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U.S. Global Change Research Program

Northeast Regional Climatology and Outlook

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NOAA Cooperative Institute for Climate and Satellites

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http://assessment.globalchange.gov

Regional Climatology Content

- General Description
  - Maps of spatial patterns of mean annual temperature and precipitation
- Major Climate Factors
  - e.g. drought, heat waves, winter storms, flash floods
- Trends (examples)

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Data

- National Weather Service Cooperative Observer Network
- Started in late 19th Century
- Daily observations of precipitation, maximum temperature, minimum temperature, snowfall, and snow depth

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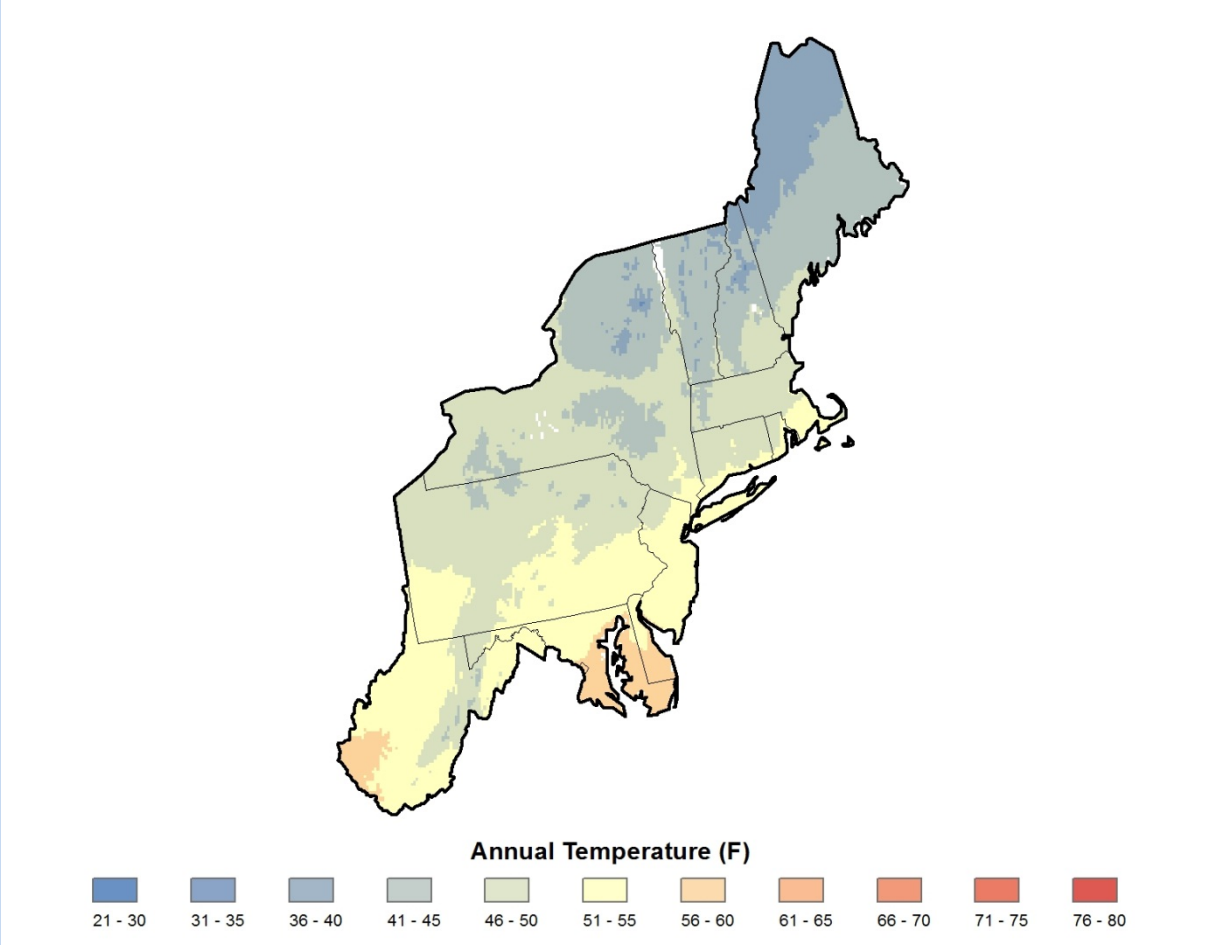
Annual Temperature Pattern



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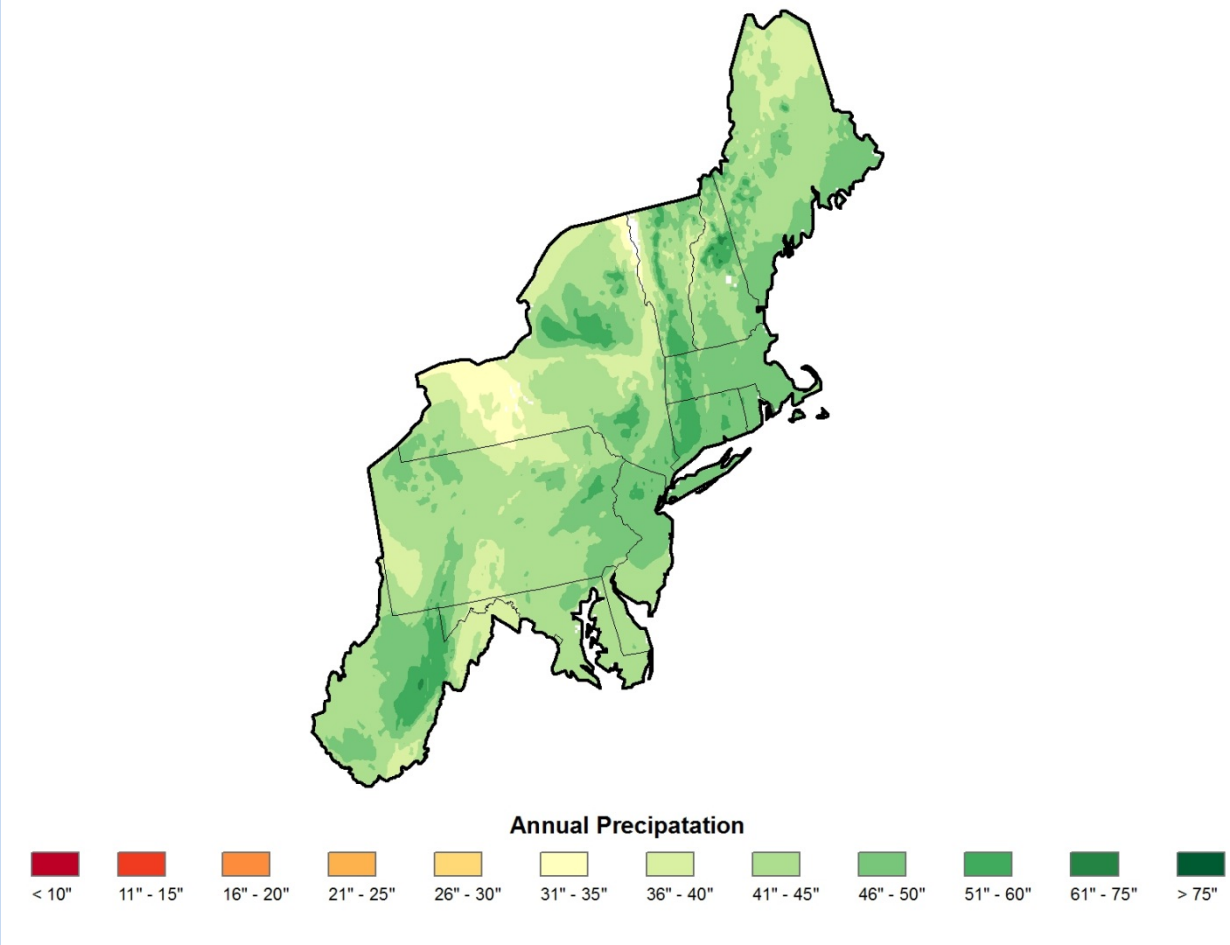
Annual Precipitation Pattern



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Important Climate Factors

- Floods
- East Coast Winter Storms
- Lake Effect Snow
- Ice Storms
- Heat waves
- Droughts
- Tropical Cyclones

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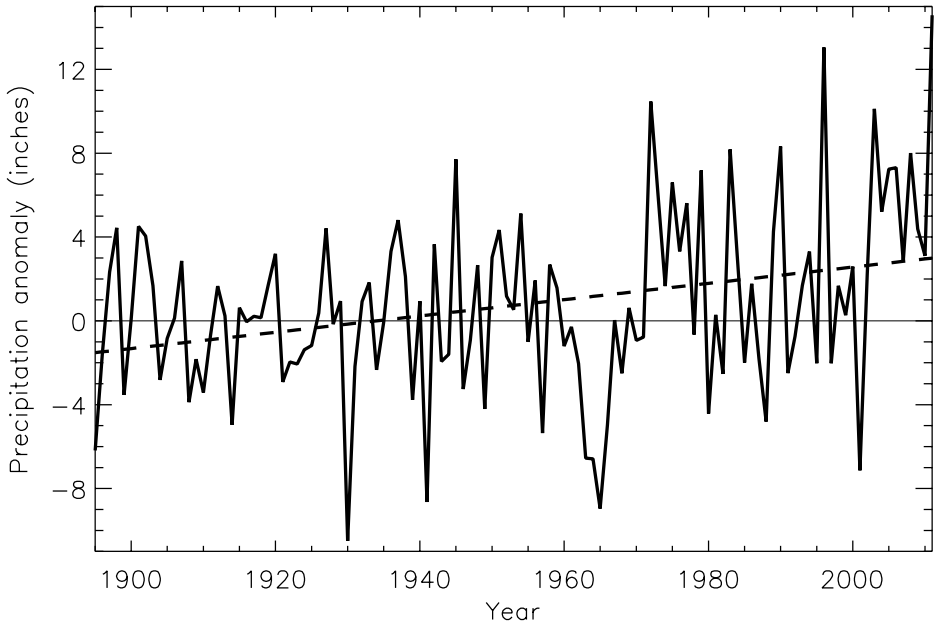
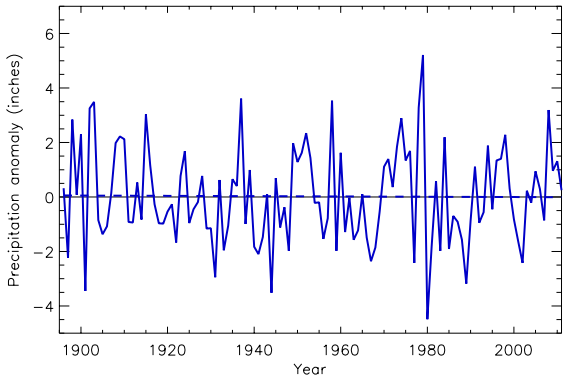
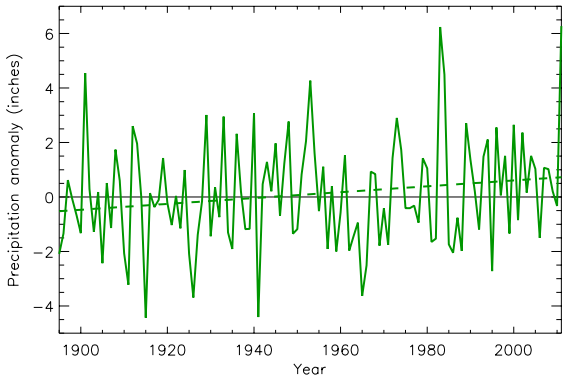

