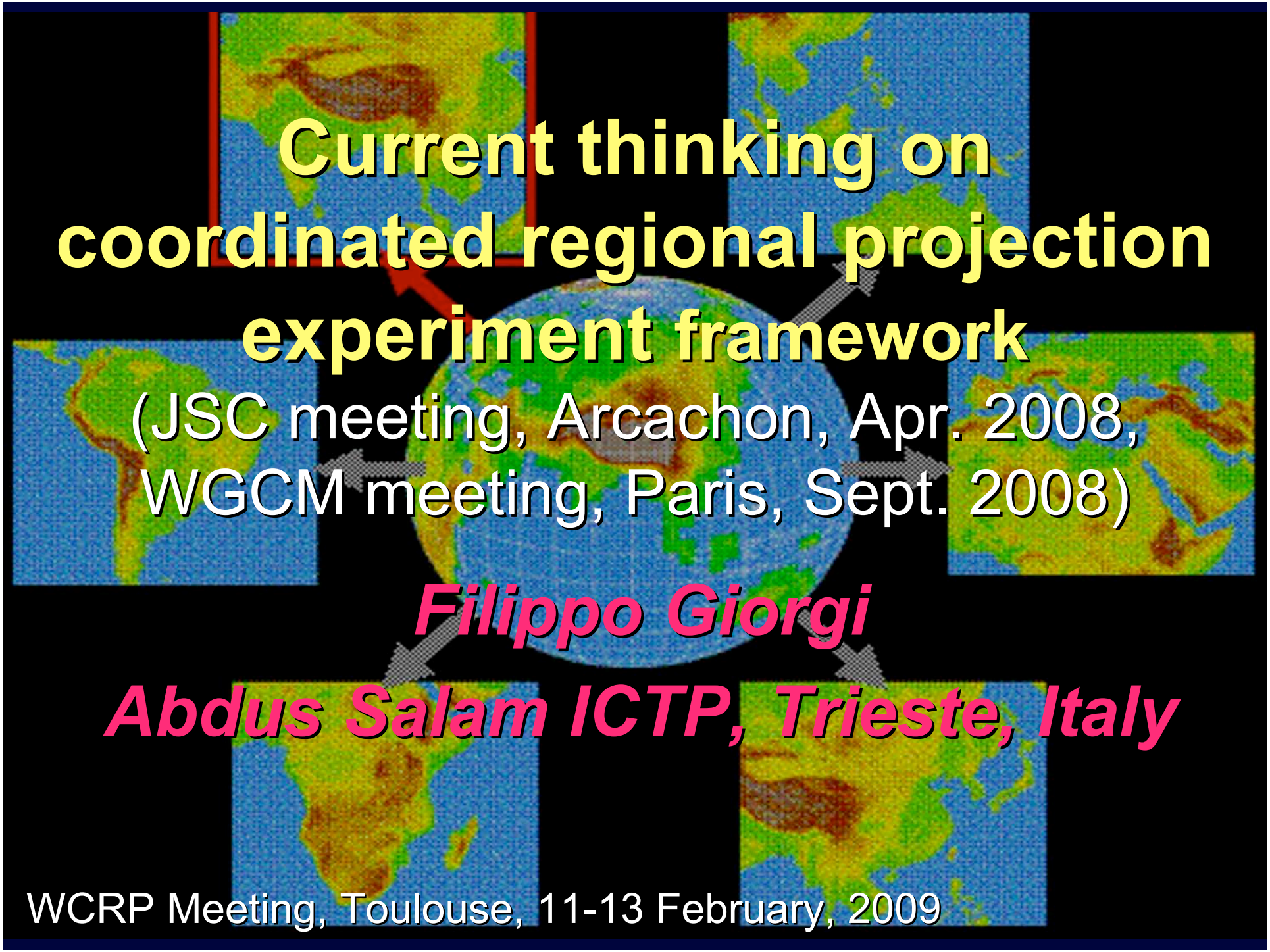


Current thinking on coordinated regional projection experiment framework

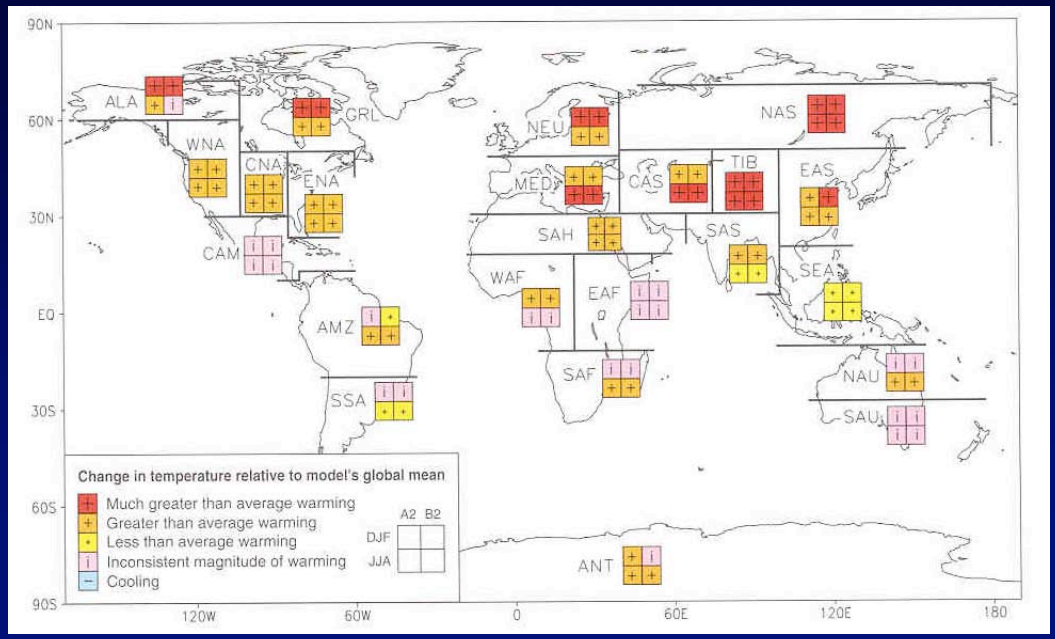
(JSC meeting, Arcachon, Apr. 2008, WGCM meeting, Paris, Sept. 2008)

