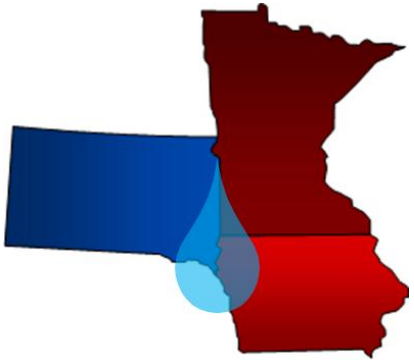
A Presentation of the 2012 Drainage Research Forum

November 20, 2012
Farmamerica, Waseca MN



IOWA STATE UNIVERSITY
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Iowa State University
Climate Science Program

Long Term Outlook for Rainfall

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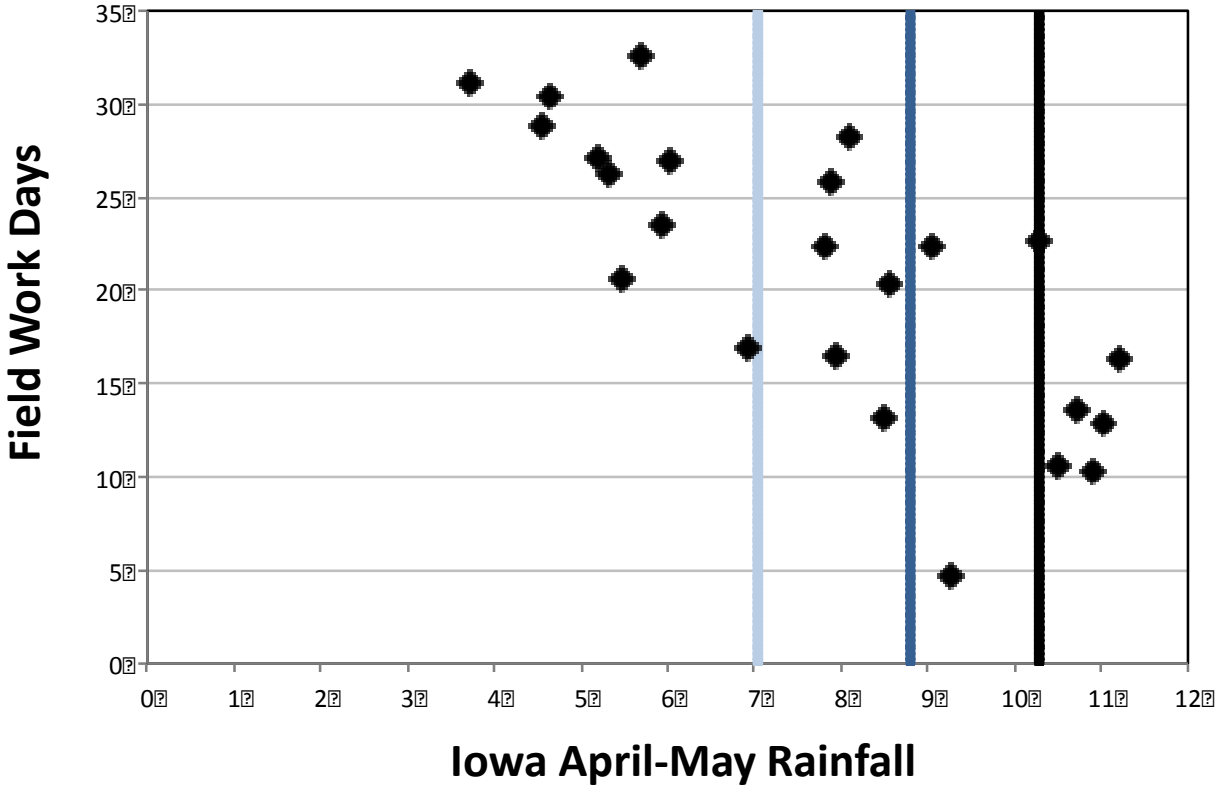
Iowa State University

Drainage Research Forum
20 November 2012
Waseca, MN

Overview

- Historical change of rainfall.
  - Recent trend is an increase in spring rainfall.
  - 30-yr average spring rainfall in Iowa exceeds all previous 30-yr periods.
- Historical data suggest what about the future?
  - Historical pattern points to 2020-2030 as a period of higher drought risk.
- Climate simulation data suggest what about the future?
  - Drought conditions are likely to be as dry as and hotter than present.
  - In periods of low drought risk, average April-June rainfall should continue and should result in another 10% increase above the 1981-2010 average by 2020-2030.

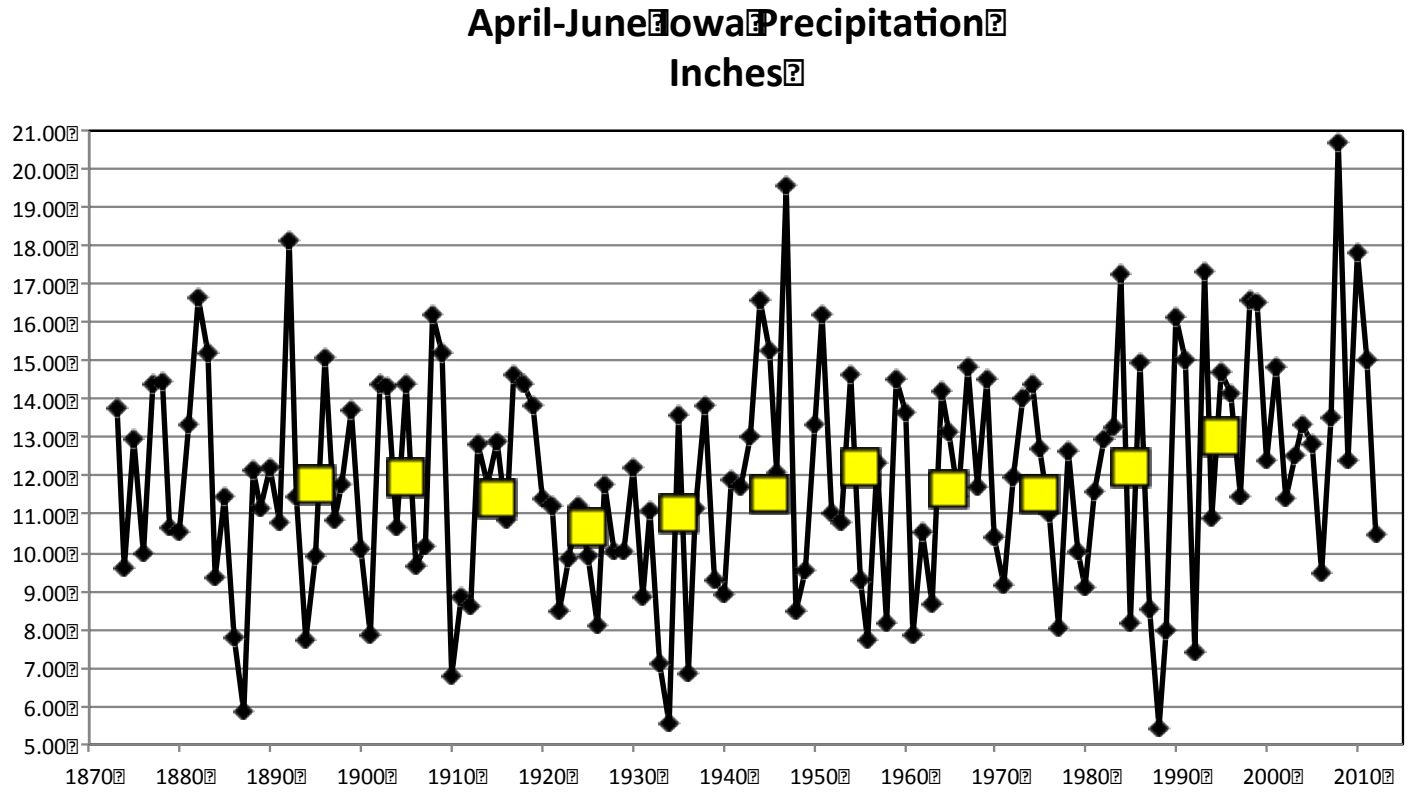
Wetter Spring/Summer is a good thing, right?



