

Reflections on future heavy precipitation

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Outline

Reasons to expect heavier precipitation

Lessons from the recent observed record

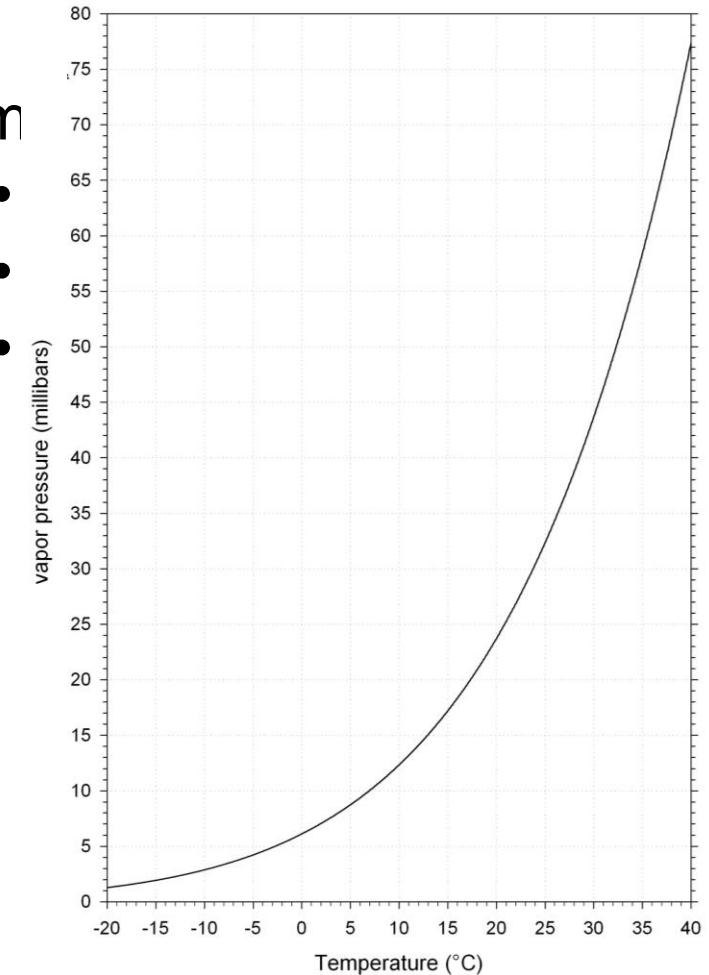
Challenges with climate models



Scaling of intense precipitation:

