The University of Florida Water Institute

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The Florida Water and Climate Alliance

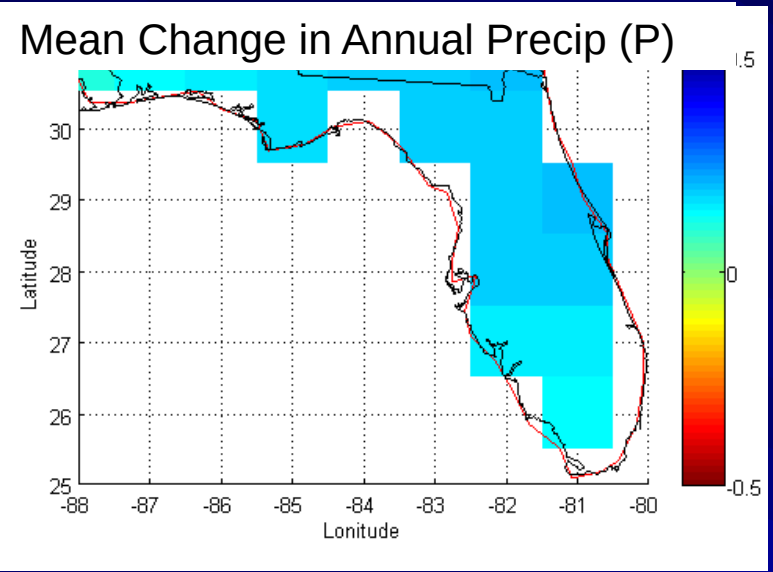
funded by NOAA Climate Program Office-Climate Societal Interactions Program (CSI) and the NOAA Sectoral Applications Research Program (SARP)

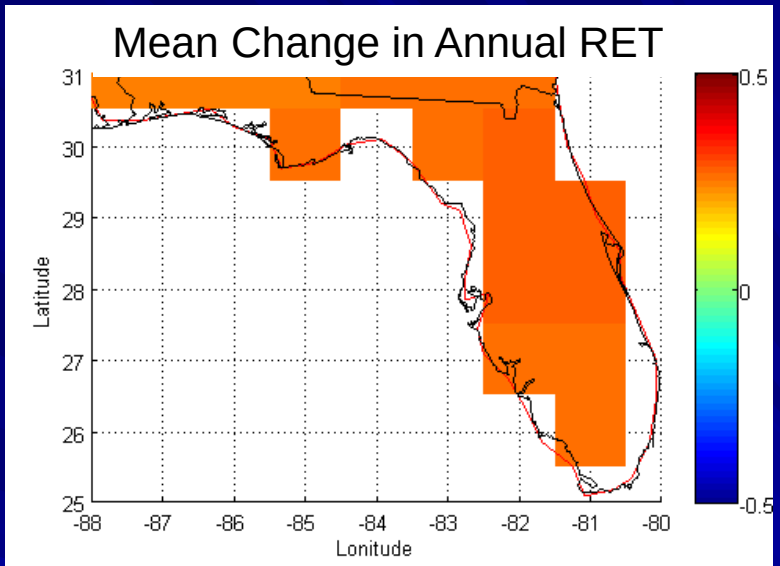
Goal: To increase the regional relevance and usability of climate and sea level rise models for the specific needs of water suppliers and resources managers in Florida.

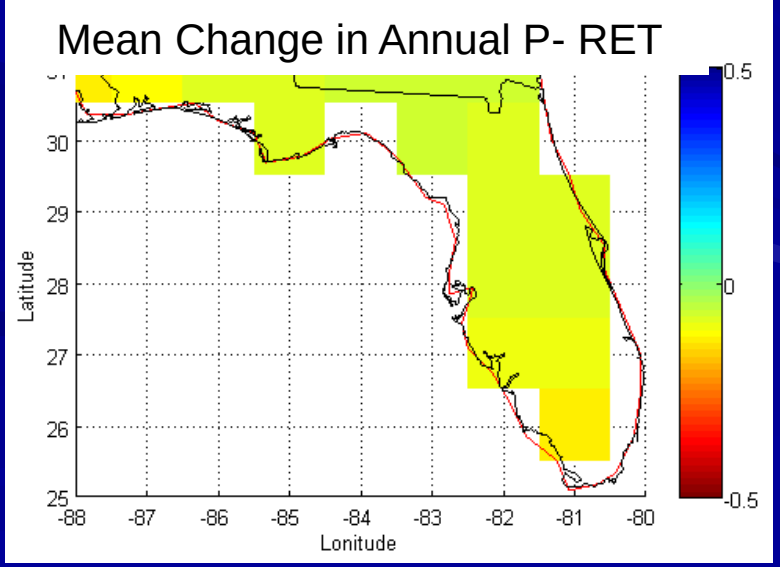
Long Term Climate Projections Working Group Update:

- What do CMIP5 projections say about Florida's future climate ?
- How much variation is there in CMIP5 projections over GCMs, RCP scenarios, ET method?
- What are the major factors causing variations among future projections?

