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

Tirusew Asefa, Ph.D., P.E. and Alison Adams, Ph.D., P.E.
Systems Decision Support
Tampa Bay Water, Clearwater, FL

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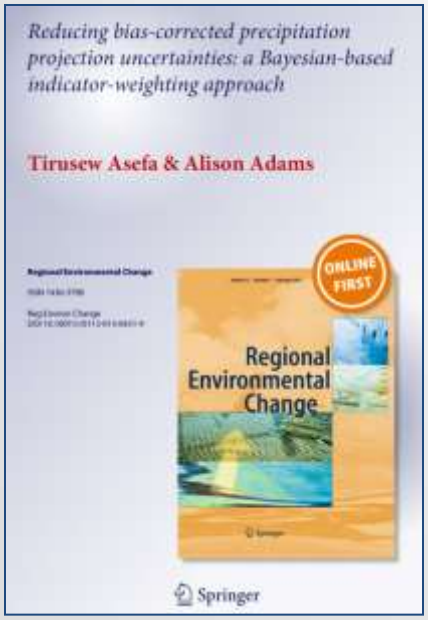
Gainesville, FL

# More Information

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)

# Climate Change for Impact Studies

- 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

# Problem Statement

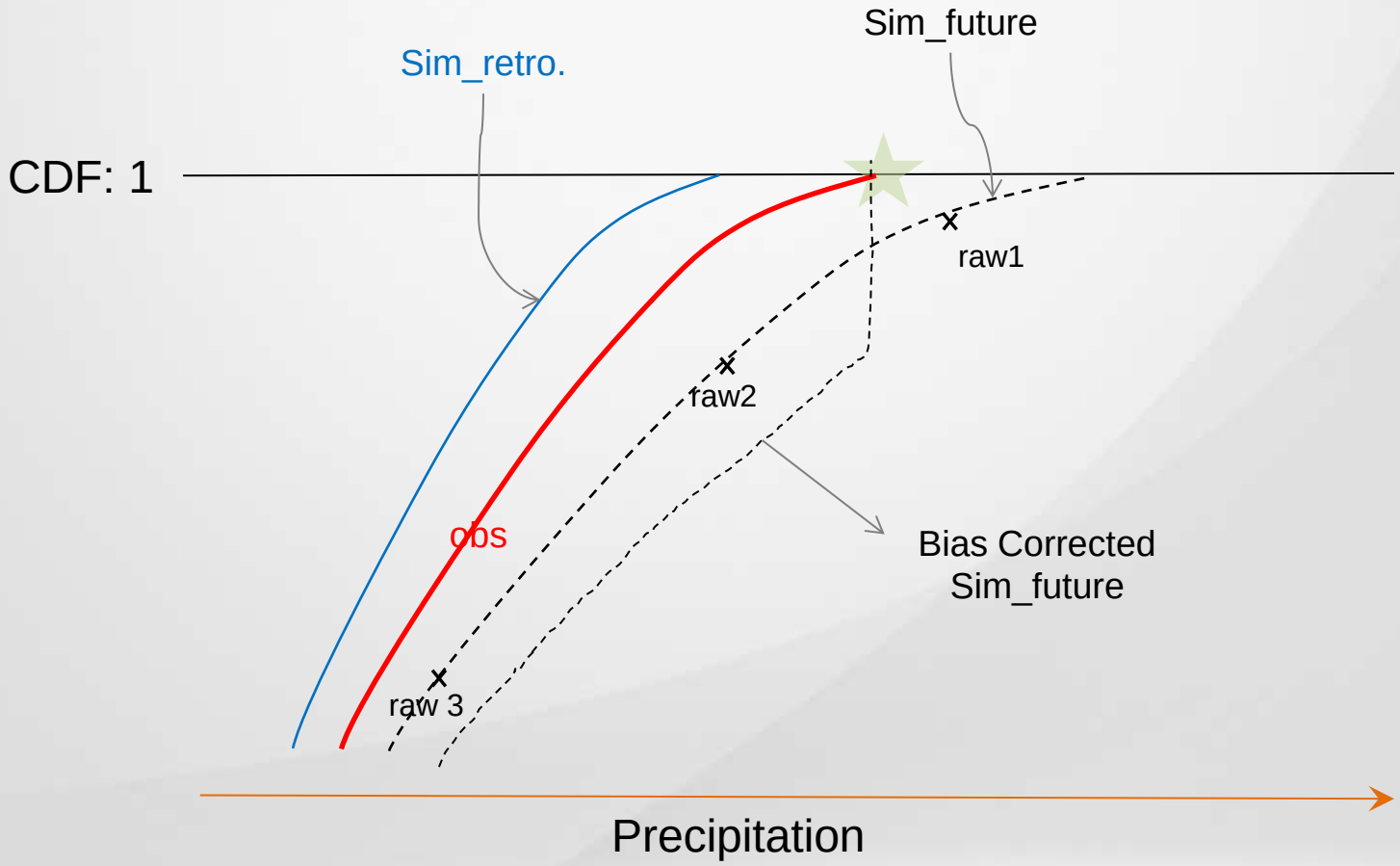
- Given the known GCM and bias on current and past performance, how to select future projections
  - Uncertainty in the process being modeled
  - Uncertainty in model parameters
  - Uncertainty because of in ability to describe a known process
  - Uncertainty because of time/scale resolution