Well… A wetter spring reduces the growing season or takes land out of production.

Recent trend in Spring Rainfall in Iowa

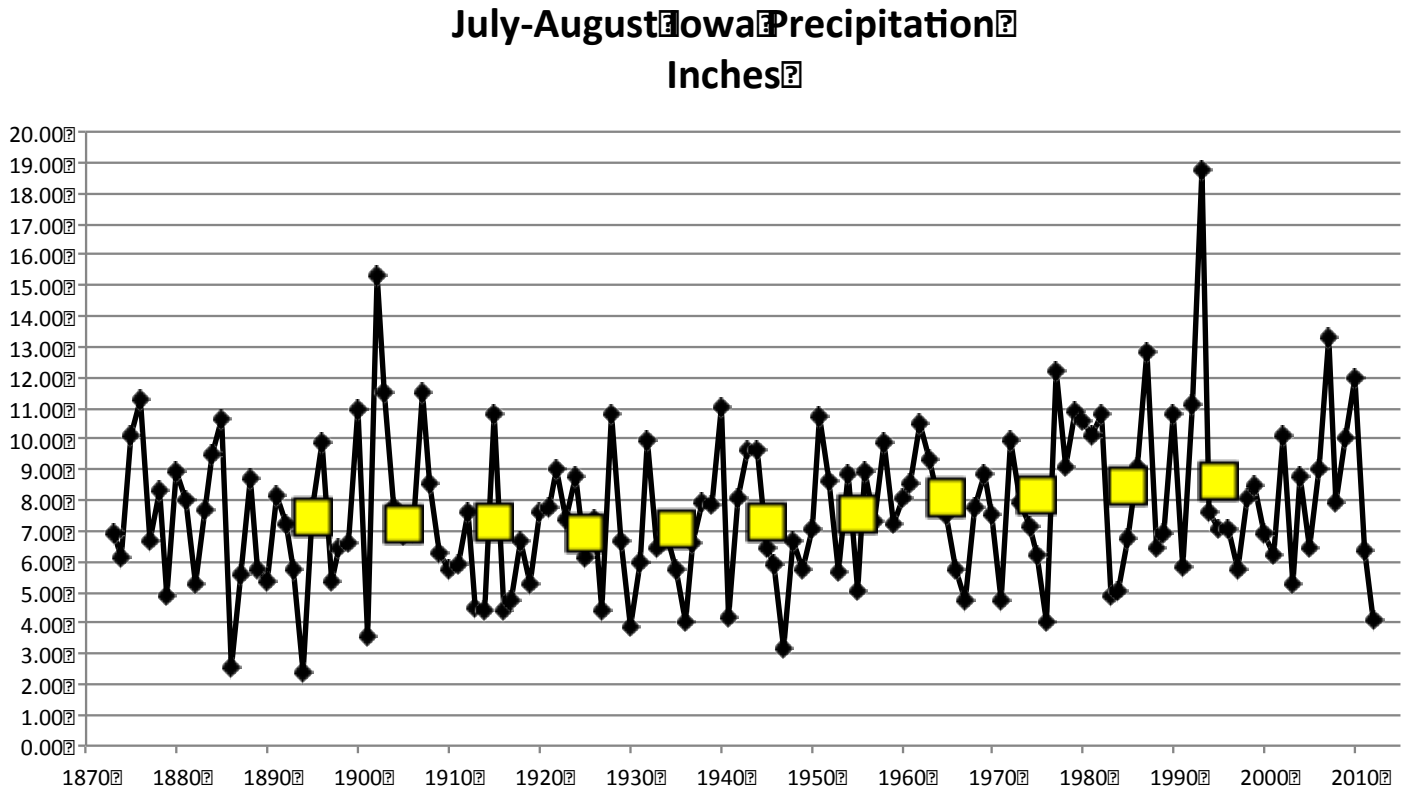
- 30-yr average Apr-Jun rainfall (13”) is highest on record.
- 9 of 19 years with Apr-June rainfall > 15” during 1981-2011.
- 27% of years during 1981-2012 have Apr-Jun rainfall > 15”.



Source: Iowa State Climatologist Office; http://www.iowaagriculture.gov/climatology.asp

Recent trend in Summer Rainfall in Iowa

- 30-yr average July-August rainfall (8.6”) is highest on record.
- 7 of 17 years with July-August rainfall > 11” during 1981-2011.
- A 1-in-20 dry July-August had not occurred since 1976 until 2012.

