

# CORDEX in the context of WGII

## *(or: life as a WG1 Émigré)*

Positioning WGII in the broader landscape

Understanding the landscape within WGII

Developing CORDEX output toward VIA interests

Challenges and opportunities



# A: The application environment CORDEX speaks into

Pick a role as a stakeholder trying to accommodate climate change

What has already changed?

Is that any different from variability?

What is the future?

When is the future?

How do you know that?

Where do you get your information?

Do you “believe” it?

How do you know how good it is?

Would you spend your **own** money based on this information?

**At the root of the issue, what level of information do you trust?**



## **B: The Confusion of offerings**

**A proliferation of portals and data sets, with poorly articulated uncertainties, weakly explained assumptions and dependencies, data implied as information, and communicated to a user community poorly equipped to understand the limitations**

**What then is the responsibility of CORDEX?**





**Delivered  
by science**

**Needed  
by society**

## **Data**

Climate models, historical observations, trends, downscaling, projections, event frequency, ...



## **Information**

Measures of vulnerability and risk, threshold exceedence, combinatory impacts, uncertainty and confidence, regional scale variations, ...



## **Knowledge**

Assessing options, understanding consequences, evaluating responses, informing decision making, ...



## **A basis for action**

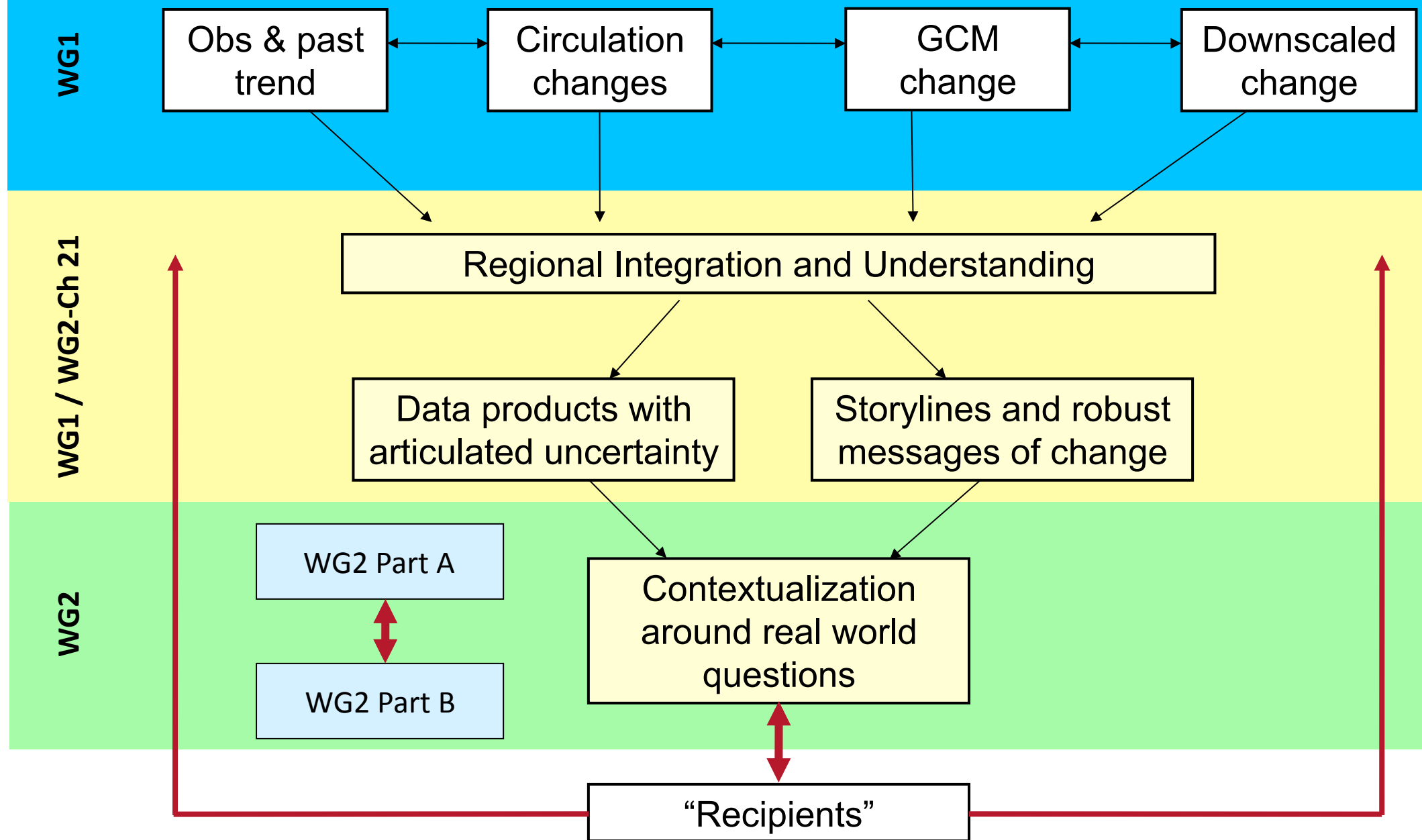
Policy development to balance competing priorities, strategic investments in adaptation and mitigation, new research avenues, coordination of response frameworks, ...