Precipitation anomaly (inches)
12
8
4
0
−4
−8
1900
1920
1940
1960
1980
2000
Year


Precipitation anomaly (inches)
6
4
2
0
−2
−4
1900
1920
1940
1960
1980
2000
Year


Precipitation anomaly (inches)
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2
0
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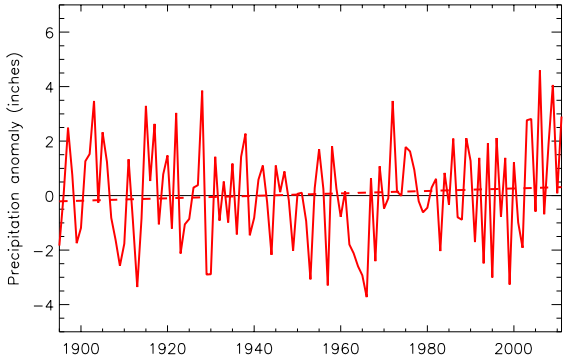
−4
1900
1920
1940
1960
1980
2000
Year


Precipitation anomaly (inches)
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1900
1920
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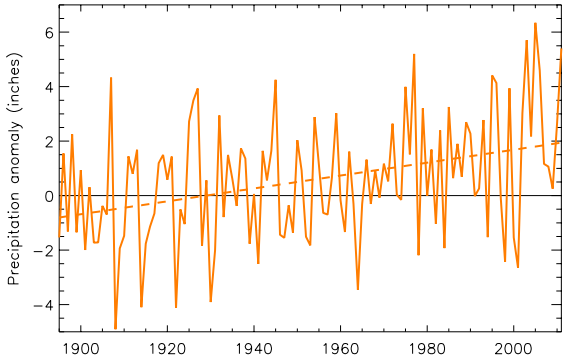
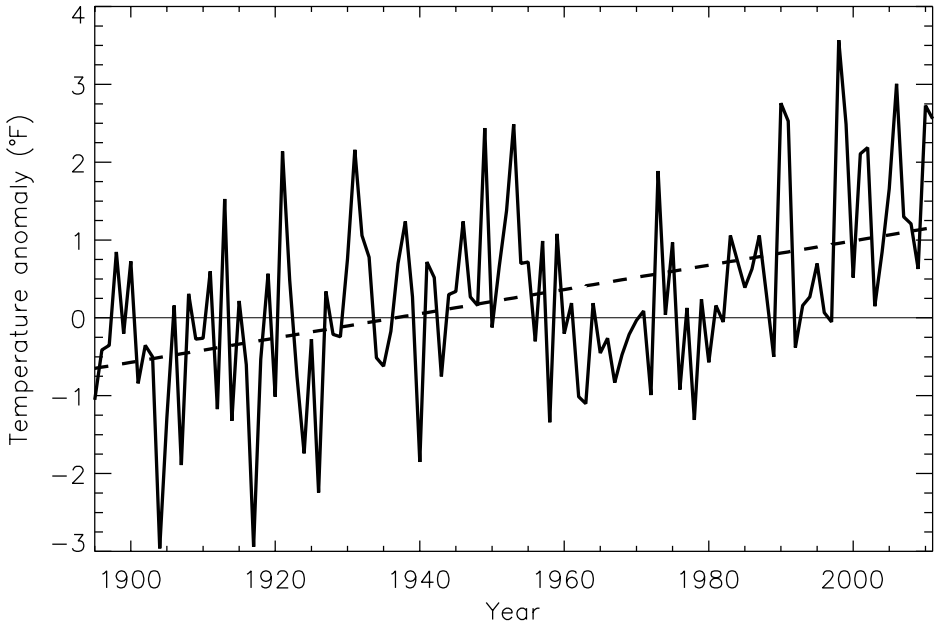
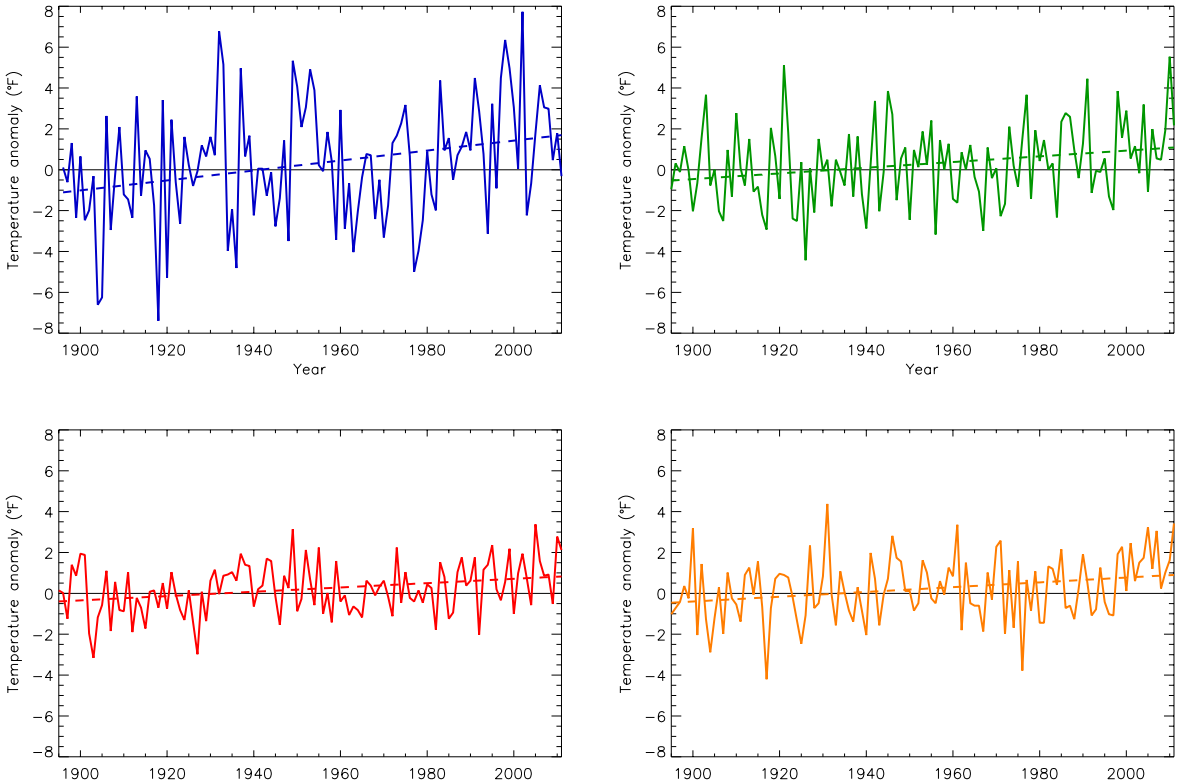
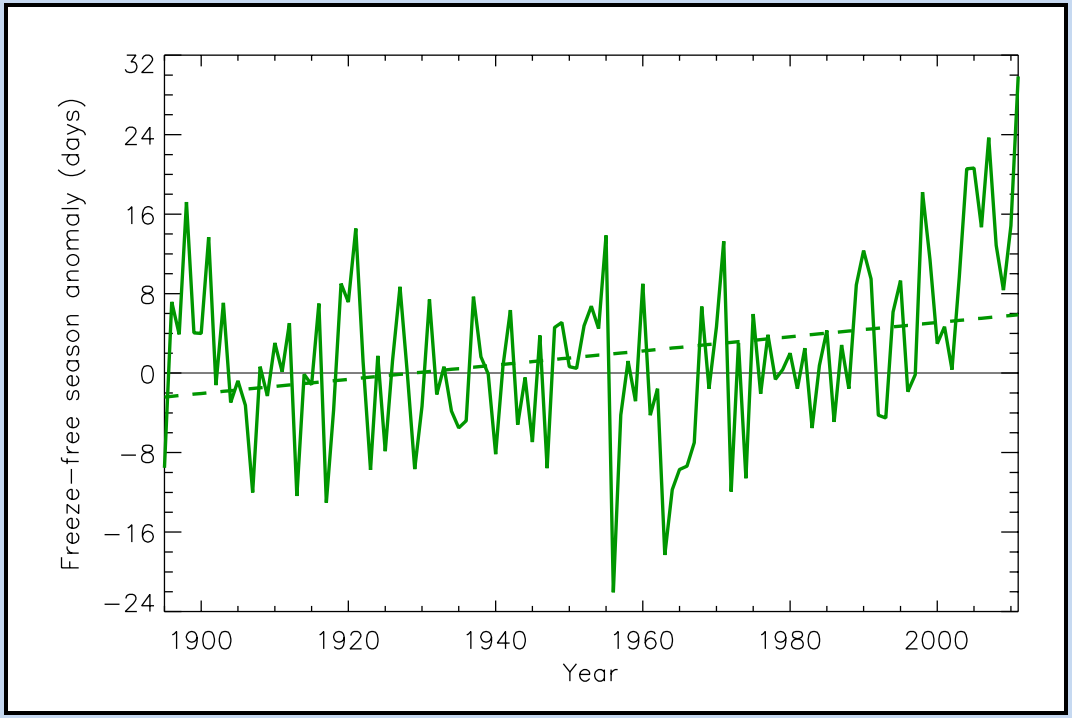
1980
2000