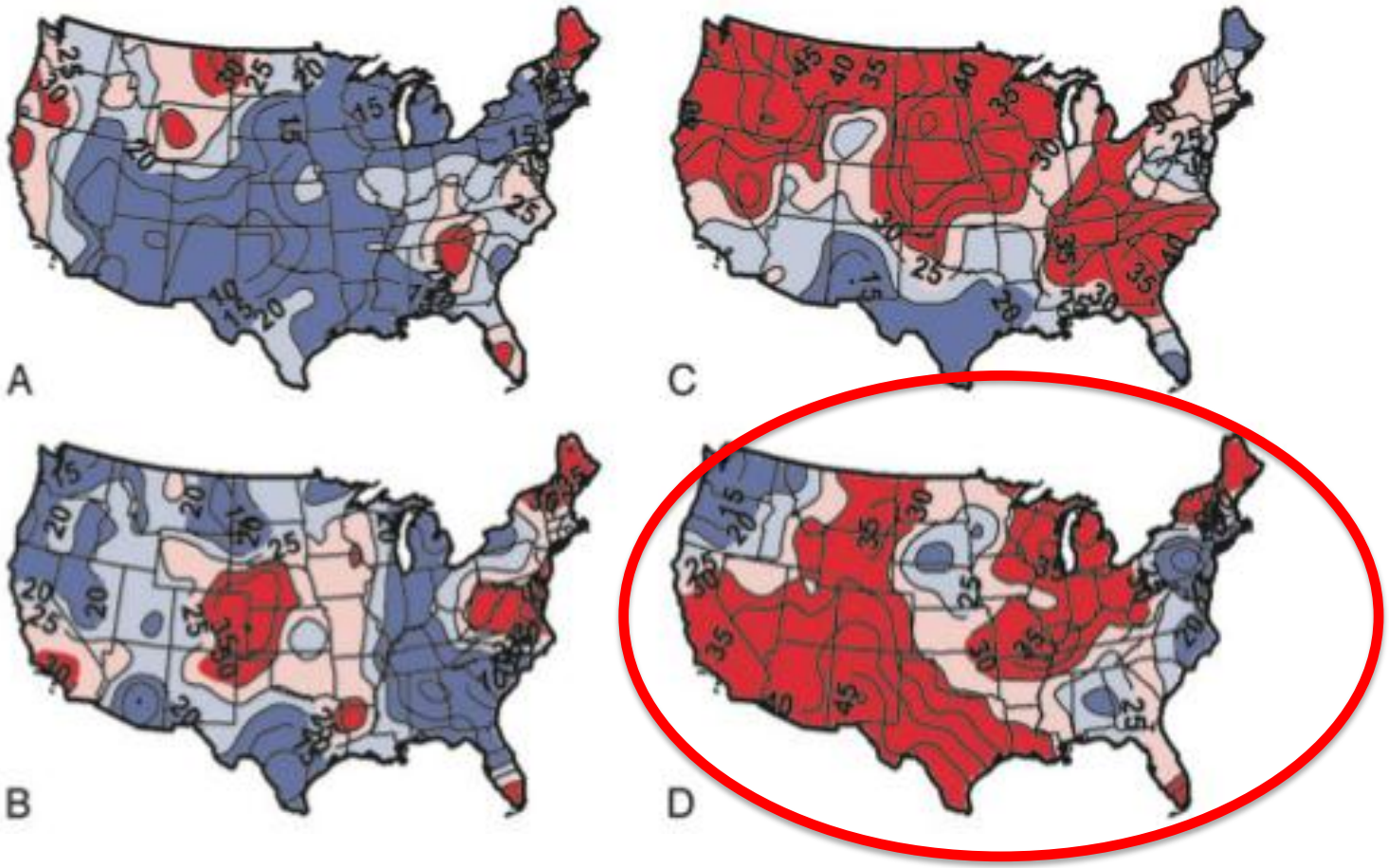


Source: Iowa State Climatologist Office; http://www.iowaagriculture.gov/climatology.asp

Caveat: 2020 and Beyond has Larger Uncertainty

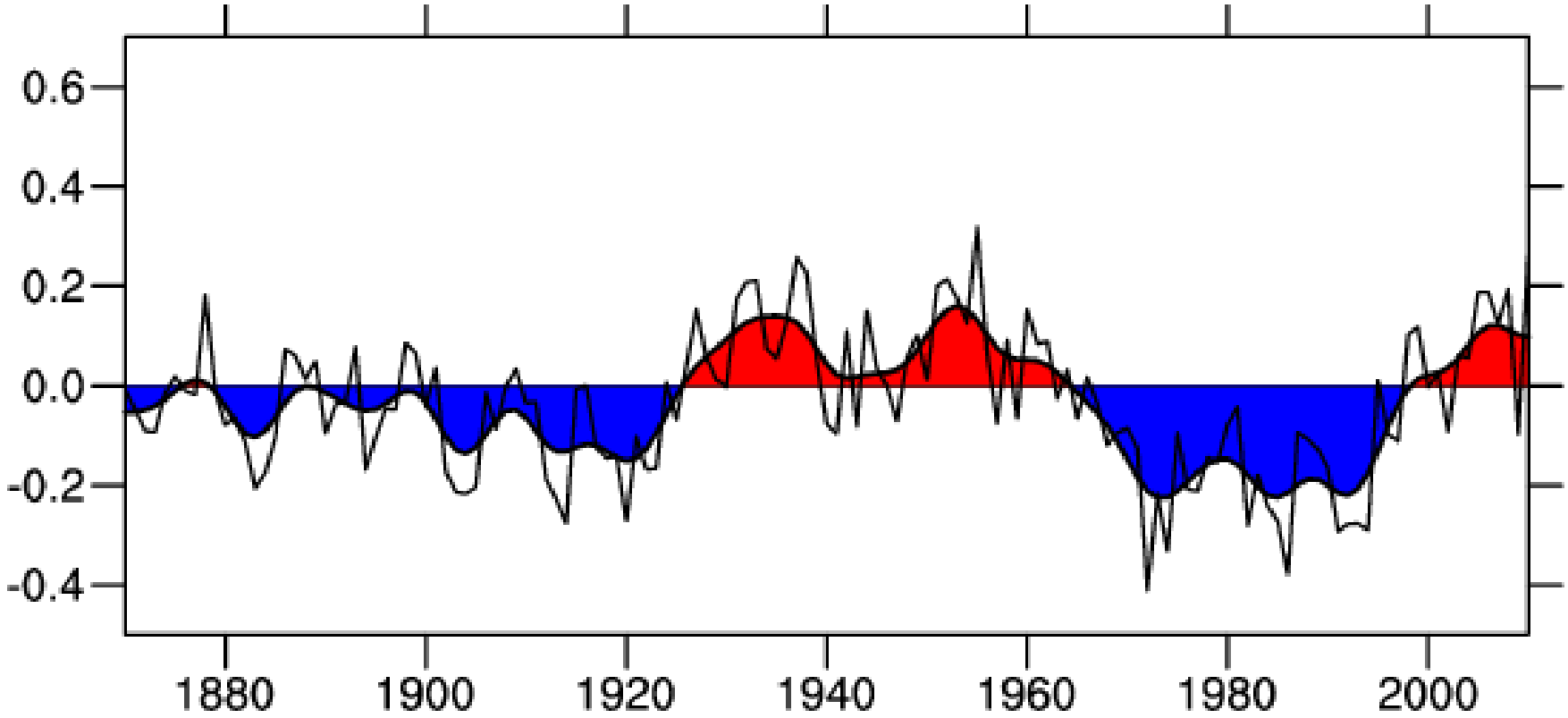
- While historical data is the best available guidance for 2020-2030, a systematic approach for blending recent trends and past performance is an area of research.

