

Coping with uncertainties in CMIP5 precipitation projections: A case study from west central Florida

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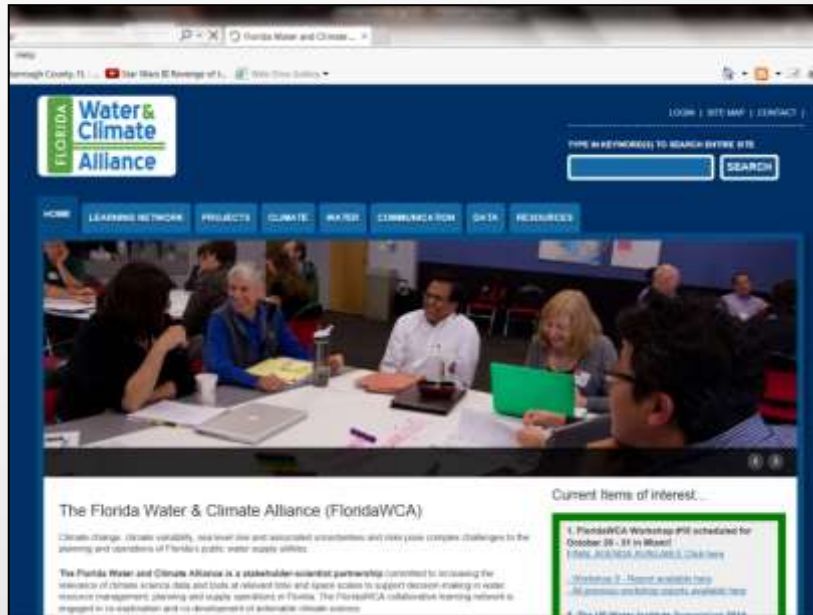
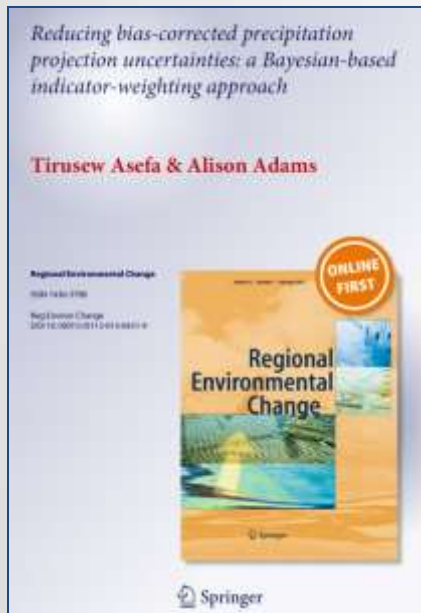
Systems Decision Support

Tampa Bay Water, Clearwater, FL

February 12, 2014

Gainesville, FL

Asefa, T. and A. Adams, 2013, Reducing Bias Corrected Precipitation Projection Uncertainties: A Bayesian Based Indicator Weighting Approach, Journal of Regional Environmental Change, special issue, March 9, 2013



Florida Water and Climate Alliance (<http://floridawca.org/>)

A multi-disciplinary assessment of the southeastern United States climate. Edited by: Dr. Misra (FSU)

- The two most important parameters are rainfall and temperature
- Challenge:
 - several emission scenarios (4) and models/ensemble
 - Which model to trust?
 - Why?
 - GCMs are at high resolution (200Km) and low frequency (most at daily or more)
 - Past performance doesn't guarantee future