**Generated by models, analyses, downscaling, observations ...**

**We are not always sure when we have “information”**

**Comes with close coupling between science and society**

**Actions are risky, and takes place within a multi-stressor context**



IPCC structure related to integrating CORDEX-type information for regional impacts and adaptation needs

The users landscape of downscaled information  
 $\text{Local climate} = f(\text{larger scale predictors}) + \text{locally forced variance}$

Dynamical  
Two approaches

RCM

Hi-res GCM

Empirical-statistical  
Three main classes

Weather Generators

Trained on long term  
time series and  
atmospheric re-analysis  
data, conditioned by  
GCM parameters to  
capture low frequency  
variance

Transfer Functions

Trained on time series  
that spans range of  
variability, residual local  
scale variance added  
stochastically

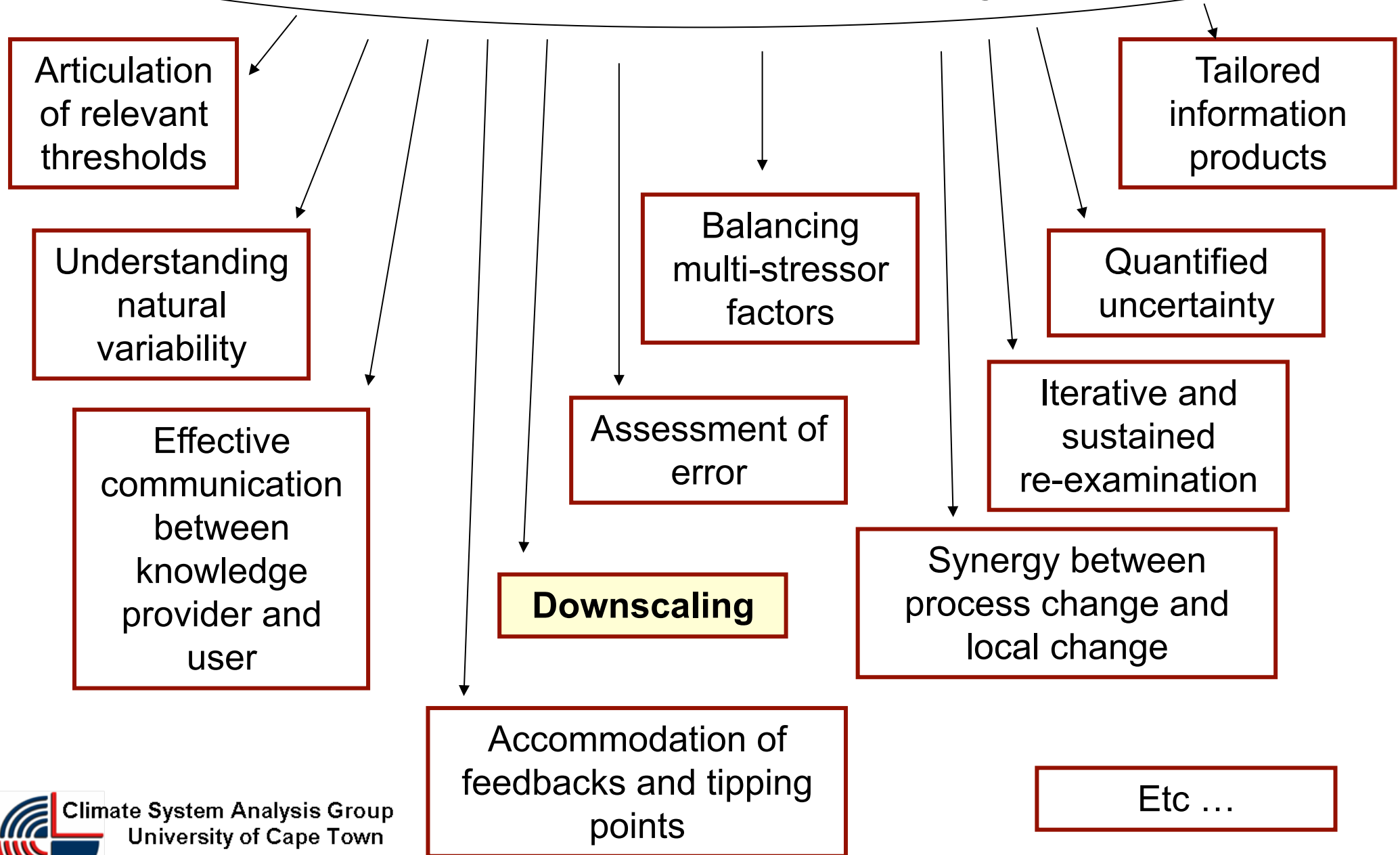
Index / analogues

Requires long term data  
sets and uses weather  
typing or historical  
analogues