Drought Risk Varies with Pacific and Atlantic Sea Surface Temperature Pattern



Source: McCabe et al. (2004); www.pnas.org/cgi/doi/10.1073/pnas.0306738101

Expect Atlantic Sea Surface Temperature Pattern to Change in 2020-2030



Source: National Center for Atmospheric Research
http://www.cgd.ucar.edu/cas/catalog/climind/AMO.html

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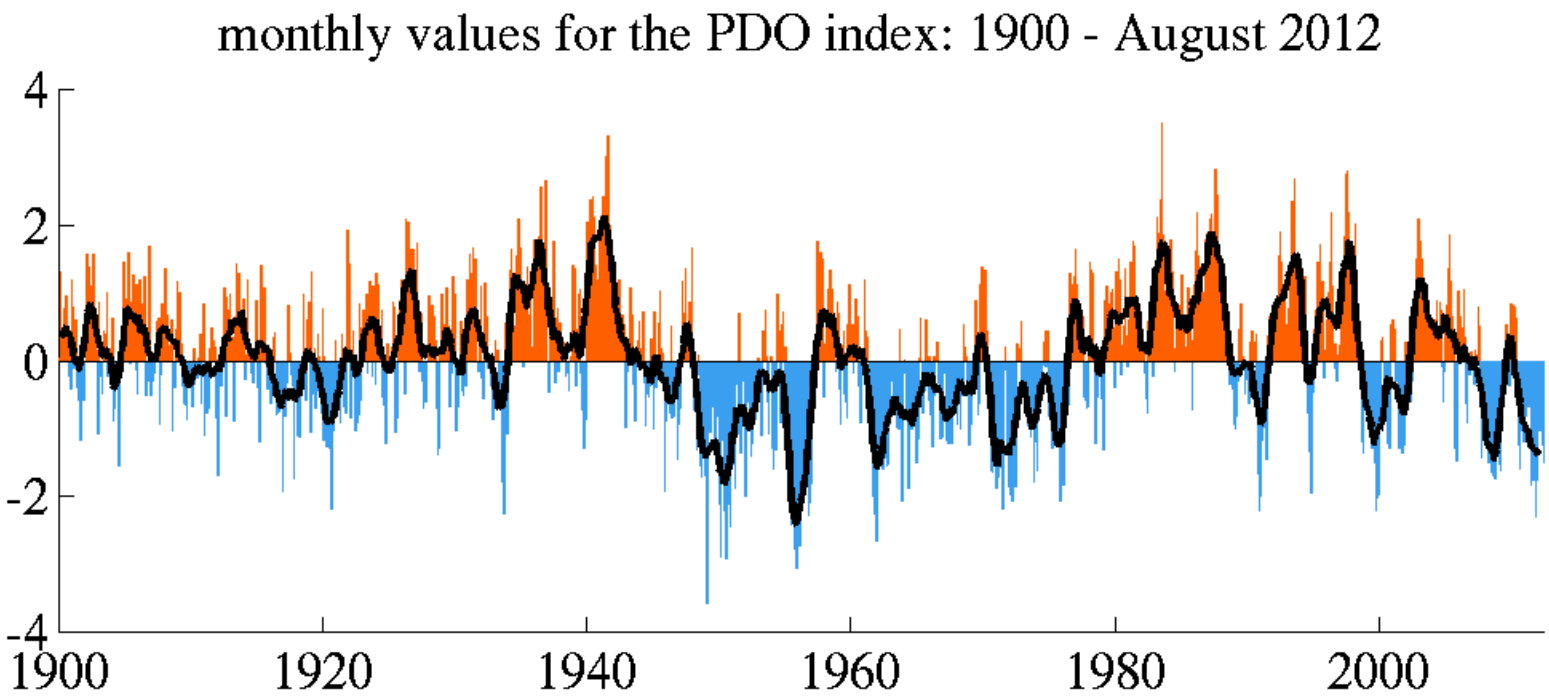
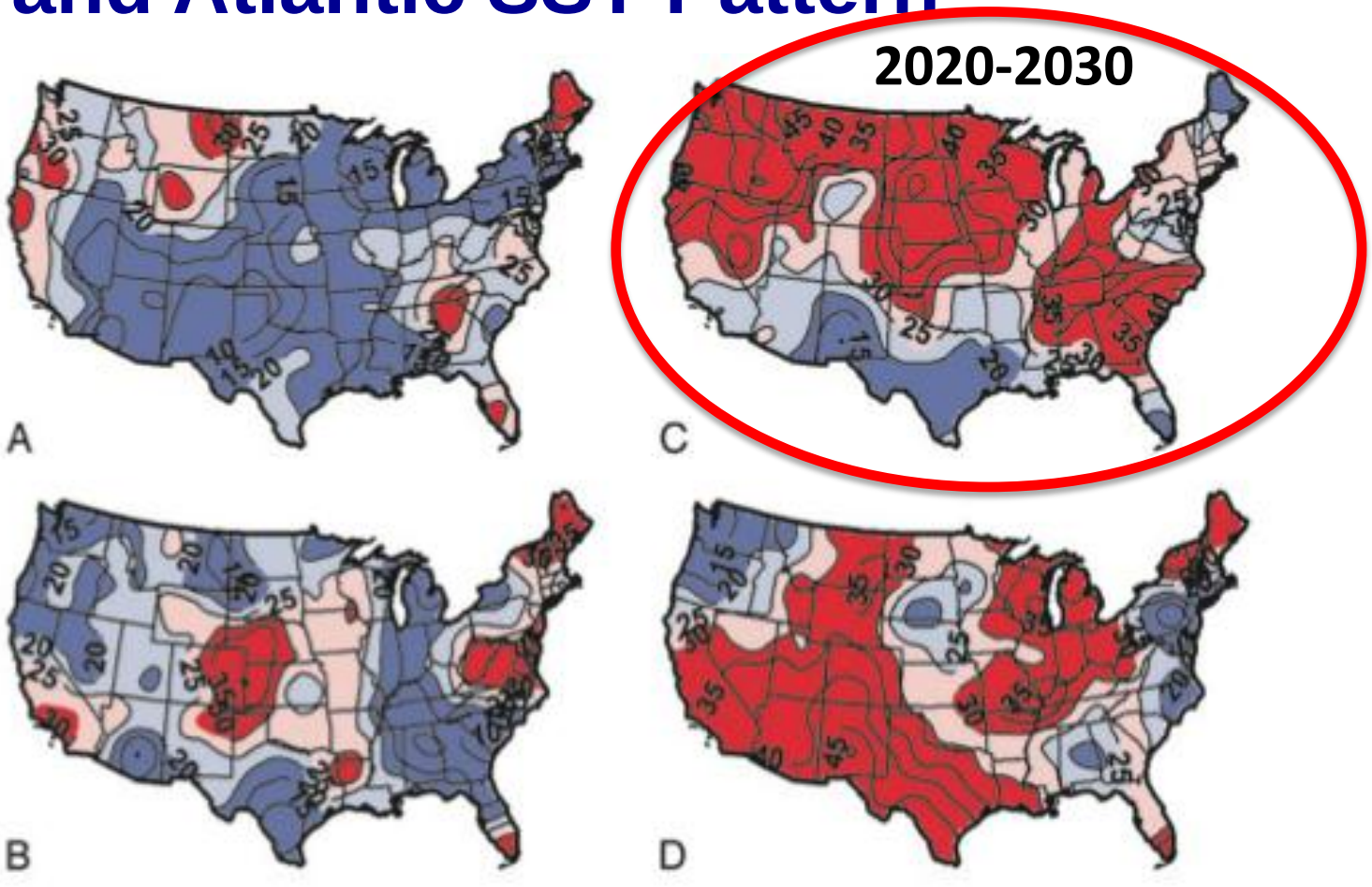