CMIP5 Mean Projected Change
2030-2060

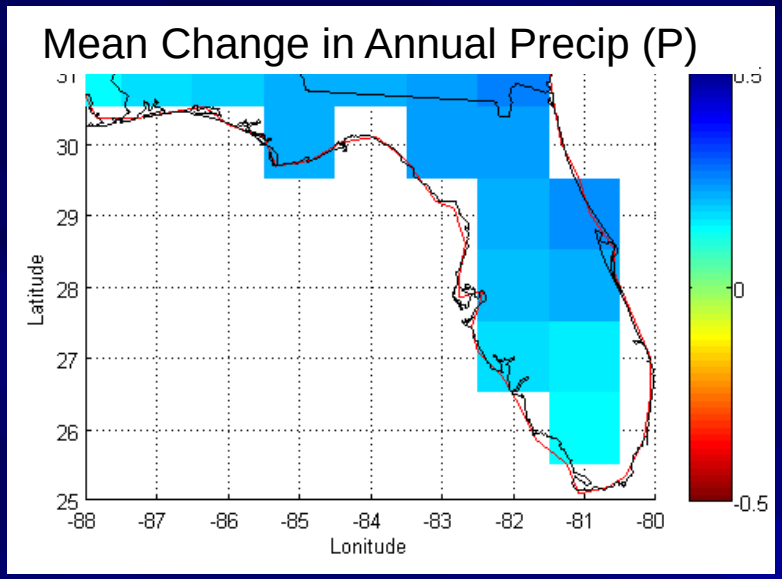


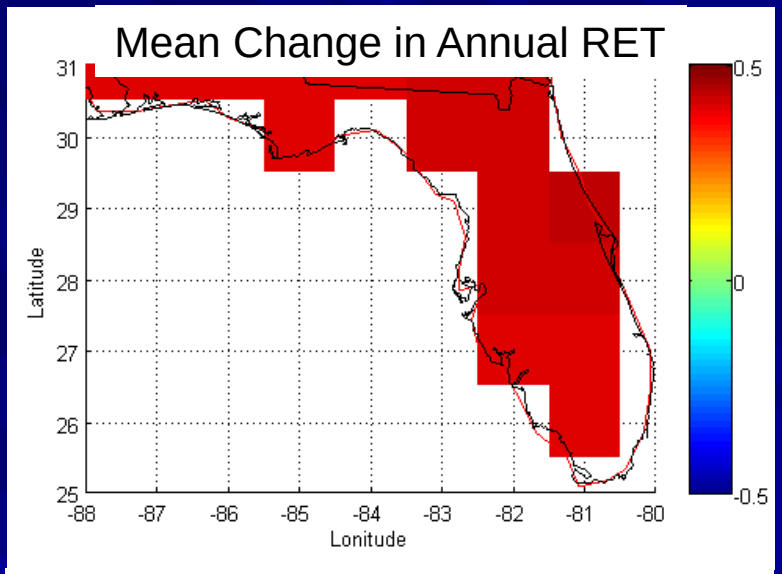


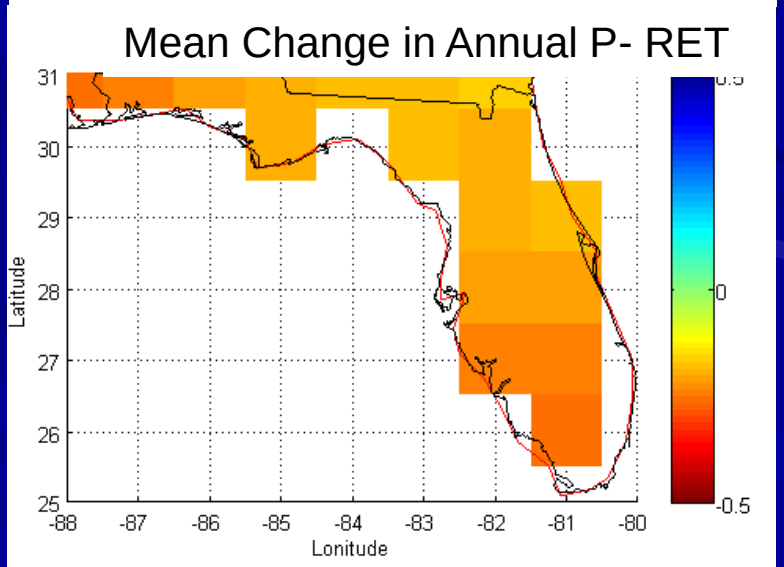


<u>On average</u>: slightly more rain, higher potential ET, slightly drier (i.e. slightly higher rainfall deficit)

CMIP5 Mean Projected Change
2070-2100



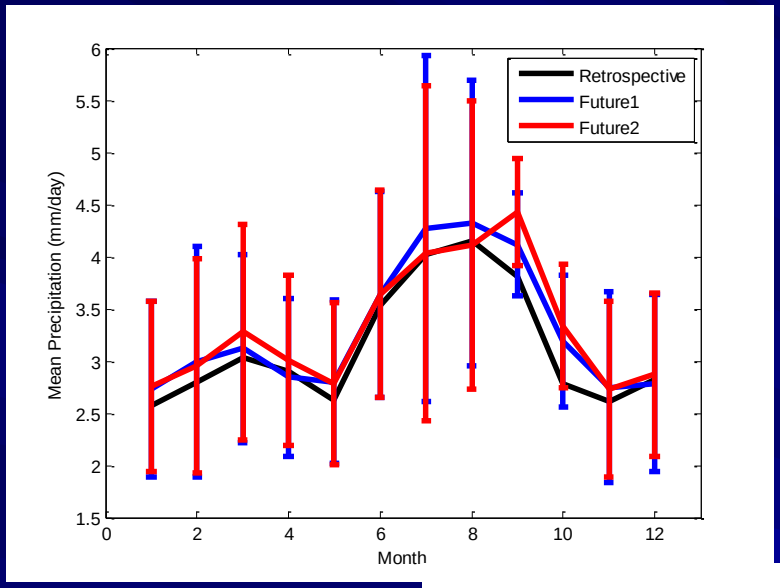




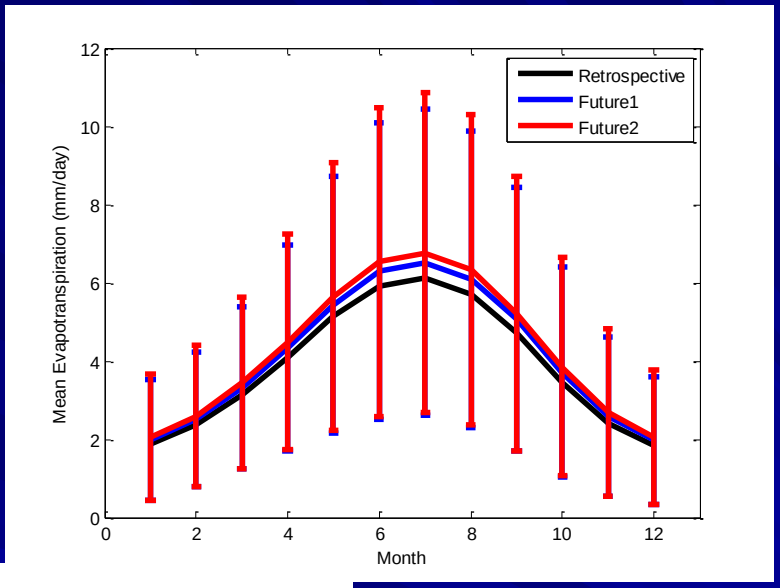
On average: more rain, higher potential ET, drier (i.e. higher rainfall deficit)