# 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

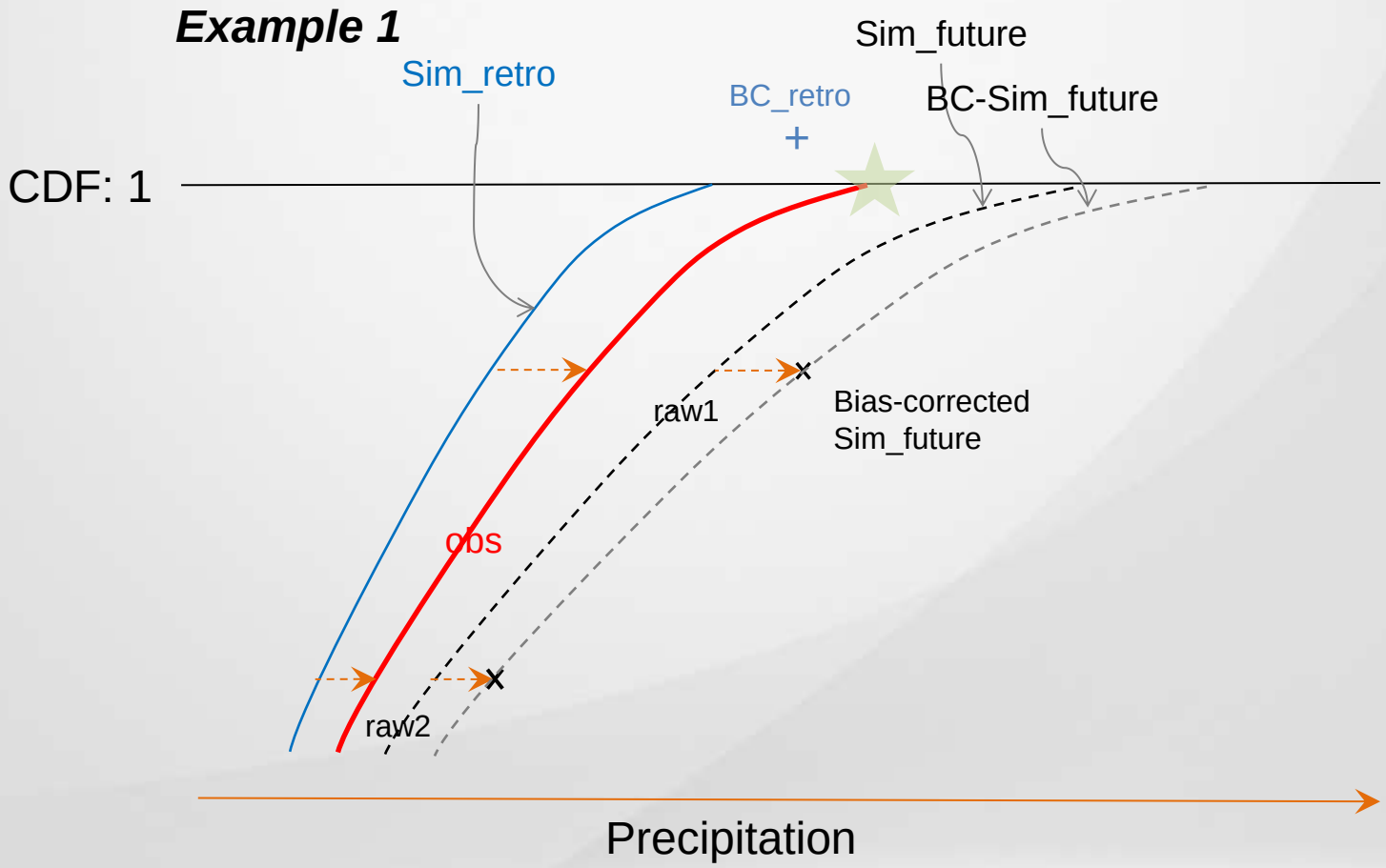
# Future Bias Correction methods

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

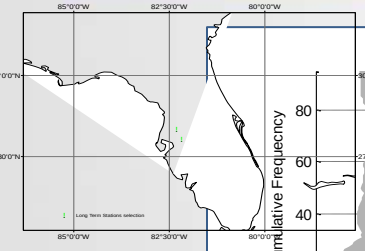


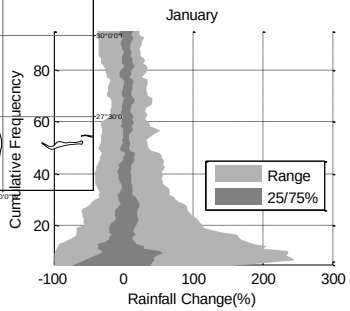
# Future Bias Correction methods

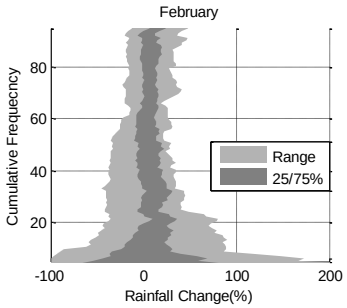
Correct using historic **bias *amount*** corresponding the '***Percentile***' of future prediction (**EDCDFm**, Li et al., 2010)