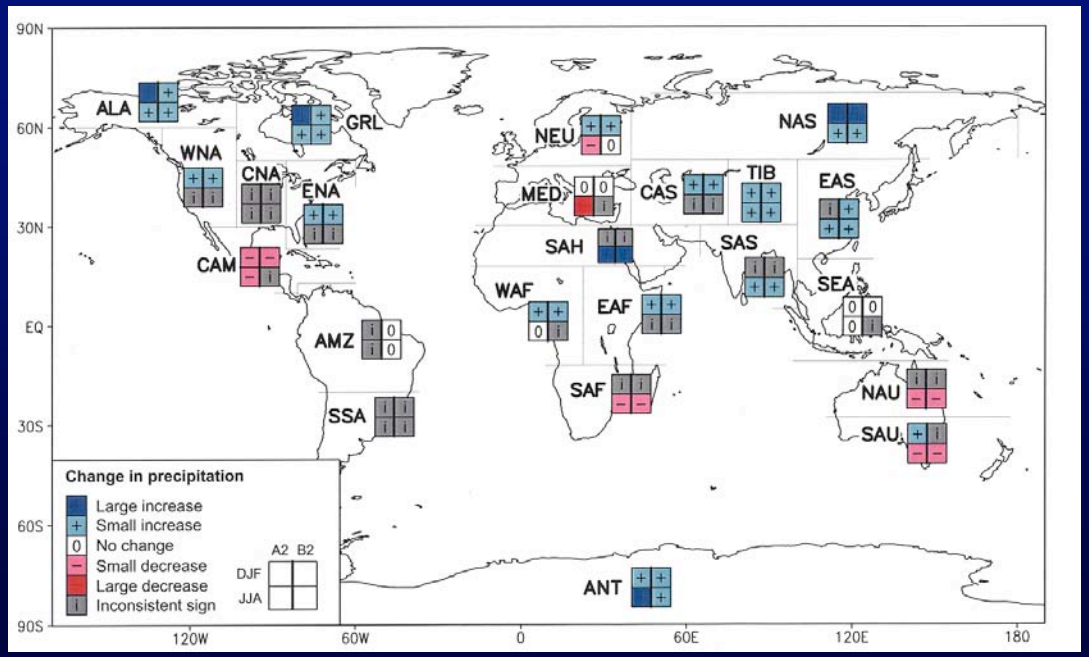
Filippo Giorgi

Abdus Salam ICTP, Trieste, Italy

WCRP Meeting, Toulouse, 11-13 February, 2009

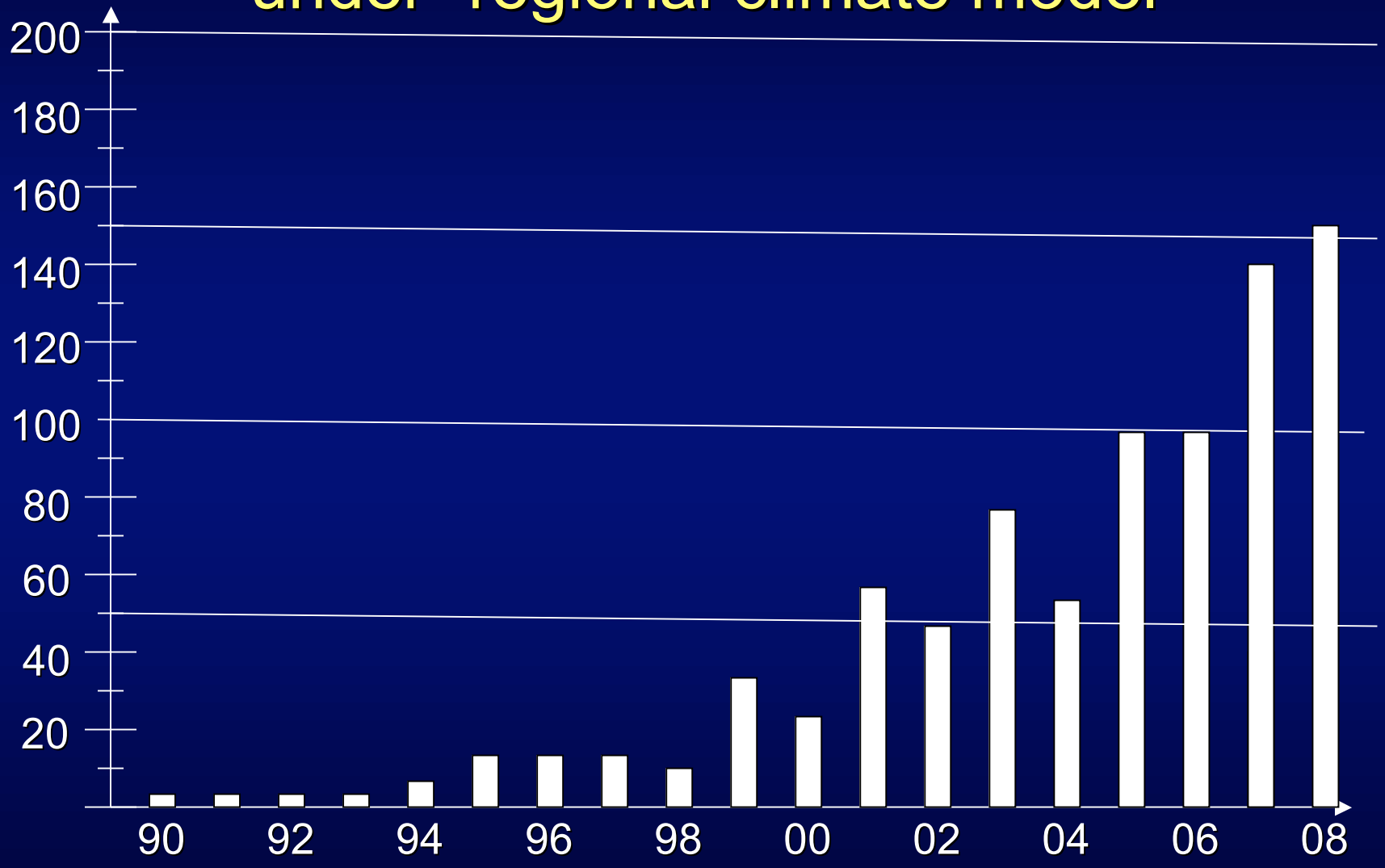
The regional climate change information in Chapter 10 of the TAR was essentially based on AOGCM simulations