CMIP5: Mean and Std Dev of Projected Monthly Averages

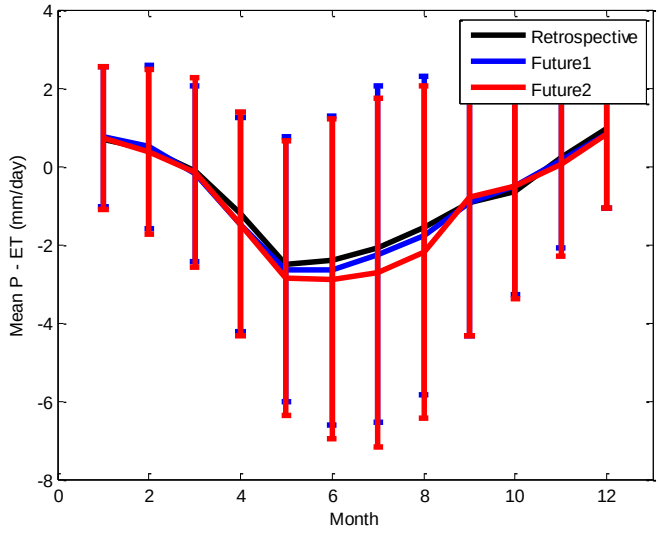
P



RET

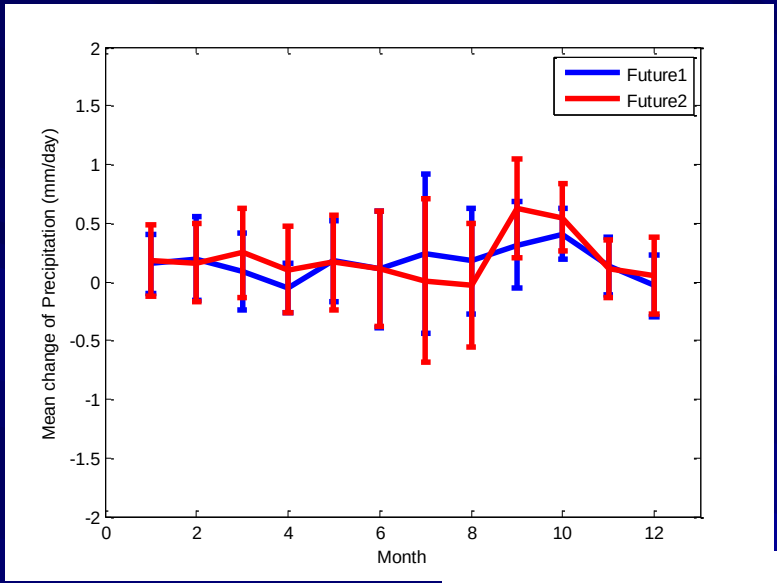


P-RET

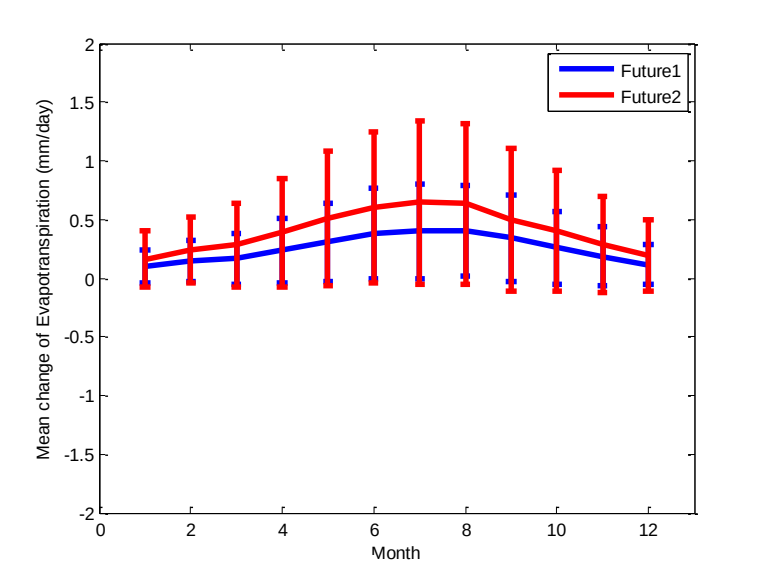


CMIP5: Mean and Std Dev of Projected Monthly Change

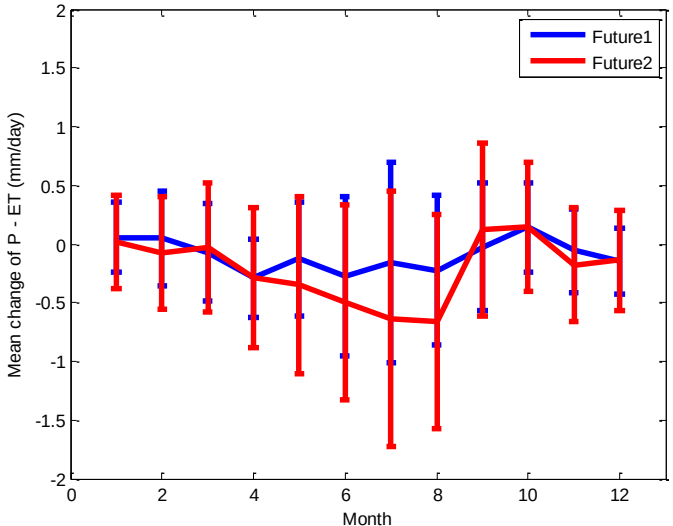
P



RET

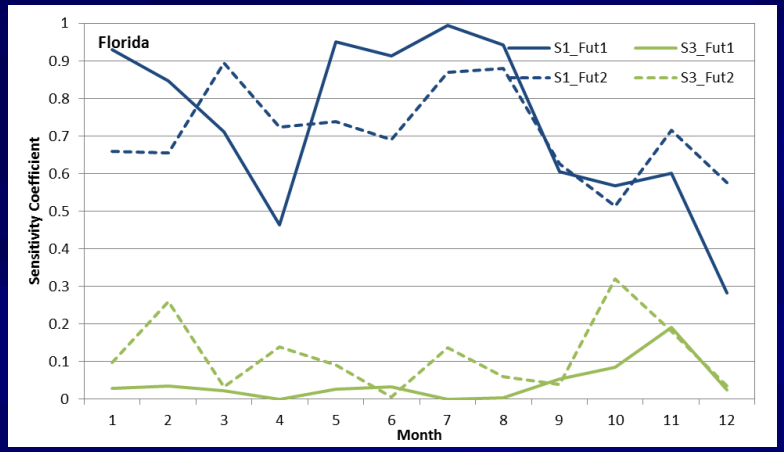


P-RET

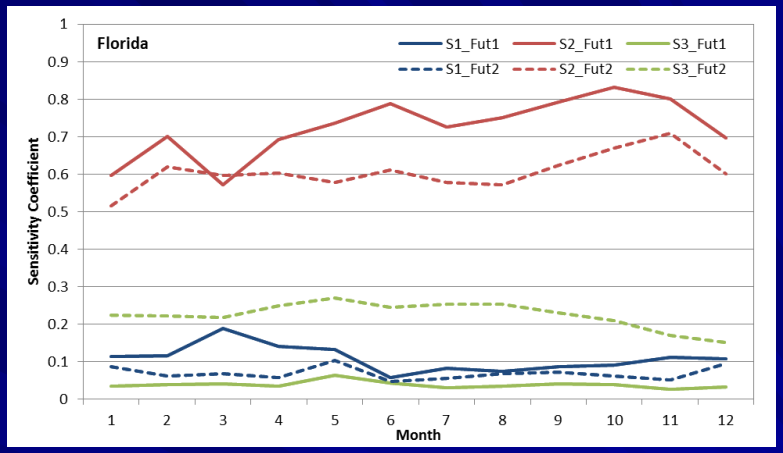


Drivers of Uncertainty in Future Change

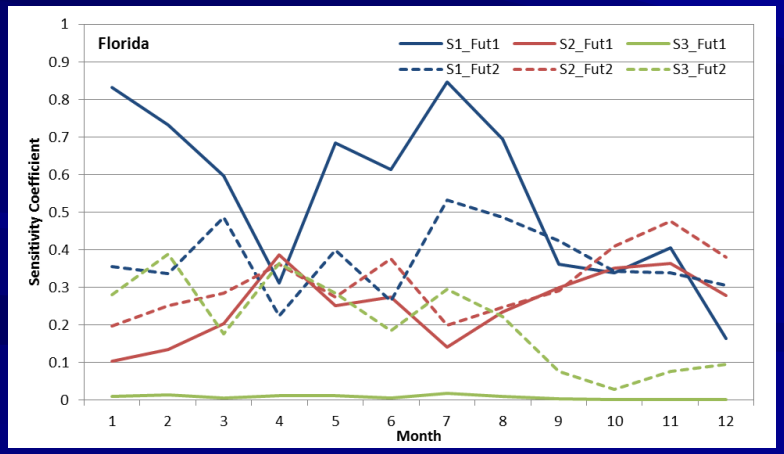
Precipitation



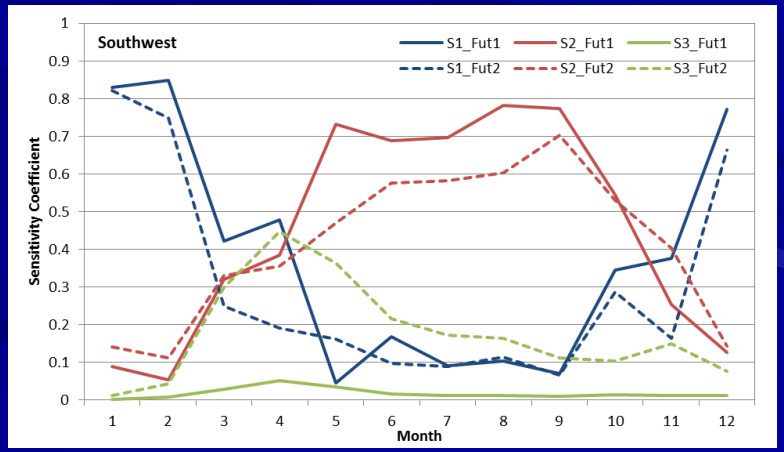
Evapotranspiration



Florida P-RET



SouthWest P-RET



Blue: uncertainty due to GCM, Green: uncertainty due to RCP scenario, Red: uncertainty due to PET method. Solid line 2030-2060, Dashed line 2070-2100

2070-2100 Change in Annual P-RET by ET method (averaged over GCMs and RCPs)