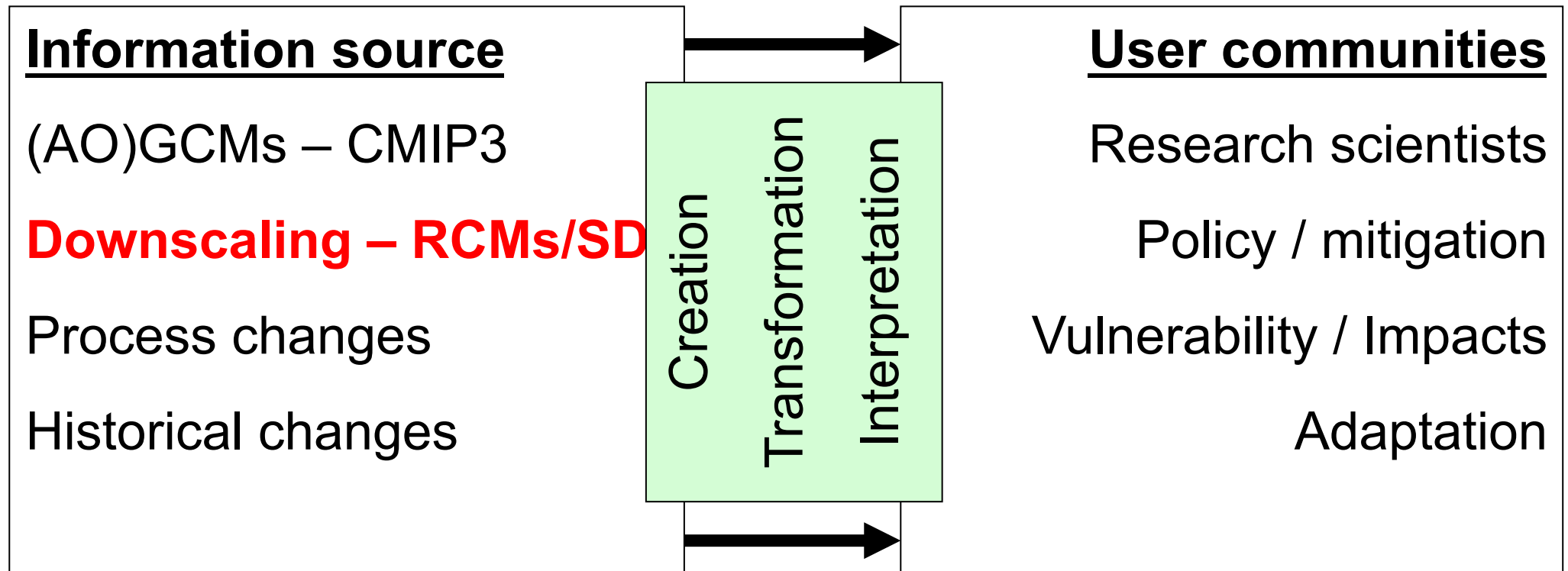
Perturbed observed



Even then ... it's not only about the data!  
Users face multiple dependencies in seeking value for  
adaptation decision making



# What we would like to accomplish ...



## Each source has different:

- attributes of signal and noise
- limitations on interpretation
- degrees of uncertainty
- methodologies of evaluation

## Each community has different:

- definitions / terminology
- priorities of need
- scales of interest
- access to information





## Examples of a question the WG2 community is interested in exploring based on information from CORDEX

**Thresholds** : Systems operate within design parameters, it is attributes of how and when these parameters may be exceeded that is important

- Exceedence magnitude
- Exceedence frequency
- Exceedence through combination
- Exceedence by compound effect
- Proximity to threshold under current climate
- Probability versus uncertainty of projected changes
- Consequences of exceedence



# CORDEX in the context of WGII

A basic question: Where is CORDEX likely to be on the scale of delivered outputs (not data)?

- Plausible scenarios (with qualified error & bias)
- Defensible projections (with rational physical basis)
- Actionable information (you'd spend your own money)

*Alternatively: How much has the downscaling community contributed to actionable information in the last 5 years?*



# CORDEX in the context of WGII

## The landscape within WGII

Key dependencies:

- WG1 timeline
- Timely CORDEX deliverables to contribute to VIA relevant publications



# The landscape within WGII

AR5-WG2 will be in two parts:

## Part A: GLOBAL AND SECTORAL ASPECTS (20 chapters)

- Natural and Managed Resources and Systems
- Human Settlements, Industry, and Infrastructure
- Human Health, Well-Being, and Security
- Adaptation
- Multi-Sector Impacts, Risks, Vulnerabilities, and Opportunities

## Part B: REGIONAL ASPECTS (10 chapters)

*{Subtitle: Contribution of IPCC WGII Incorporating Inputs from IPCC Working Group I “The Physical Science Basis” and Working Group III “Mitigation of Climate Change”}*

- **Ch 21: Regional context**
- Ch 22-30: Regions



# The landscape within WGII

**Ch 21: Regional context** : *“What are the new regional findings / information / understanding / messages / identification of gaps or limitations in knowledge, which have bearing on or add context to IAV”*

Approximately 2/3<sup>rd</sup> of the chapter devoted to:

- **Assessment of methods of regional adaptation / vulnerability literature**  
*Including context, baseline information, characterizing the future, Information Quality and Uncertainty*
- **New emerging findings / information / understanding / knowledge**

Ch 21 will not do exhaustive syntheses of regional information





# The landscape within WGII

Two metrics for communicating uncertainty:

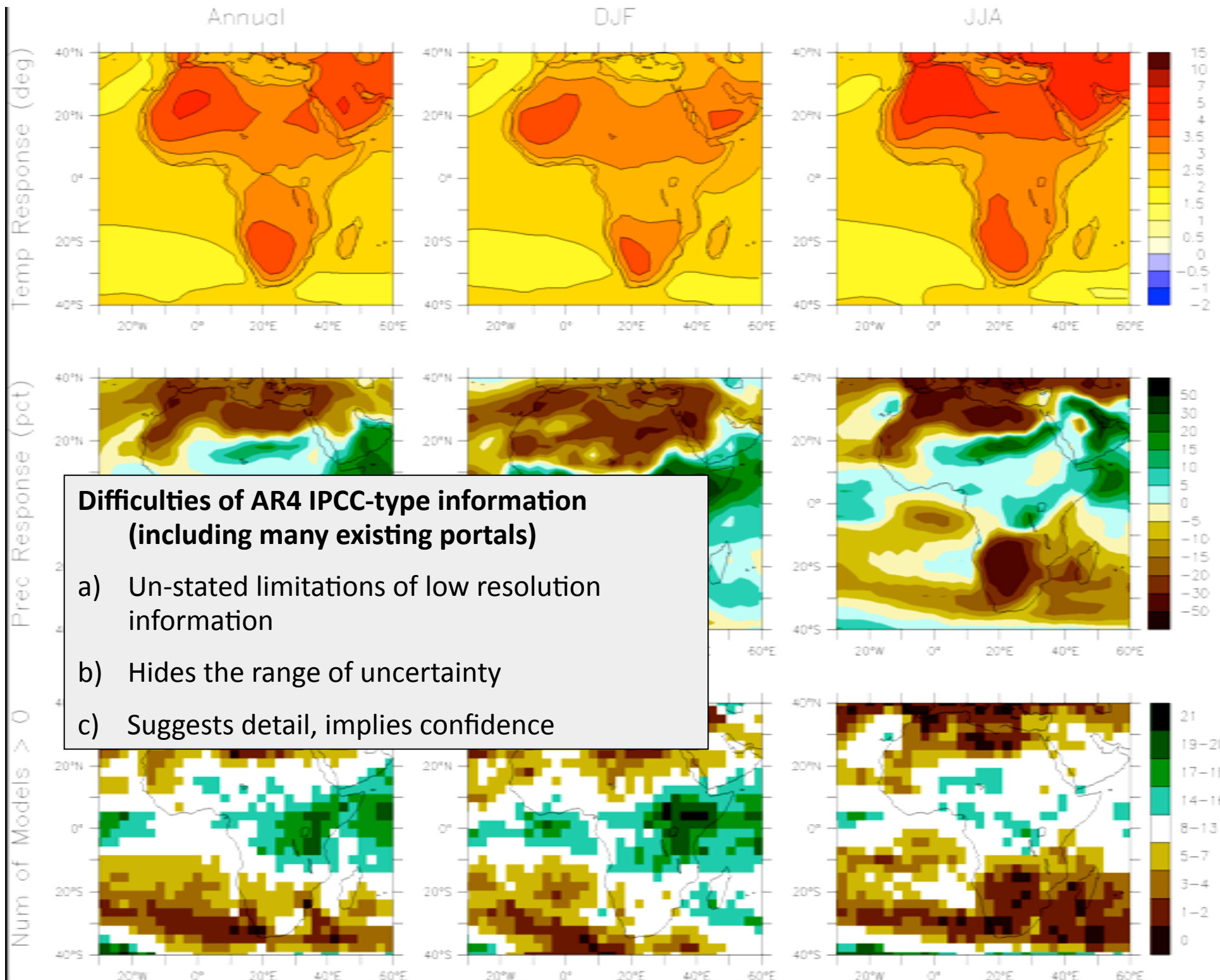
- Qualitative expression of confidence based on evidence and the degree of agreement.
- Quantified measures expressed probabilistically based on statistical analysis