Precipitation anomaly (inches)
6
4
2
0
−2
−4
1900
1920
1940
1960
1980
2000


Temperature anomaly (°F)
Year
4
3
2
1
0
−1
−2
−3
1900
1920
1940
1960
1980
2000


Temperature anomaly (°F)
Year
8
6
4
2
0
−2
−4
−6
−8
1900
1920
1940
1960
1980
2000

Freeze-Free Season



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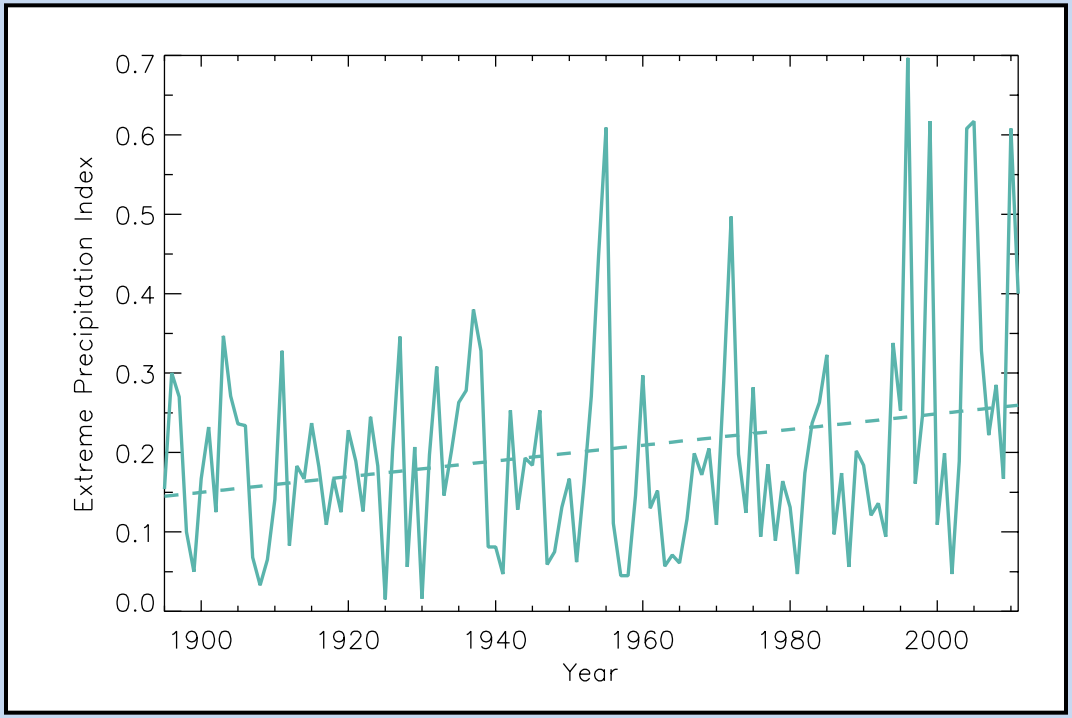
Extreme Precipitation (5-yr recurrence)



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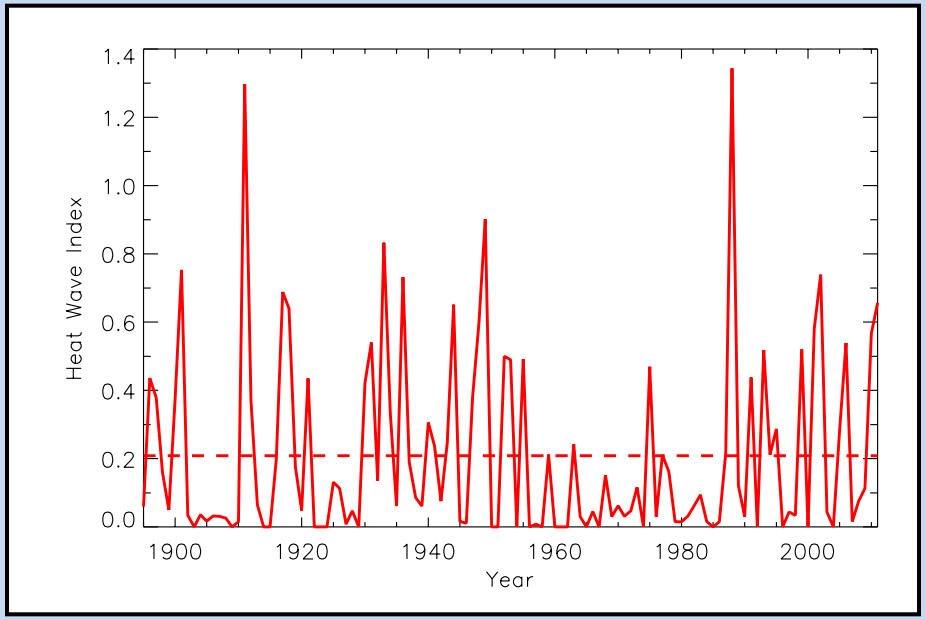
Heat Wave (5-yr recurrence)



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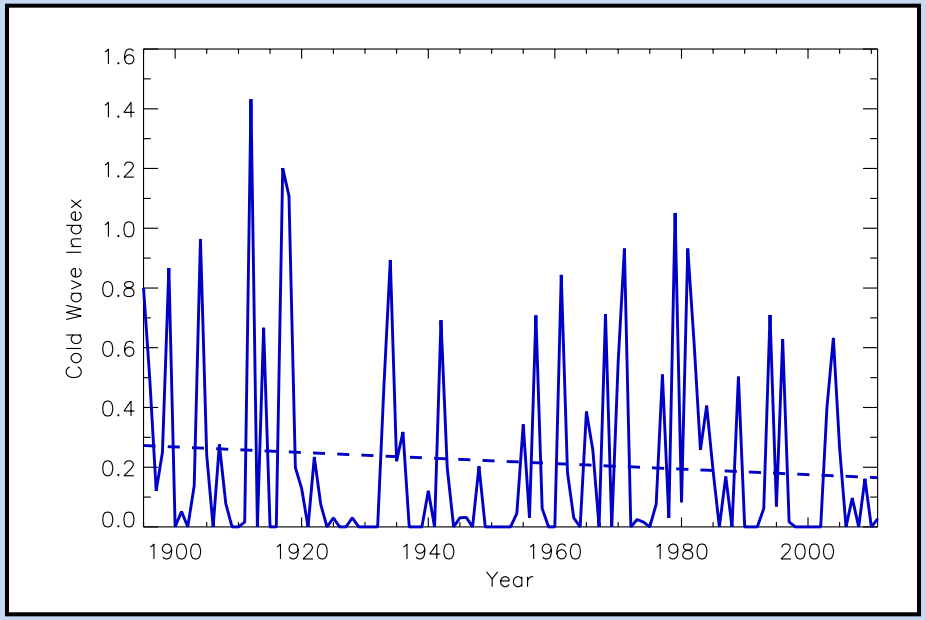
Cold Wave (5-yr recurrence)



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Regional Outlooks

- The National Climate Assessment Development and Advisory Committee (NCADAC), at its May 20, 2011 meeting, directed the "use of simulations forced by the A2 emissions scenario as the primary basis for the high climate future and by the B1 emissions scenario as the primary basis for the low climate future for the 2013 report" for climate scenarios.
- Approved the the use of both statistically and dynamically downscaled data sets
- Decided that "regional teams should be given the latitude to incorporate results from the CMIP5 RCP8.5 and RCP2.6 simulations as time and resources permit

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Regional Outlook Data Sets

- CMIP5 suite not available for this first draft outlook
- Direct GCM output from CMIP3 archive
- Maurer et al monthly statistically downscaled data
  - 1/8 degree resolution
- Daily version of Maurer et al data produced by Katharine Hayhoe
  - Sampling of historical months and adjusting by delta method
- NARCCAP
  - 50 km resolution
  - 1971-2000 and 2041-2070
- Frich extreme indices

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Time Periods

- 2021-2050: represents 25-yr outlook
- 2041-2070: matches NARCCAP period
- 2070-2099: as close as we can get to 100-yr outlook

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Products

- Multi-model mean maps
  - May be most robust estimate of future changes
- Spatially-averaged products
  - general comparisons of different models, periods, and data sources
- PDFs
  - estimate of the uncertainty of future changes

