

Current and Projected Changes in Precipitation Extremes in Illinois

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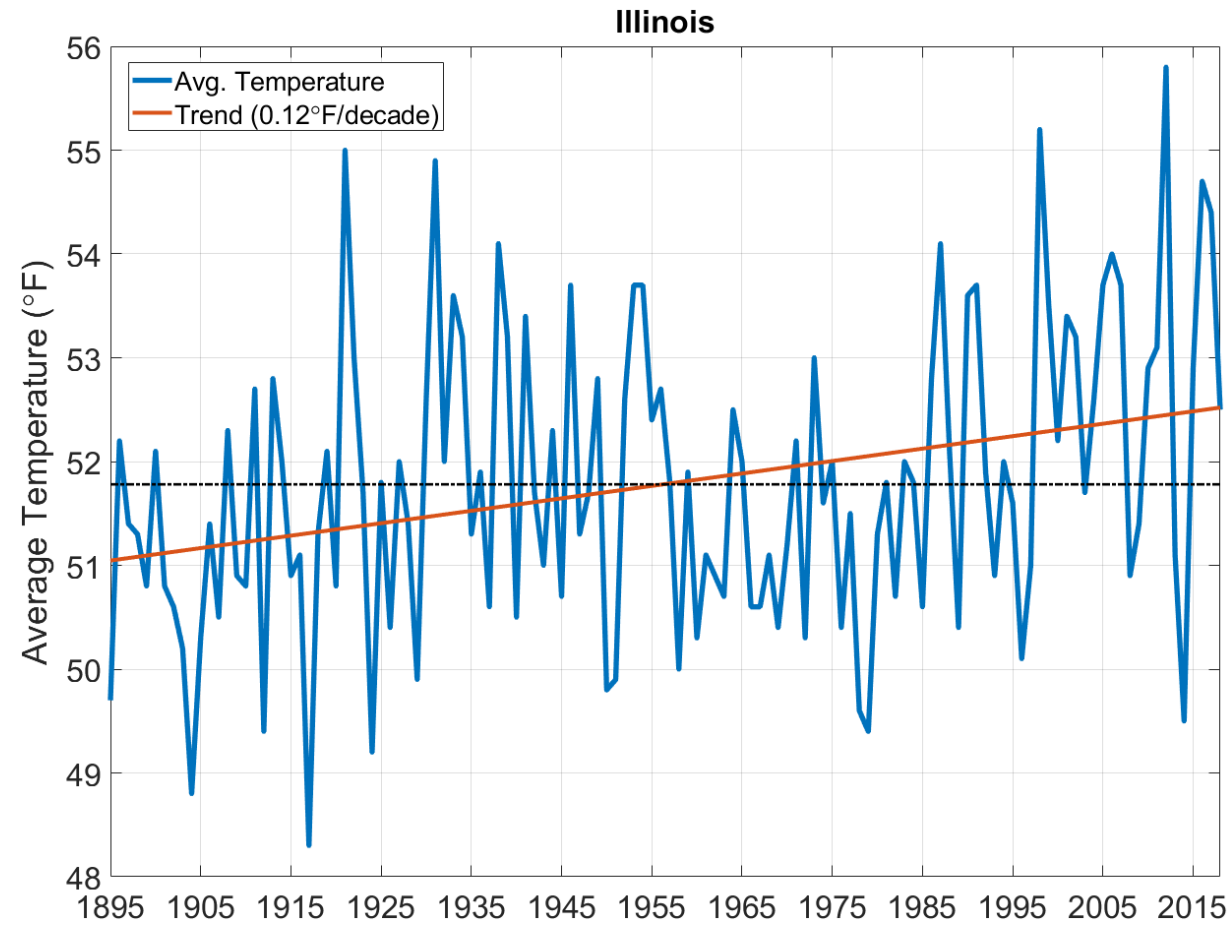