# CORDEX in the context of WGII

## Challenges and opportunities for CORDEX

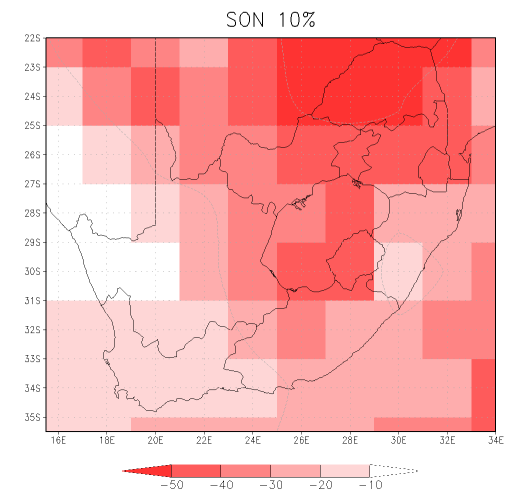
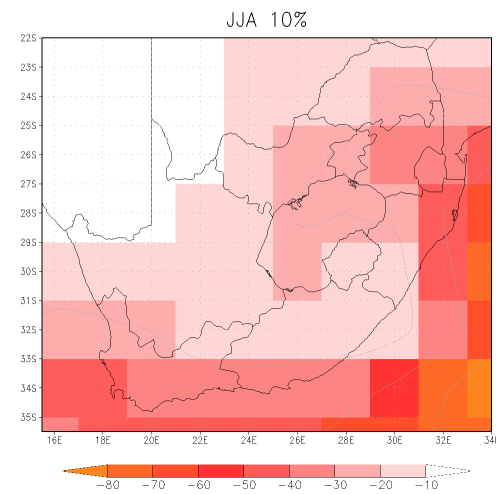
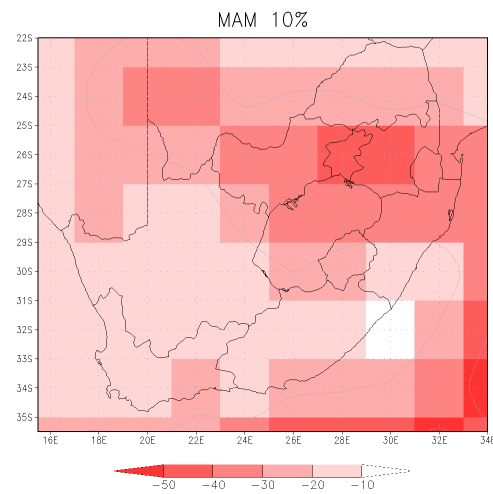
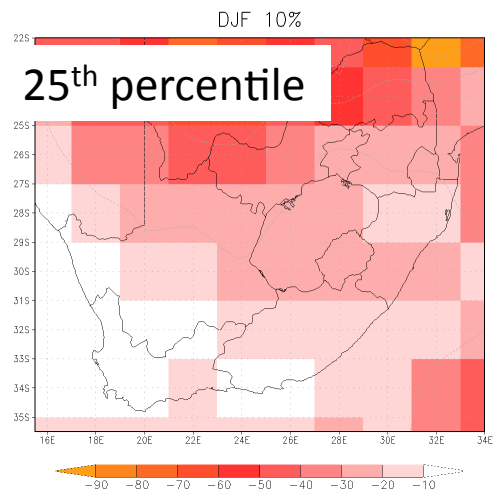
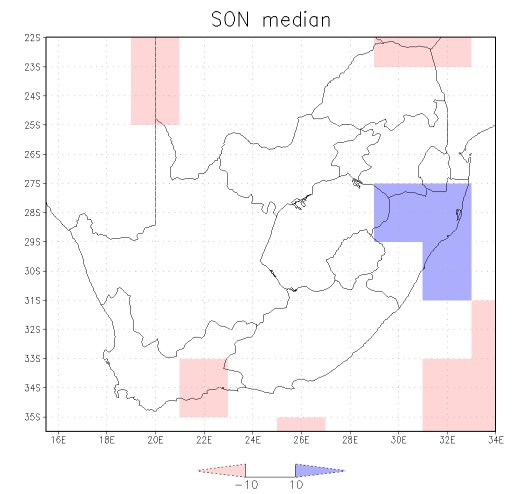