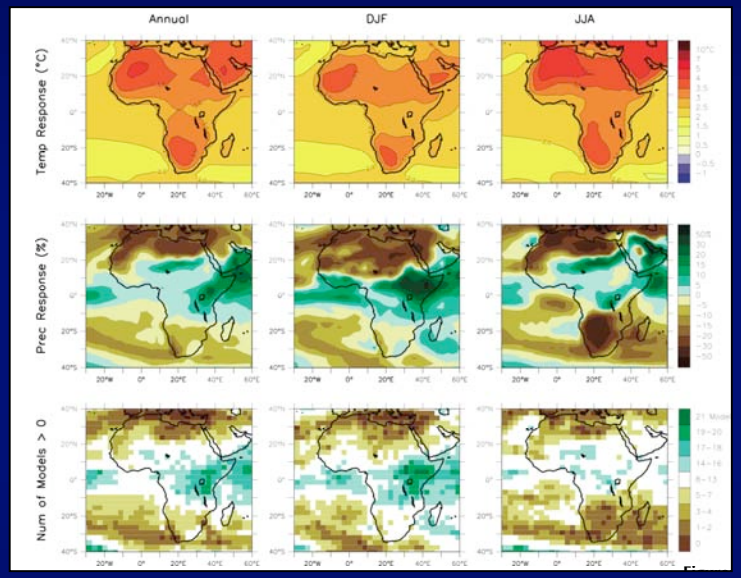
10 out of 18 figures in Chapter 10 were based on regional downscaling work, but mostly on methodological issues

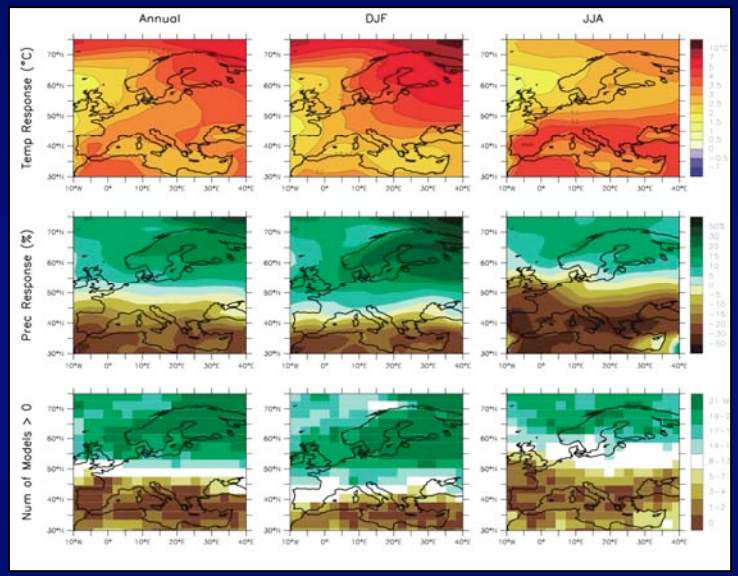
Number of papers in the ISI under “regional climate model”



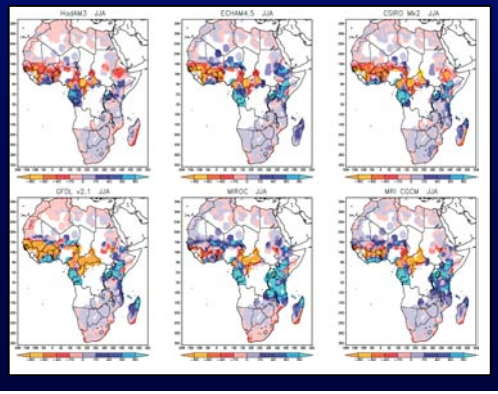
Was this development reflected in the AR4?