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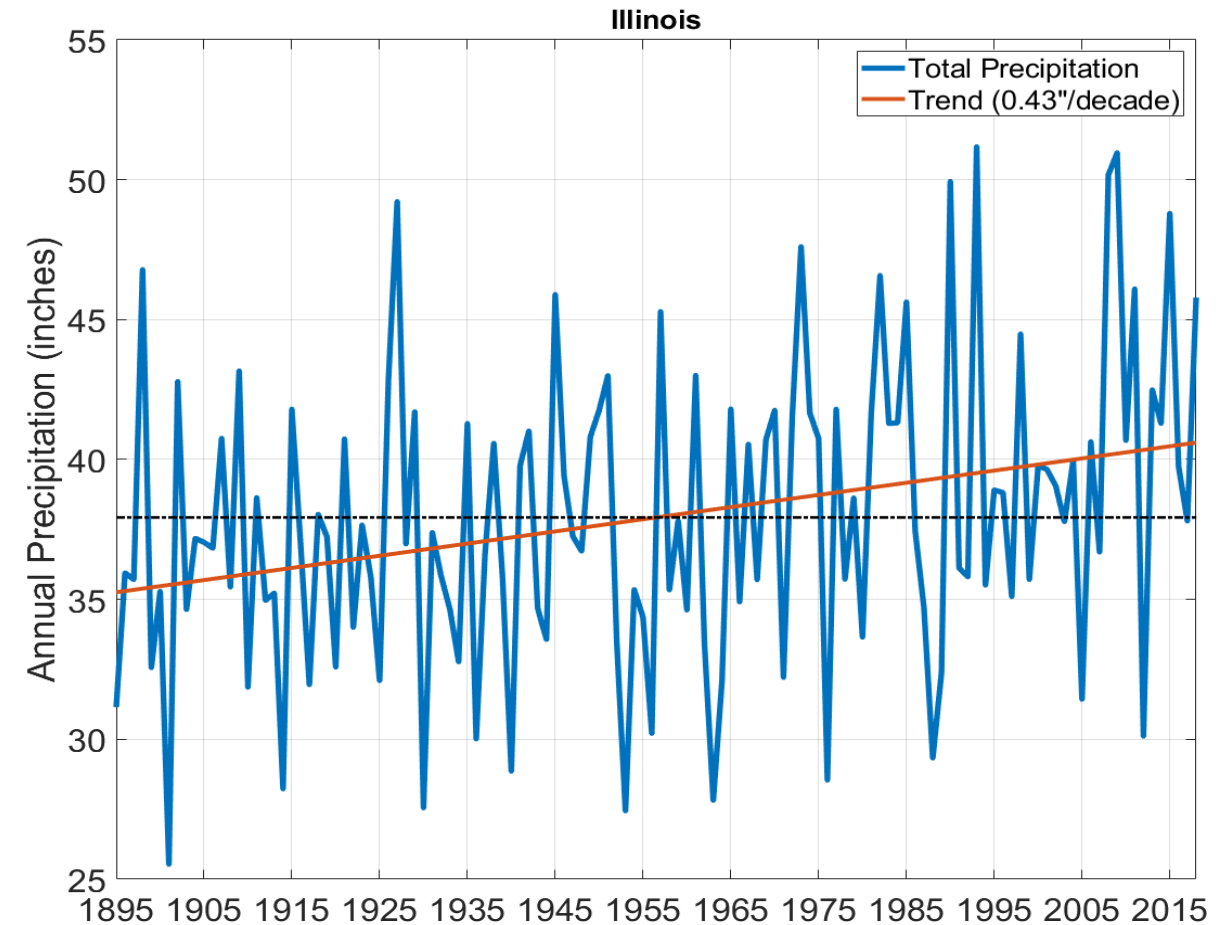
Illinois State Water Survey
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Climate Change in Illinois

WARMER



WETTER

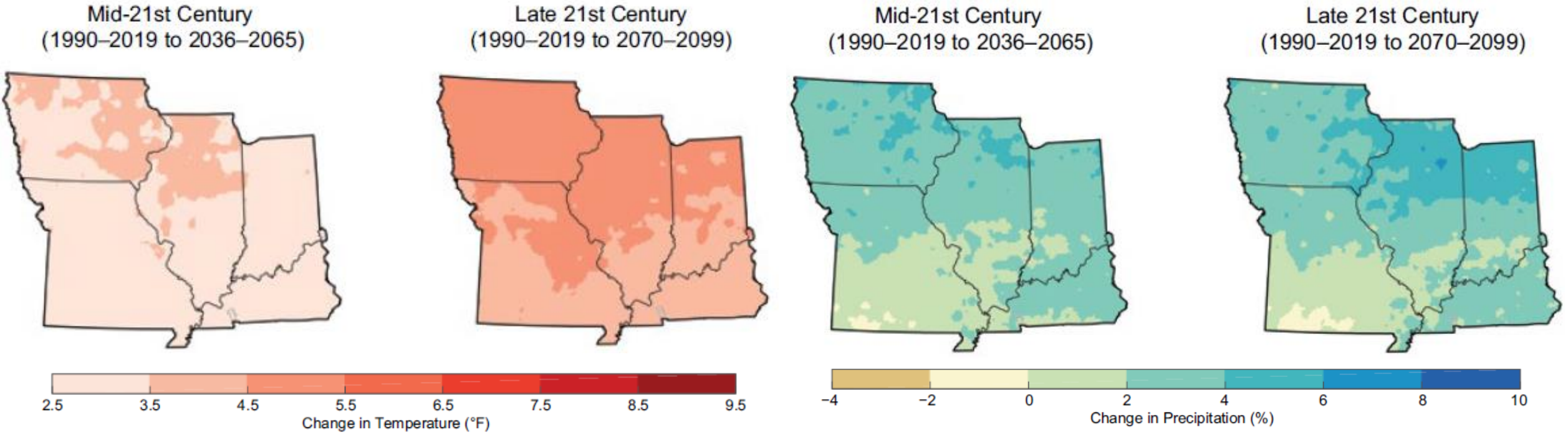


What is Expected in the Future

Source: Wuebbles *et al.* (2021)

Change in Annual Average Mean Temperature

Change in Annual Total Precipitation



- Projections to end of century show much of the same for Illinois, continued warming and more precipitation overall
- Precipitation changes over the next 20-30 years are less sensitive to mitigation efforts

What Does This Mean for Extreme Precipitation?