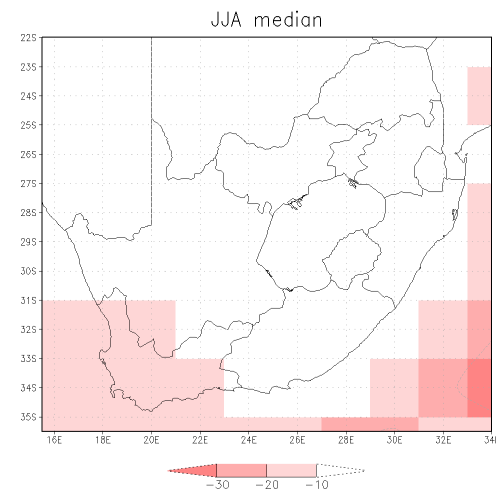
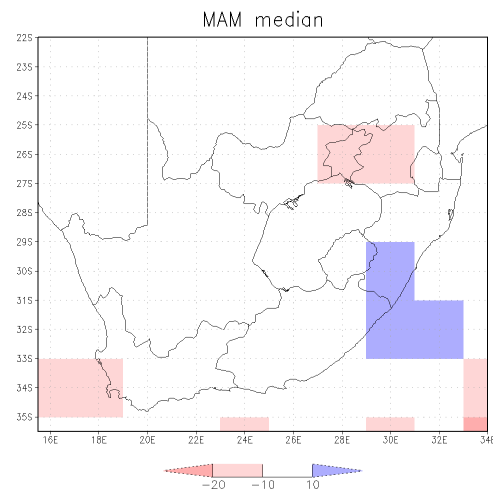
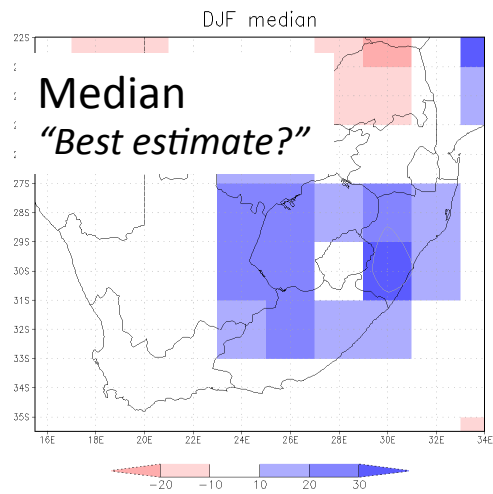
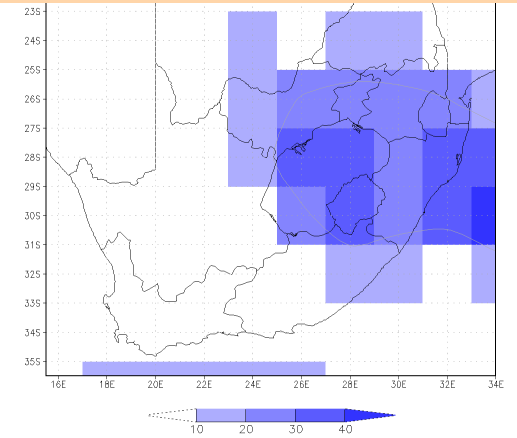
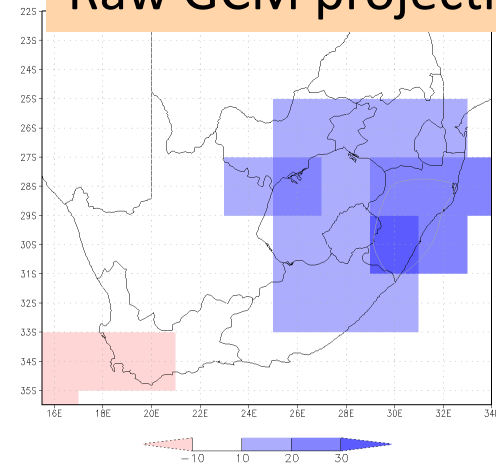
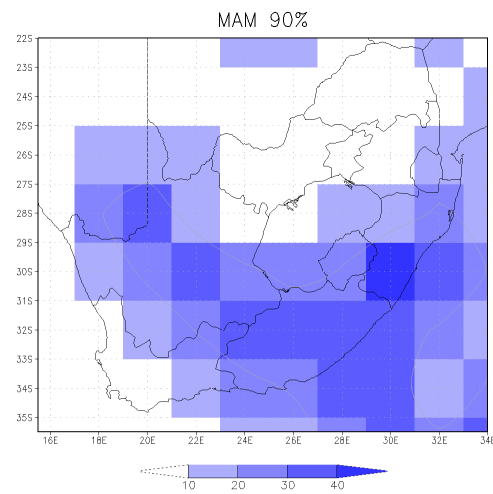
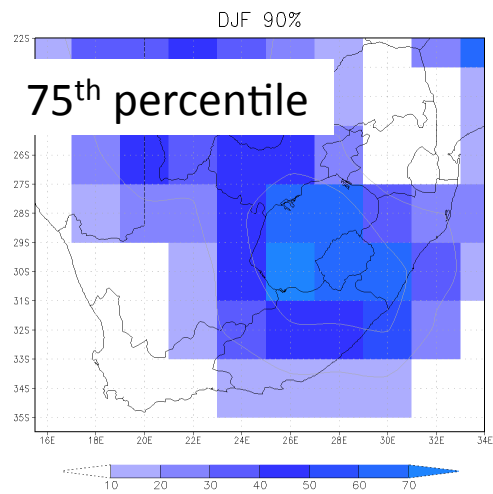




