

Climate Science Data, Information and Service Delivery – a complex road

- Drivers
- Evidence
- Attribution
- Modeling
- Projections
- Limitations
- Uncertainty
- Regions
- Interpretation
- The IPCC
- Ethics
- Etc ...

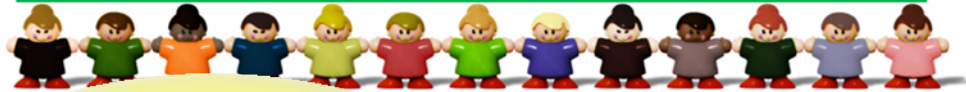


Communities of language & agendas
Data chains and knowledge networks
Robust messages vs any messages

A (cynical?) view of relevant knowledge communities

The adaptation community advises

("stop, wait, move over there, run!!!")



The mitigation community tries to steer it

("we think can keep it under 2 degrees warming – with a bit of luck")

The conspiracy community

(Its really a mouse, you're just trying to take advantage of me)

The catastrophe community

(It's the end of the world

The funding community

(I'm not interested unless I get my agen

The Denial community
(Elephant? What Elephant?)

The self-interest community

(I'll wait until you do something first)

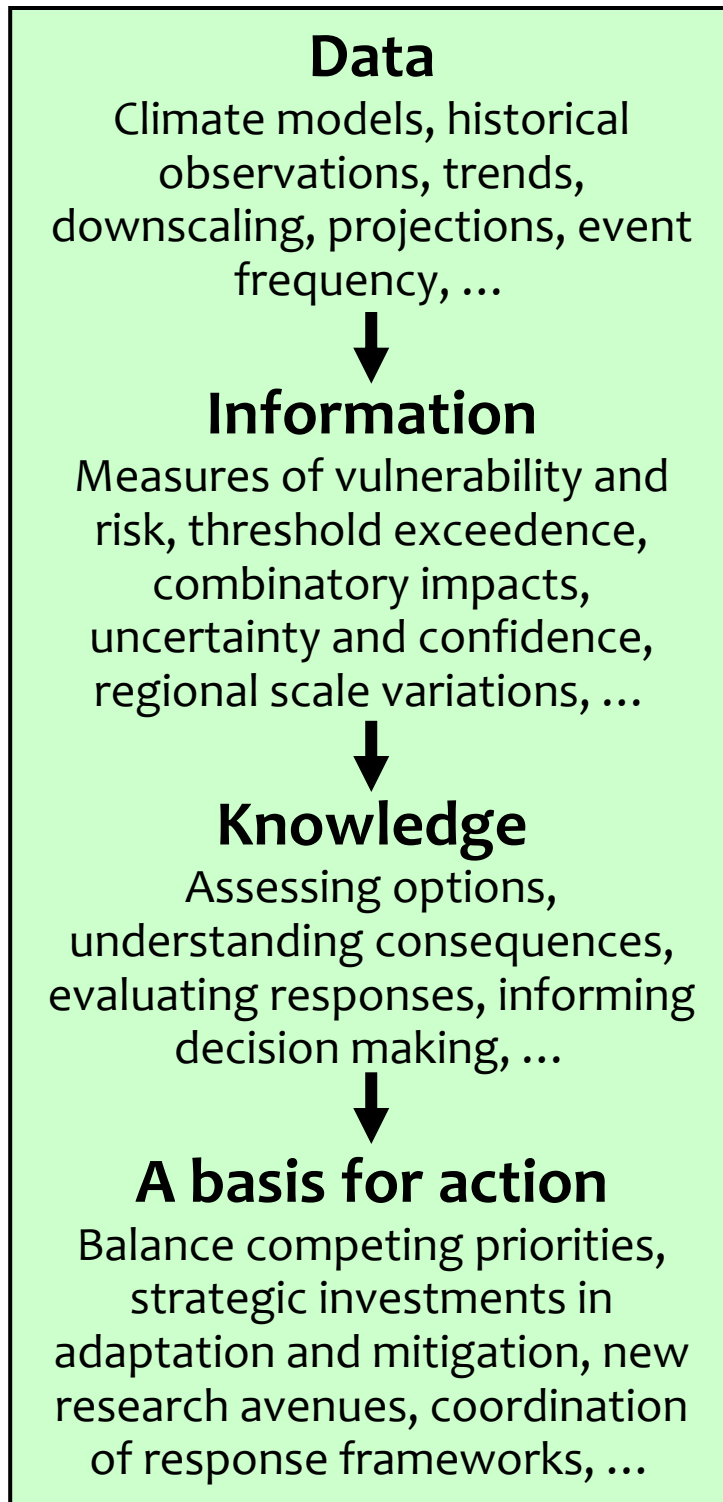
Objective climate reality

The "with-the-best-of-intentions-but-am-not-very-self-aware" community
(I've never seen your elephant, but just use this data I have ...)

Scientists trying to understand what the elephant is and will do

("it's *probably* headed that way")

**Delivered
by science**



**Needed
by society**

The knowledge chain approach to linking communities

- A producer and consumer of data
- Built on the authority of “experts”
- Dominated by a one-directional information flow
- Producers define the knowledge product (sometimes after consultation)

The emerging “Confusion of Information”

A proliferation of portals and data sets, developed with mixed motivations, with poorly articulated uncertainties and weakly explained assumptions and dependencies, the data implied as information, displayed through confusing materials, hard to find or access, written in opaque language, and communicated by interface organizations only semi-aware of the nuances, to a user community poorly equipped to understand the information limitations