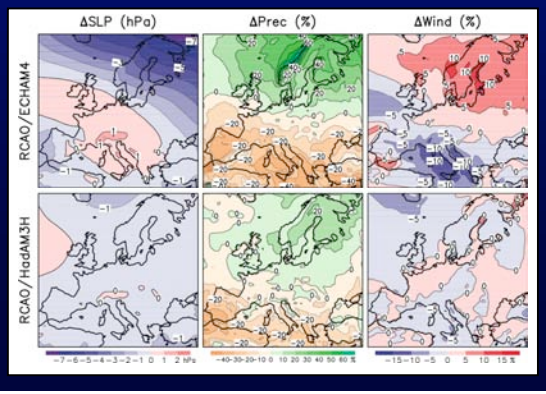
Most regional climate change information in the AR4 was still derived from AOGCMs

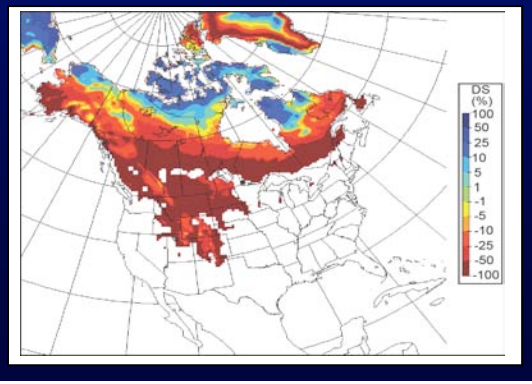




Only 3 figures in Chapter 11 from RCMs or SD (out of 30)



