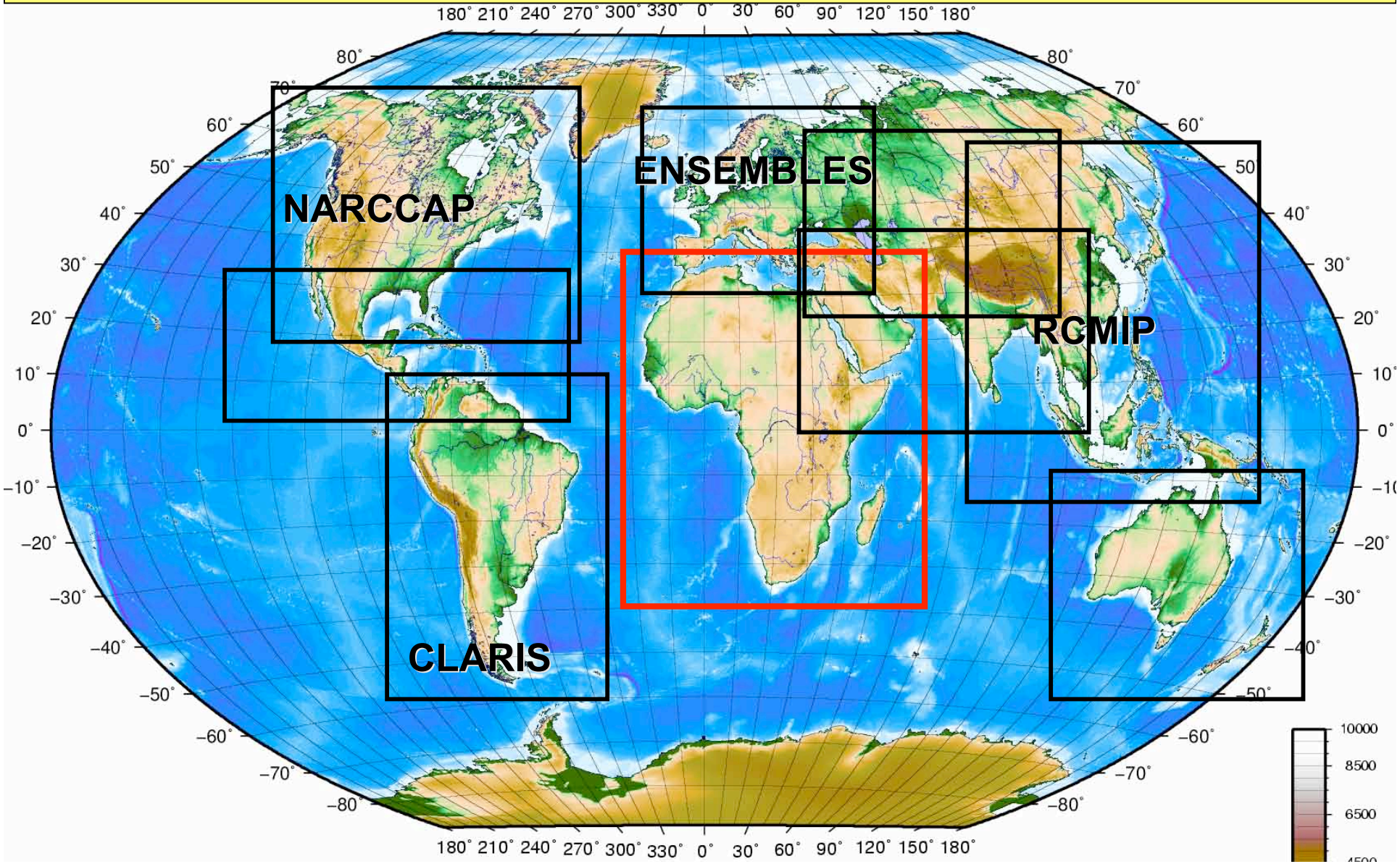
Foster coordination between Regional Downscaling efforts around the world and encourage participation in the downscaling process of local scientists/organizations