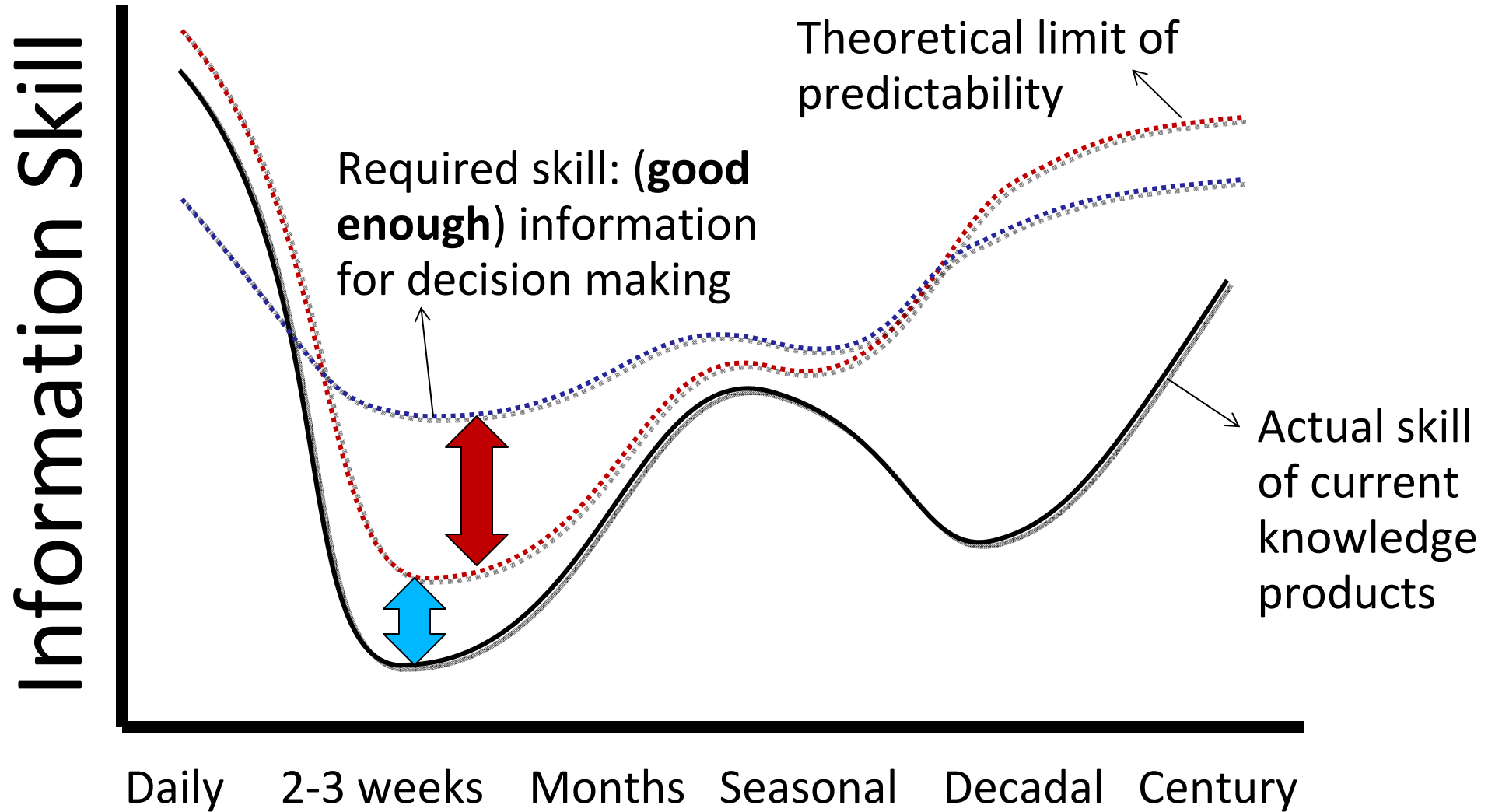
Knowledge networks as integrations of knowledge chains



- What are the consequences of knowledge gaps?
- How best does one inform decision-making under conditions of incomplete information
- What are the best investments in knowledge production for informing adaptation
- How should one approach the integration of multiple streams of information

What are we really trying to achieve?

For a given spatial scale, variable, metric, and application, the information skill is a function of time scale