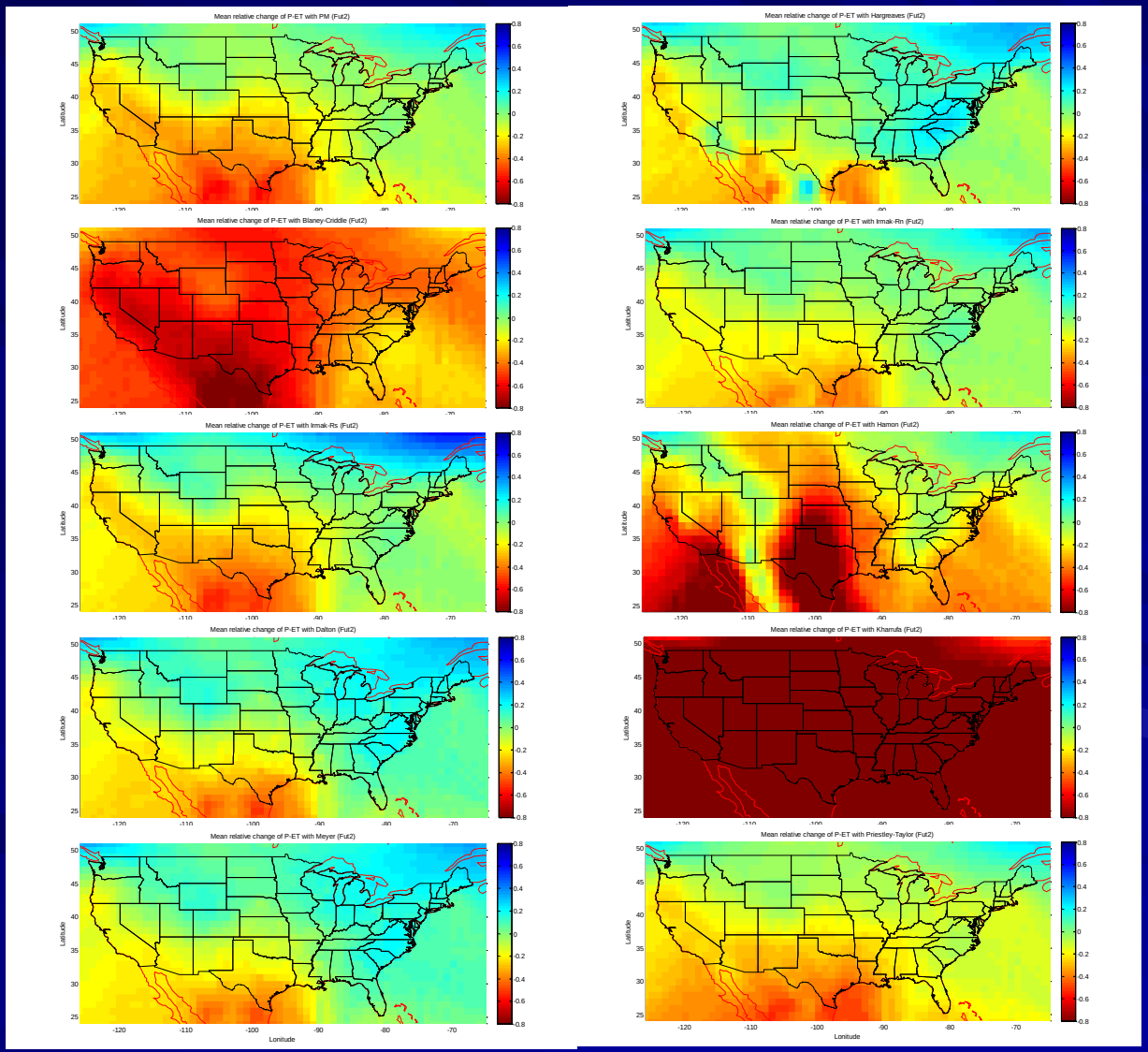
Penman-Monteith

Blaney-Criddle

Irmak- Rs

Dalton

Meyer



Hargreaves

Irmak- Rn