Source: U. Washington Joint Institute for the Study of the Atmosphere
http://jisao.washington.edu/pdo/

Expected Drought Risk Based on Historical Pacific and Atlantic SST Pattern



Source: McCabe et al. (2004); www.pnas.org/cgi/doi/10.1073/pnas.0306738101

Caveat: 2020 and Beyond has Larger Uncertainty

- It isn't possible to say with precision how closely 2020-2030 will resemble the past in light of recent trends.
- Nevertheless, historical data suggest 2020-2030 as a period when drought risk will be higher than present.

Caveat: 2020 and Beyond has Larger Uncertainty

- Additional information can be obtained from climate model simulations of rainfall outcomes resulting from increasing greenhouse gas concentration.

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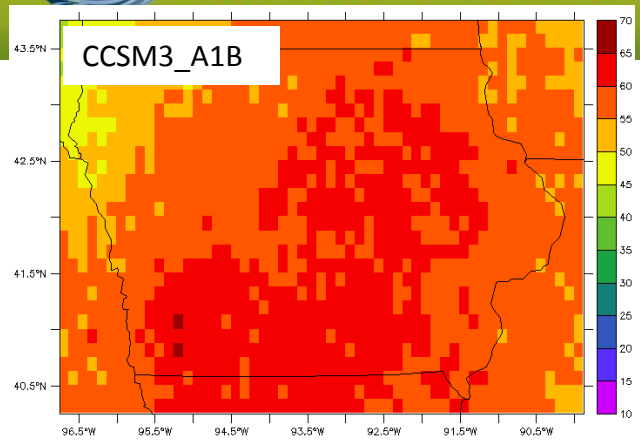
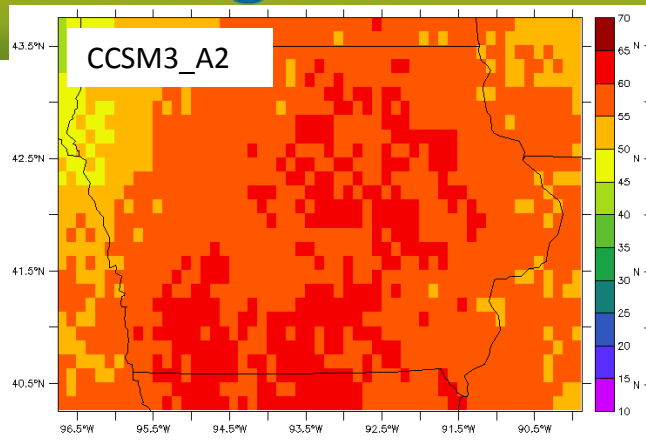
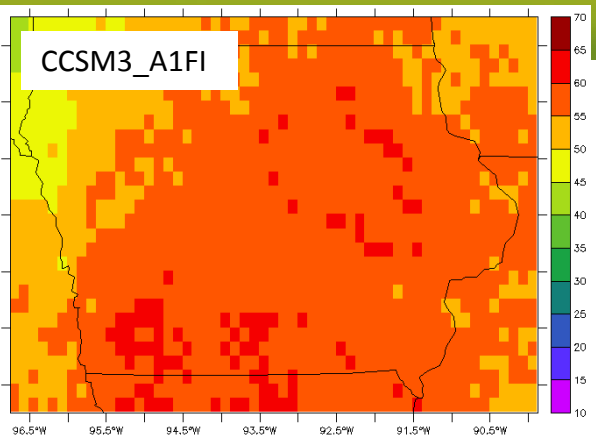
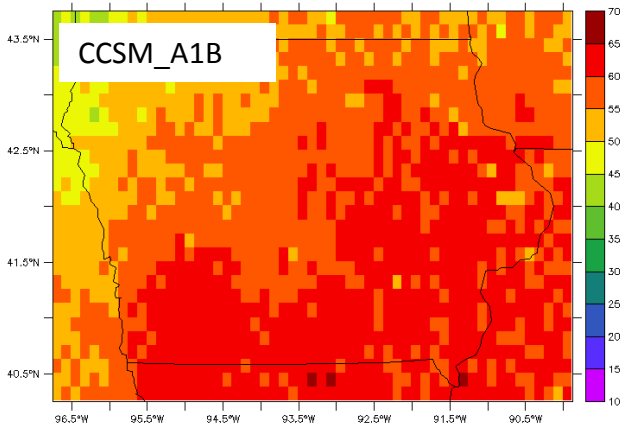
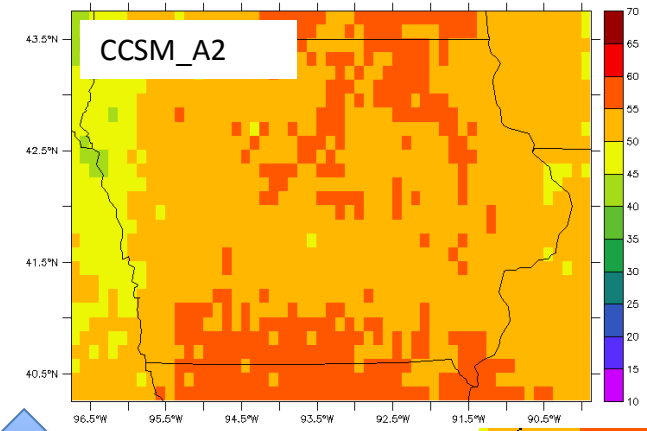