Global Climate Models

The basis of (large scale) projections

AR4: Overview of climate change science

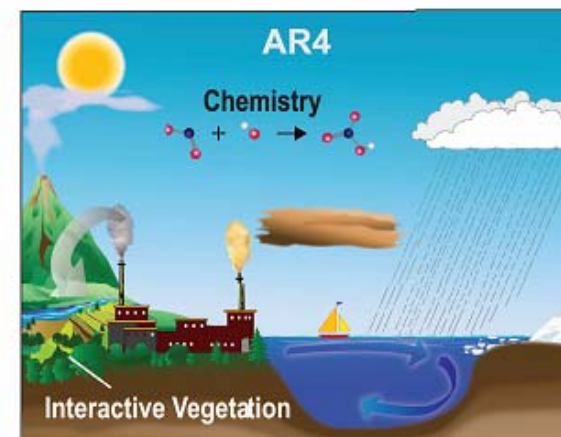
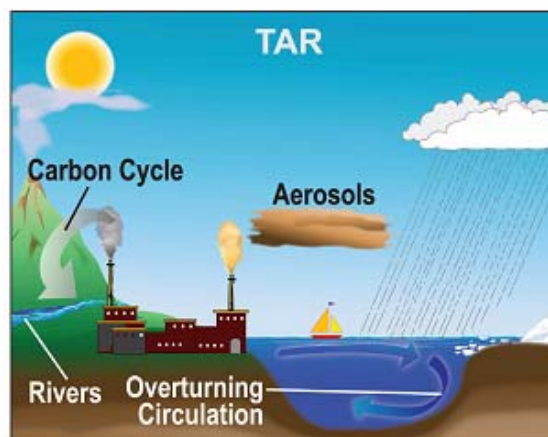
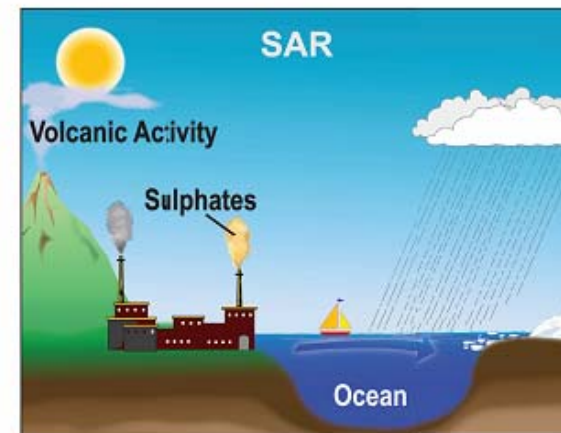
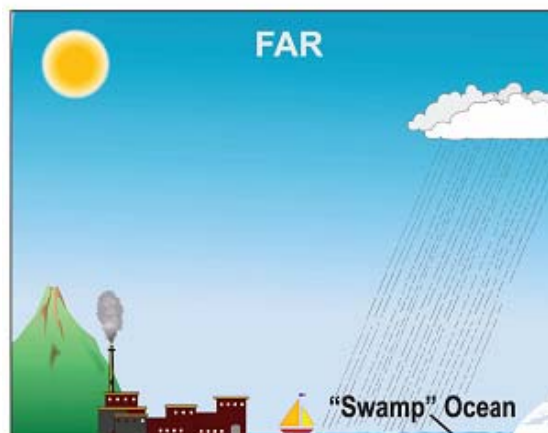
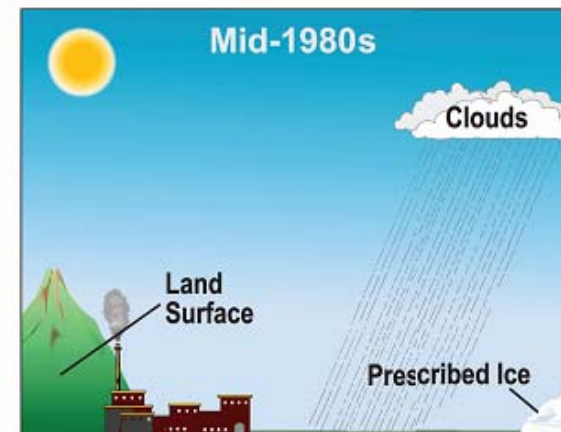
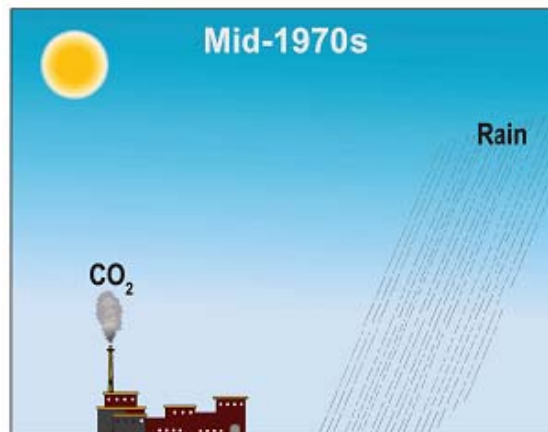
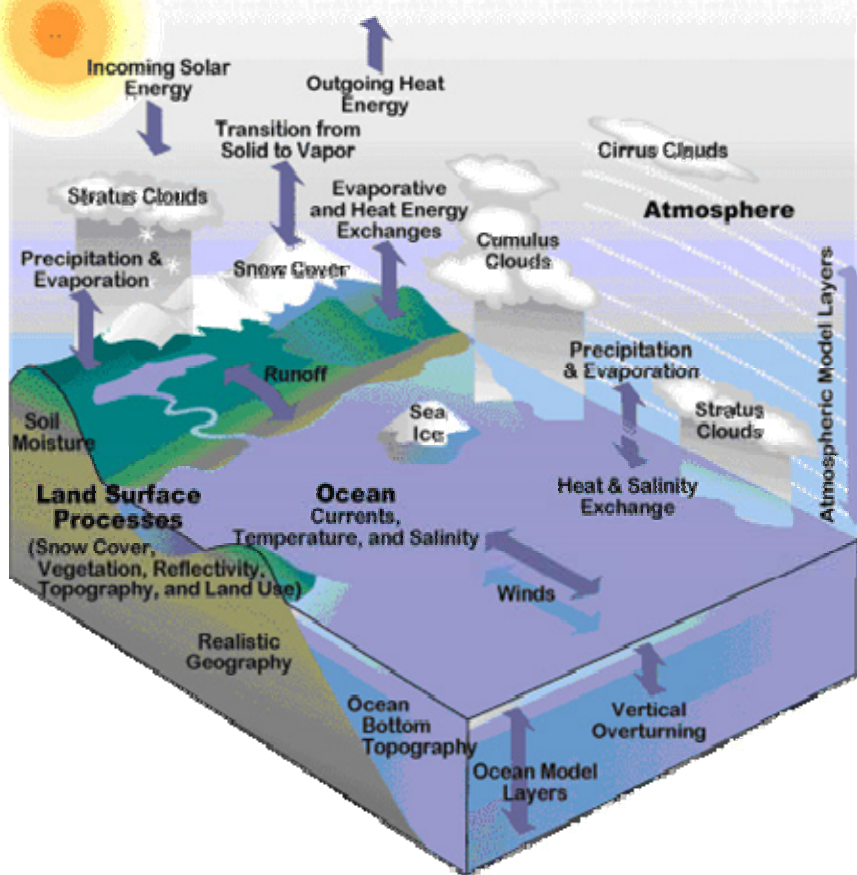


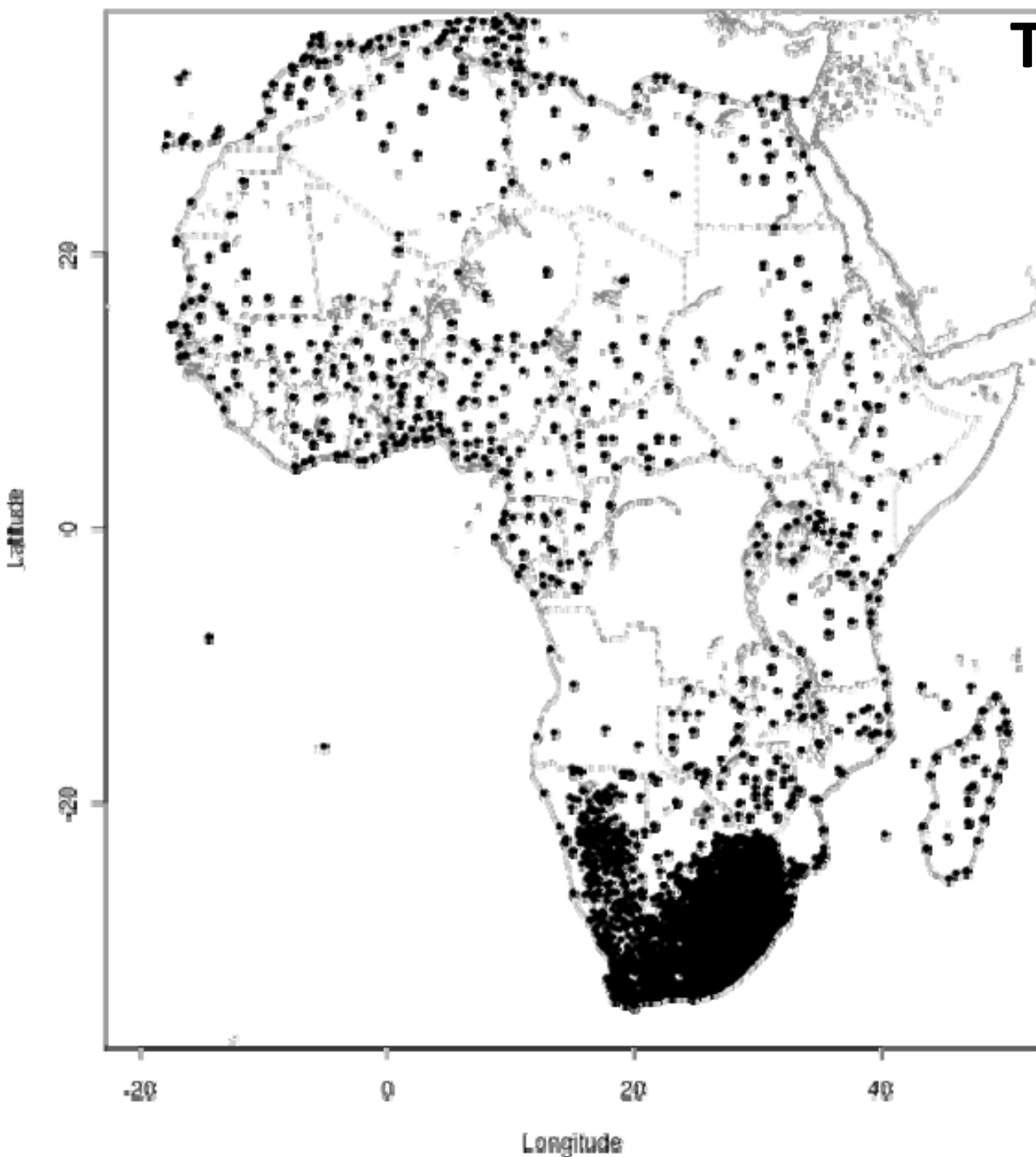
Figure 1.2. The complexity of climate models has increased over the last few decades. The additional physics incorporated in the models are shown pictorially by the different features of the modelled world.