Recent Extreme Precipitation Events

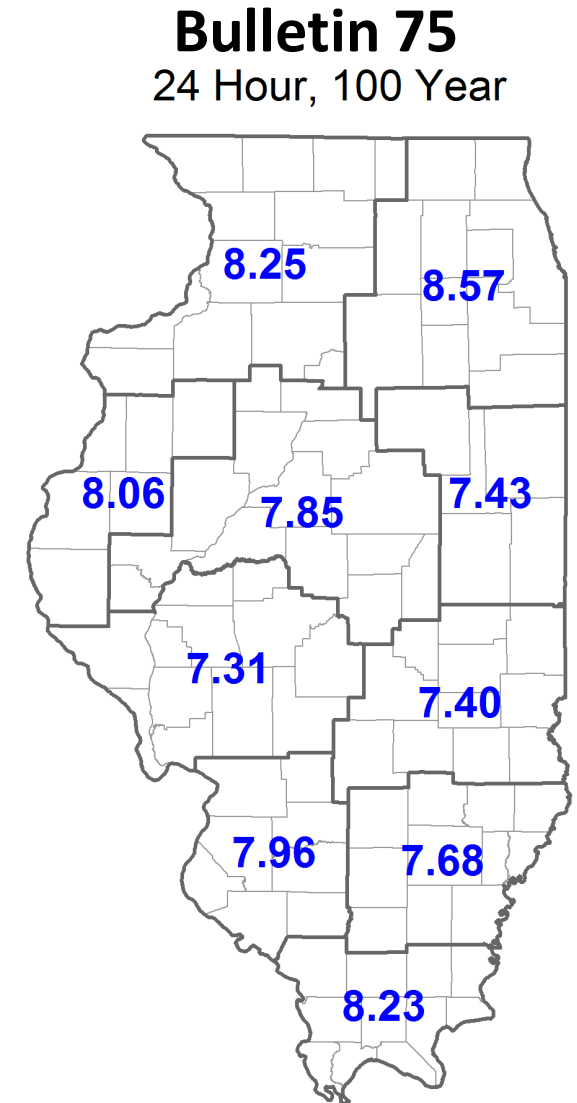
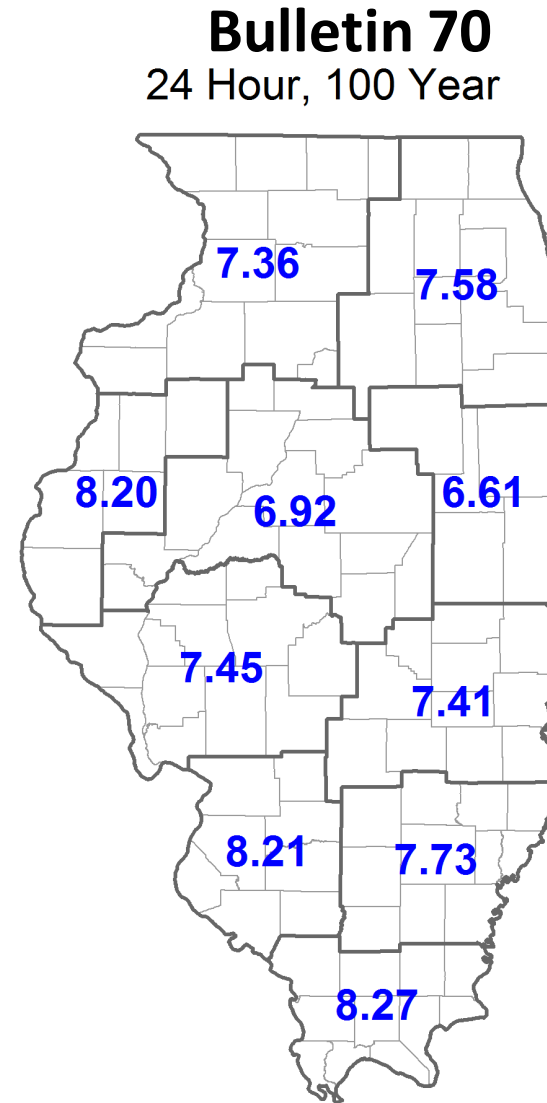
- Heavy rainfall is becoming more frequent, especially in spring and summer
- Likelihood of 2”+ has increased 40% in the last 50 years
- 3 events last year that exceeded the 500-year estimates from Bulletin 75

Event	Rainfall
January 2020, Vandalia	5.6” in 3 days
May 2020, Chicago	7.88” in 4 days
June 2020, Quincy	6.85” in 4 days
July 2020, Peoria	5.80” in 6 hours
August 2020, Scott AFB	5.36” in 3 hours
June 2021, Bloomington	10.19” in 3 days
July 2021, Seneca	5-6” in 3-hours
August 2021, Gibson City	10”+ in 6 hours



Intense Precipitation – Bulletin 75 vs. Bulletin 70

- Increases in return intervals of most storm durations/intensities
- 24-hour, 100-year storm totals increased in northern and central Illinois between Bul. 70 and 75... dropped a bit in western and southern IL