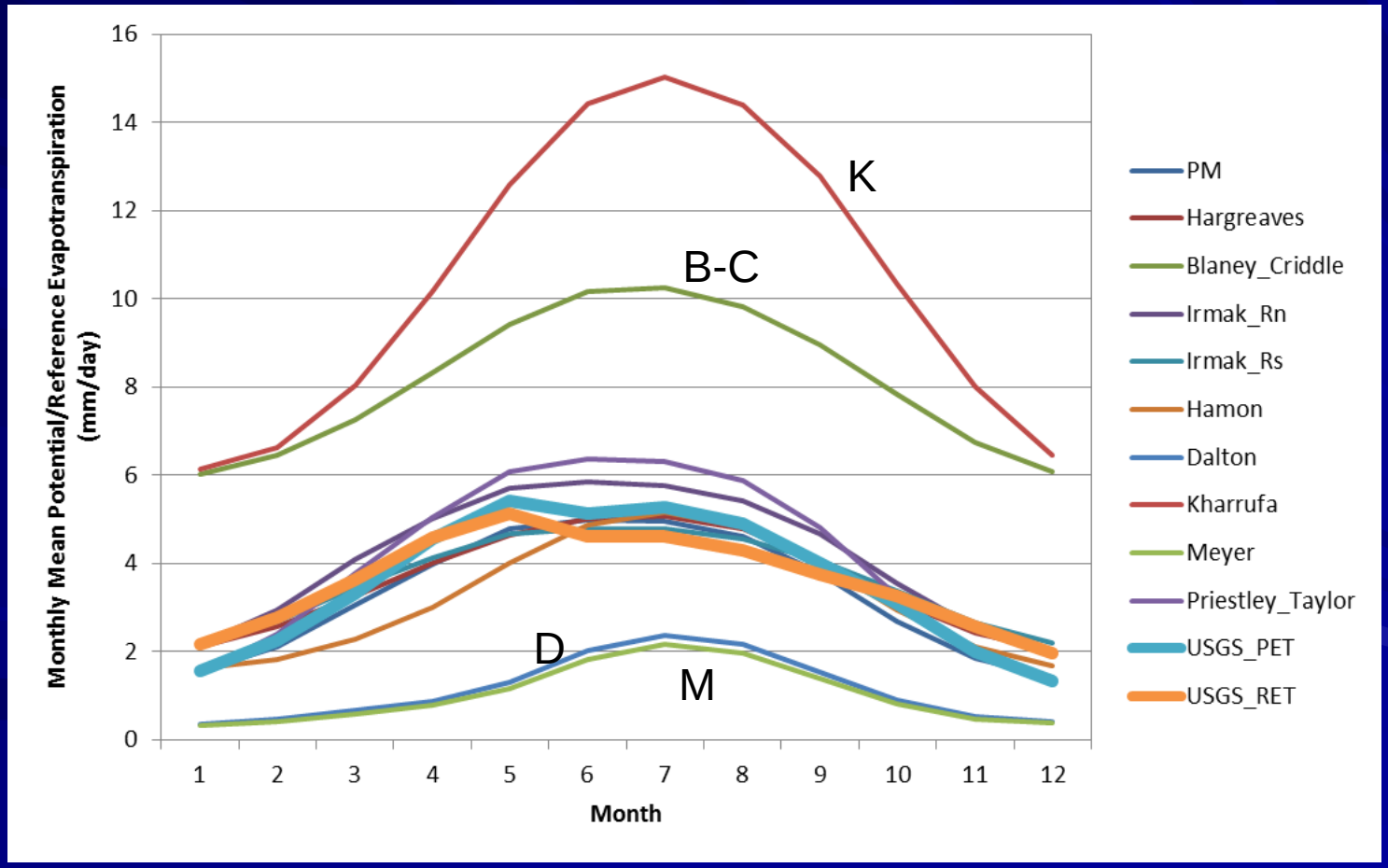
Hamon

Kharrufa (PET)

Priestly Taylor (PET)

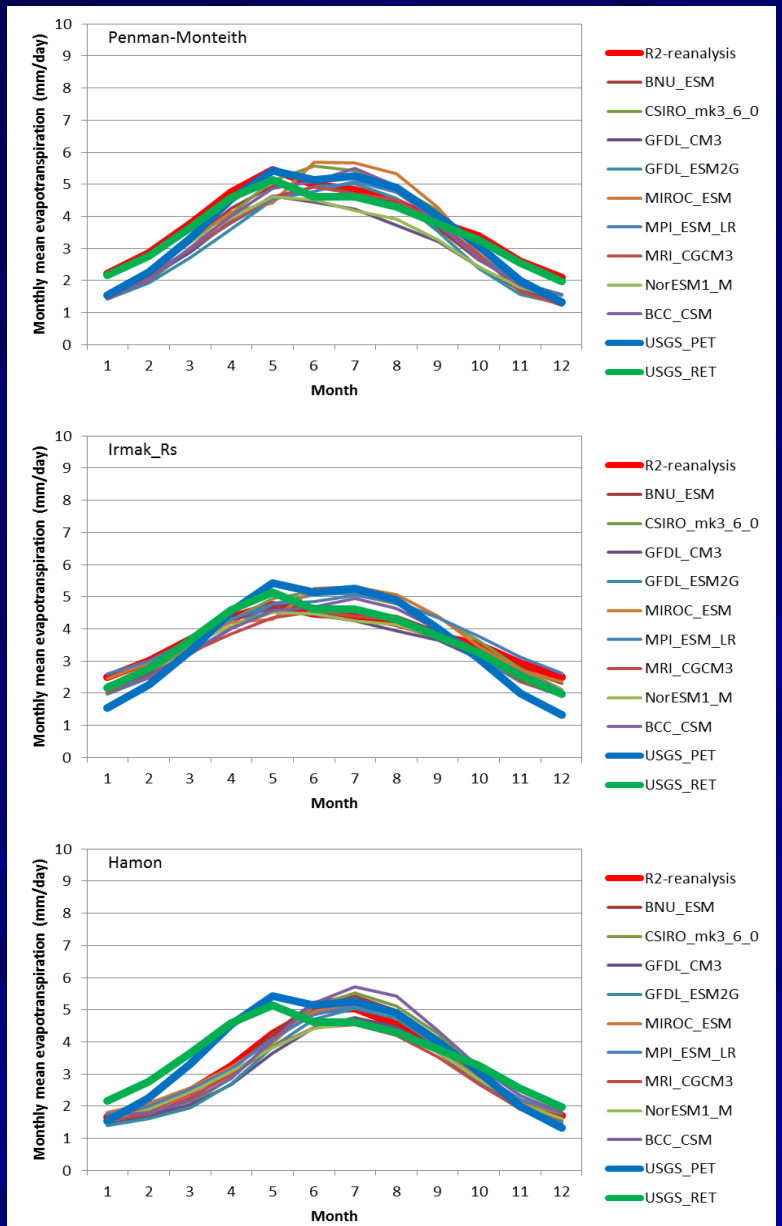
Which PET methods are better?