But, all models are “wrong” – they are not an exact representation of reality

Climate models, hydrological models, vegetation model, (your investment!) financial models, health models, ecosystem models, etc., etc., are imperfect, because they are reduced complexity

Climate models simplify the deterministic components of a system, and weakly (if at all) capture the chaotic and stochastic elements

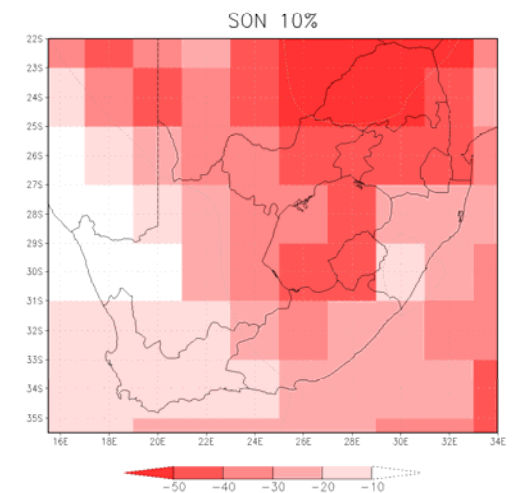
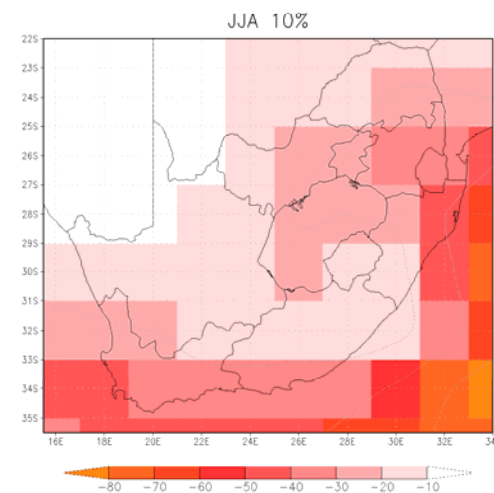
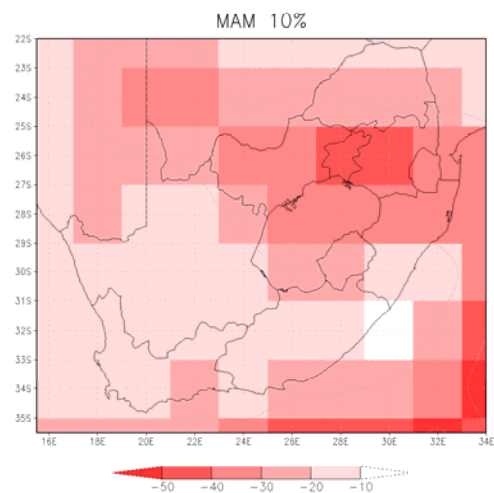
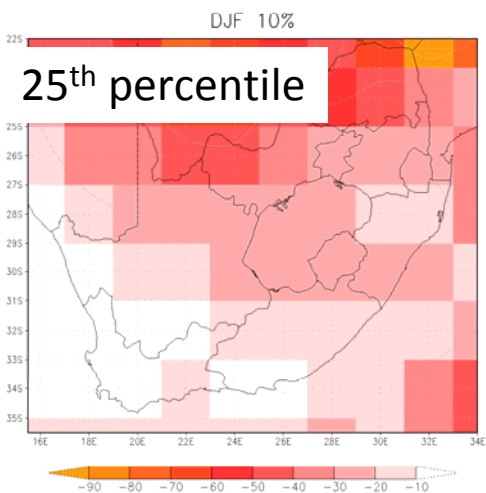
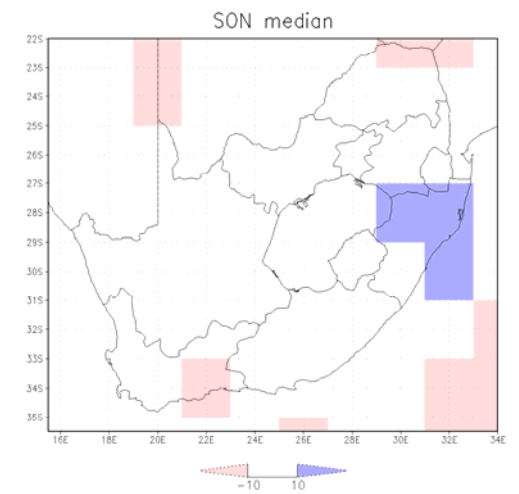
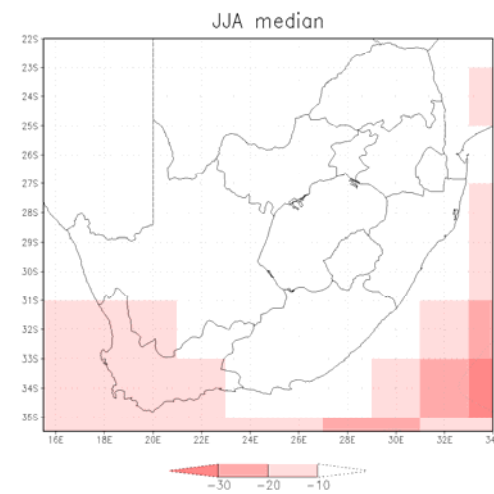
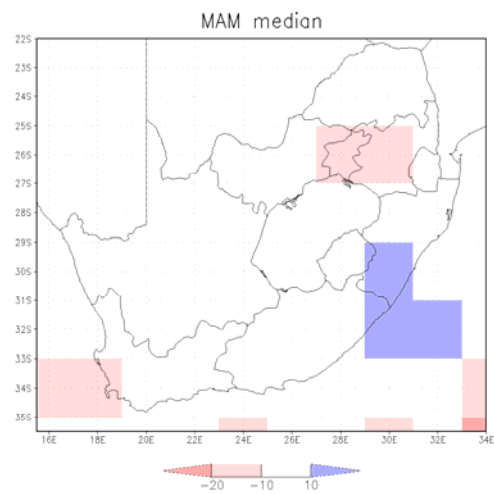
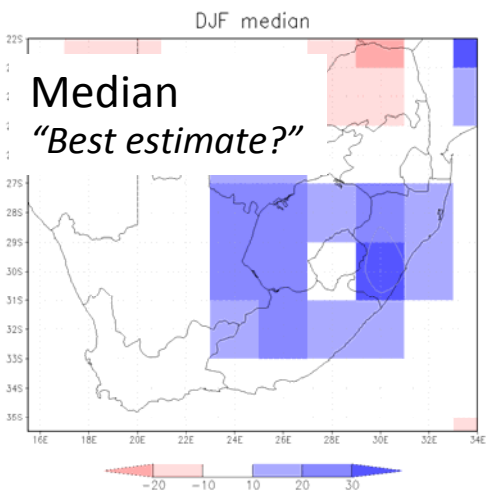
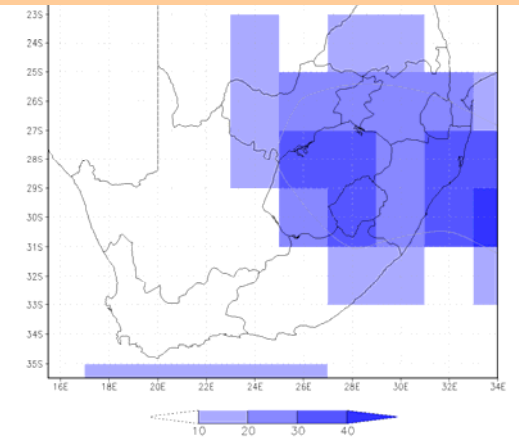
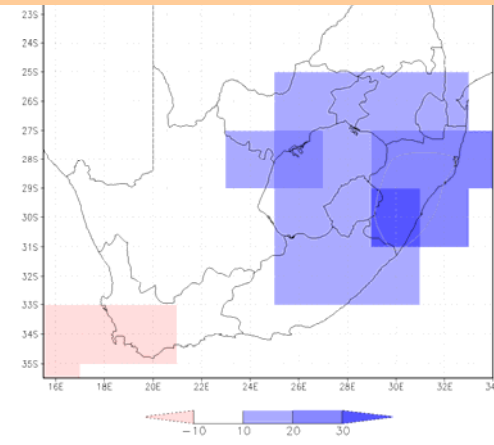
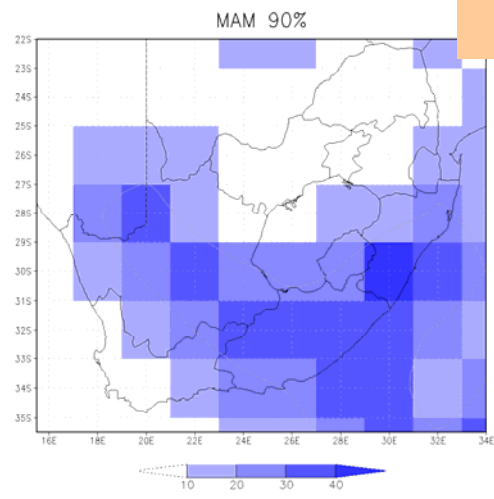
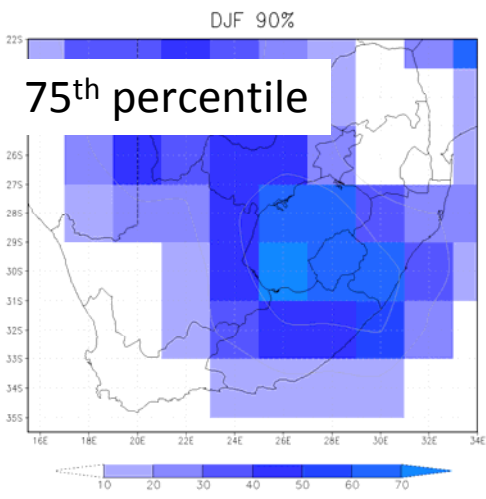
The model validation problem for Africa