Source: ISWS Bulletin 75



Intense Precipitation – Updated Storm Duration Numbers

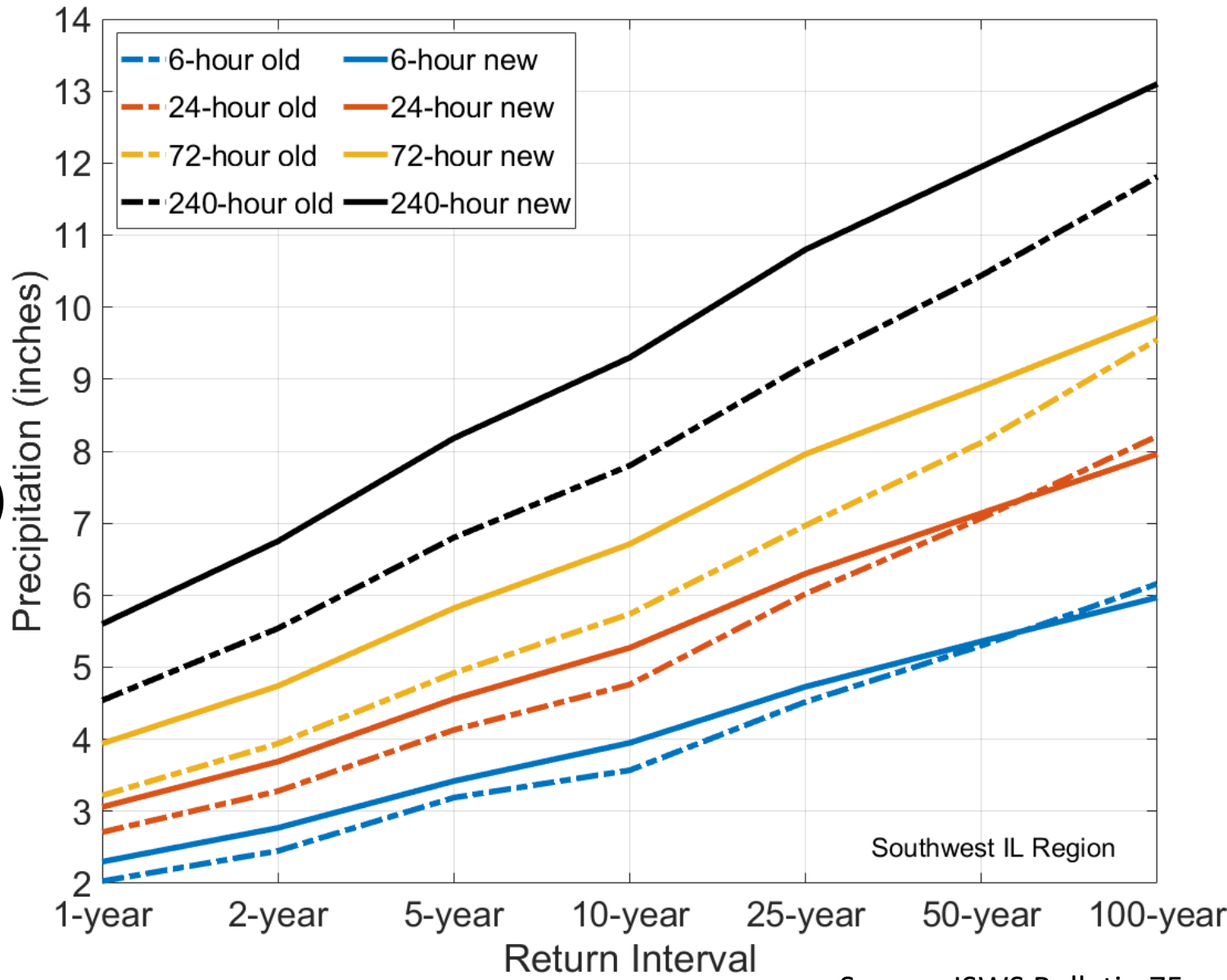
Change in Design Storms (SW Illinois)

2-year return (50% annual occurrence)

- 1-day totals +0.50"
- 5-day totals + 0.80"
- 10-day totals +1.25"

10-year return (10% annual occurrence)

- 1-day totals +0.40"
- 5-day totals +1.10"
- 10-day totals +1.40"