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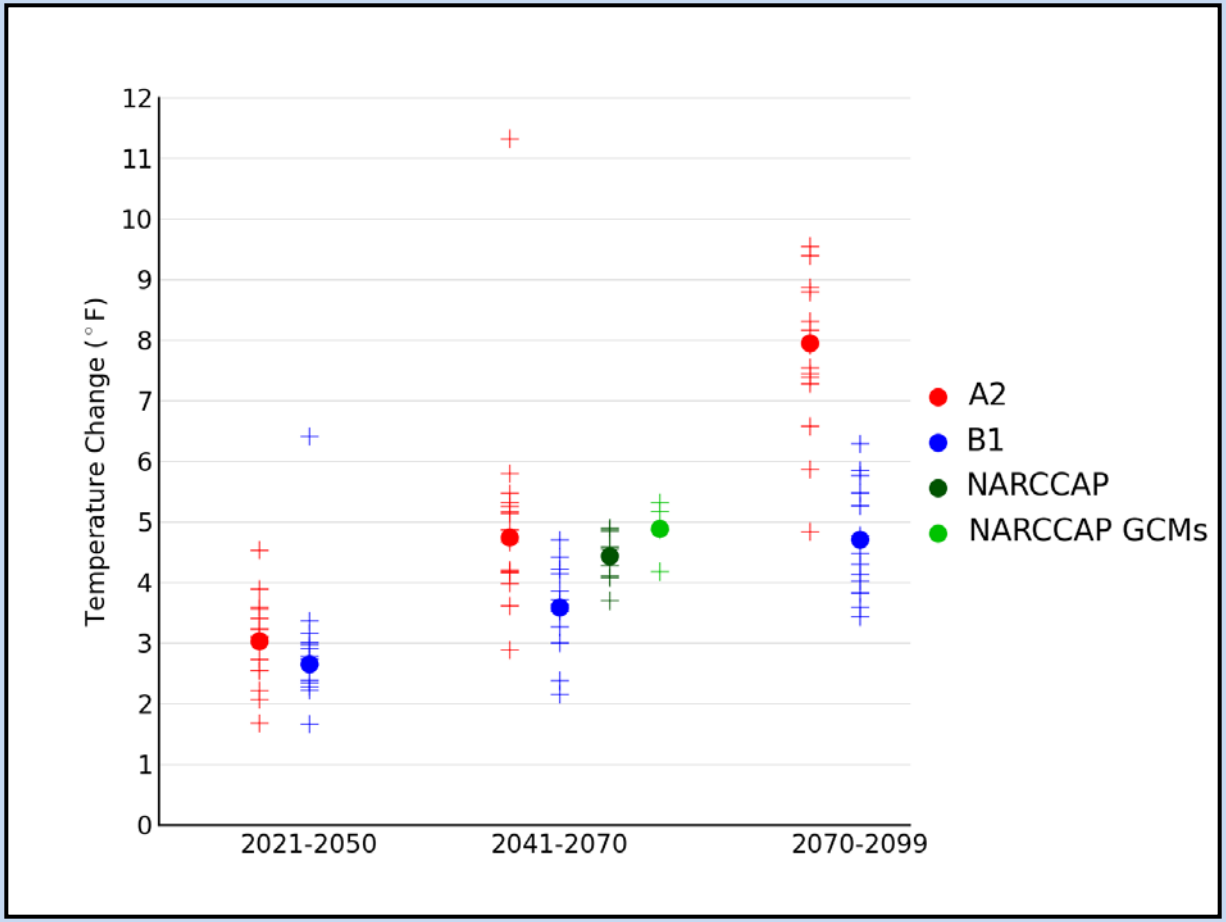
Temperature Changes

Summary of model simulations



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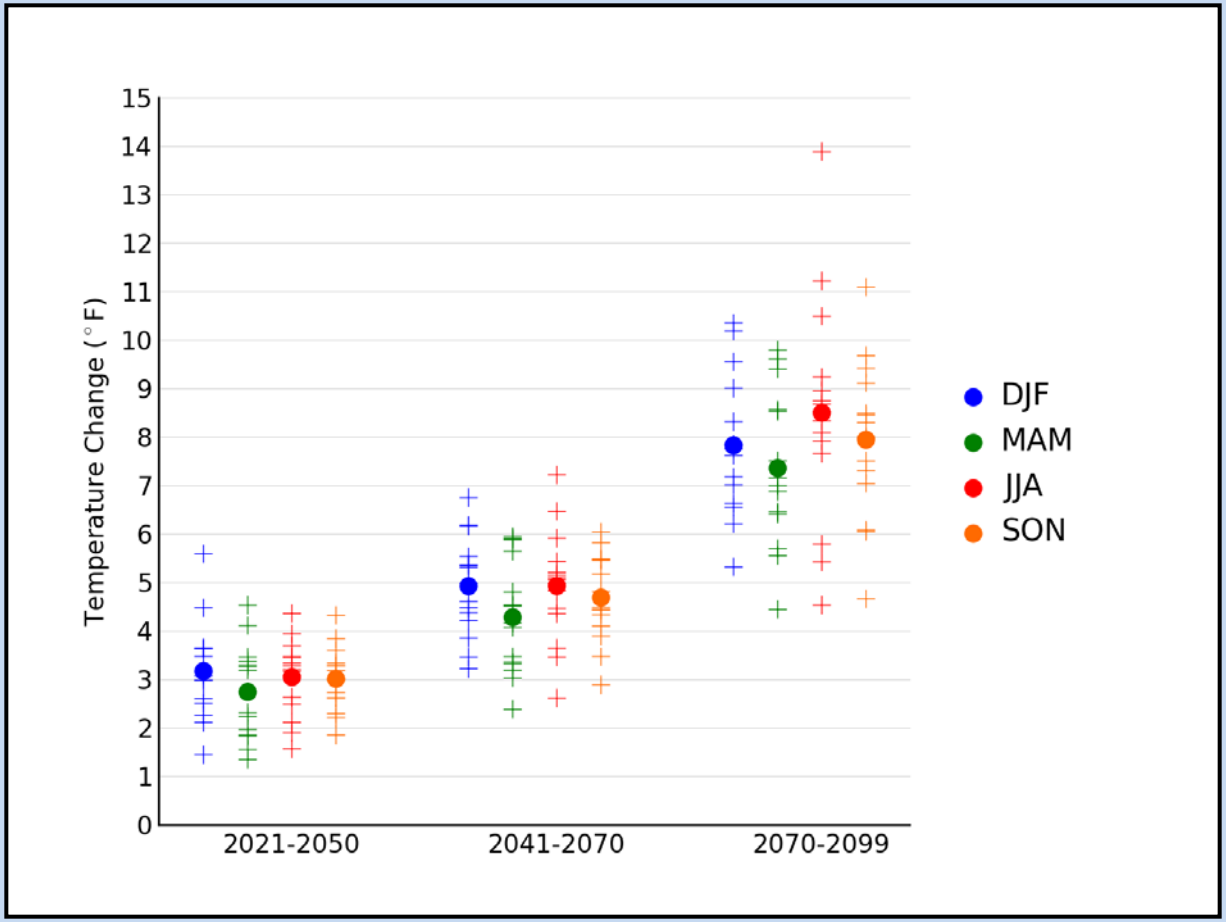
Seasonal Temperature Changes



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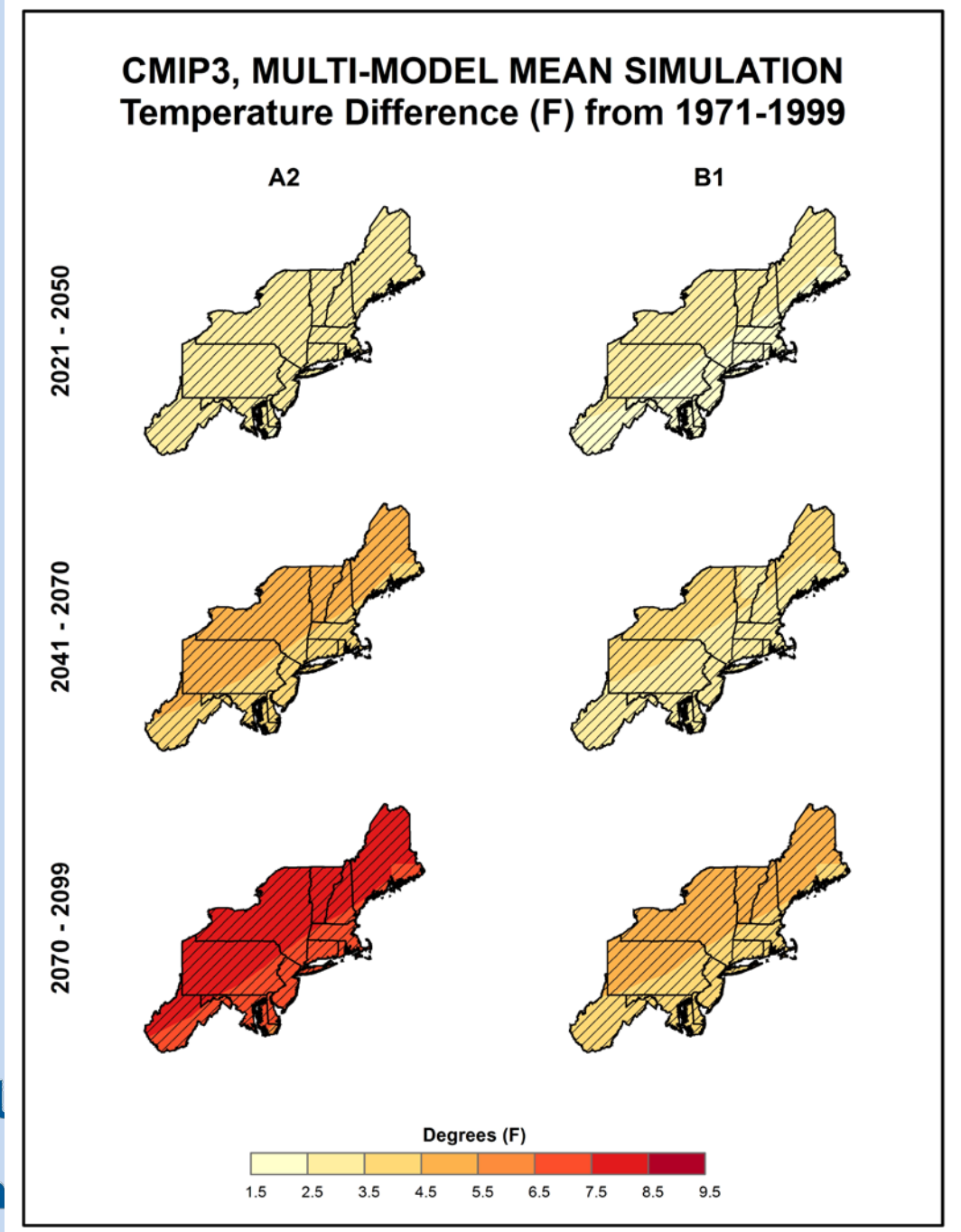