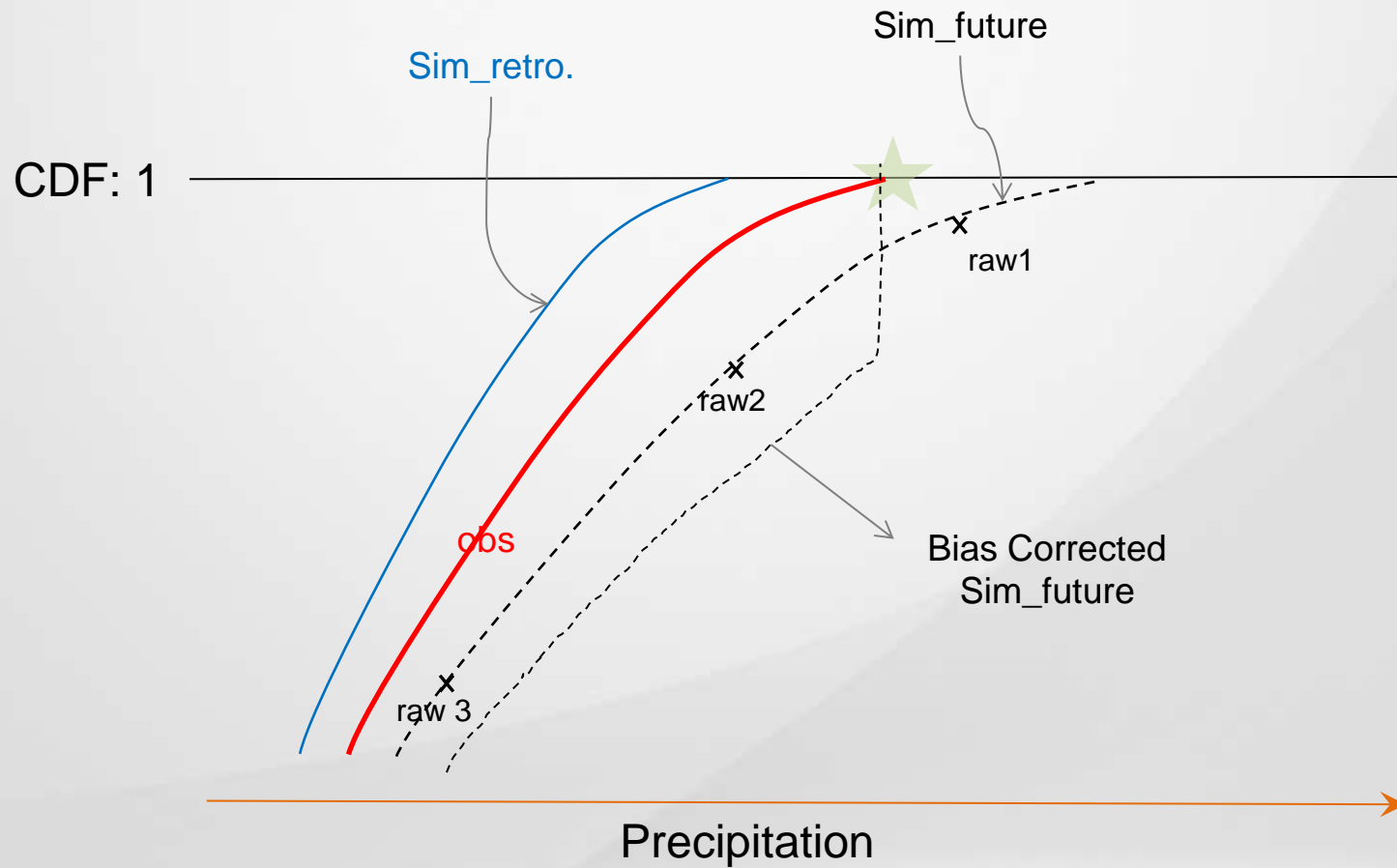
- Given the known GCM and bias on current and past performance, how to select future projections
 - Uncertainty in the process being modeled
 - Uncertainty in model parameters
 - Uncertainty because of inability to describe a known process
 - Uncertainty because of time/scale resolution

Before using GCM Projections.....

- Delta
 - Uses the difference in GCM values between retrospective and future projection
- Quantile mapping
 - Uses the “actual” amount but modify them depending past performance
- Use a statistical relationship to produce dependent variable, such as streamflow