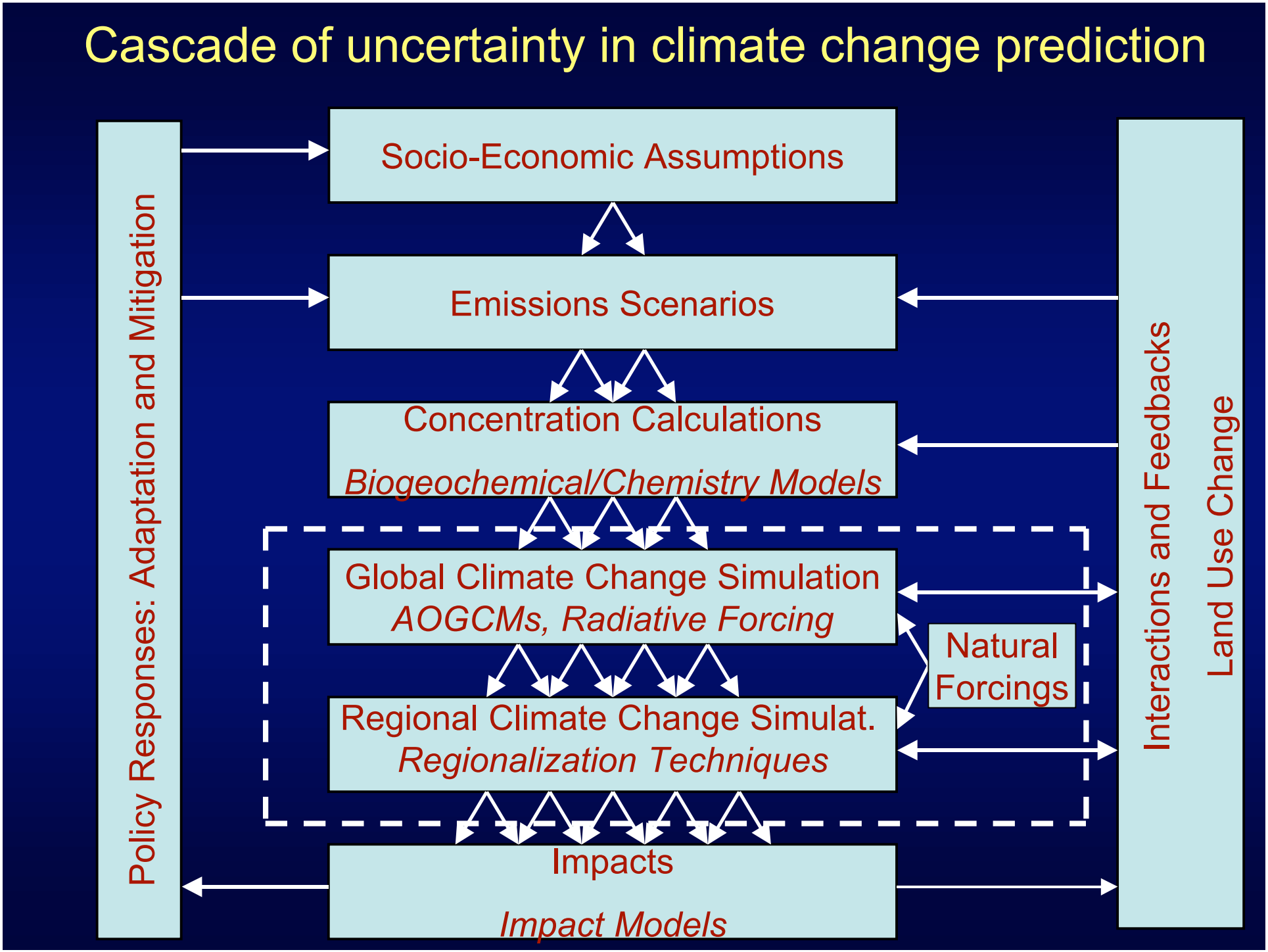




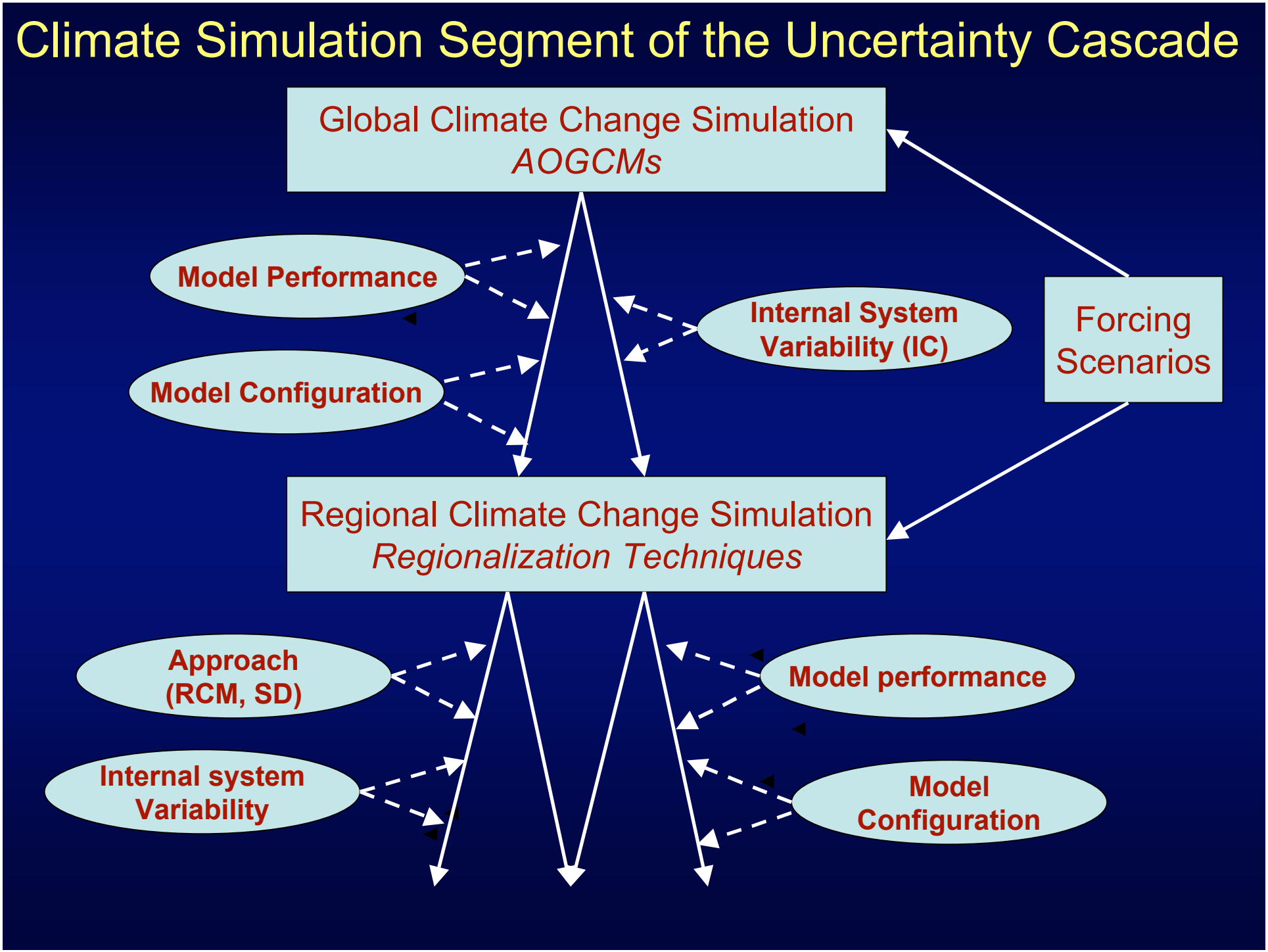
Why is RCM (and SD?) -based information under-used (and undervalued)

- There is still scepticism towards RCMs in a segment of the modeling community
  - RCMs are not ready and they are “spreading” too fast through an unexperienced user community
  - RCMs are not sufficiently evaluated
  - RCM output is taken too un-critically and it is not sufficiently “checked”
- Aside from a few exceptions (PRUDENCE, ENSEMBLES, NARCCAP), RCM efforts have been mostly isolated and unorganized
  - Mostly individual experiments without characterization of uncertainties