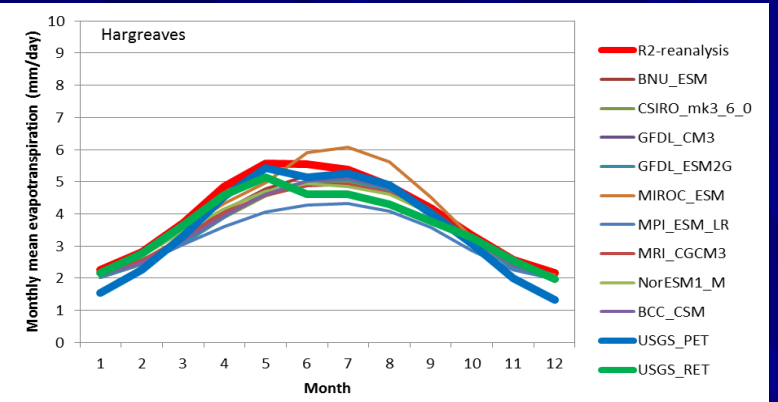
Compare mean retrospective PET over GCMs to USGS estimates

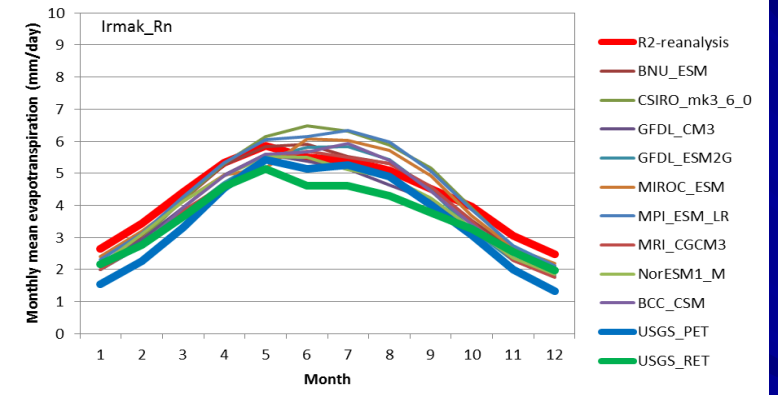


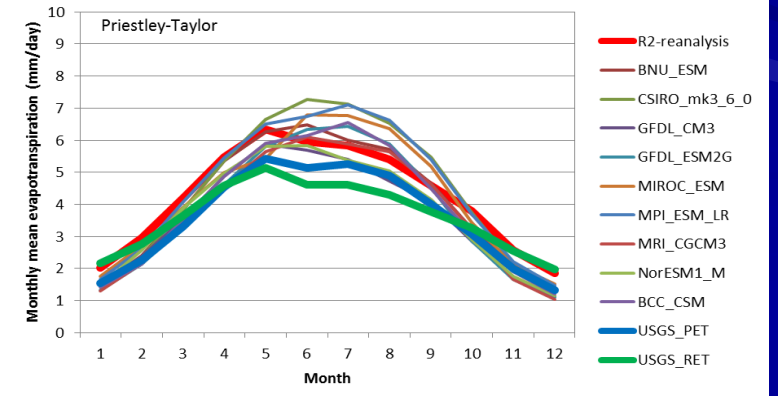
Which GCMs are better for ET?