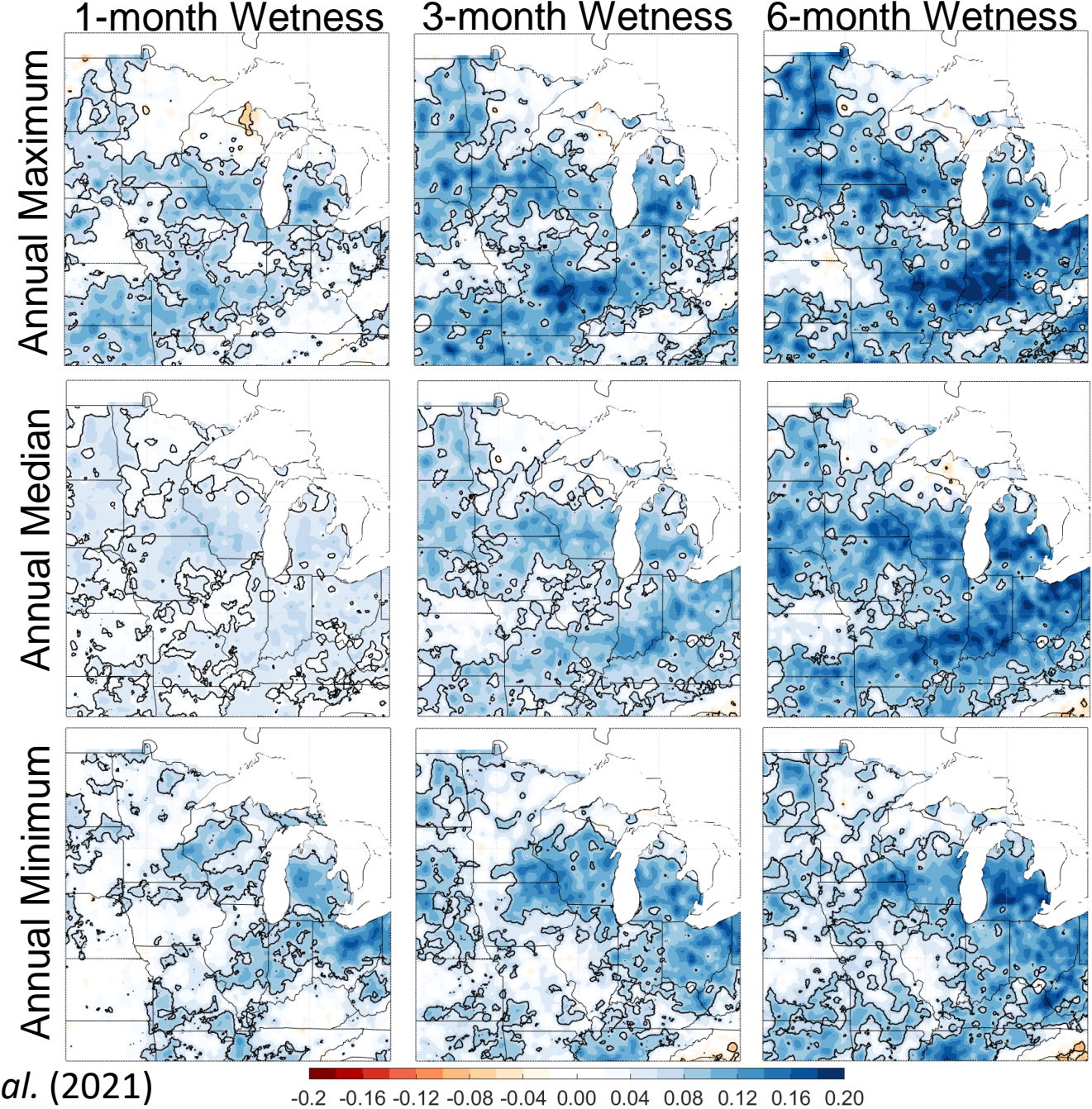


Source: ISWS Bulletin 75



Changes in Longer-Term Extremes

- All of Illinois has gotten wetter since the 1950s (middle panels)
- Annual maximum wetness (top panels) has increased a bit more than the annual minimum (bottom panels)
- Largest trends are in the 6+ month totals, reflecting effects of longer-term wetting