Cascade of uncertainty in climate change prediction

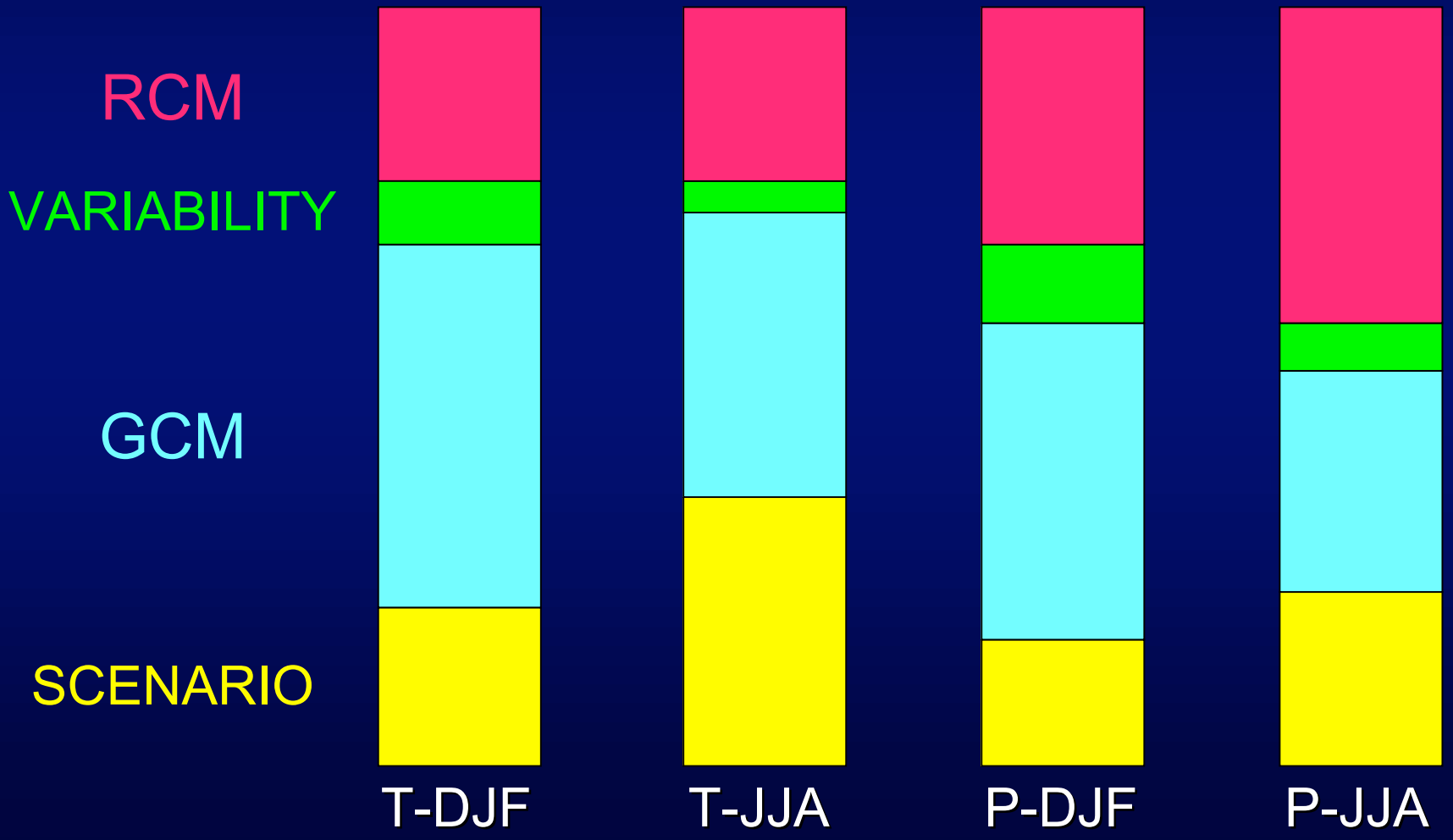


Climate Simulation Segment of the Uncertainty Cascade

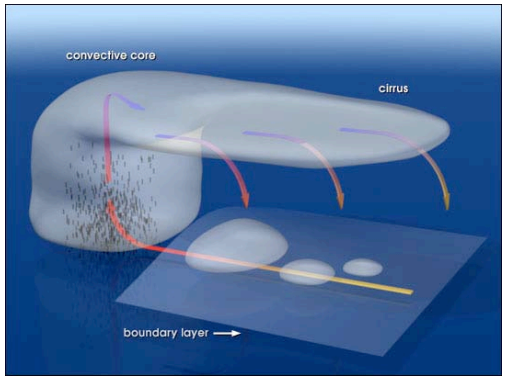


Sources of uncertainty in the simulation of temperature and precipitation change (2071-2100 minus 1961-1990) by the ensemble of PRUDENCE simulations (whole Europe)

(Note: the scenario range is about half of the full IPCC range, the GCM range does not cover the full IPCC range) (Adapted from Deque et al. 2006)



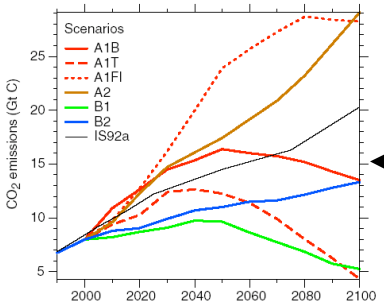
Regional Climate Change "Hyper-Matrix Framework" (HMF)



Internal Variability

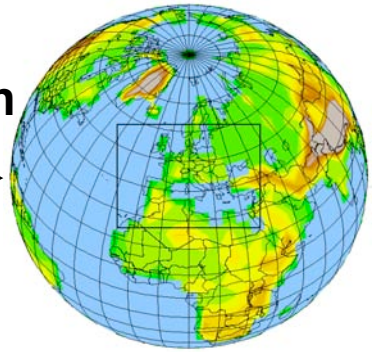
RCD Configuration

GCM Configuration



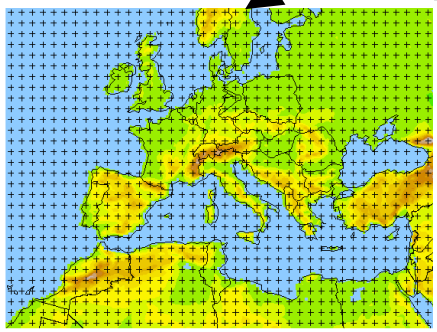
Forcing Scenario

Experiment (i,j,k …)

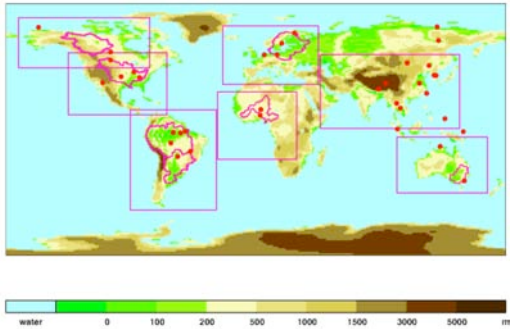


RCD Approach

Geographic Region



Giorgi et al. EOS 2008



What do we need to do to enhance the RCD input into the IPCC process?