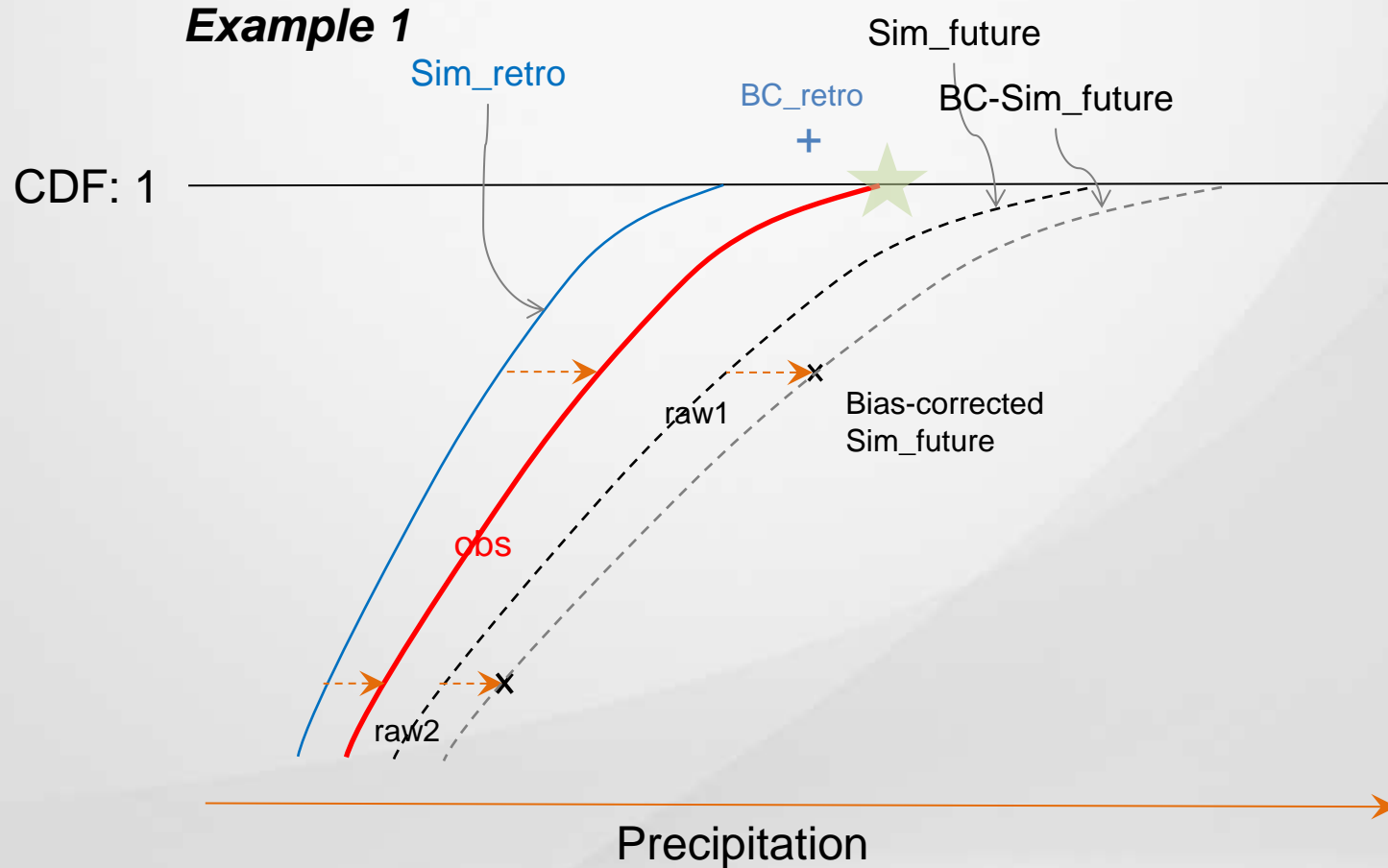
Future Bias Correction methods

Correct using historic **bias amount** corresponding the '*magnitude*' of future prediction (CDFm, Wood et al)