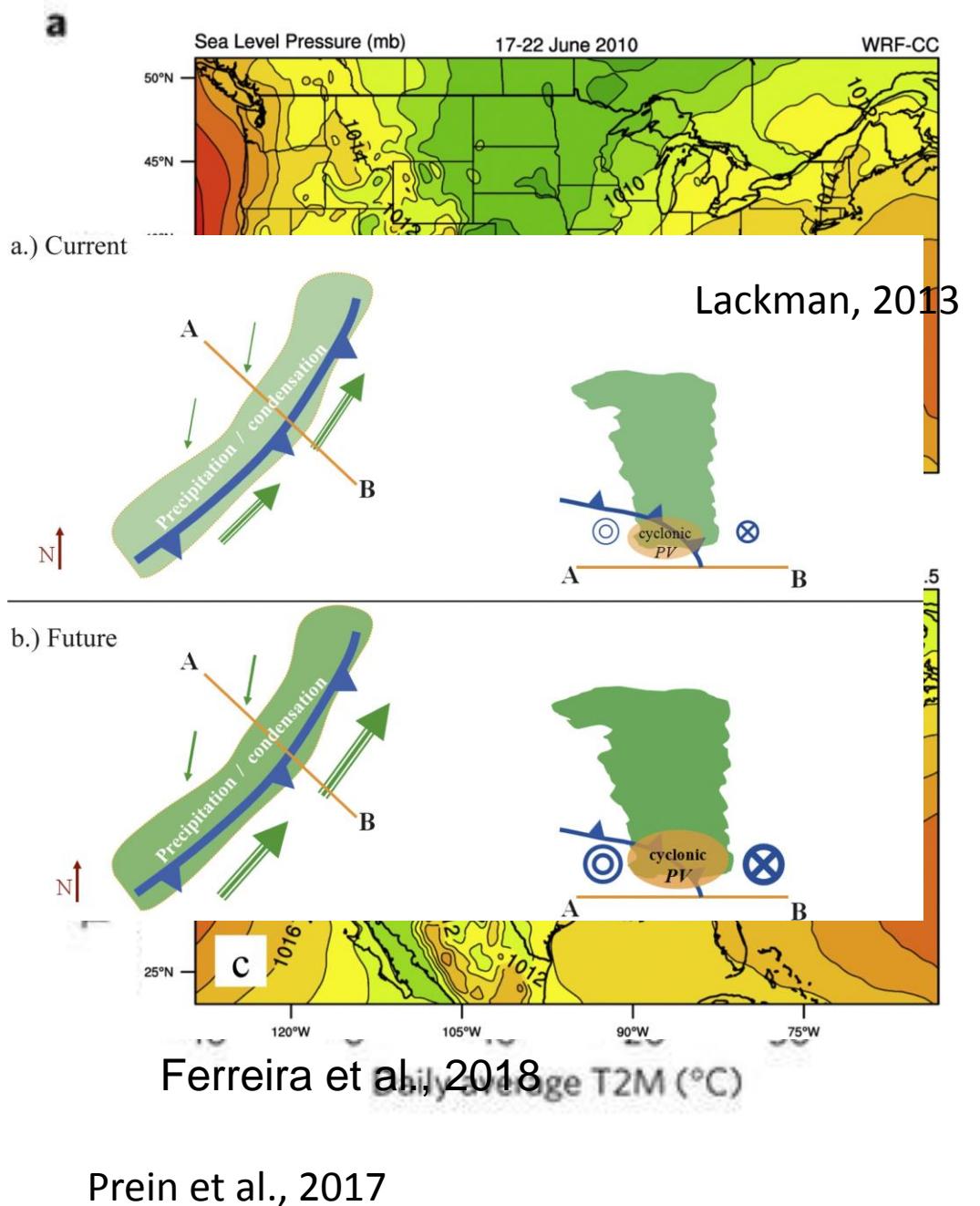
+7% per 1°C

Com

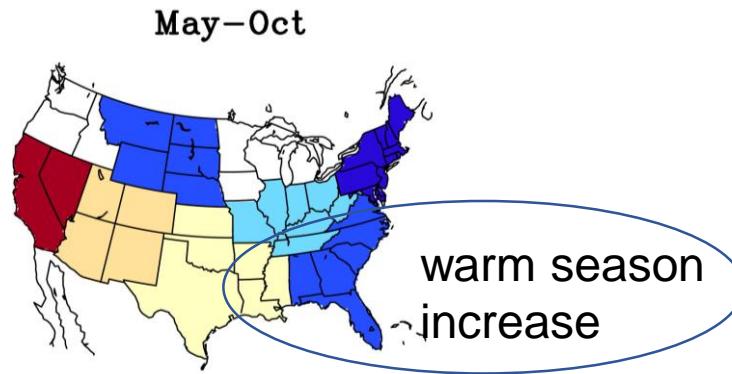


temperatures?

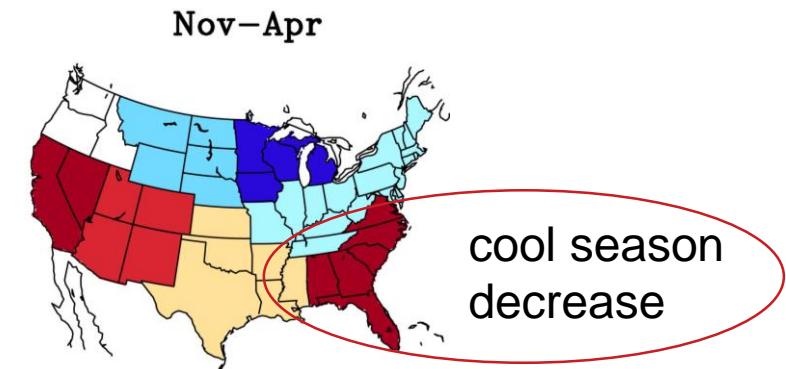
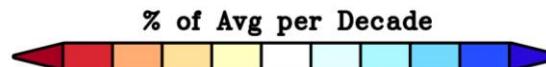
jh?



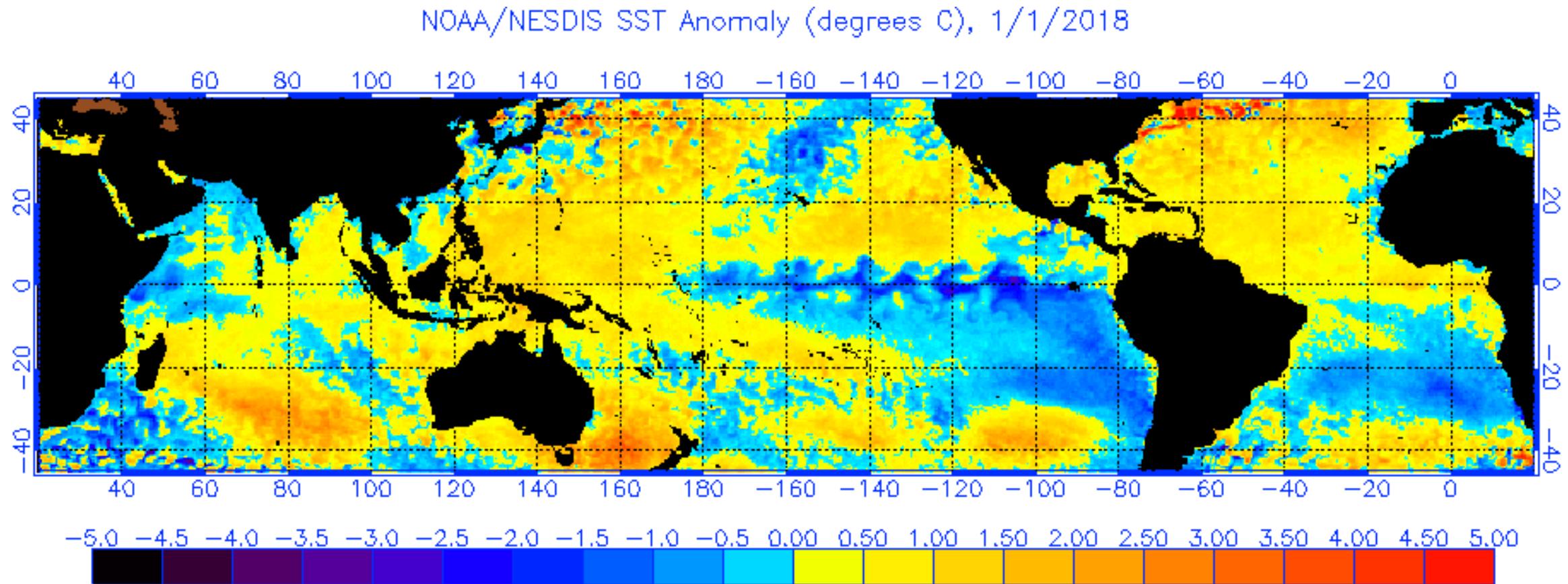
Changes in heavy precipitation, 1979-2013