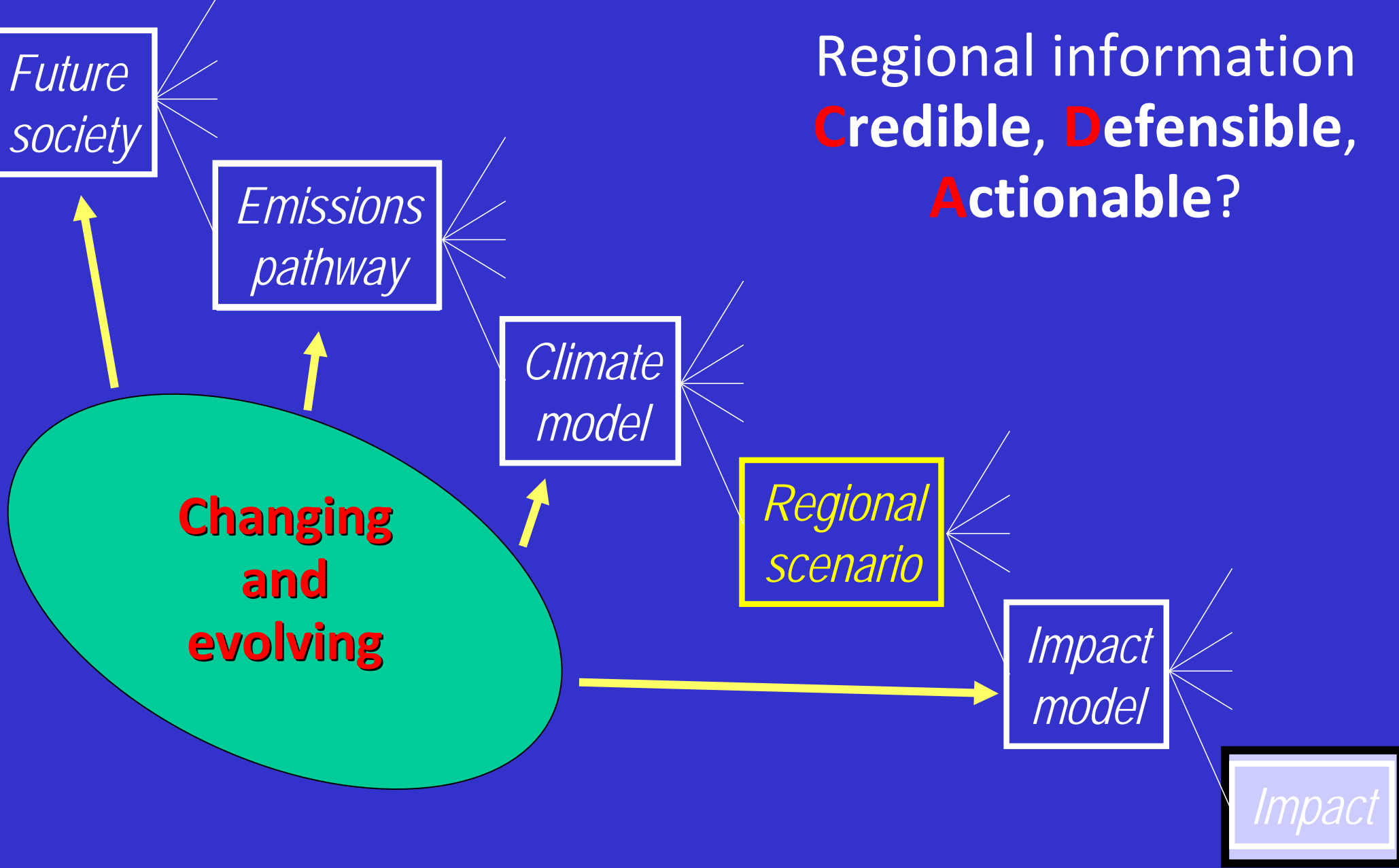
The challenge of observational data, and the lack thereof!