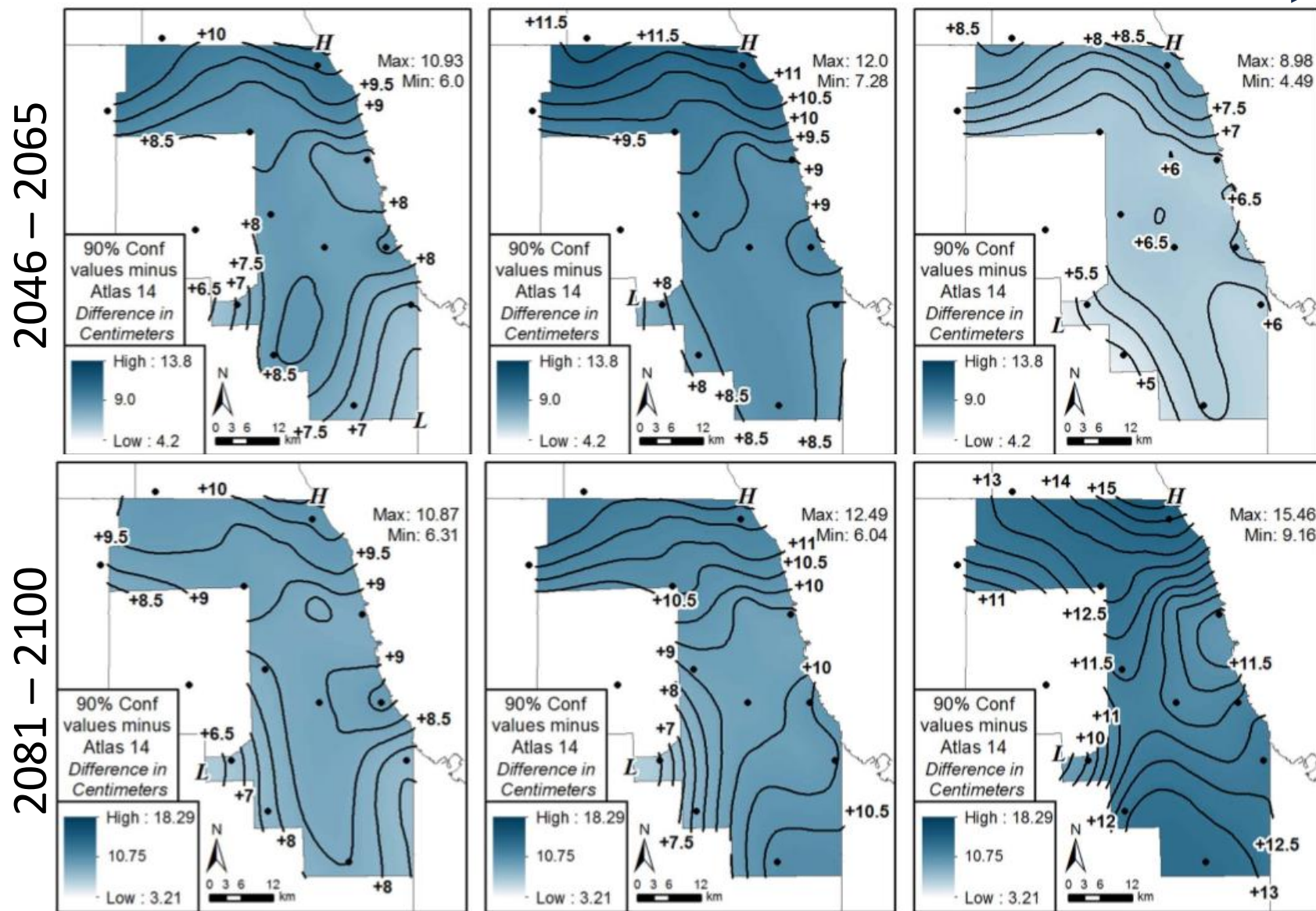
Looking Into the Future



Projected Change in 100-year, 24-hour isohyets, relative to NOAA Atlas-14

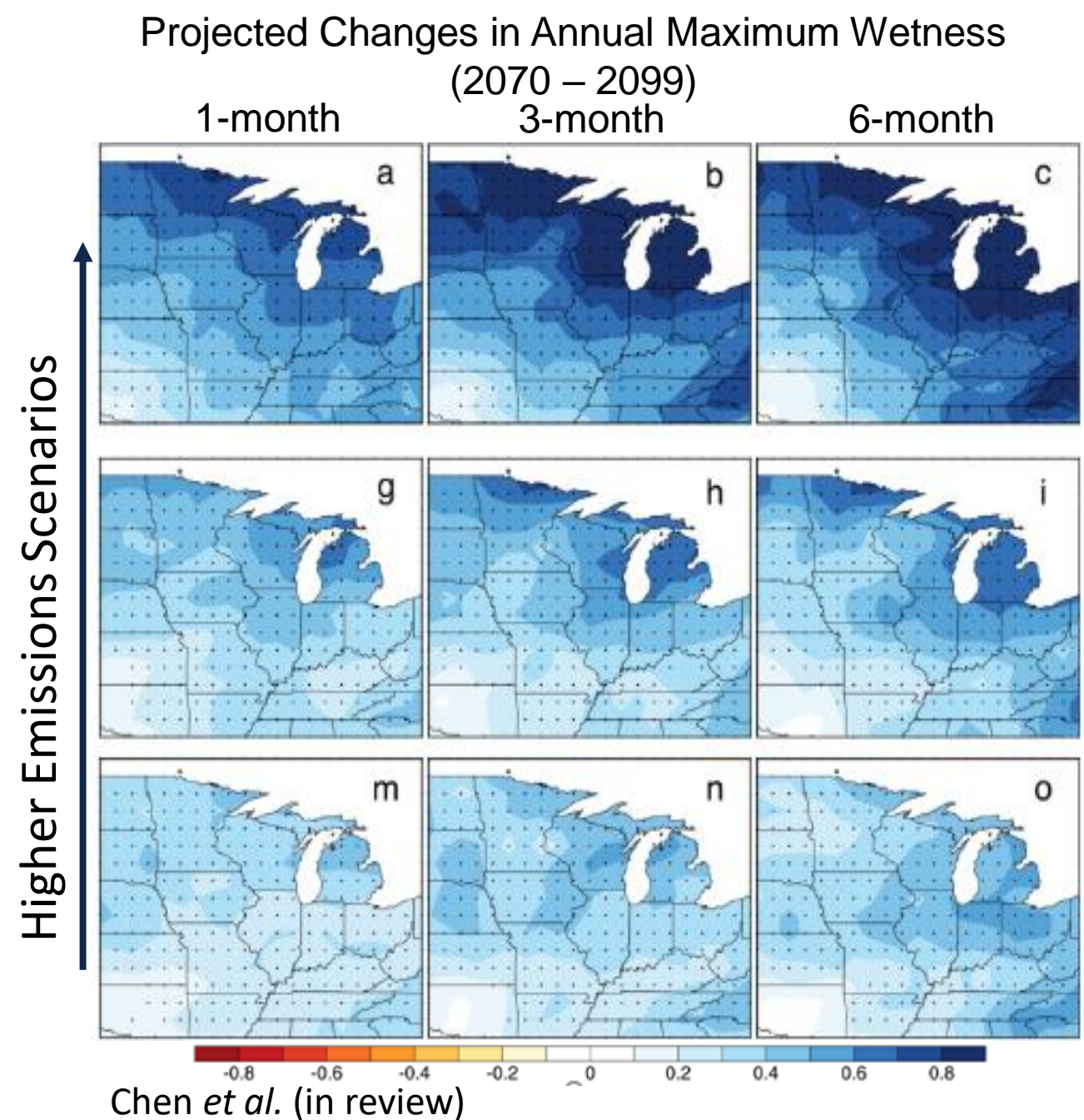
Higher GhG Emissions

- Models project further increase in 24-hour, 100-year storm totals across IL
- 1.75" to 4.5" increase by mid-century
- 2.4" to 6.0" increase by late-century
- Precipitation extremes are sensitive to emissions by late century