Observed
1979-2013



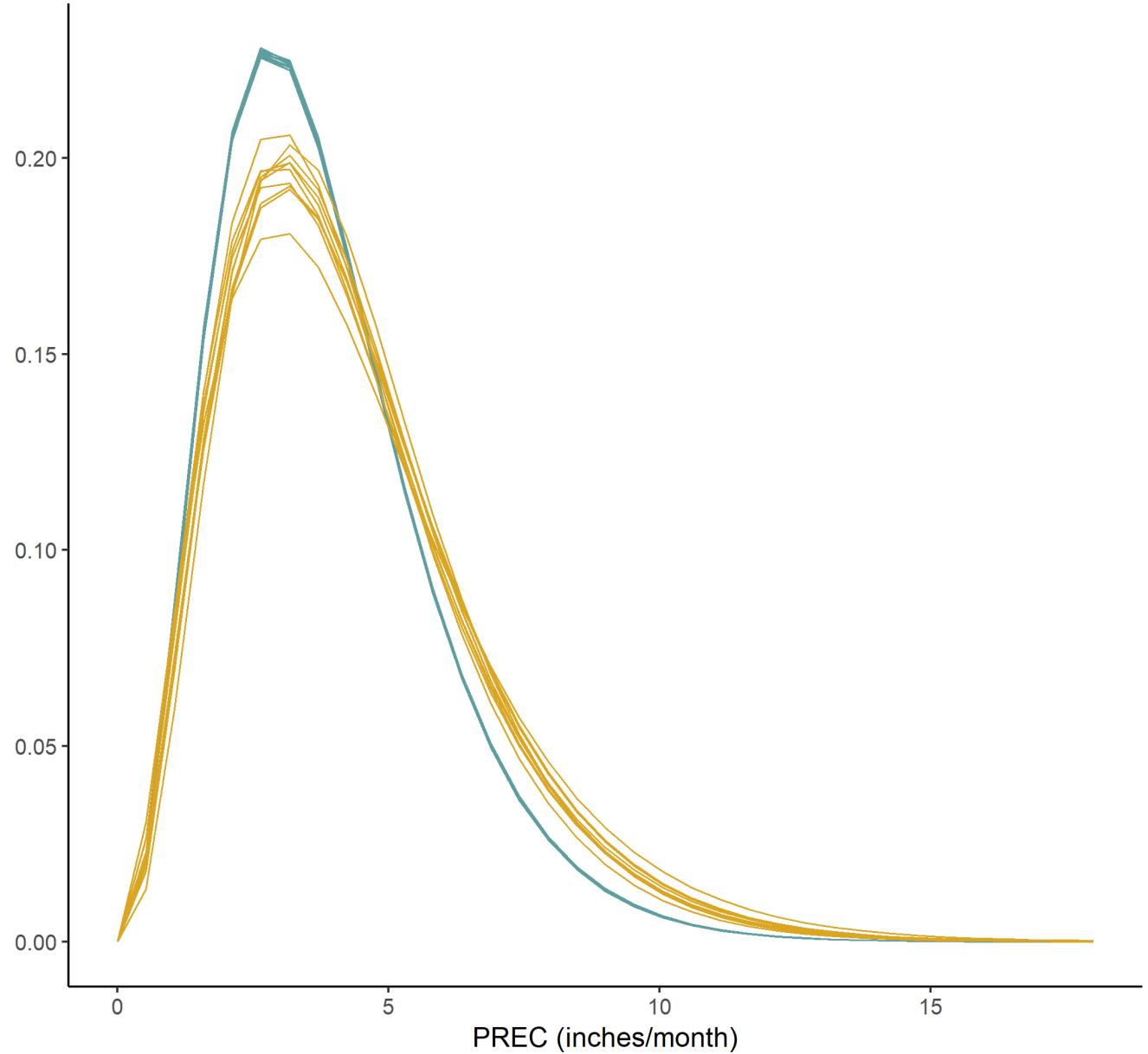
Observed recent heavy precipitation changes can be largely explained by interannual/interdecadal variability



Climate Models

Some consistency
showing wetter
conditions

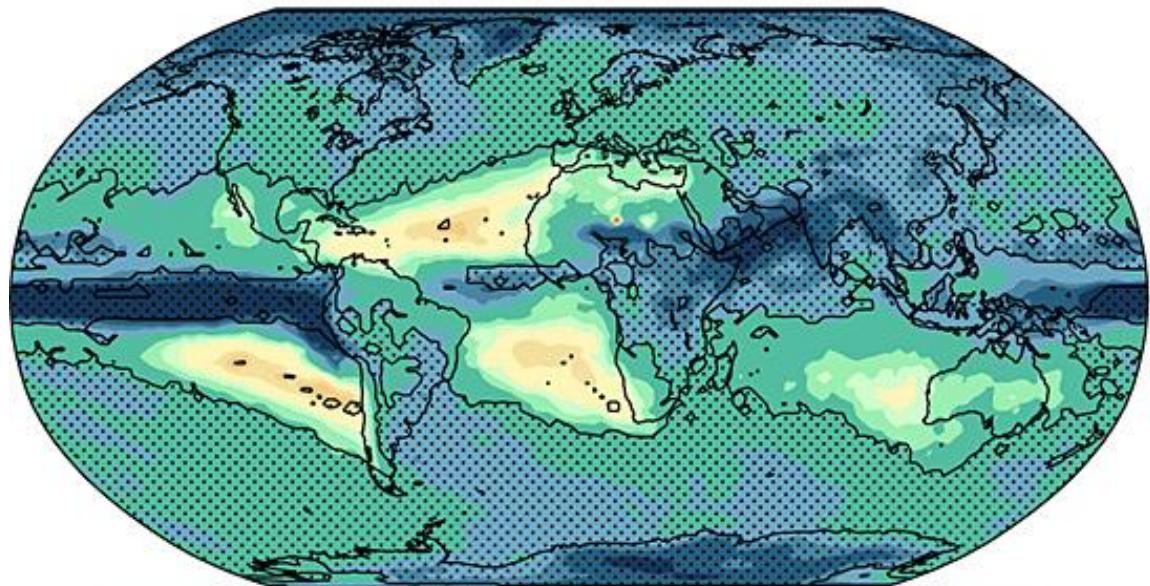
CSIRO-MK3-6-0 | Bias-Corrected
10 runs | control: 1950-1998 future:2030-2078