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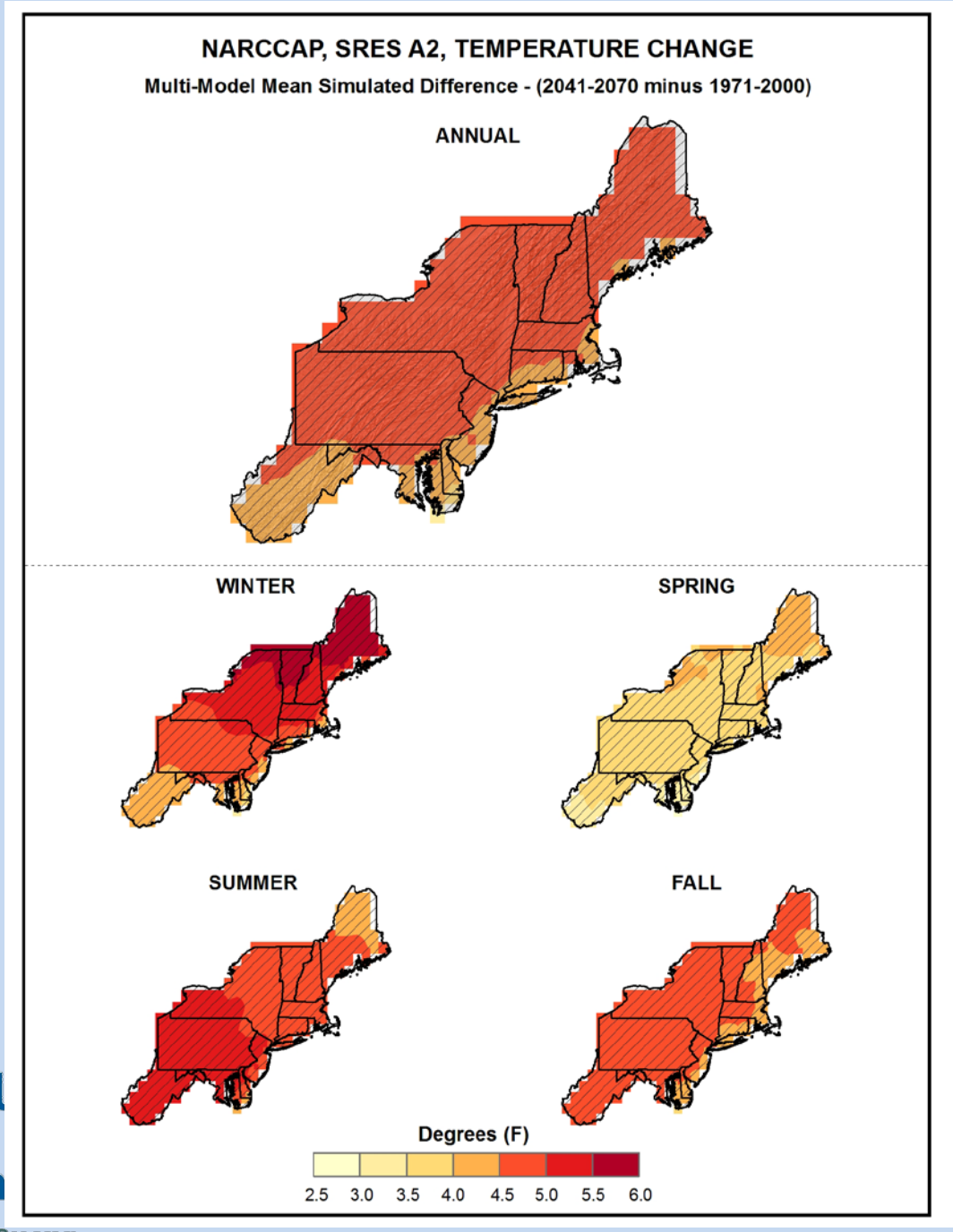

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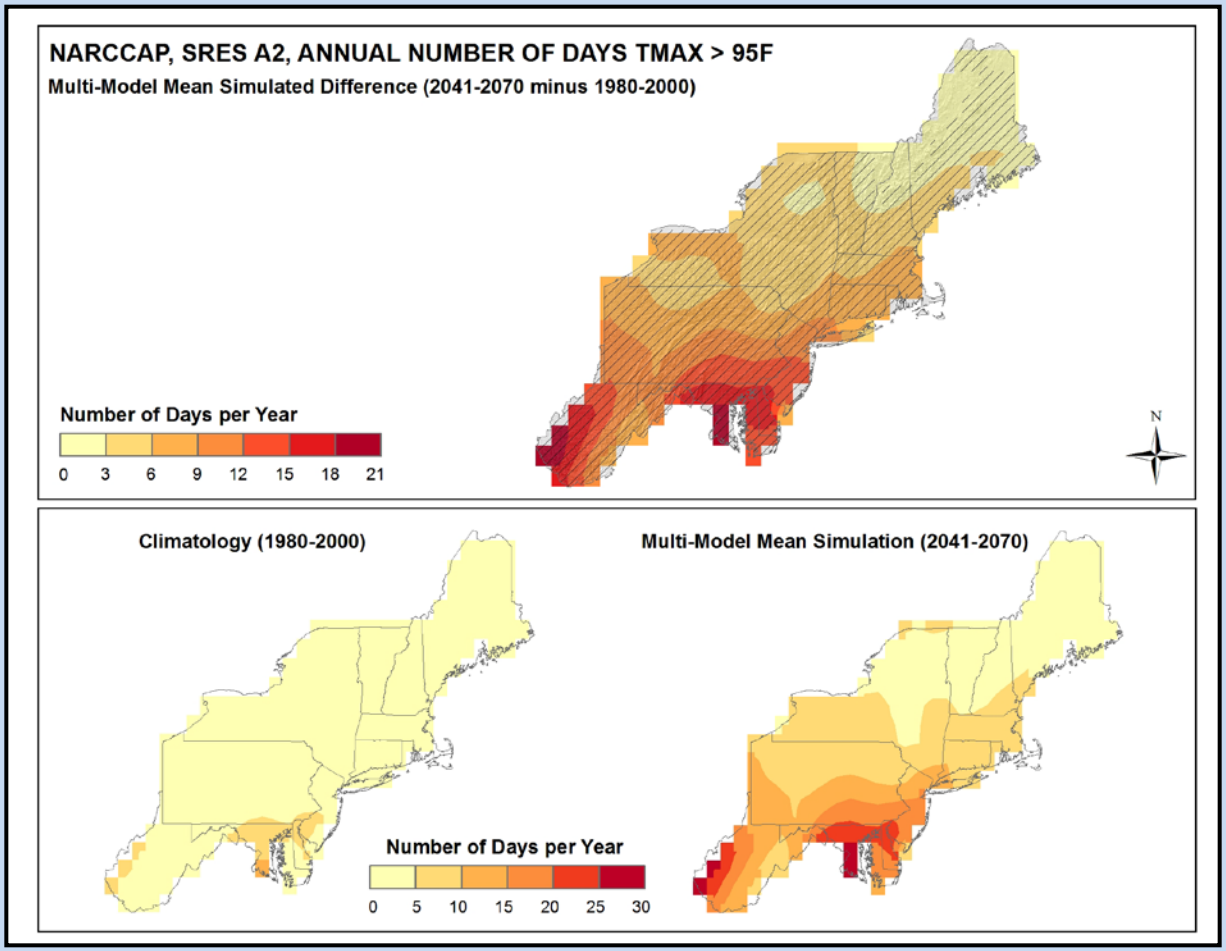

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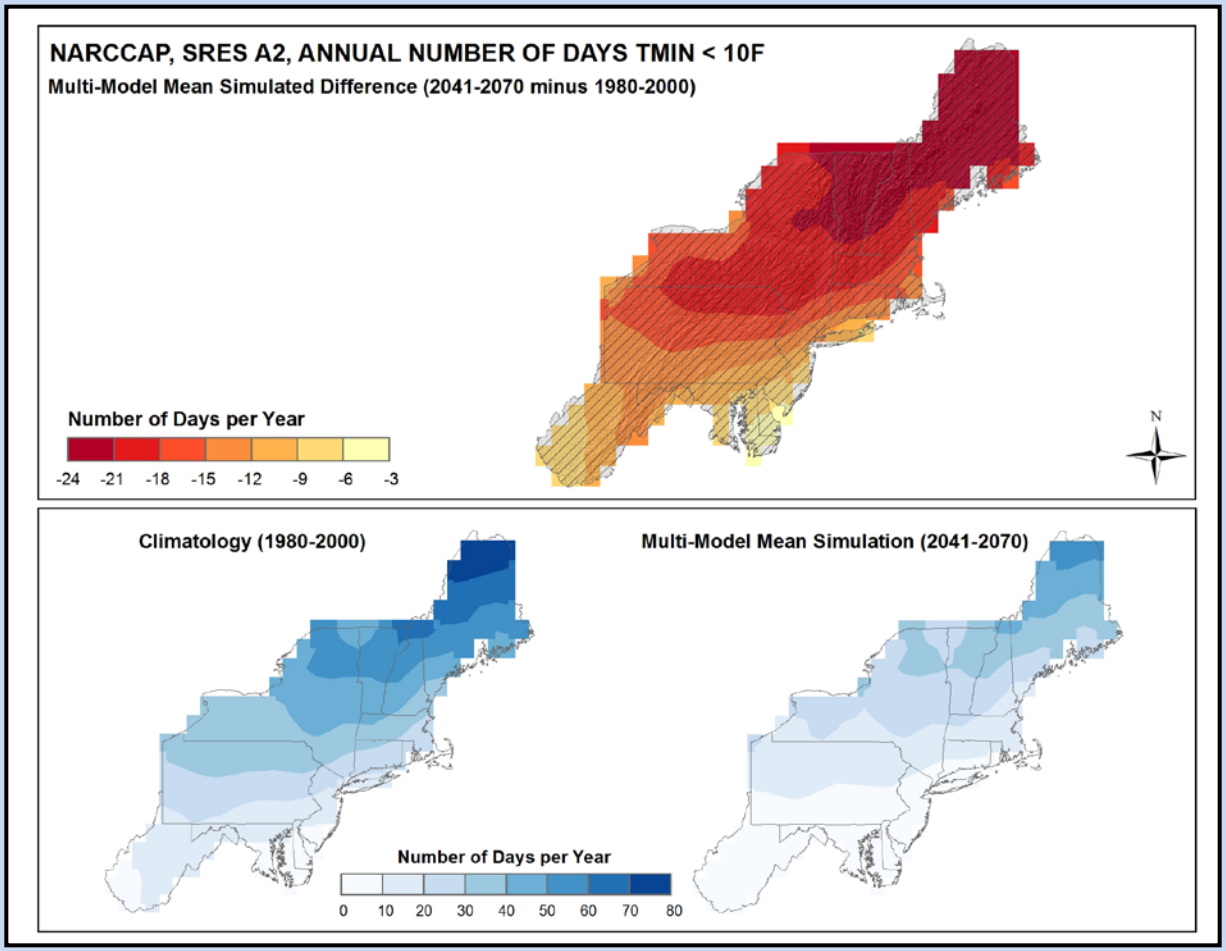