AR4 Ch 11

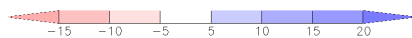
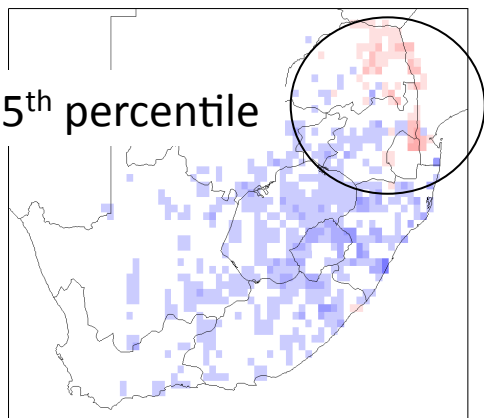
**Rainfall(%) / Temperature changes by end of 21<sup>st</sup> Century**

# Raw GCM projections: rainfall – CMIP3

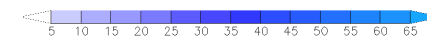
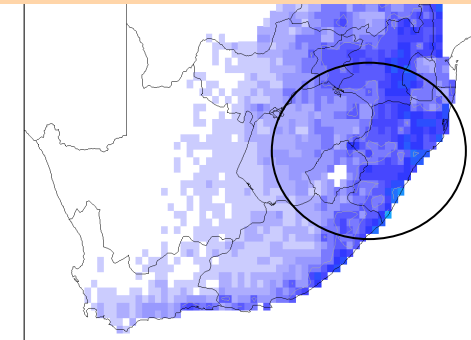
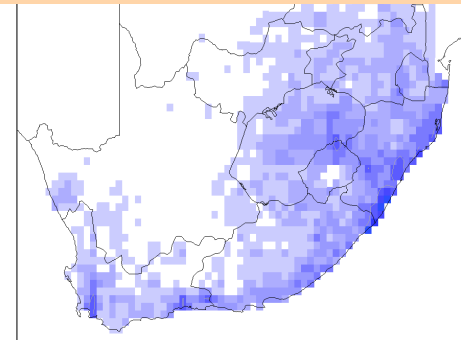
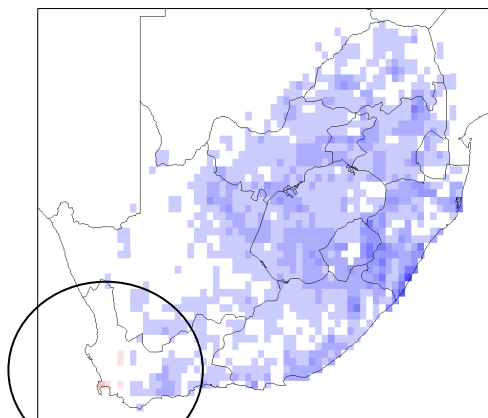


# Downscaled rainfall change

75<sup>th</sup> percentile

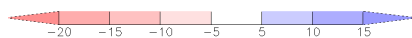
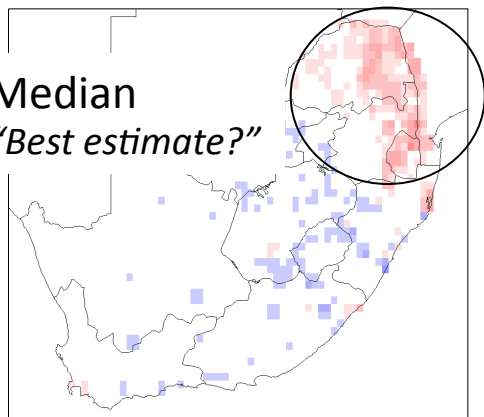


MAM 75%

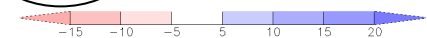
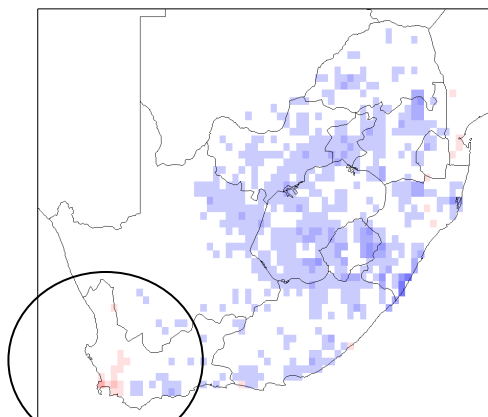


DJF median

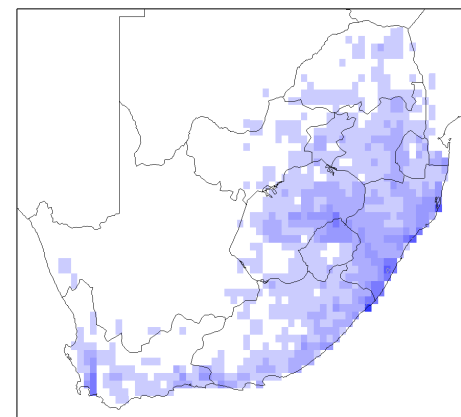
Median  
"Best estimate?"



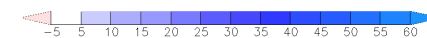
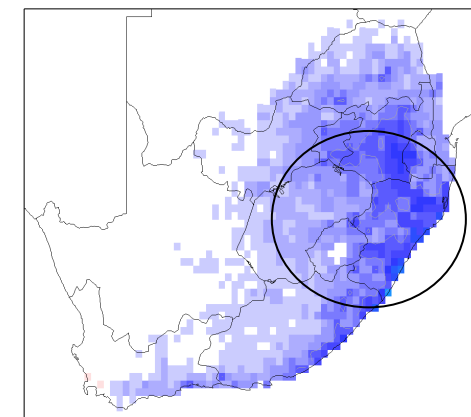
MAM median