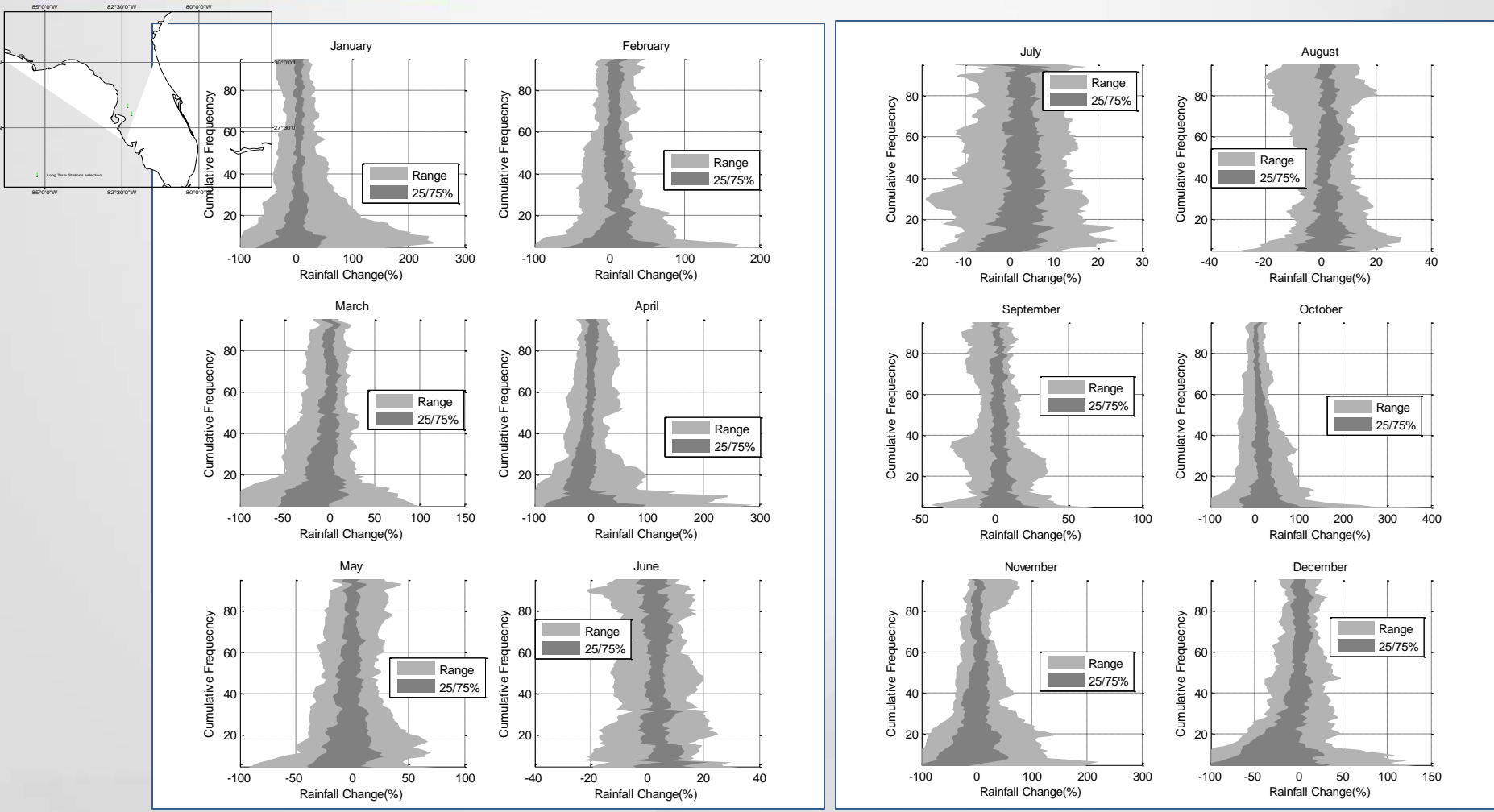


Future Bias Correction methods

Correct using historic **bias amount** corresponding the '**Percentile**' of future prediction (EDCDFm, Li et al., 2010)



Projection for 2040's



Need a way to Discriminate GCM Outputs

- What relevant processes are reproduced by GCMS?
 - ENSO,
 - Spatial-temporal correlation
 - Frequency of extreme events
 - Mean performance
- Some statistical frame work need to be used

- Truth Centered
 - Retrospective GCM runs are assumed to be sampled from a distribution that is centered on observation plus error.
- Each member of the ensemble is exchangeable with other members and with the natural system