- New developments in high resolution reanalysis data sets
- Some moderate data rescue balanced by network decline
- Supplemented (but not replaced) by growing satellite products

GCMs projections: regional rainfall problems

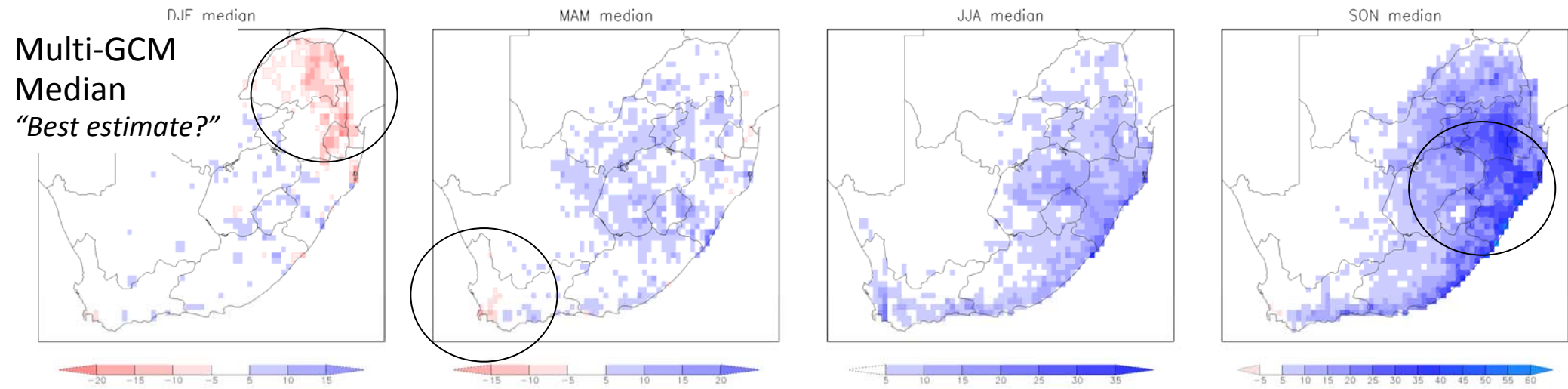


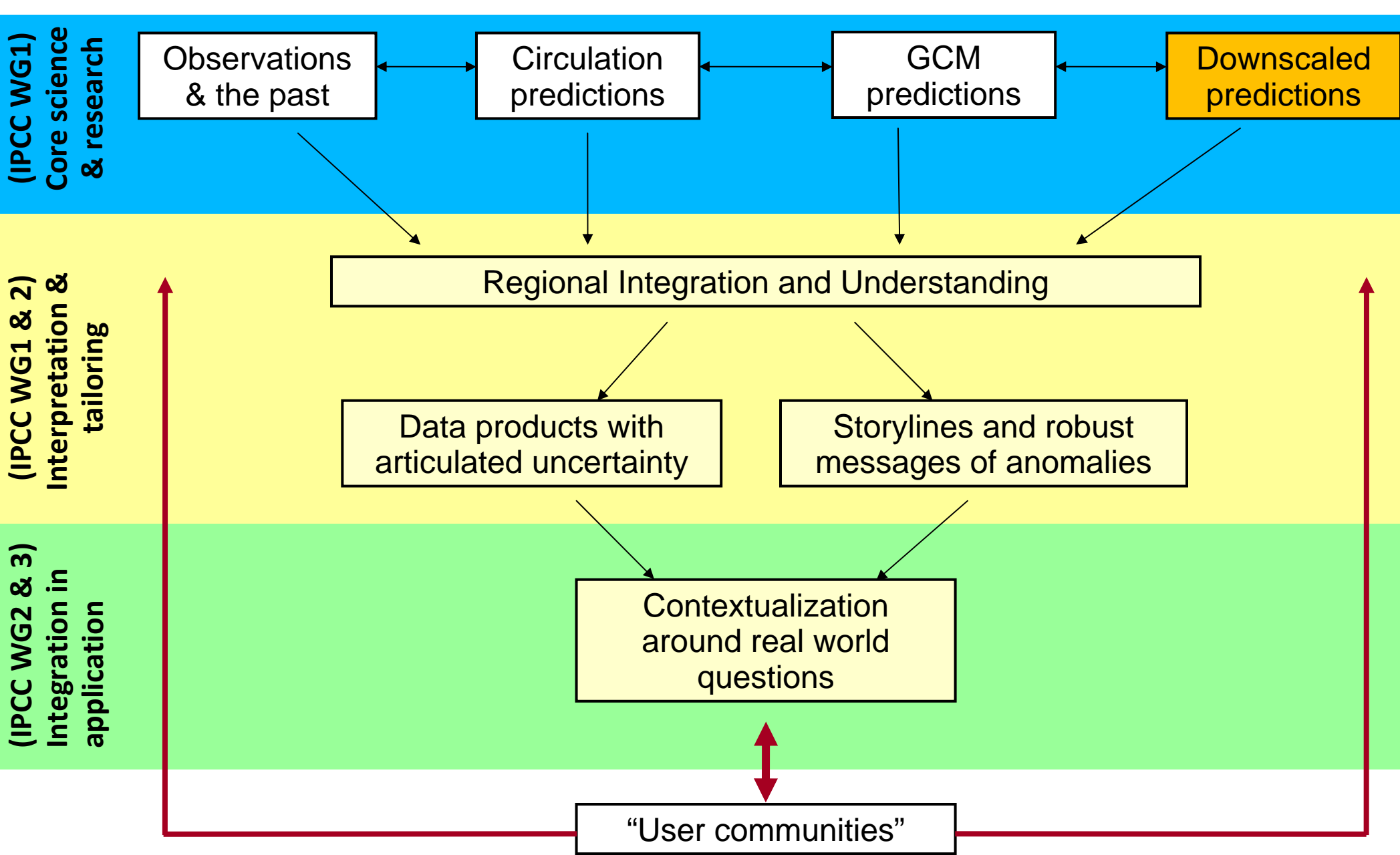
Regional information
Credible, **D**efensible,
Actionable?