Compare retrospective monthly PET to individual GCMs



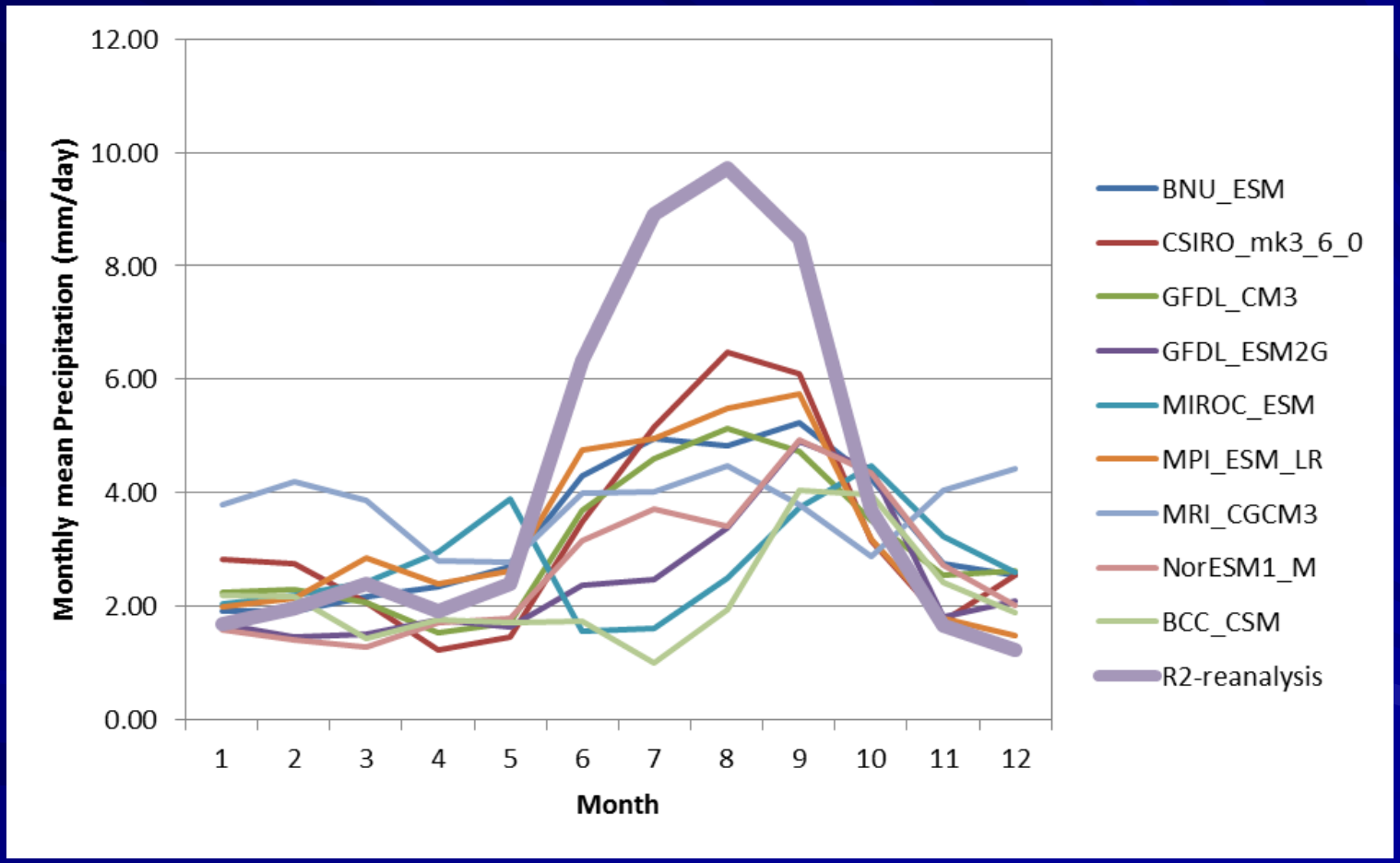






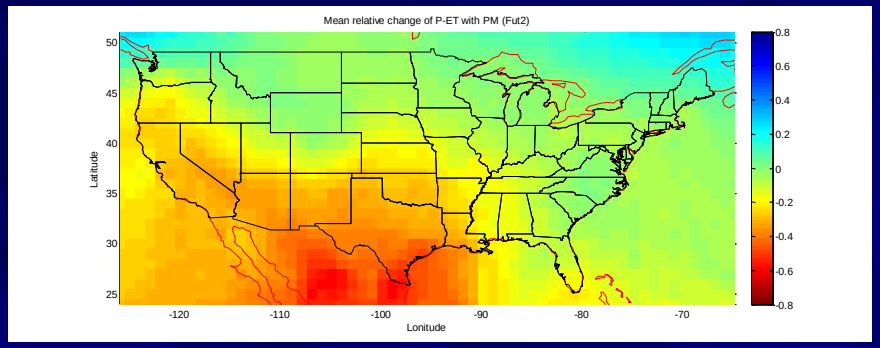
Which GCMs are better for P?

Compare retrospective monthly precipitation to GCMs

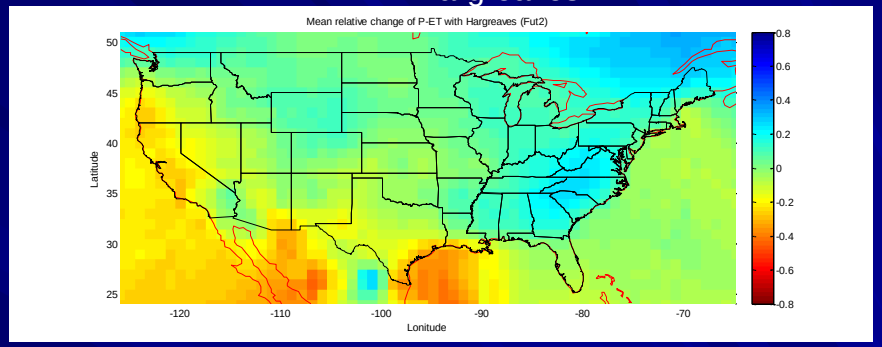


2070-2100 Change in Annual P-RET by ET method (averaged over GCMs and RCPs)