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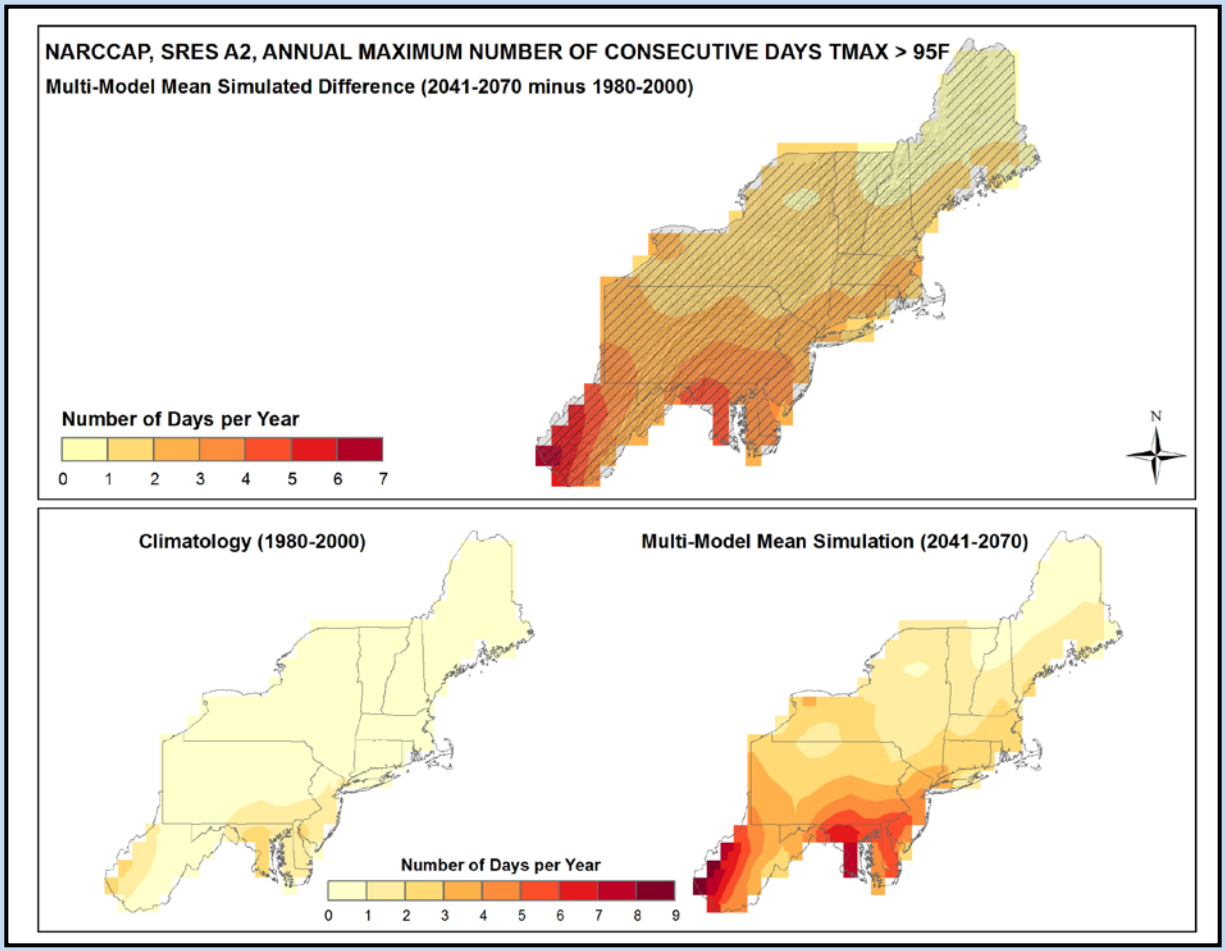

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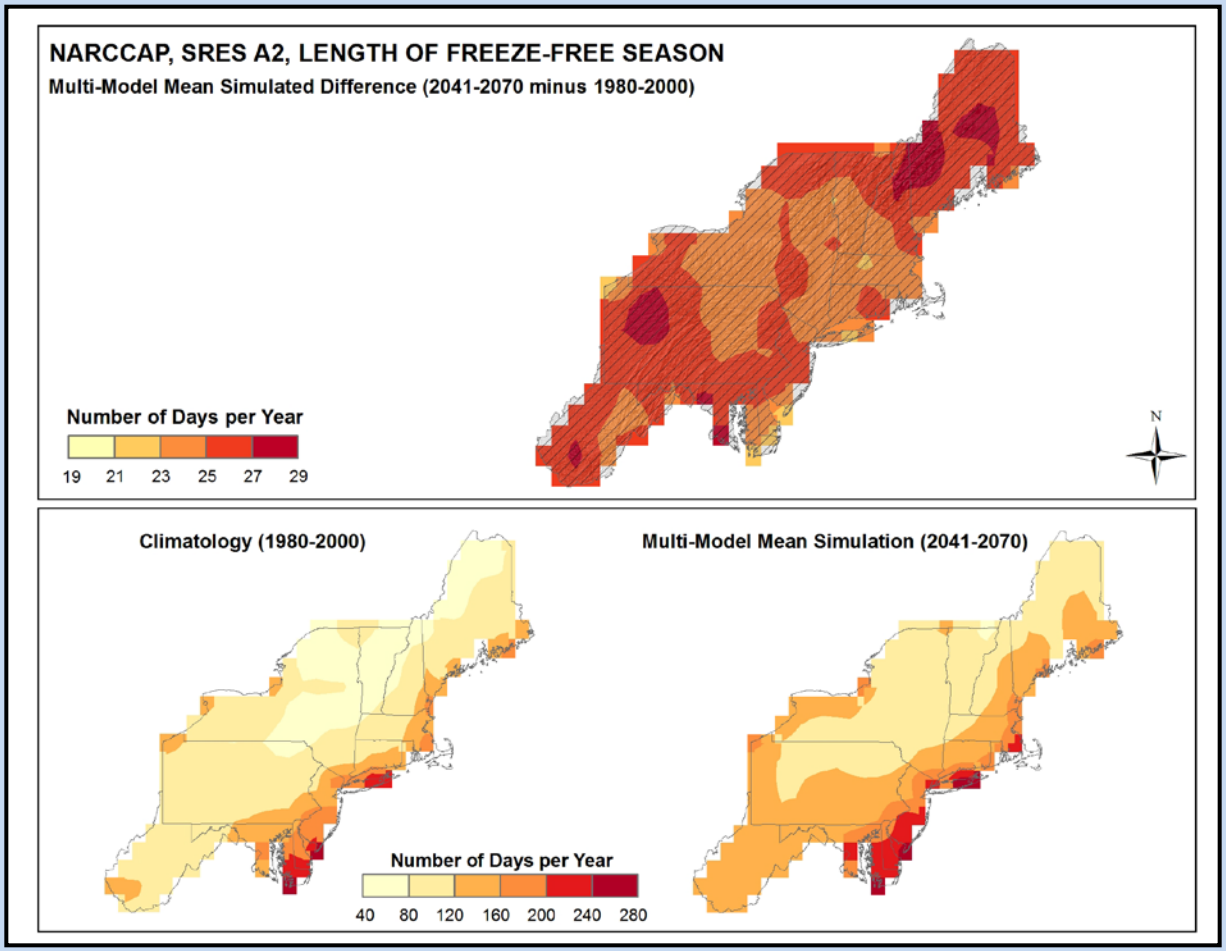

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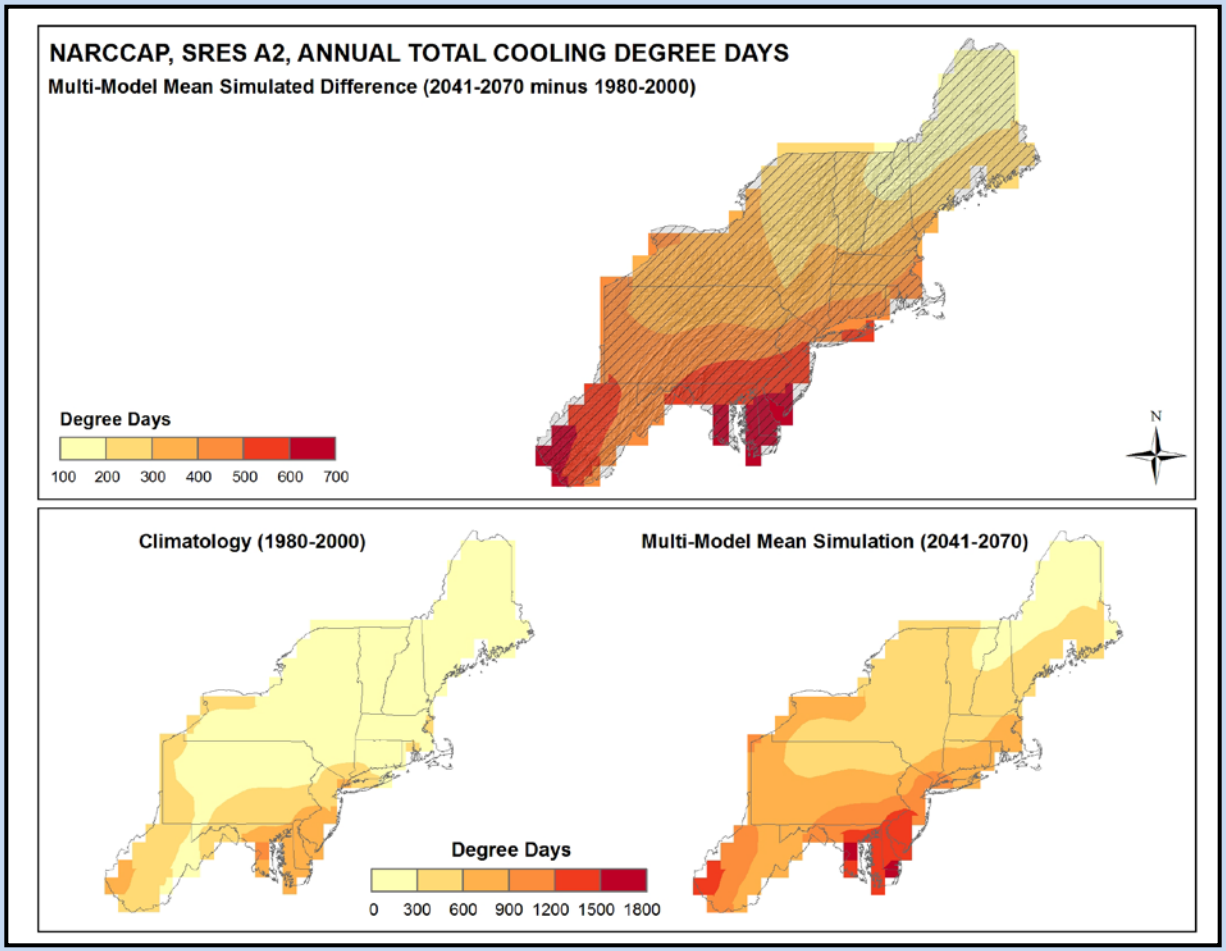