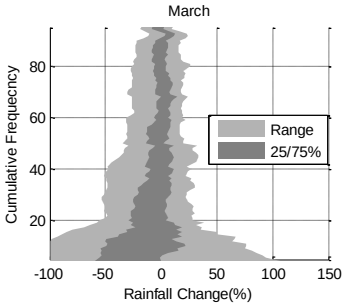


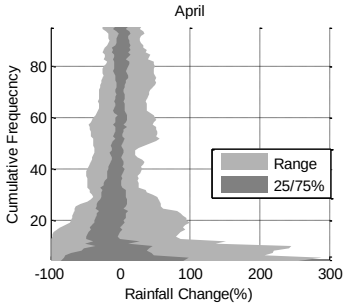
# Projection for 2040's

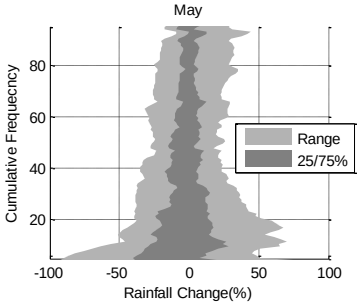


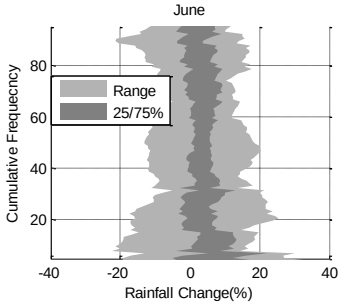


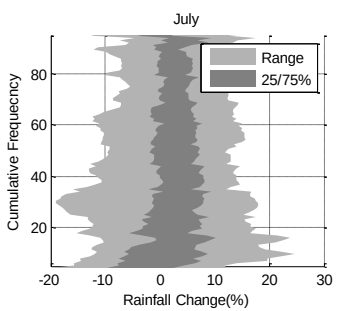



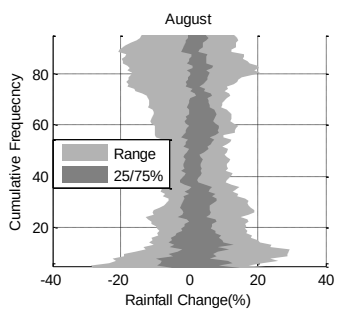



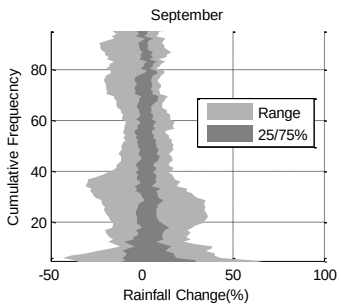