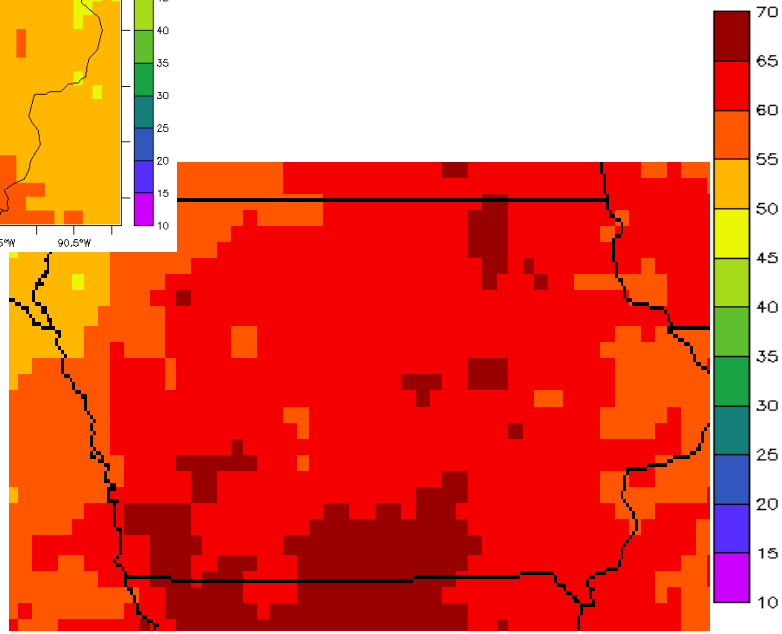




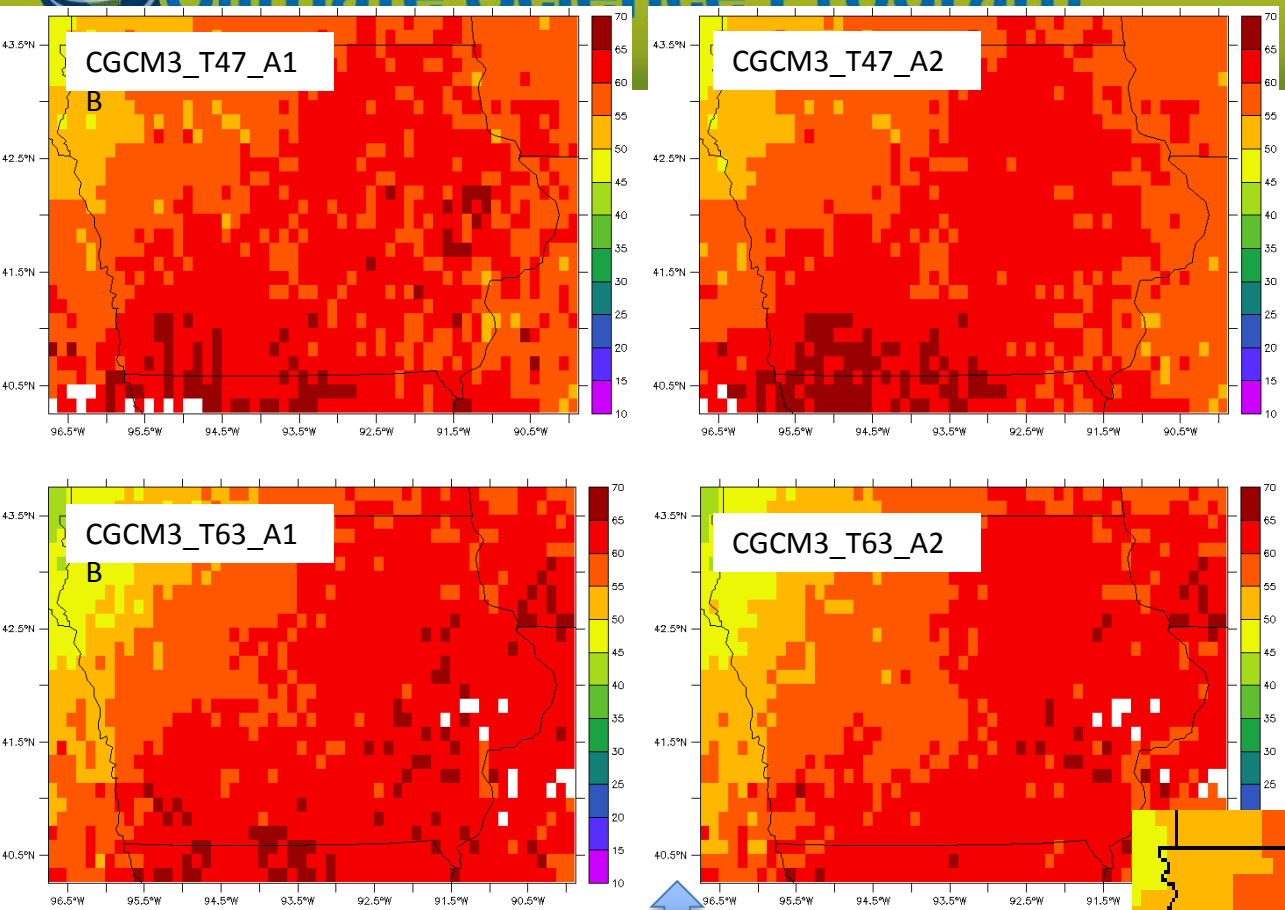


Apr-Sep Rainfall (cm) Historical Climate Simulations 1981-2000

Historical Rainfall 1981-2000



Source: ASR; http://cida.usgs.gov/climate/gdp/



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