Model ensemble averages show some agreement in sign (+/-) of change

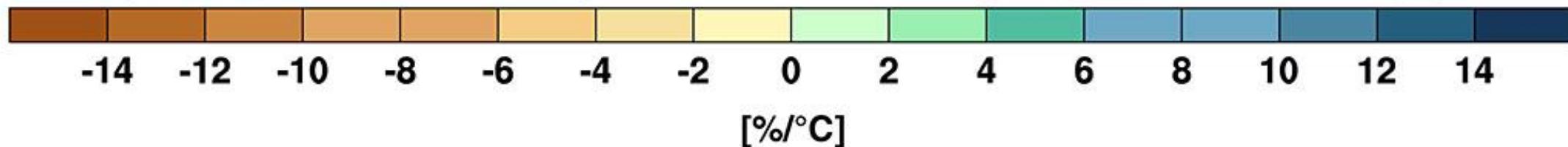
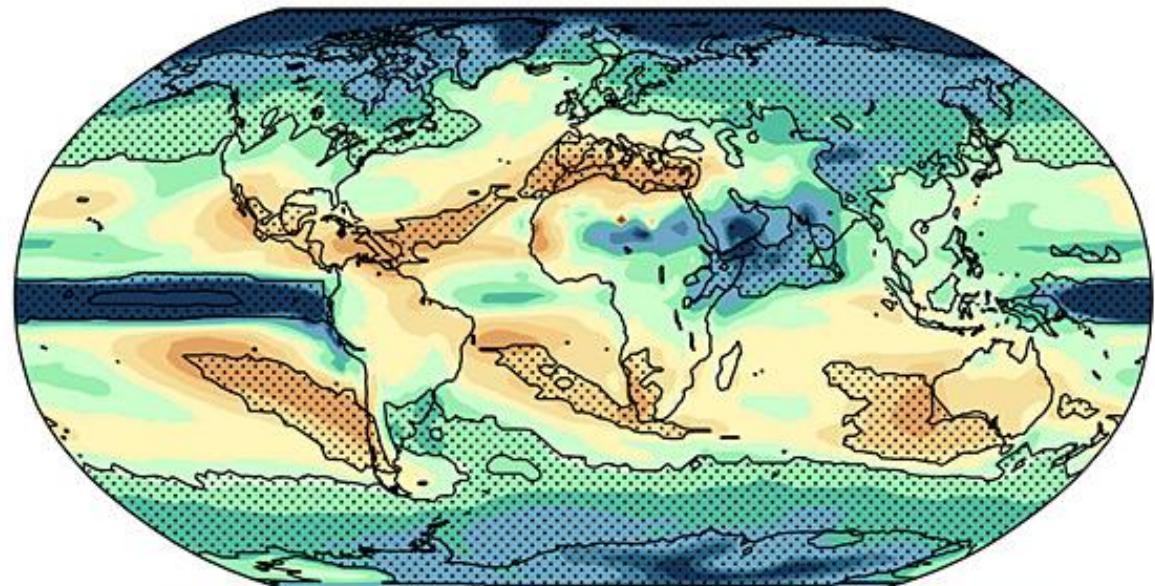
a) Change in heavy precipitation