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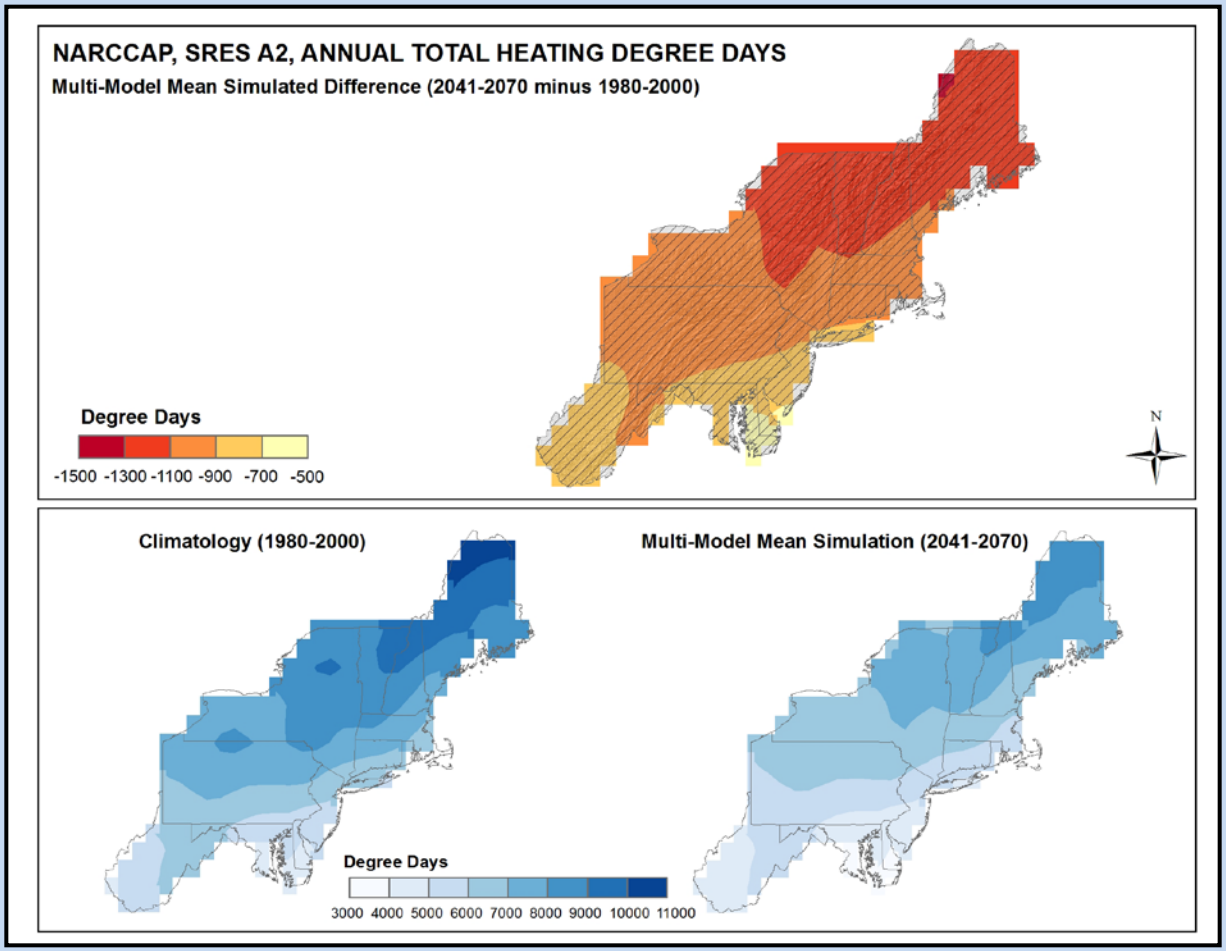

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Derived Temperature Variables

Variable	NARCCAP	SD
• Freeze-free period	+26(+/-5) days	+25 days
• #days Tmax>90° F	+13(+/-7) days	+15 days
• #days Tmax>95° F	+8(+/-6) days	+4 days
• #days Tmax>100° F	+4 (+/-5) days	0 days
• #days Tmin<32° F	-26 (+/-3) days	-32 days
• #days Tmin< 10° F	-17 (+/-4) days	-13 days
• #days Tmin<0° F	-9 (+/-4) days	-6 days
• Max run days > 95° F	+171% (+/-105%)	+309%
• Max run days > 100° F	+237% (+/-212)	+786%
• Heating degree days	-16% (+/-1)	-18%
• Cooling degree days	+99% (+/-32)	+91%
• Growing degree days (base 50F)	+41%(+/-6)	+35%

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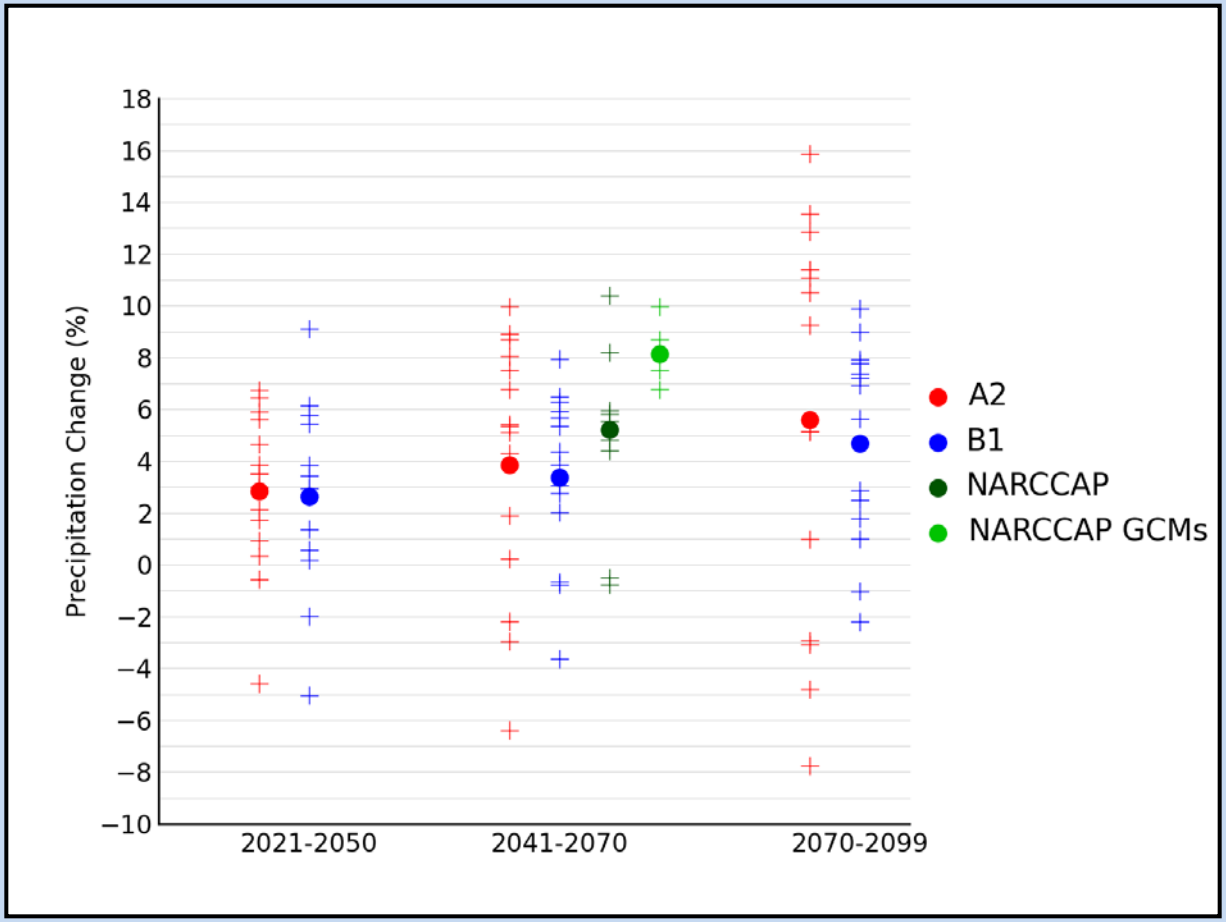
Precipitation Changes