- Design an experiment framework for improving coordination across RCD (RCM and SD) groups
  - Better evaluation and possibly improvement of models and techniques (AMIP-type)
  - More coordinated sets of RCM/SD projections to assess uncertainties (CMIPn-type)
  - Greater involvement of the end-user community and the scientific community from developing countries

Key ingredients for success emerging from the ongoing discussion

- Strong formal endorsement from WCRP - Done
- Formation of a formal ad-hoc task force to oversee the process under the WCRP auspices – Done (TFRCD)
- Involvement of a wide model development, application, and analysis community
- Involvement of the end-user community (impact, adaptation)
- Strong and possibly formal commitment of global modeling groups to provide suitable sets of 6-hourly fields for RCM nesting and SD
- Fast-tracked procedure for transfer of GCM fields to RCM/SD users
- Creation of databanks for storage of global “driving” fields and RCM/SD output.

A possible (IPCC-driven) time-schedule

- September 2008 – December 2008 - Done
  - Formation of the “task force”
- February 2009 – WCRP Workshop in Toulouse - Doing
  - First discussion meeting on technical issues of the program plan
  - First draft of a working document
- April 2009 – Report to JSC meeting
- May 2009 – Lund workshop
  - Finalization of plan and working document
  - Identification of contributions by different groups
- September 2009 – Report to WGCM meeting
- June 2009 – December 2009 (or later)
  - Completion and analysis of first set of validation runs driven by analyses of observations over the different domains
- (Possibly earlier than) June 2010?
  - Begin scenario runs
- We do not, or only partially, care about the IPCC schedule

Tasks at hand (1)
Define a framework for model evaluation

- Define a standard set of analysis-driven (perfect LBC) benchmark cases to assess the model performance and intercompare methods (analogous to AMIP)
  - ERA-Interim (1989-2007) ?
- Define a set of benchmark metrics
  - Region dependent?
  - Application dependent?
- Use the same metrics to assess the model performance when driven by GCM historical runs

Tasks at hand (2)
Define a model projection framework

- Models (GCMs and RCM/SD)
- Regions
- Domains and resolution (25 km?).
- Top priority runs (full or time slices):
  - Tier 1: RCP4.5 (ideally 1950-2100)
  - Tier 2: RCP8.5 (ideally 1950-2100)
  - Tier 2: DHFG (2005-2035)
- Possible additional runs
  - Emission driven coupled carbon runs
  - Additional DHFG hindcast run
  - Far future RCP4.5 stabilization time slices (2170-2200, 2270-2300)
- Possible sensitivity experiments to assess the importance of regional forcings (aerosol and landuse)

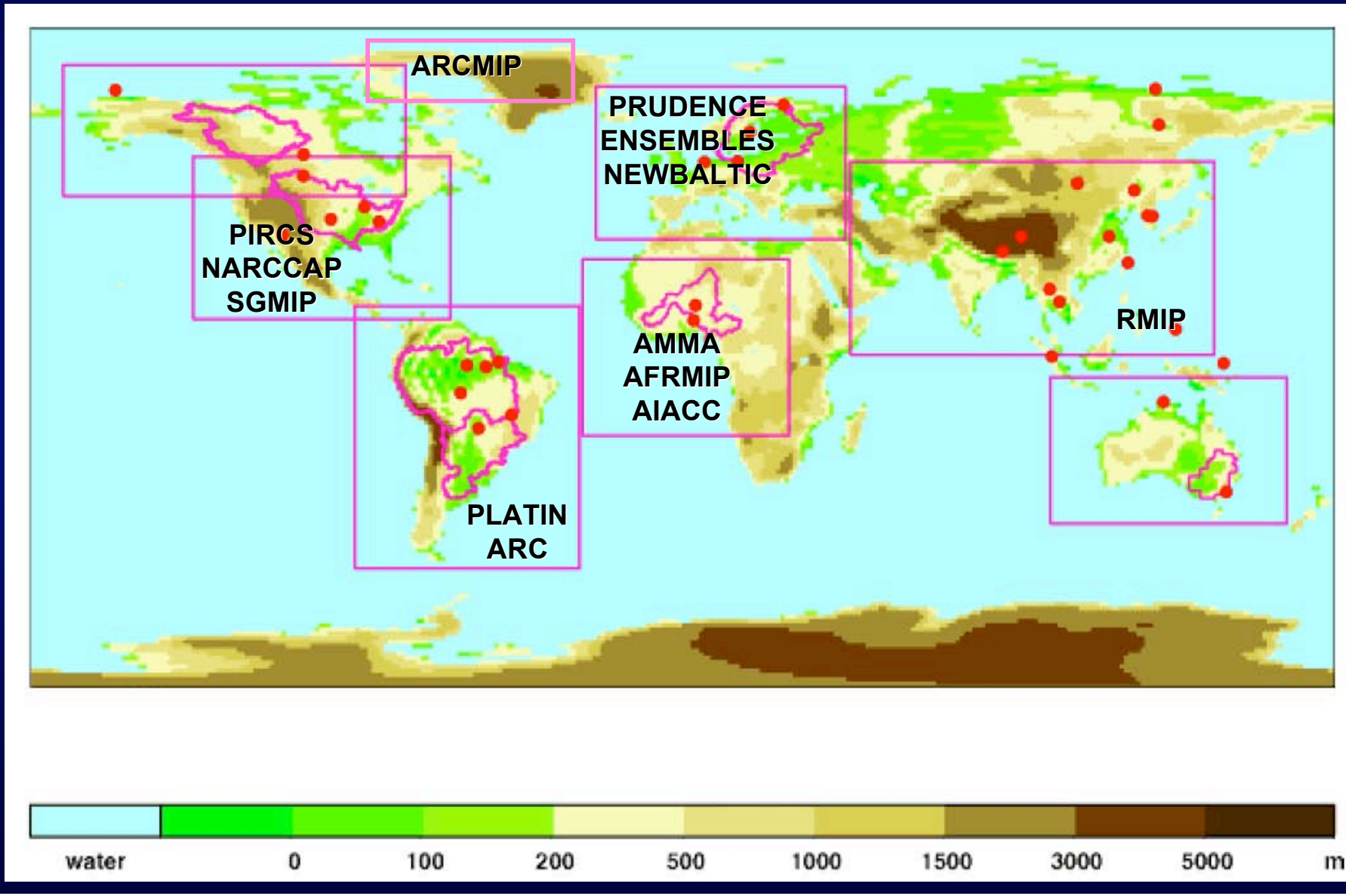
Tasks at hand (3)
Construction of databank(s)