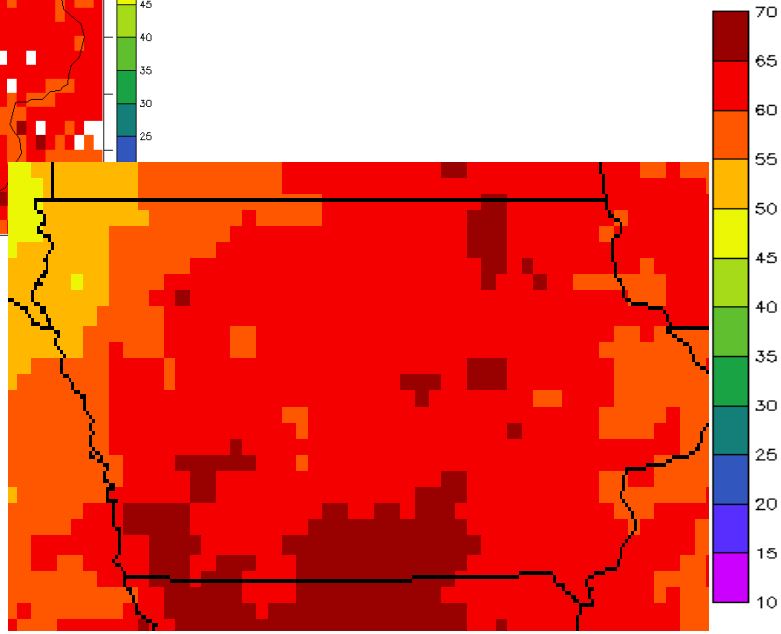
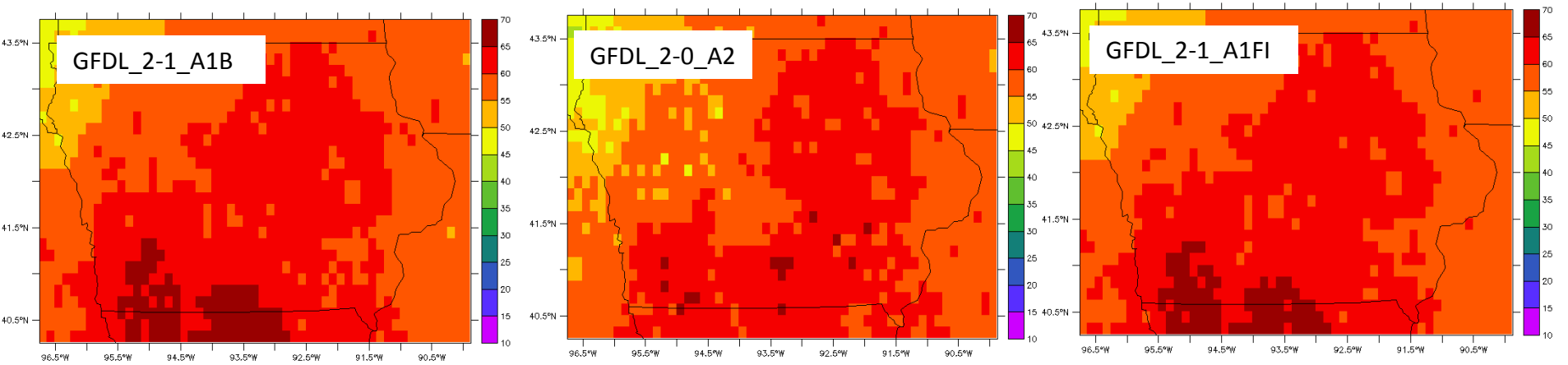


Source: ASR; http://cida.usgs.gov/climate/gdp/

Apr-Sep Rainfall (cm) ASR CMIP3 Scenarios 1981-2000



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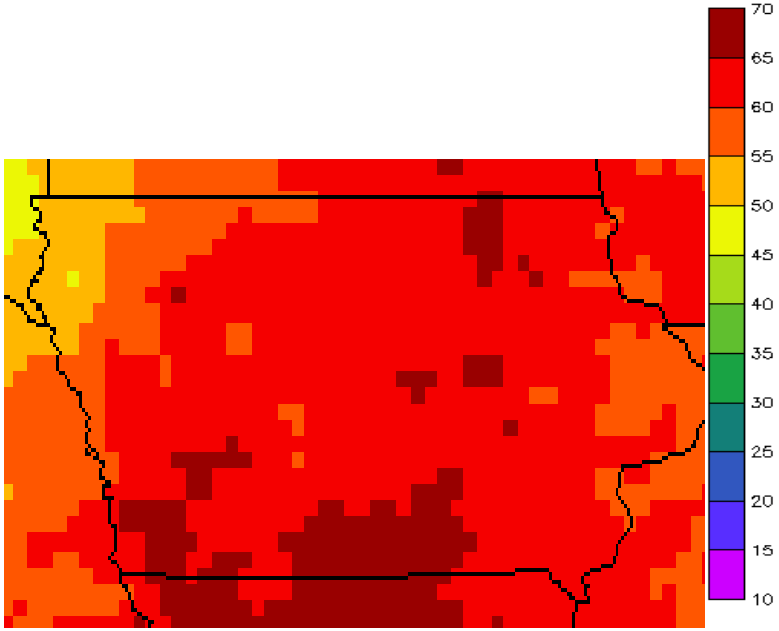