The links in the chain to regional information

Downscaled rainfall change (11 GCMs, 2050 anomaly, SRES A2)





A framework of climate information integration

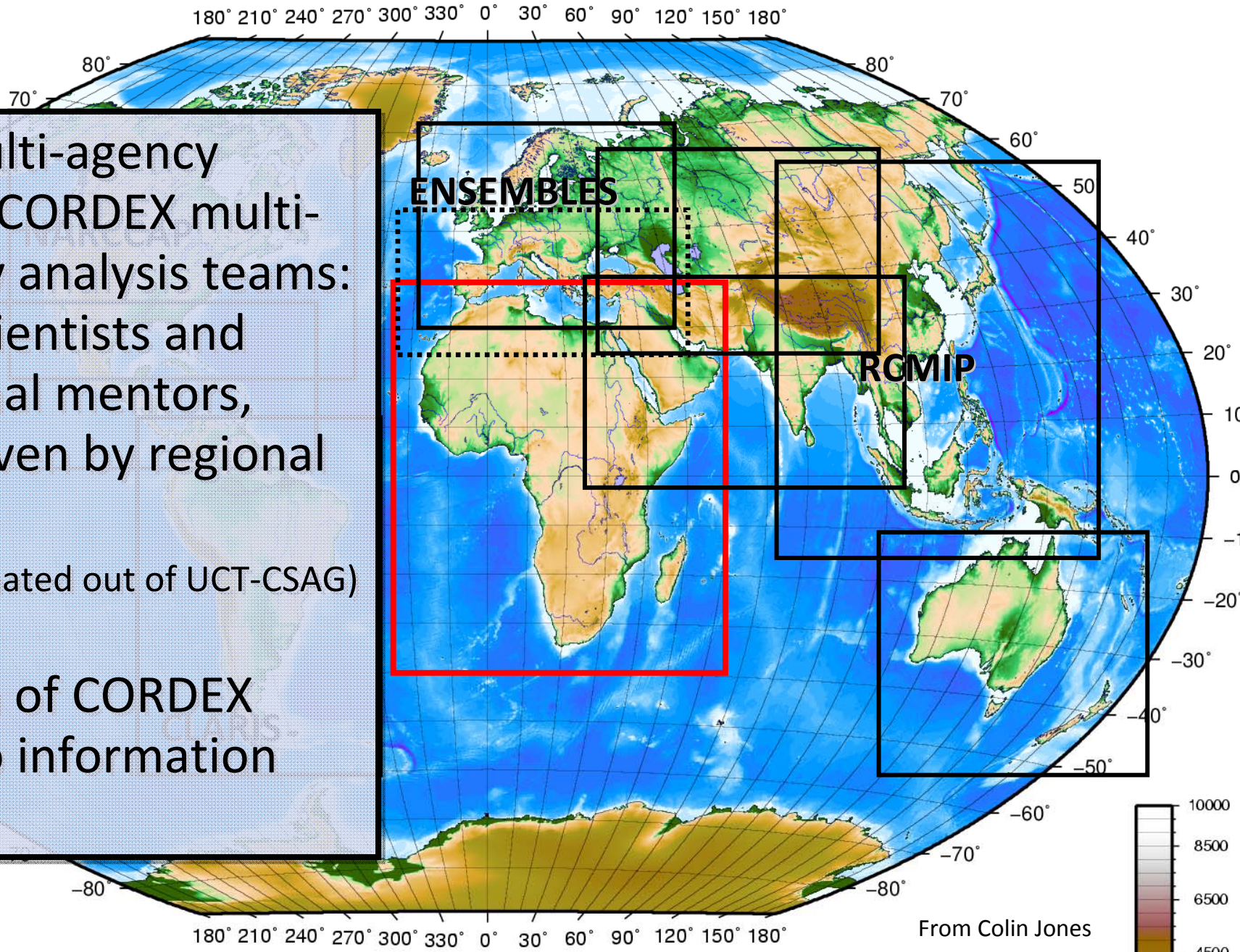
Adapted from Hewitson et al., 2010

Some developing examples

CORDEX : “The largest underfunded opportunity?”

Limited multi-agency funding of CORDEX multi-disciplinary analysis teams: regional scientists and international mentors, agenda driven by regional needs
(Africa coordinated out of UCT-CSAG)