JJA median

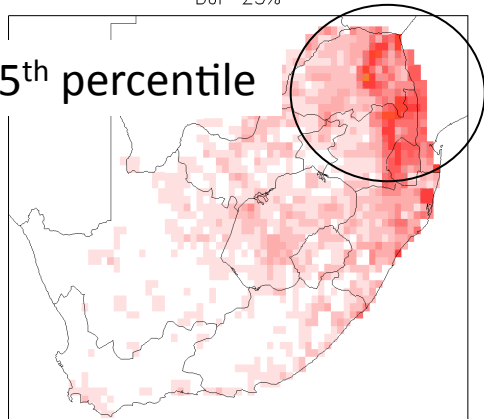


SON median

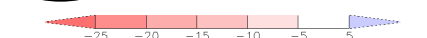
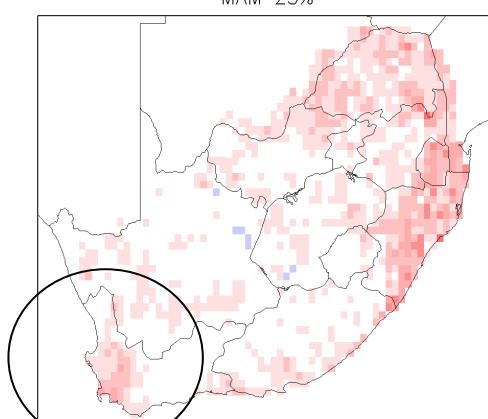


DJF 25%

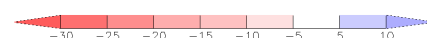
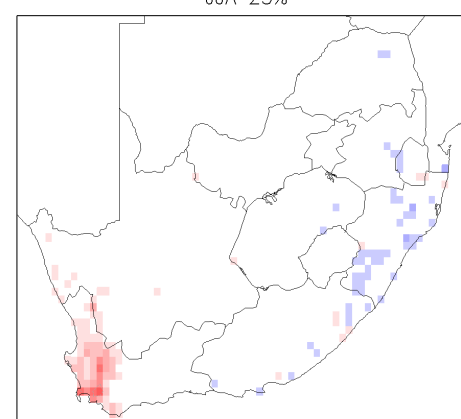
25<sup>th</sup> percentile



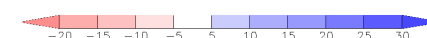
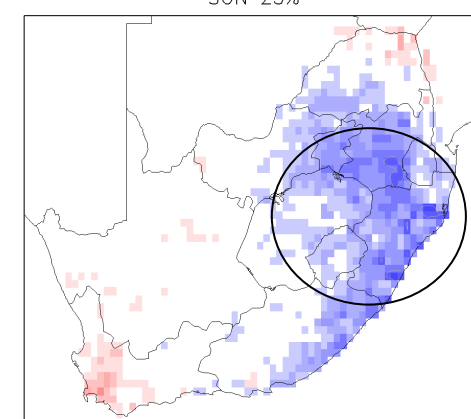
MAM 25%



JJA 25%



SON 25%





# CORDEX in the context of WGII

**Illustrative regional information needs that CORDEX can contribute to:**

- Regional baseline climate (problematic in some regions!)
- Information on regional trends and variability, and of extremes
- Trends of underlying processes and where are regional hotspots of feedbacks and sensitivities
- Regional projections of the above in the context of multiple RCP / emissions scenarios
- Ideally delivered graphically, mapped and with tabular information as appropriate, metrics of uncertainty and assessment of robust regional messages integrating multiple lines of evidence