Stippled area: 73.02%



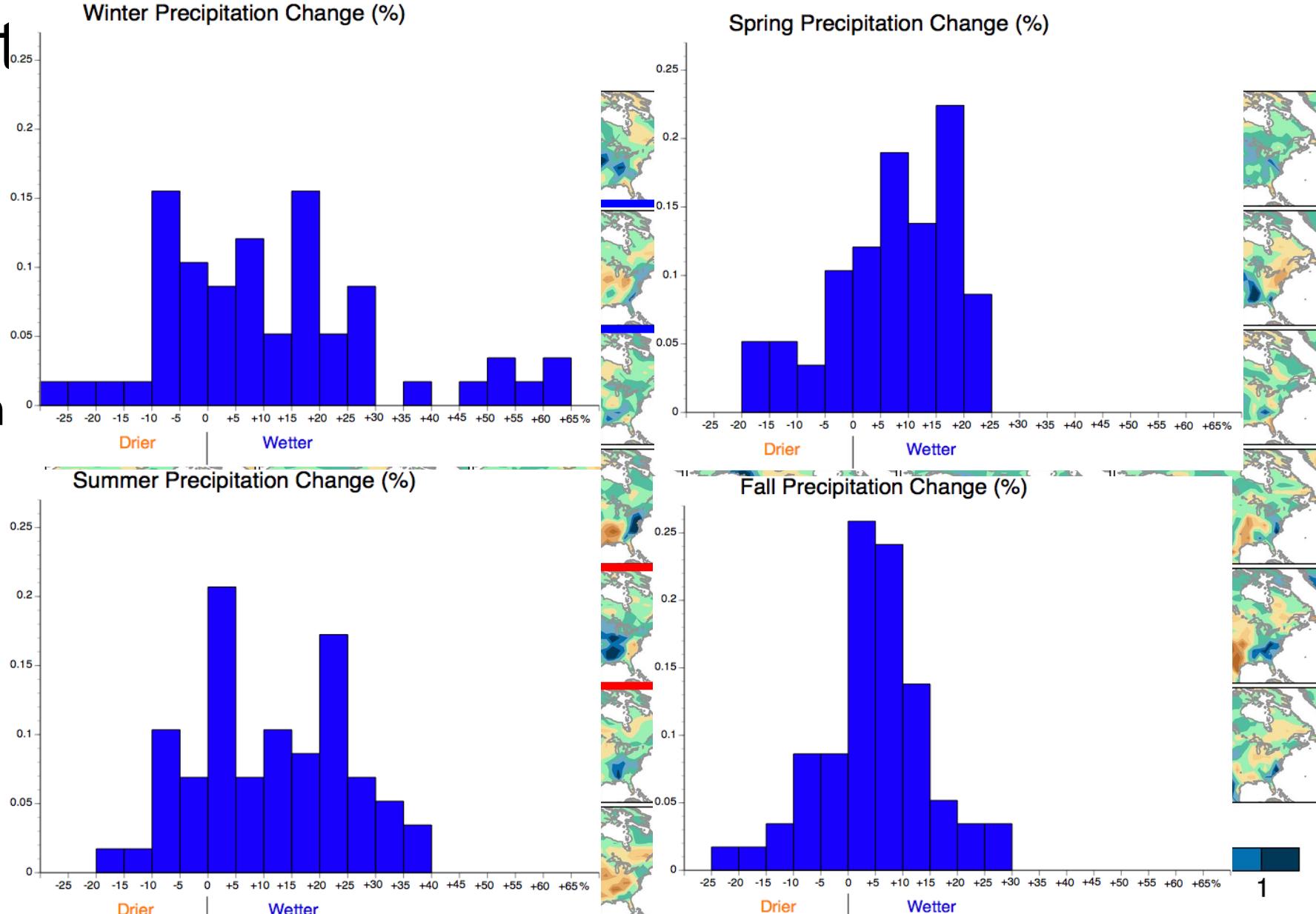
b) Change in annual mean precipitation

Stippled area: 27.36%



But projections differ across models and with time

Projected
summer
precipitation
2010-2060

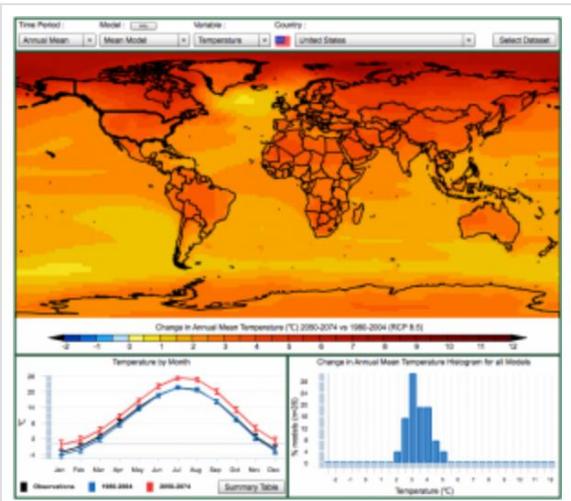


And then, there's downscaling!

The screenshot shows the GFDL (Geophysical Fluid Dynamics Laboratory) Climate Model Downscaling NARCCAP website. At the top, the GFDL logo and "Geophysical Fluid Dynamics Laboratory" are displayed. Below the logo is a navigation bar with links for EVENTS, RESEARCH, MODELS, MODEL DATA, and others. The main title "Climate Model Downscaling" is followed by the acronym "NARCCAP" in large white letters. On the left side, there is a "CMIP5 Global Climate Change Viewer" section with a world map showing temperature anomalies and two small graphs below it.

GCCV

CMIP5 Global Climate Change Viewer



The banner for the Climate Change Resource Center is displayed. It features the USDA and U.S. Forest Service logos at the top. Below them is a green bar with the text "CLIMATE CHANGE RESOURCE CENTER" and a logo featuring three stylized trees. To the right of the green bar is a dark blue bar with the text "EDUCATION TOPICS TOOLS ADAPTATION LIBRARY" and icons for a speech bubble, gear, house, and document.

National Climate Change Viewer

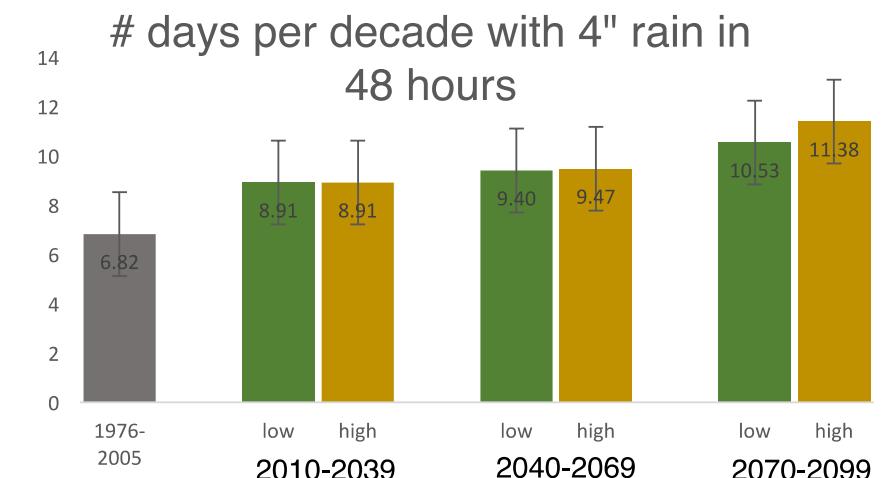
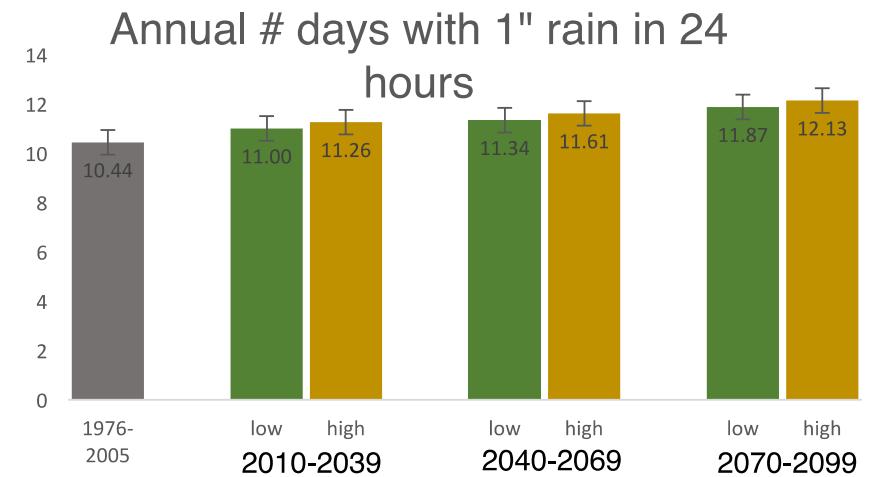
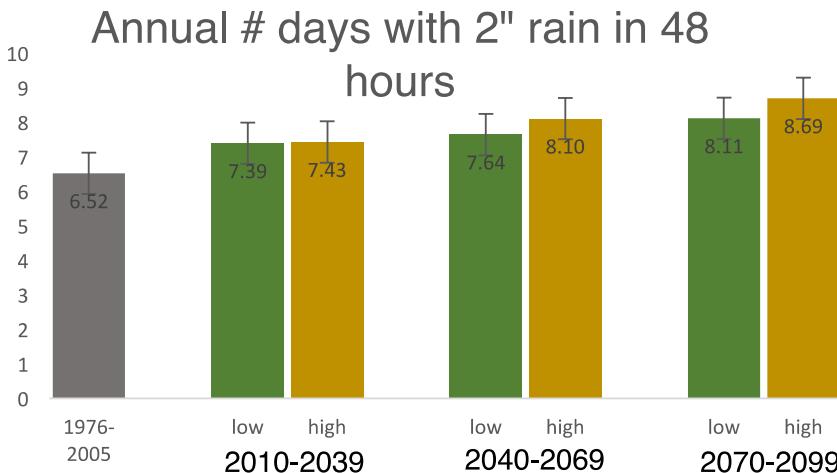
Design your Own CSV File of MACA Point Data

This interface allows users to design their own CSV file of MACA point data. It is divided into two steps. Step One includes fields for selecting the frequency of data (daily data), scenario (historical 1950-2005), and min/max years (1950, 2005). Step Two includes a map of North America with a red dot indicating a point location (33.9794 N, -81.2051 E) and a field for selecting the point location.