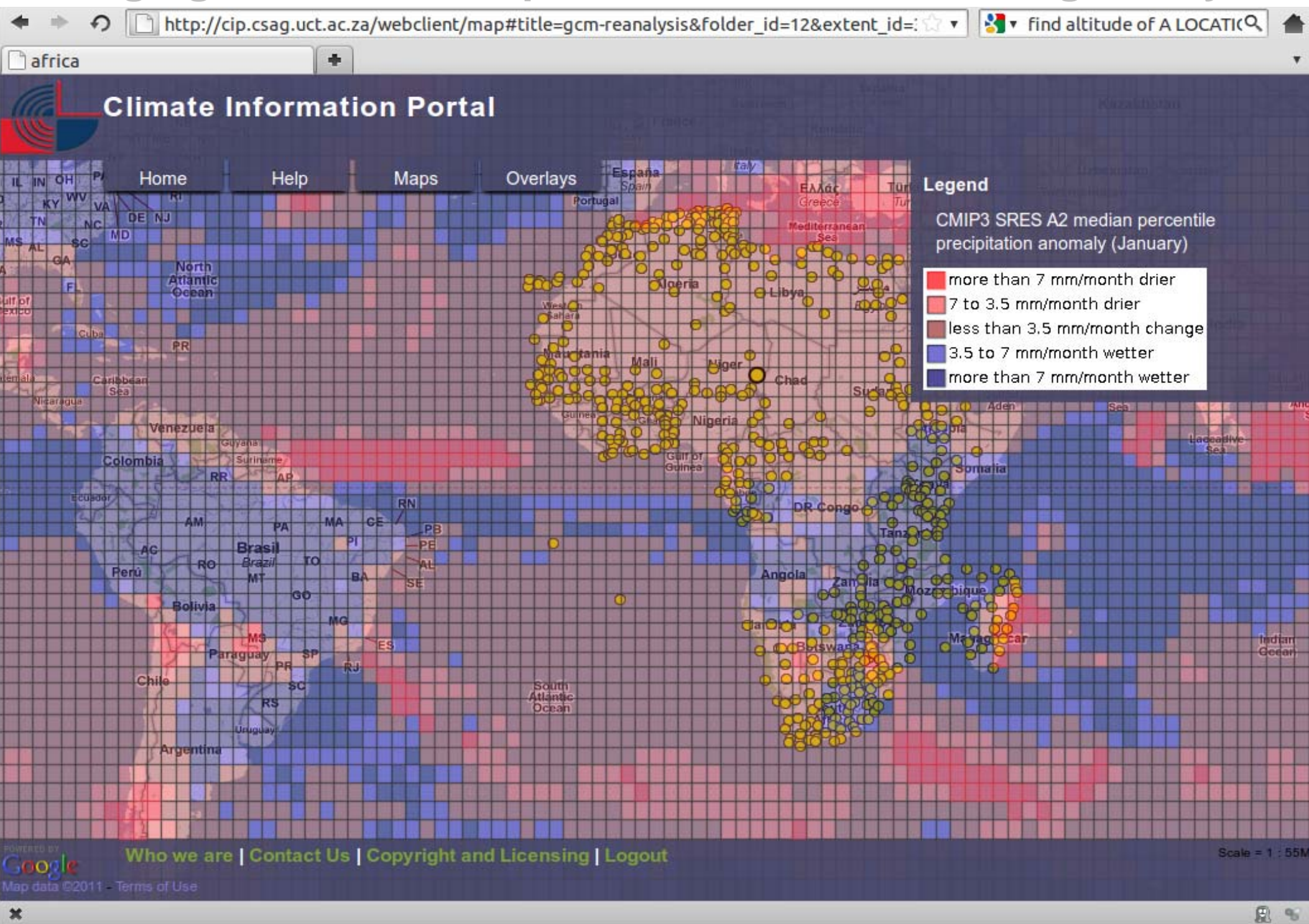
Integration of CORDEX results into information portals



+ polar regions

From Colin Jones

Changing a climate data portal into an information gateway



Changing a climate data portal into an information gateway

← → ↻ http://cip.csag.uct.ac.za/webclient/map#title=projection-monthly-tmax&folder_id=1&ex ☆ srtm download

africa +

Climate Information Portal

Future downscaled scenarios

Envelopes of downscaled monthly mean maximum temperatures for both the 20th Century control simulations and a future period allows us to determine if the suite of CMIP3 model projections, after downscaling, show any strong change signal into the future. Envelopes of temperature projections for future periods are typically much narrower than the equivalent **rainfall envelopes** as temperature changes are less sensitive than rainfall to the local regional dynamics.

If you have selected a location from the map you will see a plot to the right showing control and future multi-model envelopes of monthly mean maximum temperatures as well as monthly anomaly envelopes. Temperature projection anomalies tend to be fairly uniform throughout the season as they are largely dominated by global scale warming signals. Temperature anomalies will almost always be positive except for some unique cases.

The use of multi-model envelopes is an attempt to capture the model uncertainty. While this is not a perfect representation of model uncertainty it is a pragmatic approach. If an median anomaly shows a strong positive or negative change and the multi-model envelope is small then we can be more confident in interpreting the anomaly. However, even if the median anomaly shows a strong change, if the multi-model envelope is large then we must

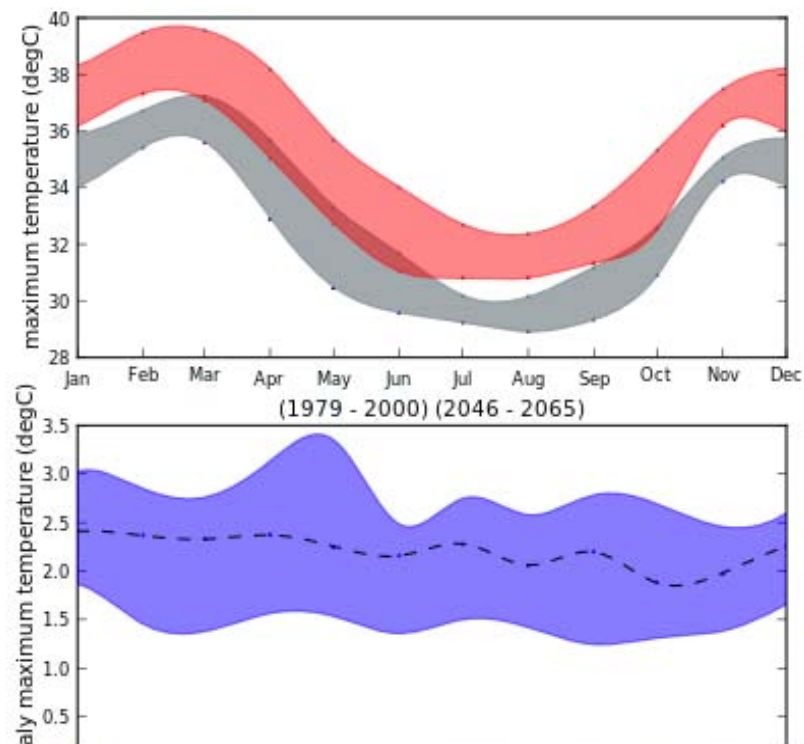
SRES A2 2046-2065

SRES A2 2081-2100

SRES B1 2046-2065

SRES B1 2081-2100

Downscaled Monthly Daily Maximum Temperature Projections



Climate services: questions that all parties need to collectively address

- 1. Is the message plausible:** Does it fall within the envelope of known experience?
- 2. Is the message defensible:** On a regional scale, am I able to explain the understanding in terms of underlying physical processes?
- 3. Is the message actionable:** at the time and space scales of interest, can I defend policy and decisions based on the probabilistic climate messages?
(Would I spend my own money?)

Thank you