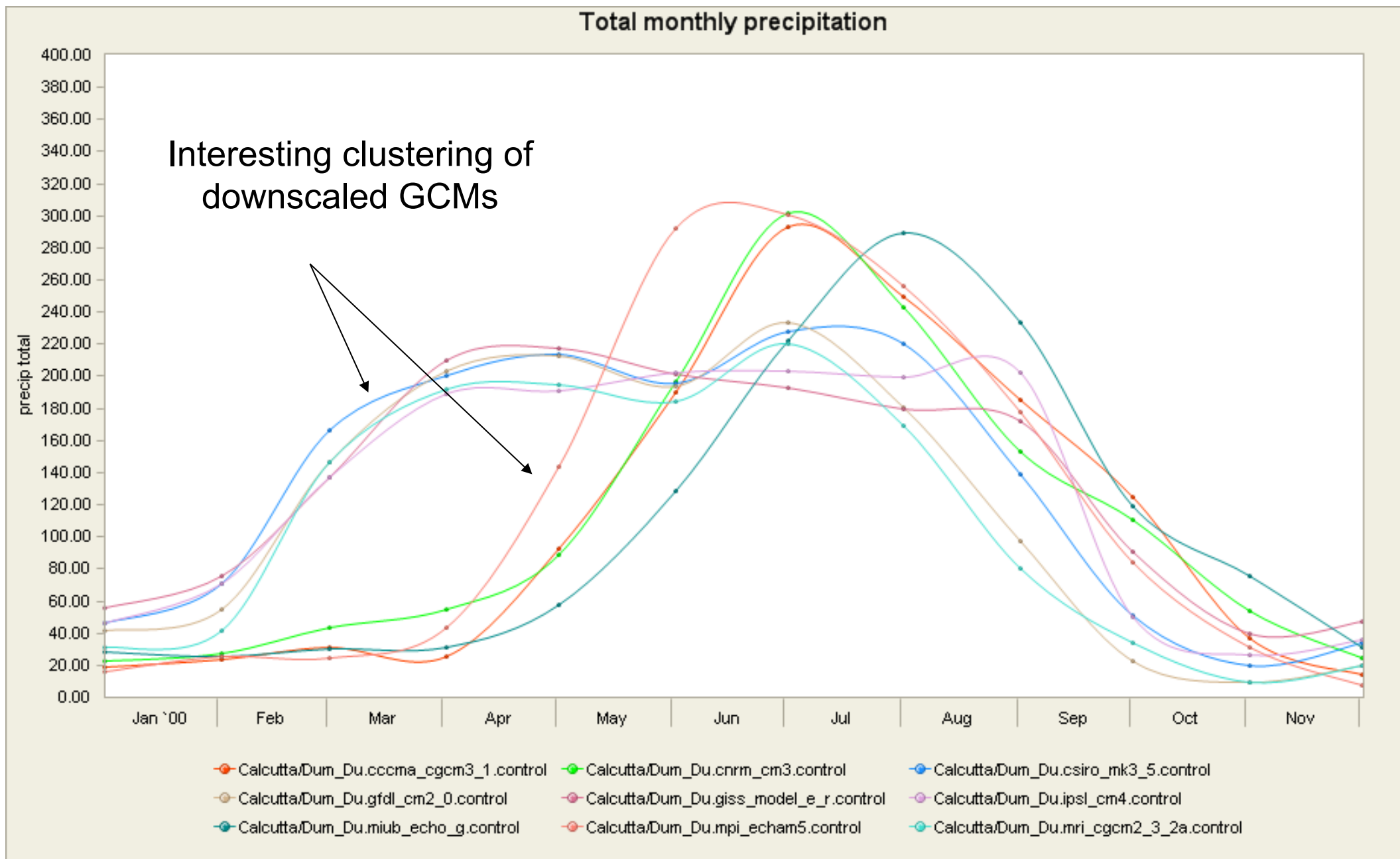


## **(Some) Frontier questions / actions to finding added value**

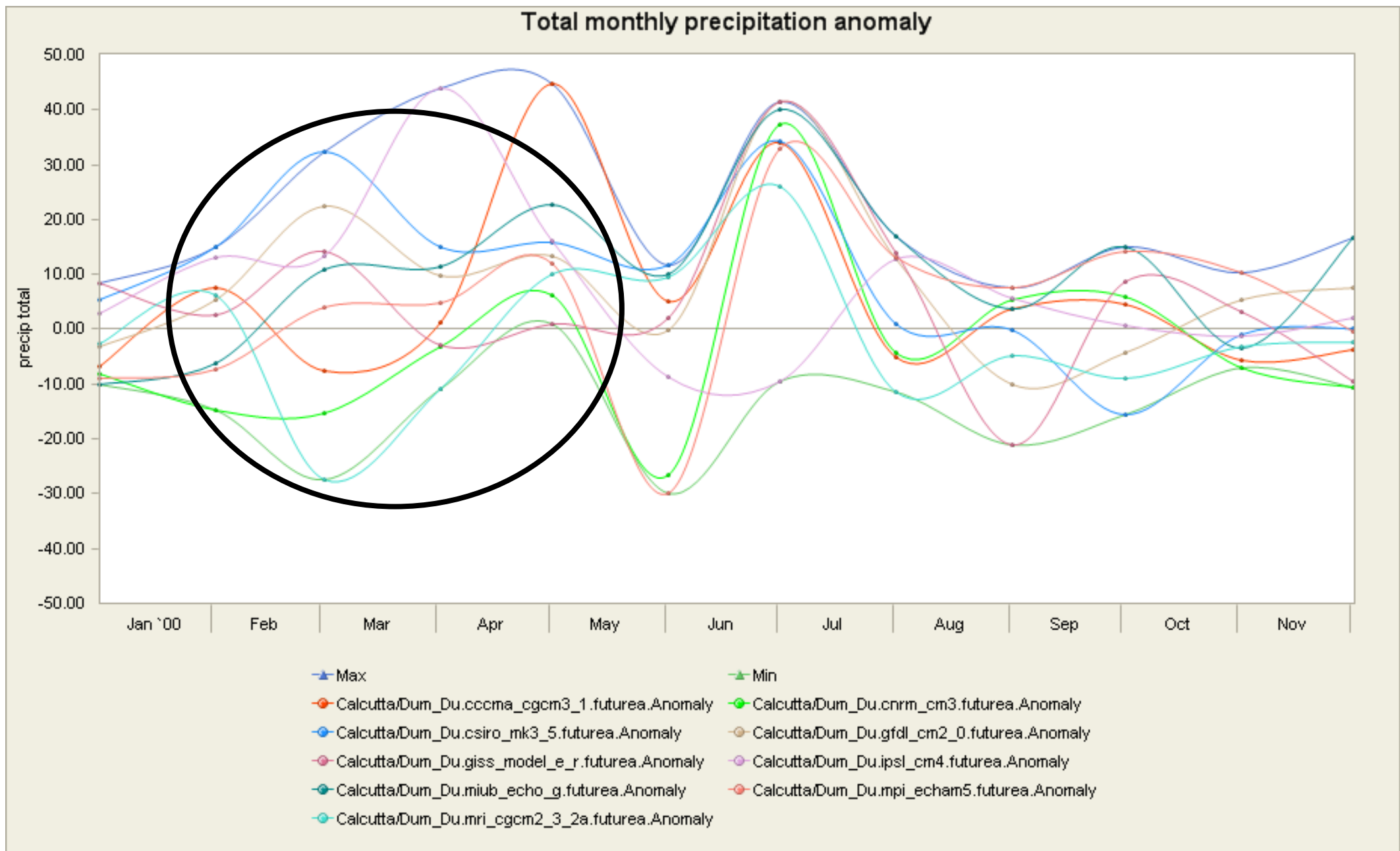
1. How to handle the multi-model spread
2. How to integrate RCM and statistical downscaling solutions
3. What new ways can we interrogate the data to find WGII relevant information, especially for process understanding?
4. If contradictions arise between RCM / GCM / SD / history, is there a consistent approach CORDEX can adopt?
5. What is used as the baseline gridded reference of past climate?
6. Can CORDEX facilitate synthesis and communication of results, especially in critical capacity-limited regions
7. How best to leverage CORDEX to facilitate and sustain capacity building in developing nations, and sensitize the modeling community to user-community needs



# Calcutta, India – one example of a downscaled complication



# Calcutta, India – one example of a downscaled complication





# **Closing thoughts from a WGII perspective**

**There are very high expectations of CORDEX,  
perceived as a key foundation for informing the  
VIA community that WG2 addresses**

**Arguably, the biggest challenge relates to  
delivering actionable value from multi-model  
multi-method results**