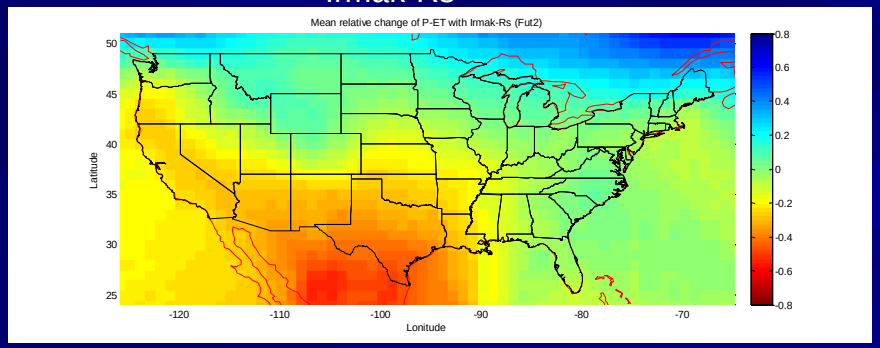
Penman- Monteith



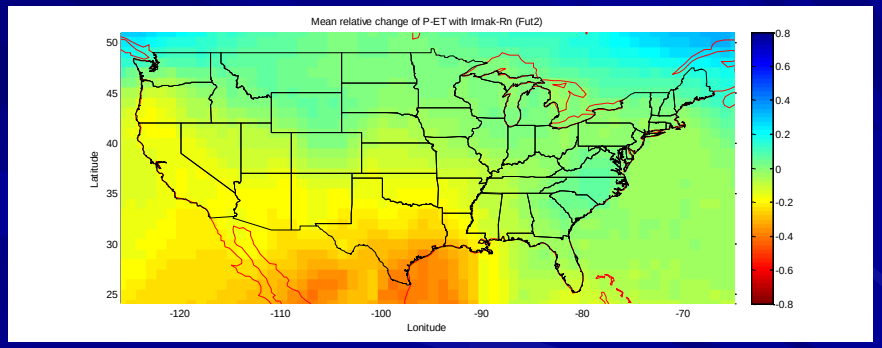
Hargreaves



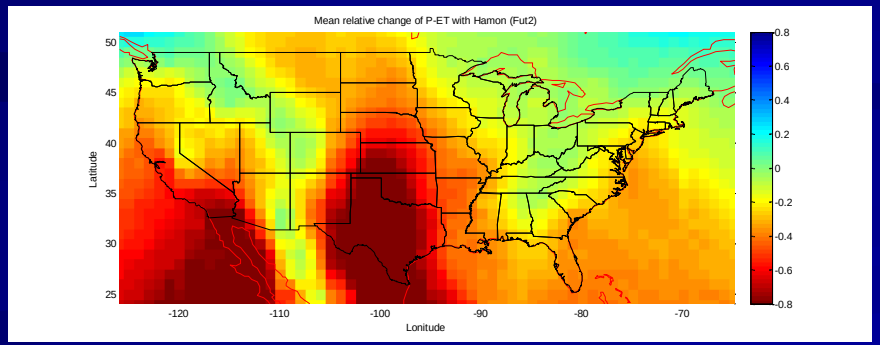
Irmak-Rs



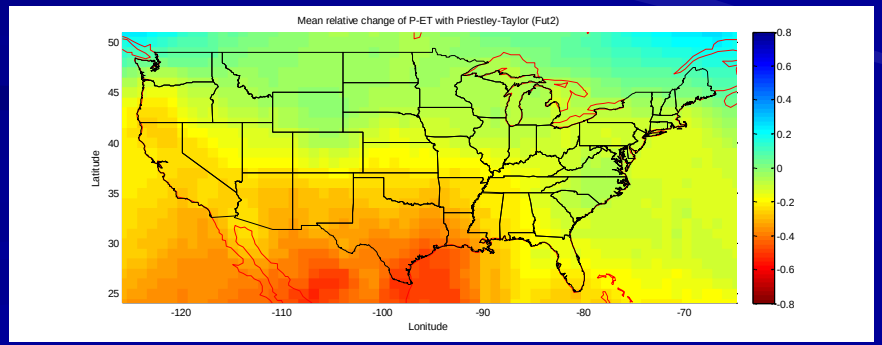
Irmak-Rn



Hamon



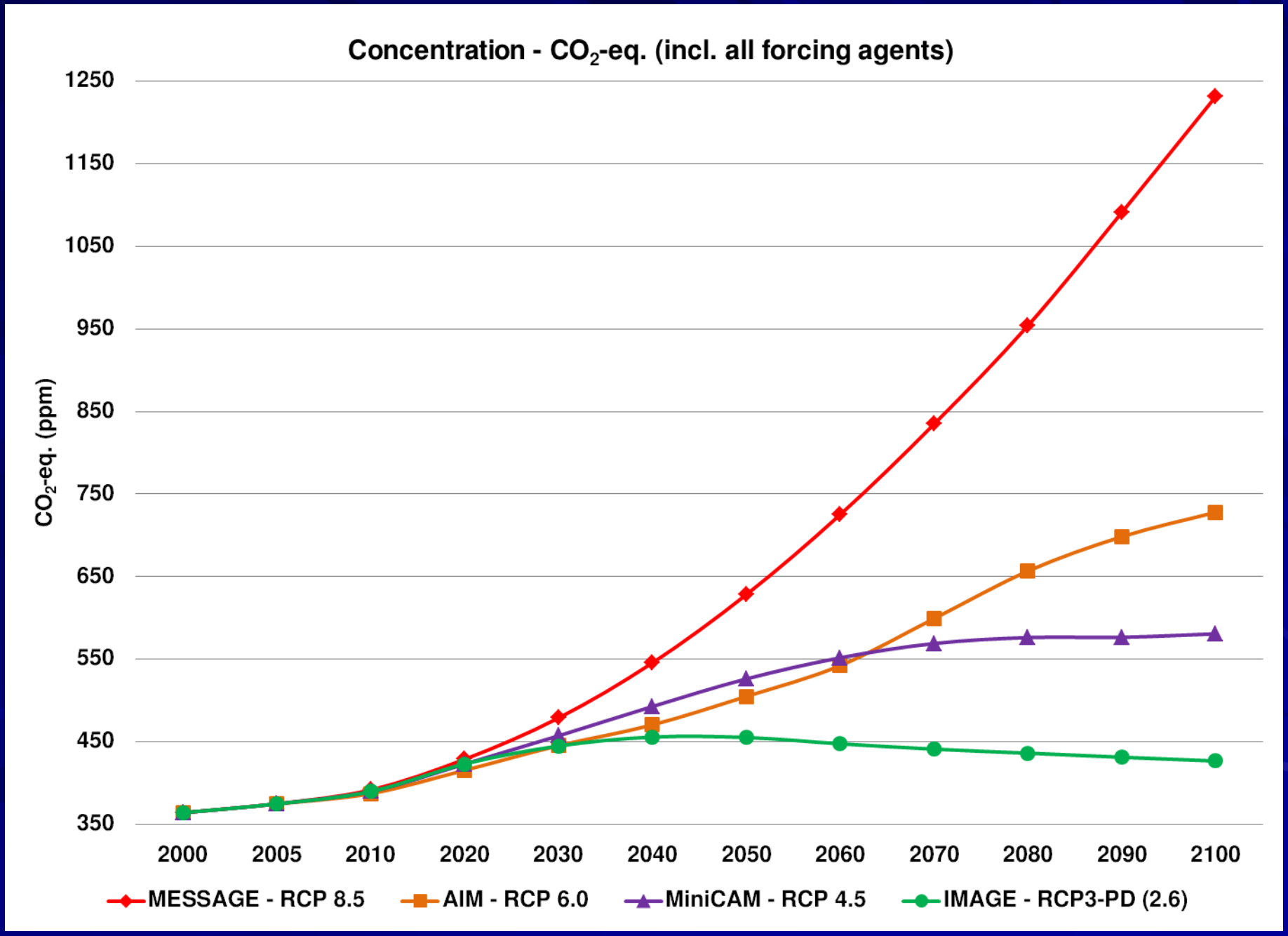
Priestly Taylor



Summary

- Projected changes in P, RET and P-RET vary depending on choice of GCM, ET method and RCP scenario with choice of ET method representing a significant source of uncertainty.
- In Florida…
  - The projected mean change in P-RET is generally drier, particularly in April through August. However there is significant uncertainty in this projection
  - Projected changes in P-RET are most sensitive to choice of GCM in the near future (2030-2060), driven by uncertainties in P.
  - For 2070-2100 P-RET projections sensitivities to GCM, ET method, and RCP are roughly equal.
  - The sensitivity to RCP increases over time.
- In other regions of the USA P – RET trends are most sensitive to choice of ET method in the summer season and to choice of GCM in the winter season, and are consistent over both time periods. The sensitivity to RCP increases over time.
- Best to evaluate impacts of future projections over an ensemble of GCMs and a variety of ET methods.


Questions…. Comments?


Concentration - CO_2-eq. (incl. all forcing agents)
1250
1150
1050
950
850
750
650
550
450
350
CO_2-eq. (ppm)
2000
2005
2010
2020
2030
2040
2050
2060
2070
2080
2090
2100
MESSAGE - RCP 8.5
AIM - RCP 6.0
MiniCAM - RCP 4.5
IMAGE - RCP3-PD (2.6)

Which GCMs are better for P?

Compare retrospective monthly precipitation to GCMs