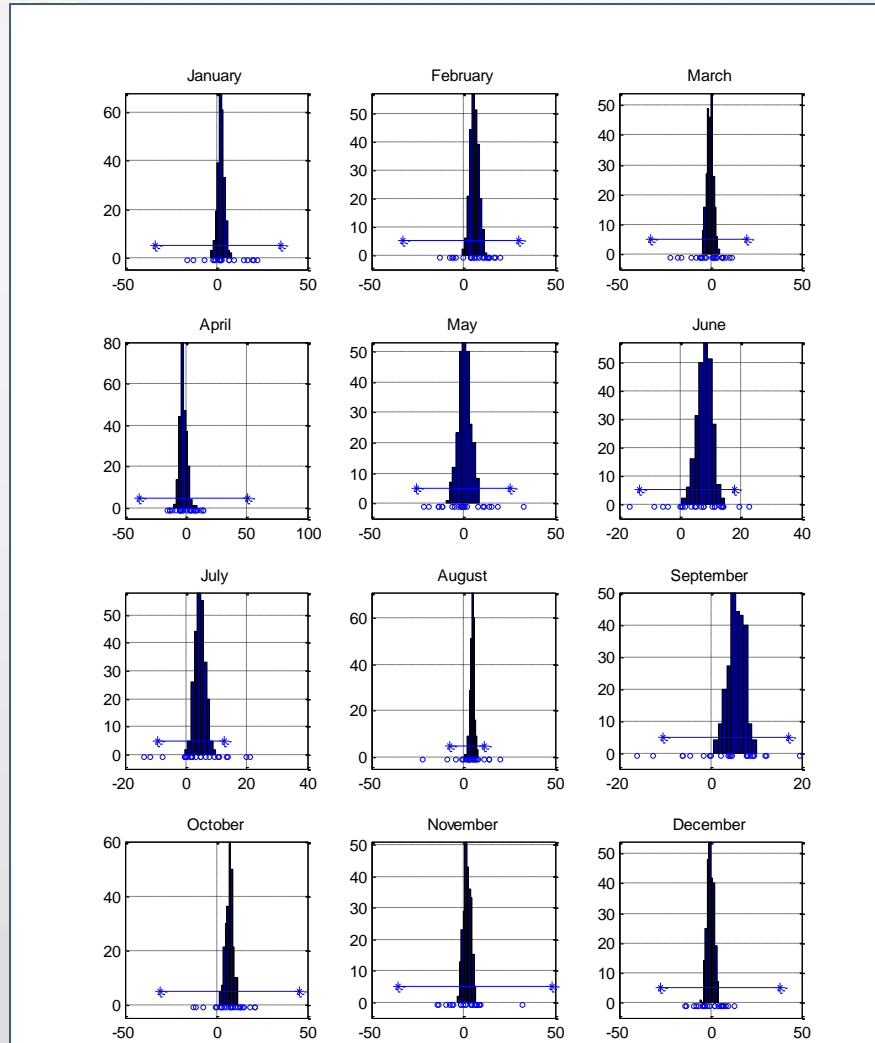
→ Gandhi

“In a matter of non-conscience, the law of the majority has a place”

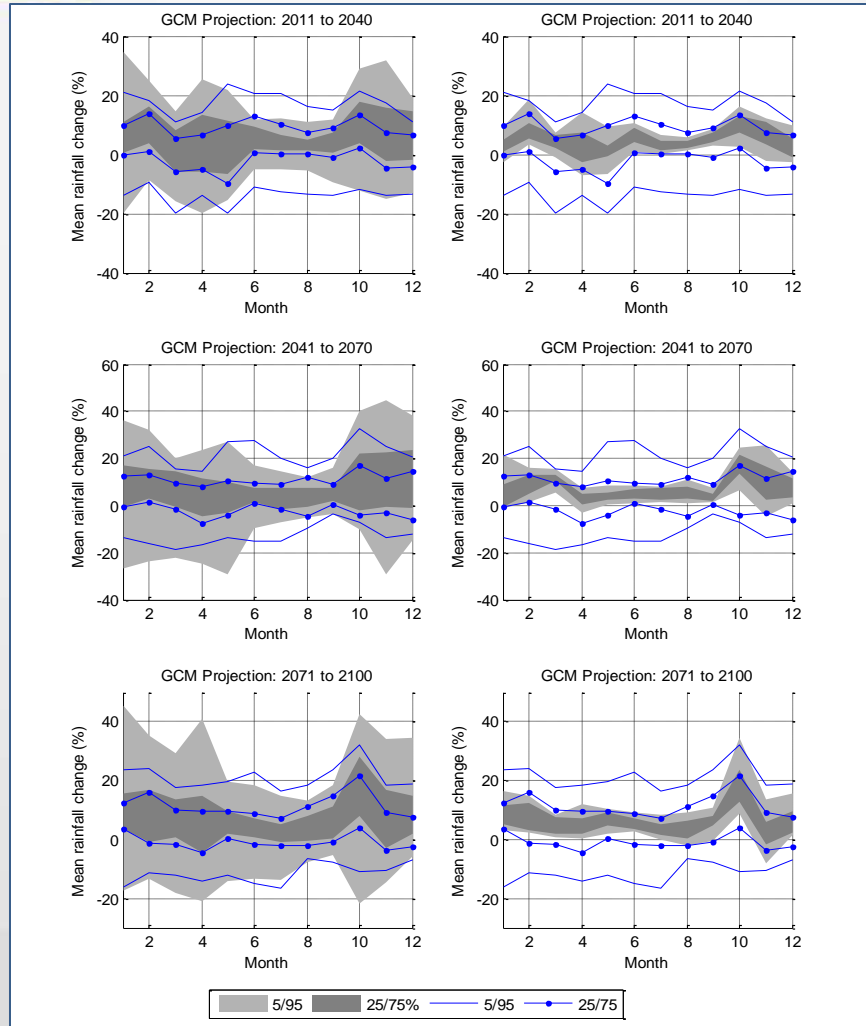
Reducing Uncertainty using Bias- Convergence Criteria

- Bias:
 - How close is a GCM retrospective simulation to historically observed data
- Convergence
 - How close is a GCM future projection to the consensus of other model

Posterior Mean Rainfall Change



Culled Projections



- Uncertainties in GCM projections are too important to ignore
- Off-the-shelf bias corrected-down scaled products may not be appropriate for all areas
- Discriminating GCM projection depend on relevant statistics for an area should be part of a rigorous impact study

Questions?

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