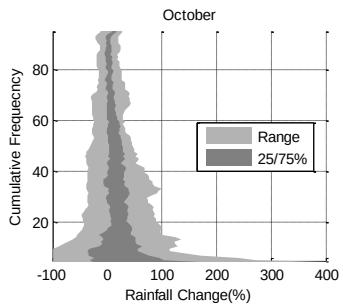



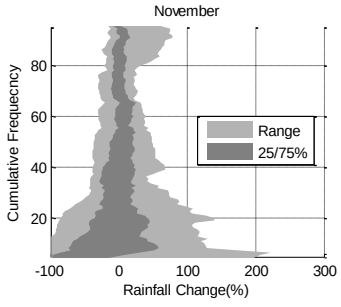



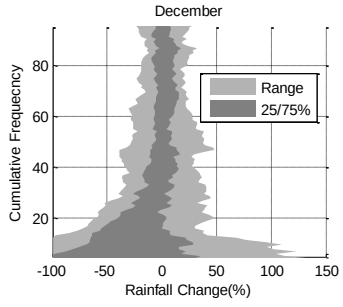



# Need a way to Discriminate GCM Outputs

- 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

# Accounting for GCMs variations

- 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

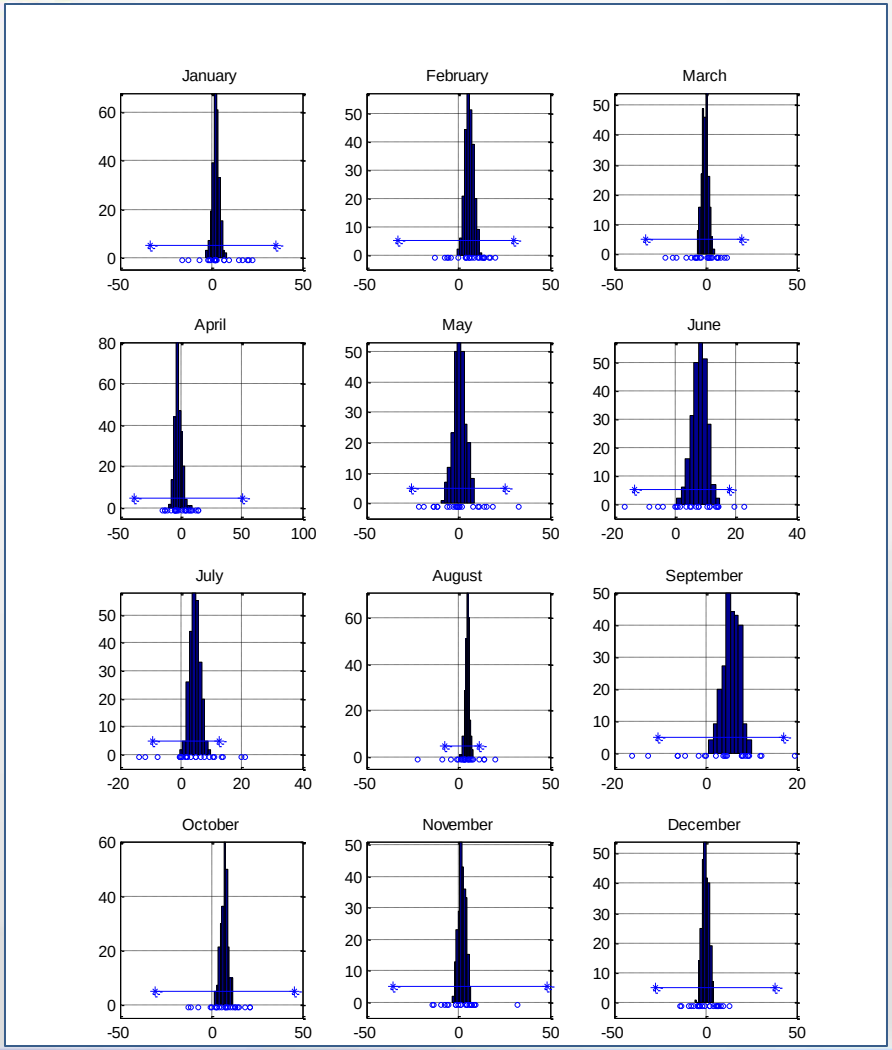
# ¬Gandhi

**“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



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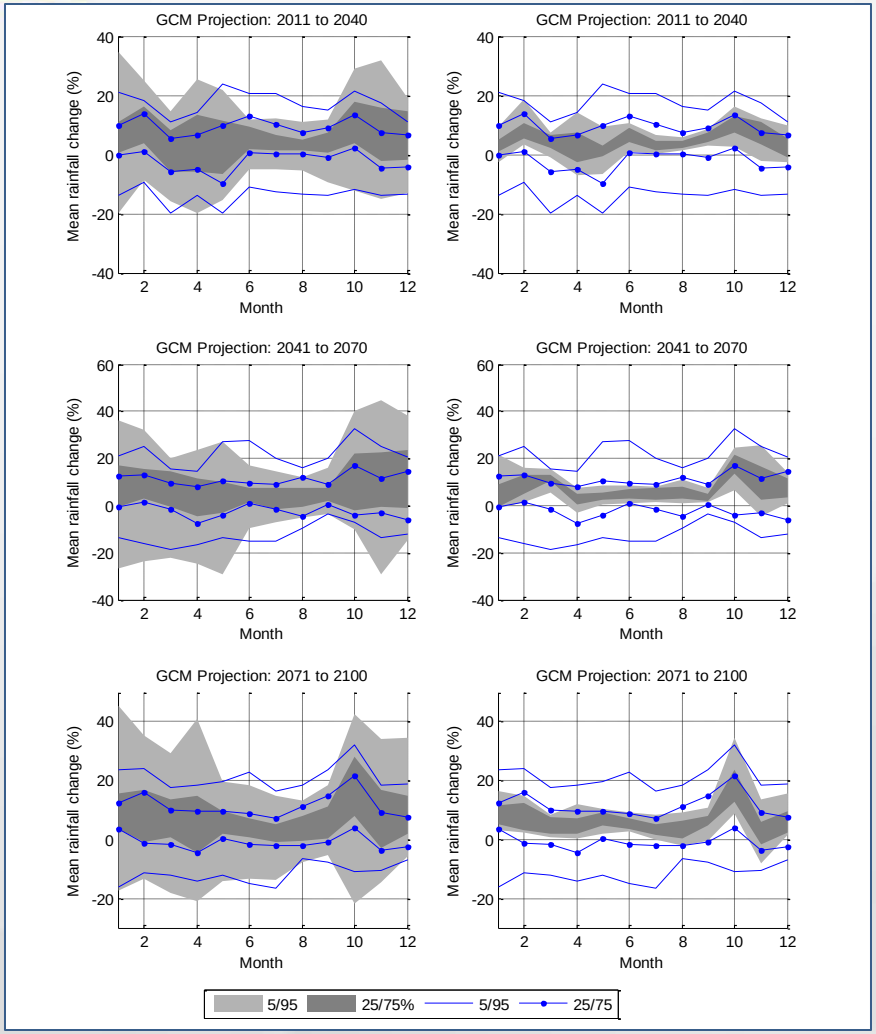
# Culled Projections



# Conclusion

- 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?

tasefa@tampabaywater.org