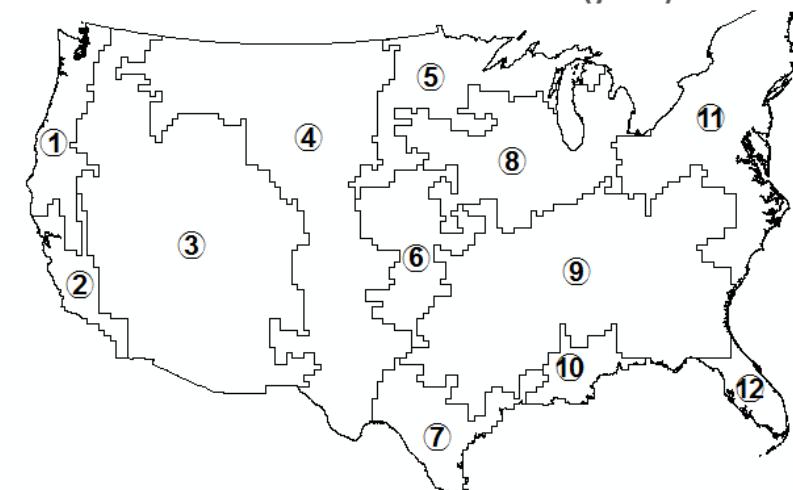
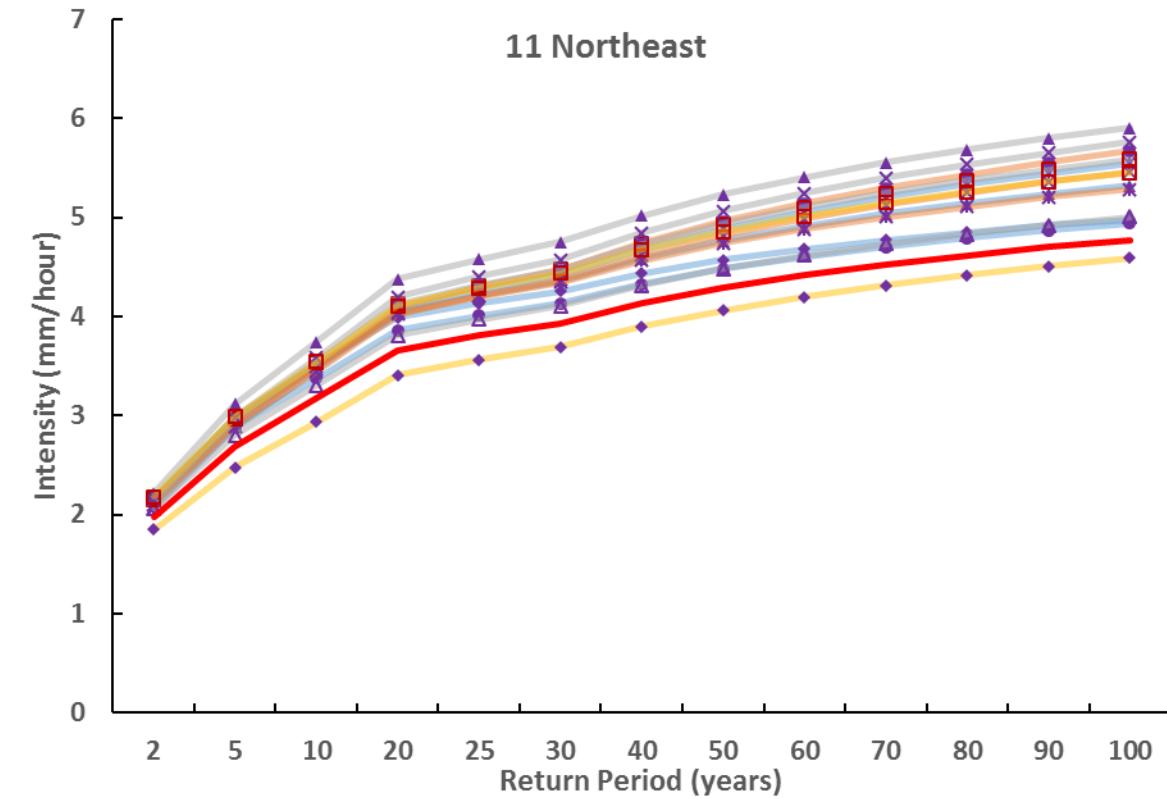
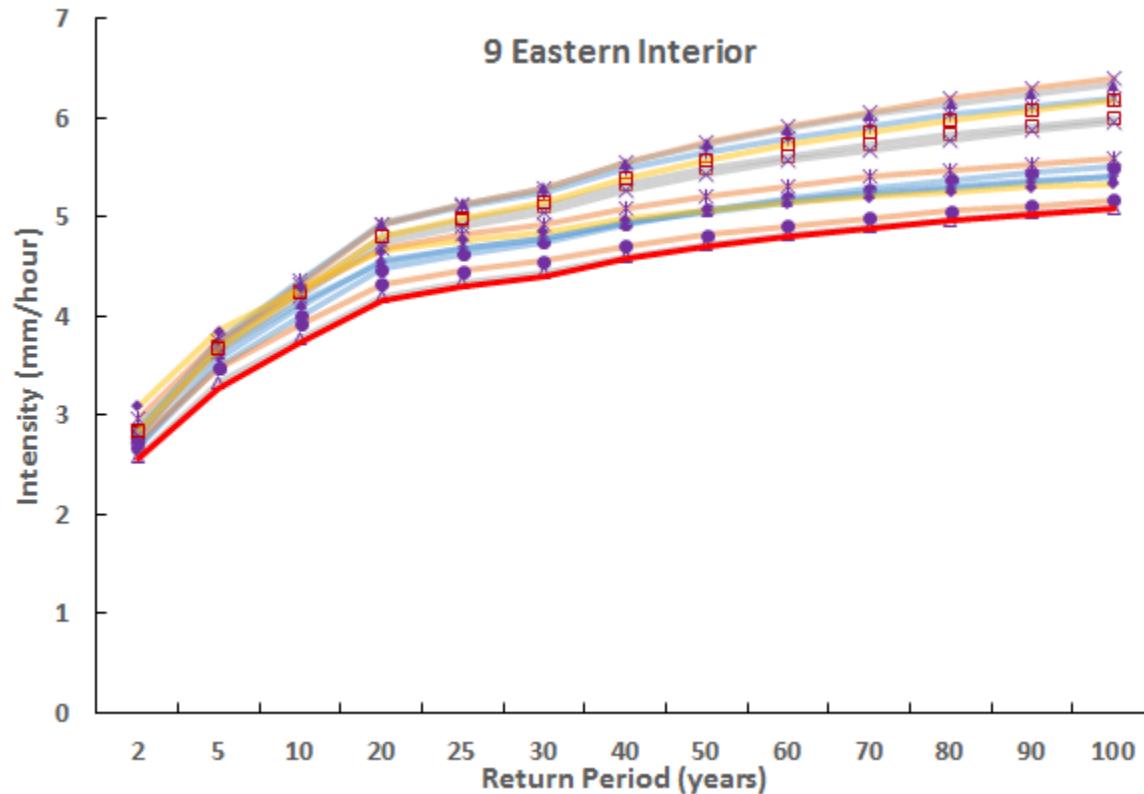
Search Tools