Changes in Longer-Term Extremes

- Models project continued precipitation increases at 1-, 3-, and 6-month intervals
- Largest changes in wetter conditions at 6+ months... more variability at 1-month
- Overall changes scale with GHG emissions between now and late-century



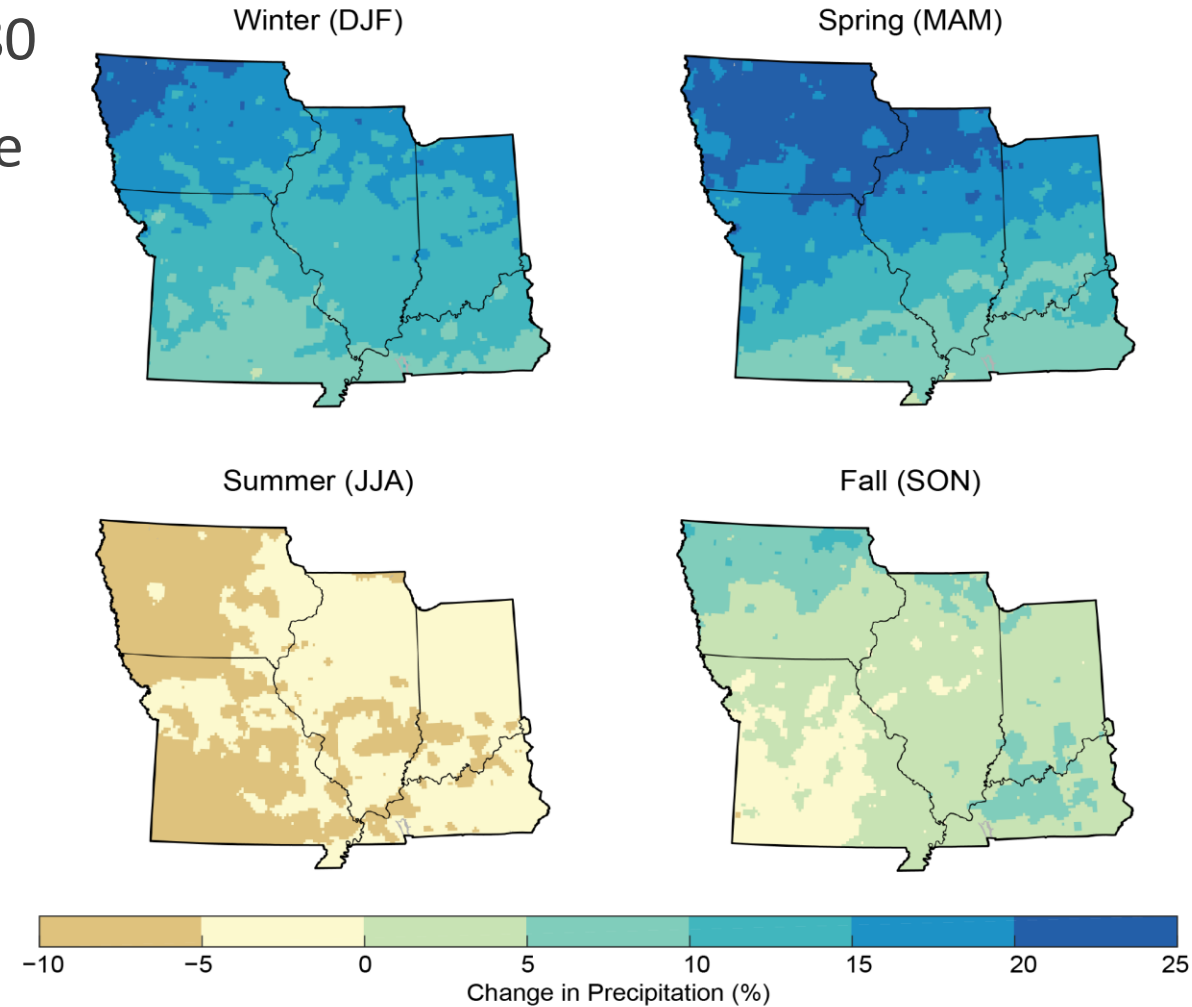
Changes in Seasonality – Wetter Springs

- Models project springs like 2019 to become much more frequent in the future, 1-in-5 years by 2080
- Summer precipitation expected to become more variable