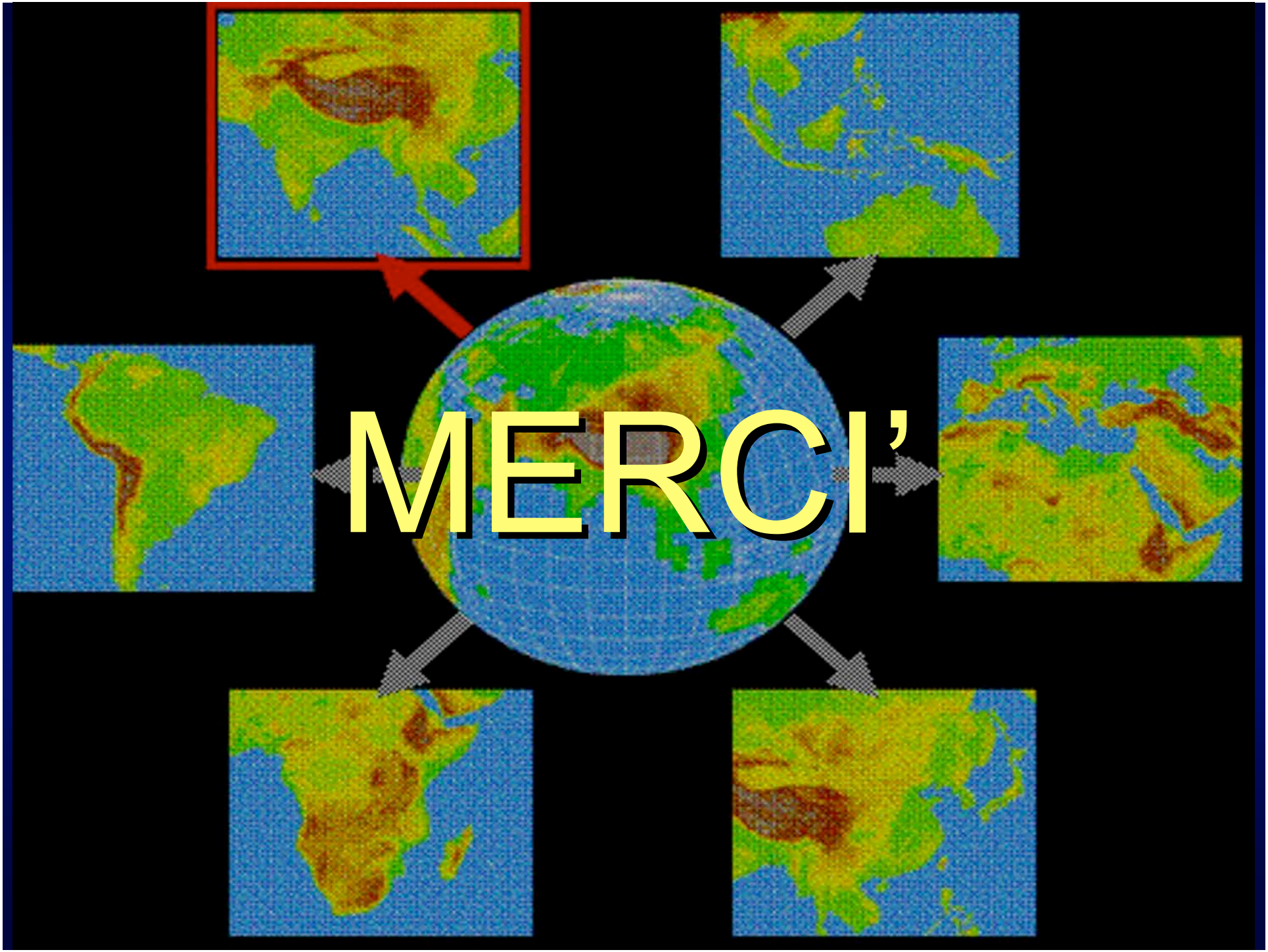
- Databanks
  - GCM-produced and reanalysis LBC data
  - RCM and SD output for use by “end-users”
- Data specification
  - Minimum but useful sets of data
  - Data format
- Data location
  - Global databank or regional ones?
- Data Transfer
  - Fast-tracked transfer from GCMs to RCMs/SD

Tasks at hand (4)
Dissemination and involvement of end-user community

- Data distribution to impact and adaptation users
- Timely feedback into the IPCC process
- Web site for the program (name of the program)
- Communication strategy

Regional intercomparison projects

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