Statistically Downscaled Climate Projections for Georgetown County

(MACA CMIP5)

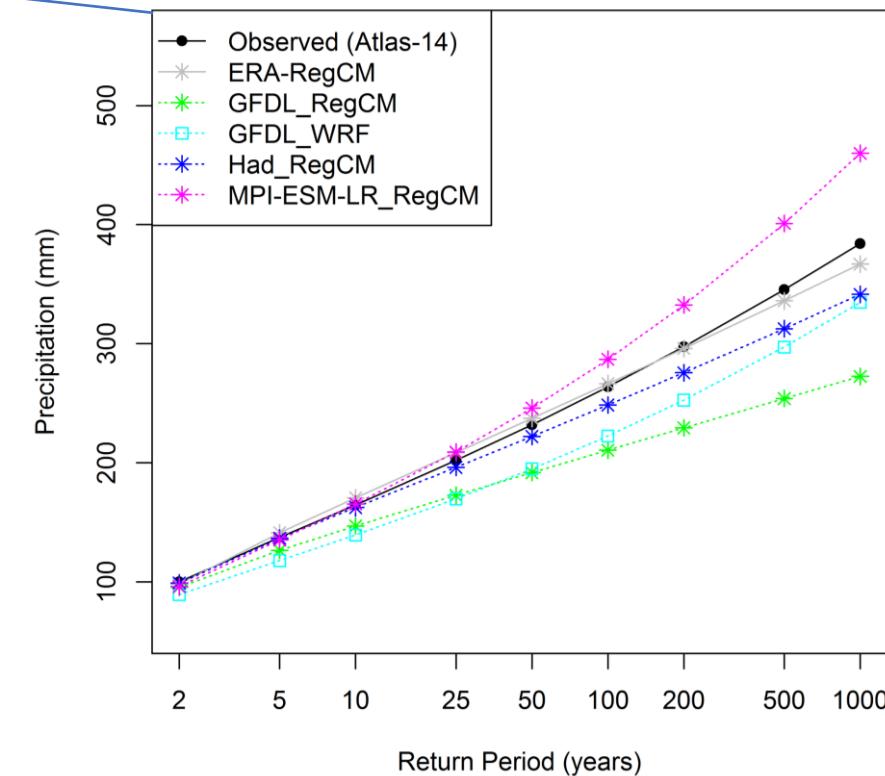
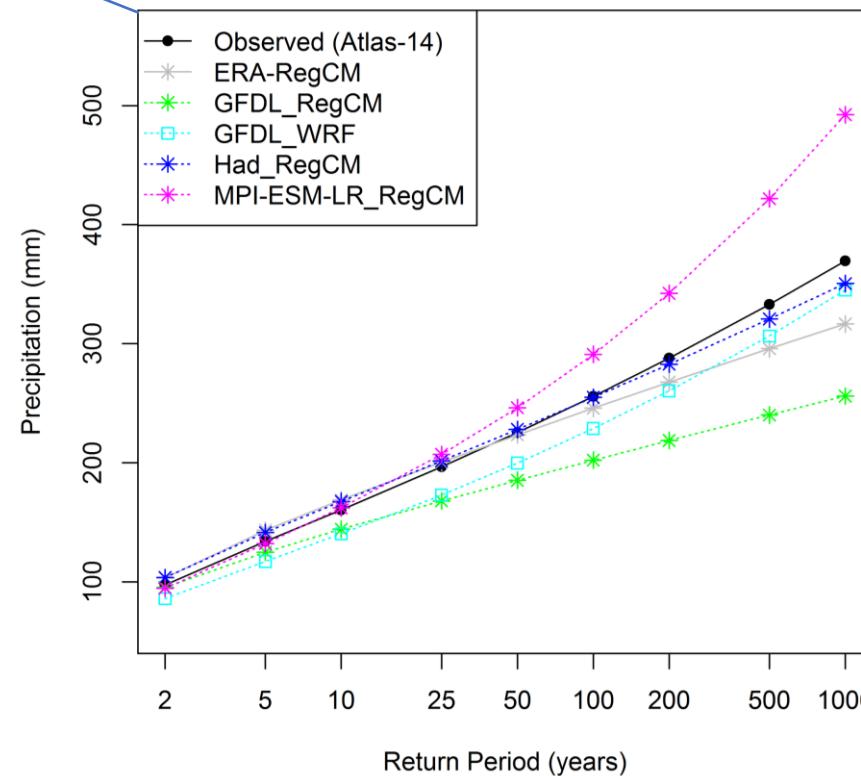