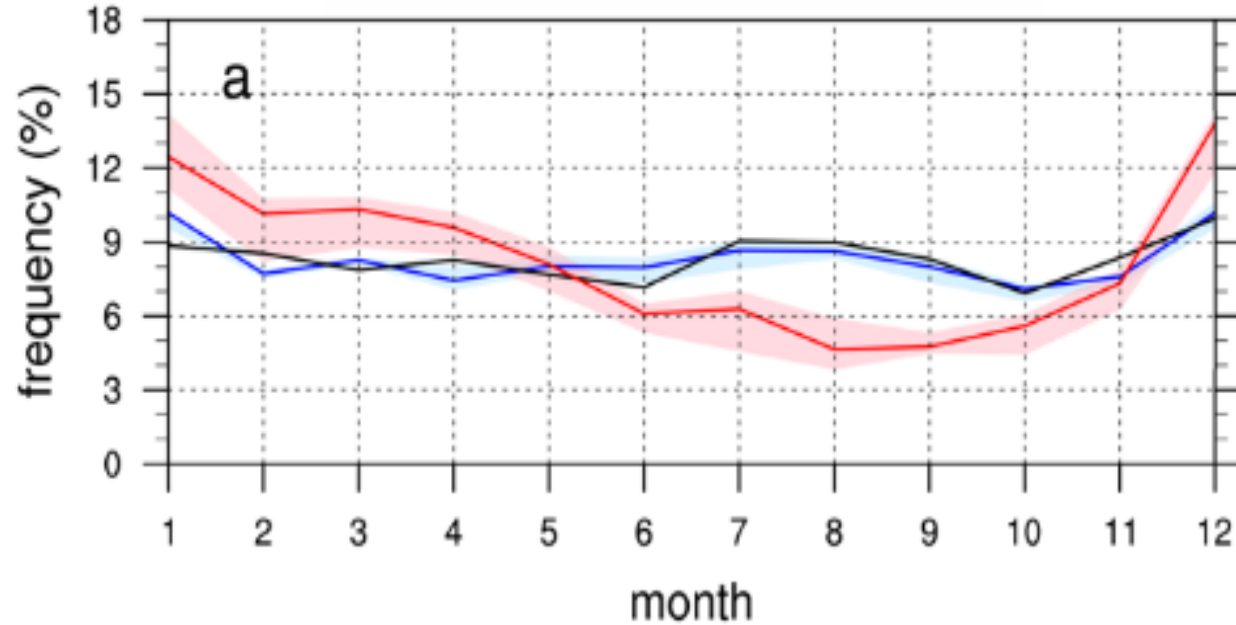
Freeport, March 2019. Source: Stephenson County EMA

Change in Seasonal Total Precipitation
Higher Emissions (RCP8.5)
Late 21st Century (1990–2019 to 2070–2099)

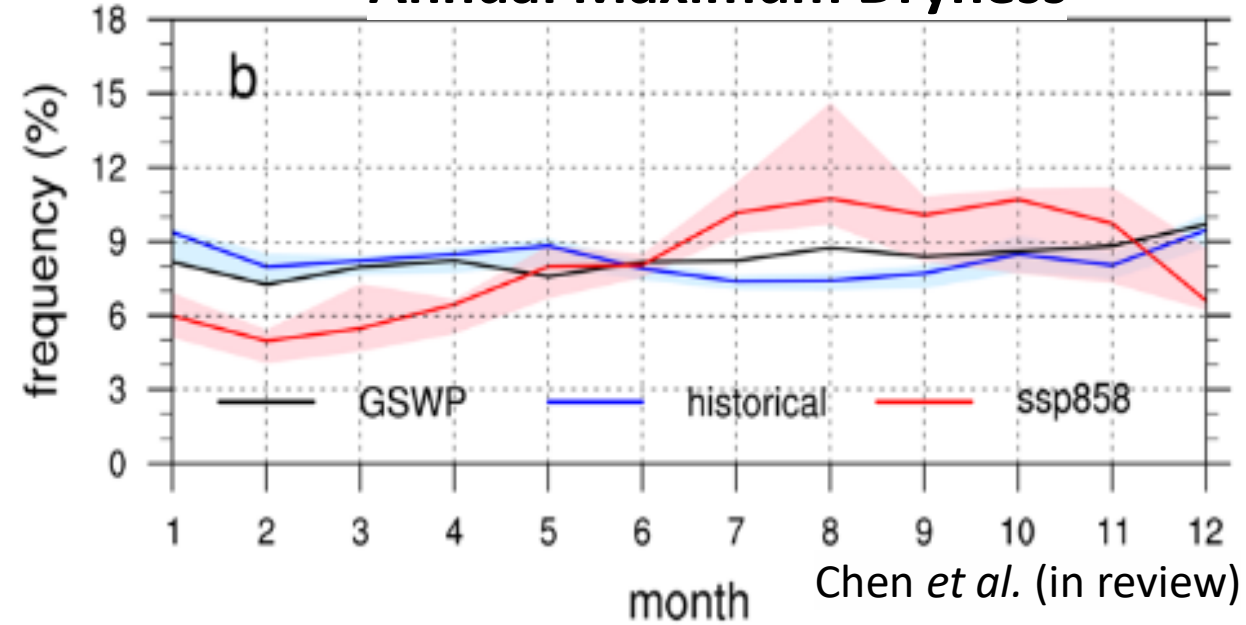


Changes in Seasonality – Wetter Springs

Annual Maximum Wetness



Annual Maximum Dryness



- Black/blue lines = historical observations | Red lines = projected changes by 2065
- Left Panel: annual maximum wetness projected to be more likely in winter and spring, less likely in summer and early fall

Summary

- Climate change exacerbates the hazard of extreme precipitation & flooding
- Higher intensity extremes + wetter overall conditions observed since 1950s
- Models project much of the same by mid- and late-century
- Potential changing seasonality... wetter winters and springs, more variable summer precipitation



Design storm #s must be updated more frequently... paramount to include projections

More work needed for urban flooding risk assessment and communication

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