Specific aims and plans for CORDEX

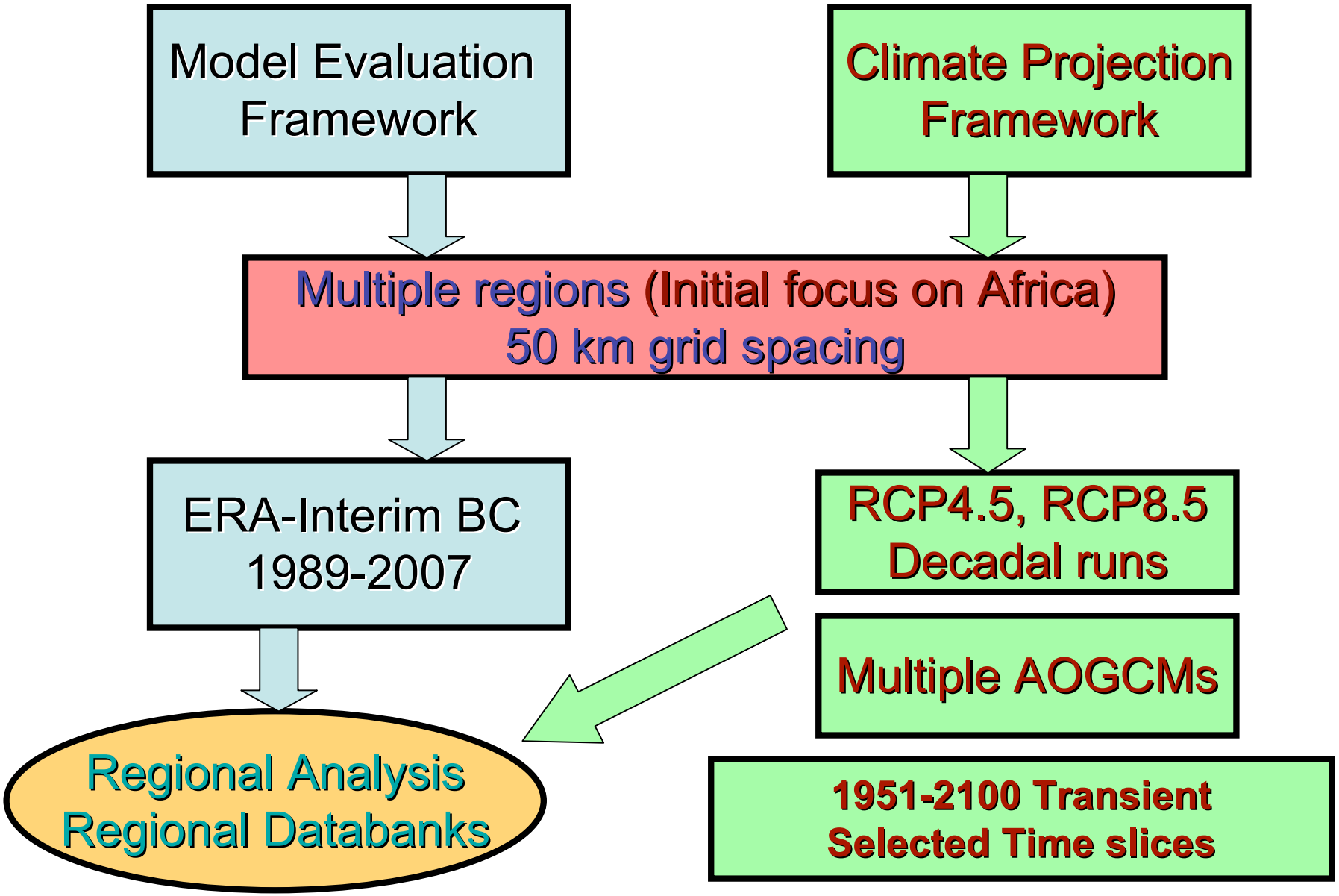
Develop a matrix of RCD simulations that employ:

1. Multiple GCMs as boundary conditions (BCs)
2. Multiple realizations of a given (single) GCM as BCs
3. Multiple RCMs driven by a given GCM over a given domain
4. More than 1 representative greenhouse emission scenario
5. With common RCM domains and resolution
6. With common RCM output variables and frequency
7. In a common format
8. Store the results online for subsequent access and use

Example CORDEX domains



CORDEX Phase I experiment design



Some Conclusions

The international RCD community is organizing around the CORDEX project:

A coordinated, ensemble approach seems beneficial (Multi: GCMs (>6), RCMs (>8), Emission scenarios (>2))

Aim to provide global (land) coverage of high-resolution RCD data for climate impact and adaptation work based on the CMIP5 GCM integrations

With an emphasis on Africa in the coming 2-3 years. (Other areas will also be sampled during this period)

What has been decided

1. A request to archive 6-hourly 3D model level fields was included in the CMIP5 GCM output protocol.

   The request was for at least 1 RCP4.5 and 1 RCP8.5 member (1950-2100). Also some limited data from decadal prediction (2005-2035) and hindcast runs.

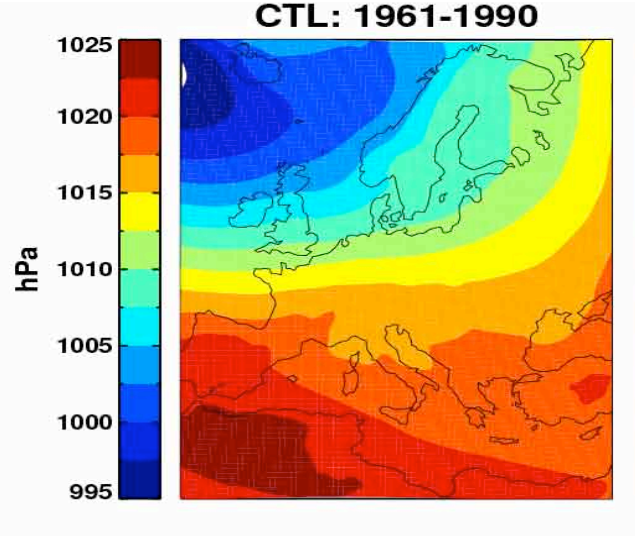
2. The standard RCM resolution is 50km (many groups plan to also run higher resolutions for selected domains)

3. Groups are encouraged to run as many of the RCM domains as possible using the ERA-interim data as boundary conditions (1989-2008) for model evaluation

4. An initial focus for future climate scenarios will be Africa with an aim to provide something for IPCC AR5

What causes the large differences between ensemble members

Mean sea level pressure
average of 5 simulations with different AOGCMs on the boundaries
Winter (DJF) control



Different changes in the atmospheric circulation in the ensemble members.

2011-2040
vs
1961-1990