Dynamic downscaling



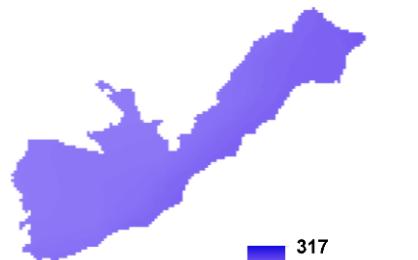
Dynamic downscaling

Large variability across models
Annual 1-day maxima



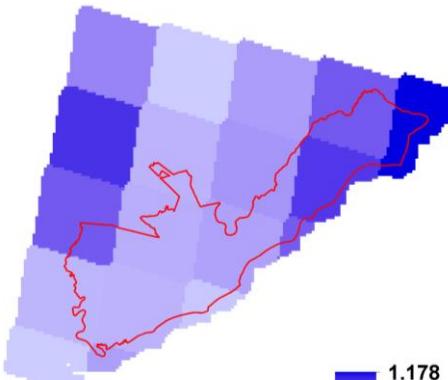
Unrealistic spatial variability

1/100



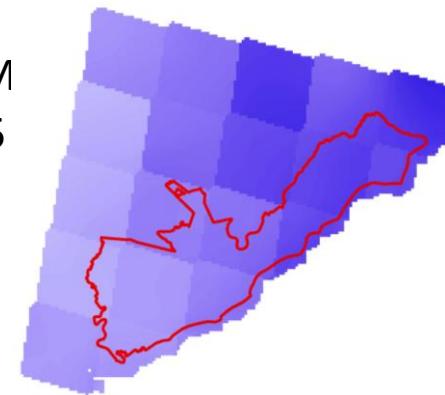
Atlas-14
(Observed, ~1km)

317
216
Depth (mm)



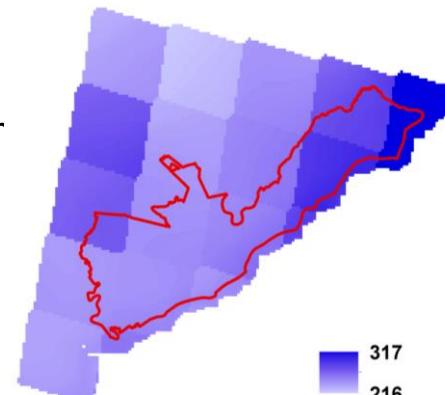
Ratio

Had-RegCM
(2006-2050, 25



317
216
Depth (mm)

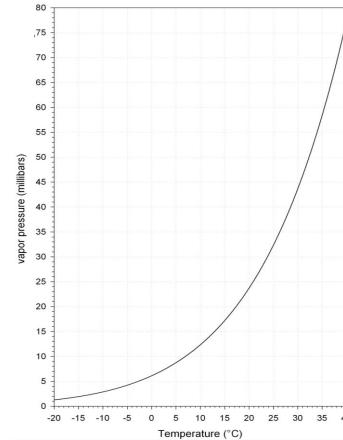
GFDL-WRF
(2006-2050, 25 kr)



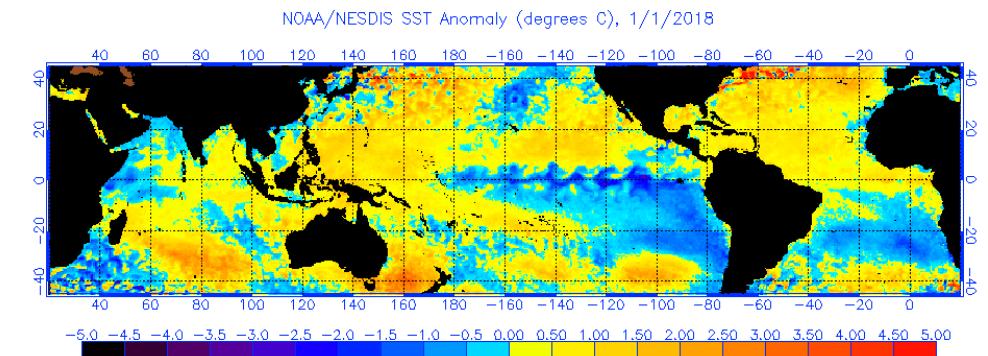
1.178
0.899
Ratio

Summary

Theoretical reasons to expect heavier precipitation



Recent observations influenced by natural variability



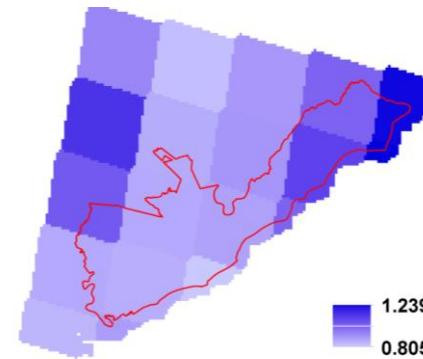
Don't wait for the models to improve



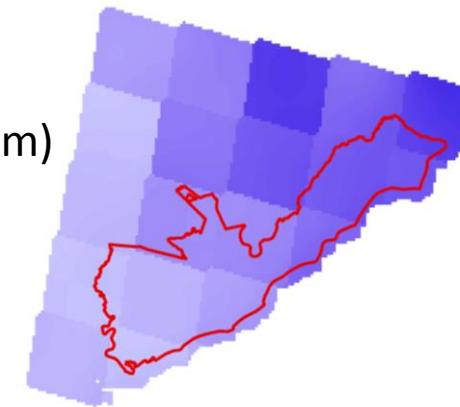


Atlas-14
(Observed, ~1km)

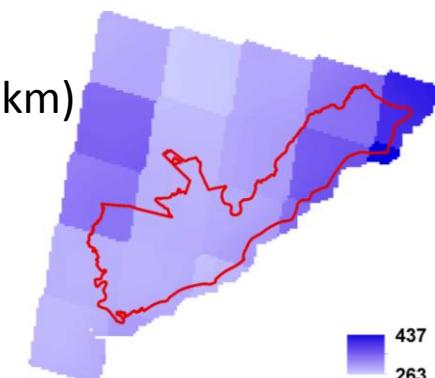
Depth (mm)



Had-RegCM
(2006-2050, 25 km)



GFDL-WRF
(2006-2050, 25 km)



Depth (mm)

Ratio

1.239
0.805

Dynamic downscaling