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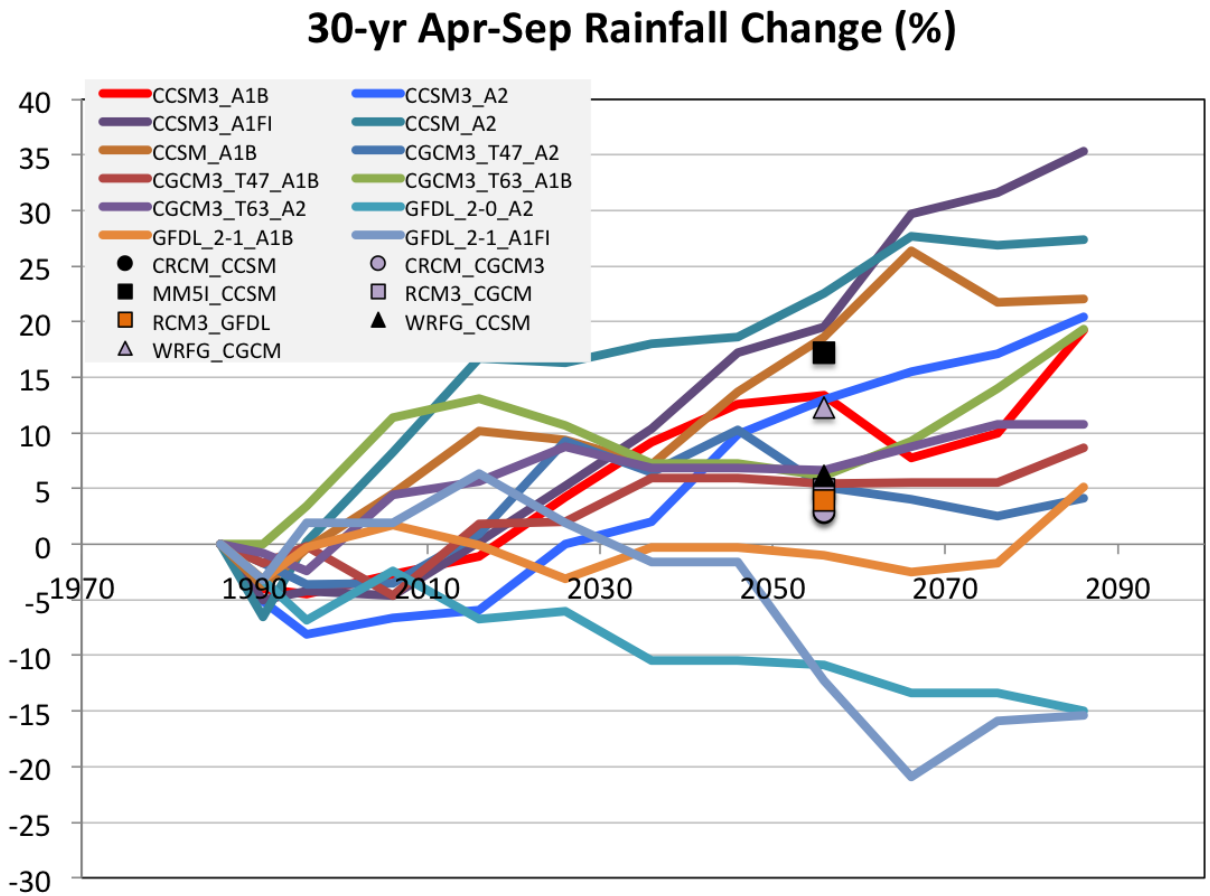
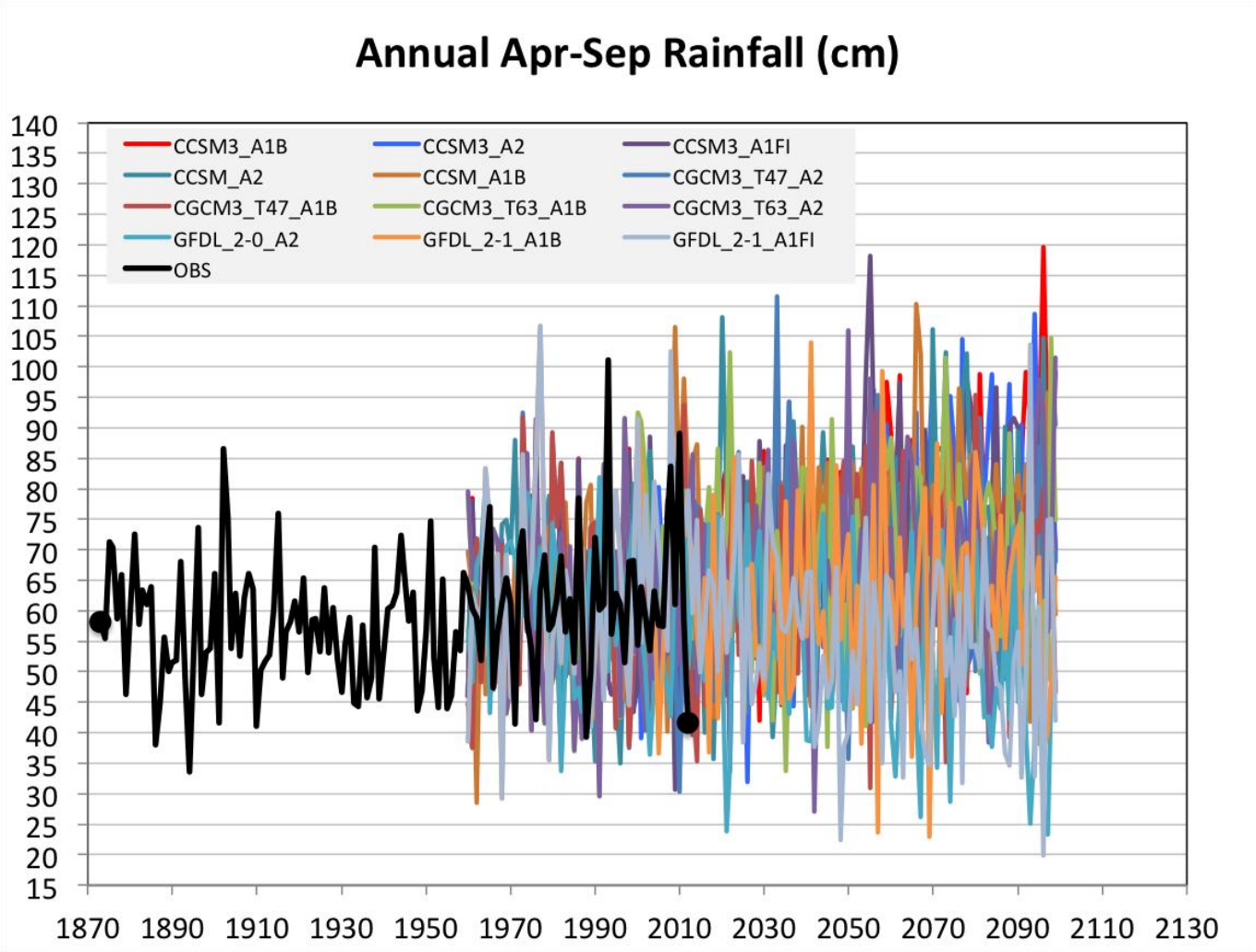
Change in 30-yr Average of Apr-Sep Iowa rainfall



Simulation of Apr-Sep Iowa rainfall 1961-2100



Caveat: 2020 and Beyond has Larger Uncertainty

- Historical data suggest 2020-2030 as a period when drought risk will be higher than present.

- Climate simulations suggest two conditions are possible.
  - When drought risk increases, drought conditions are likely to be as dry as and hotter than present.
  - In periods of low drought risk, average April-June rainfall should continue and should result in another 10% increase above the 1981-2010 average by 2020-2030.