Model mean precipitation changes



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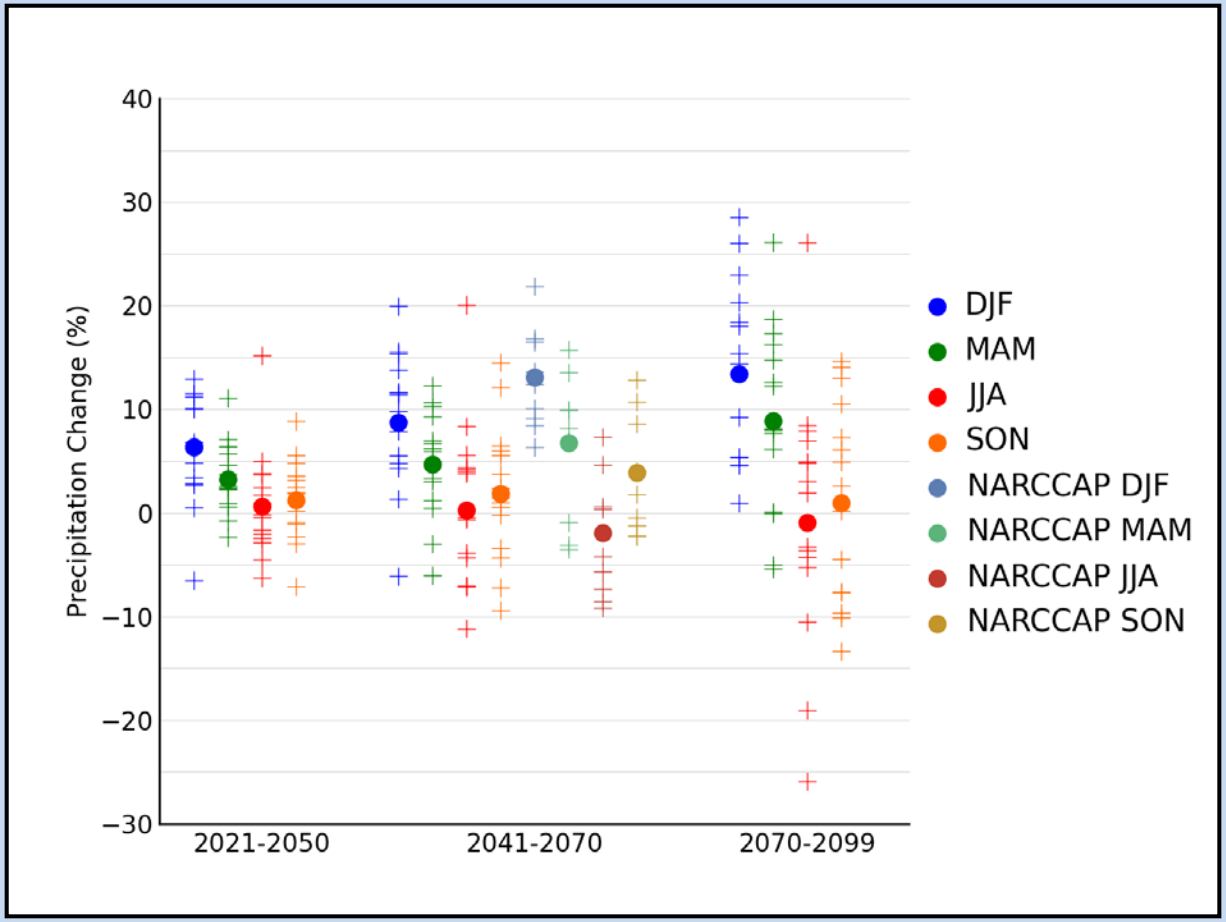
Seasonal Precipitation Changes



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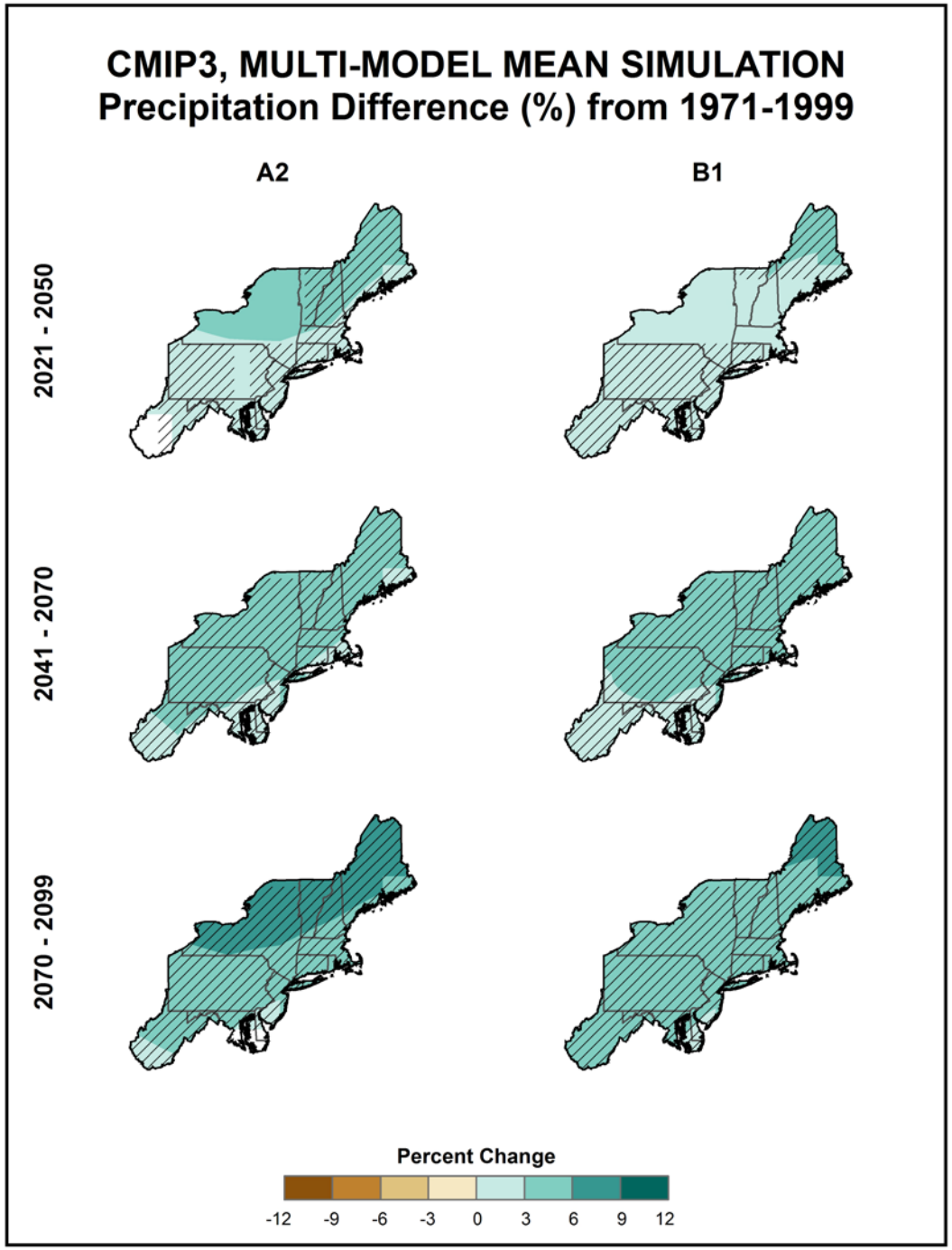

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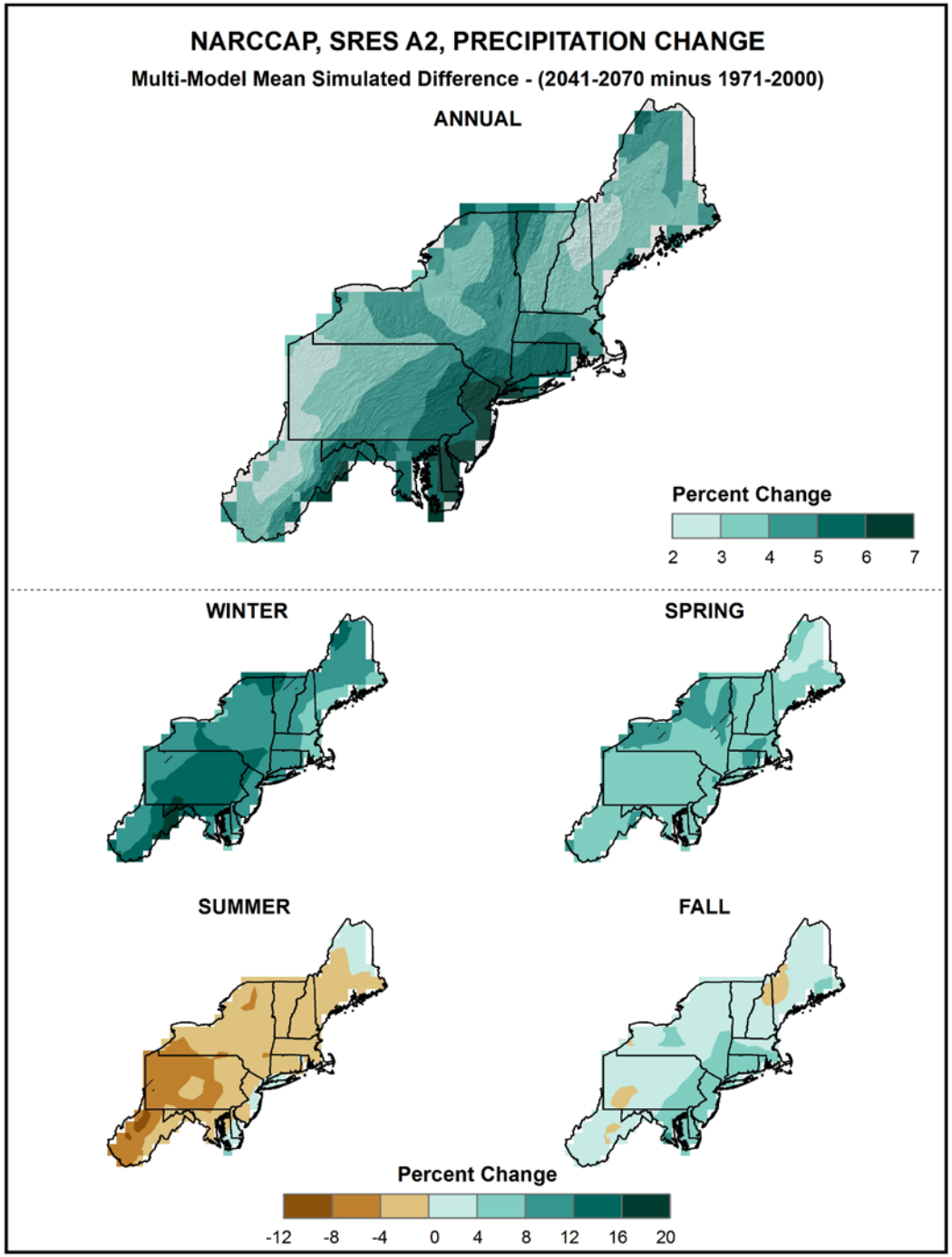

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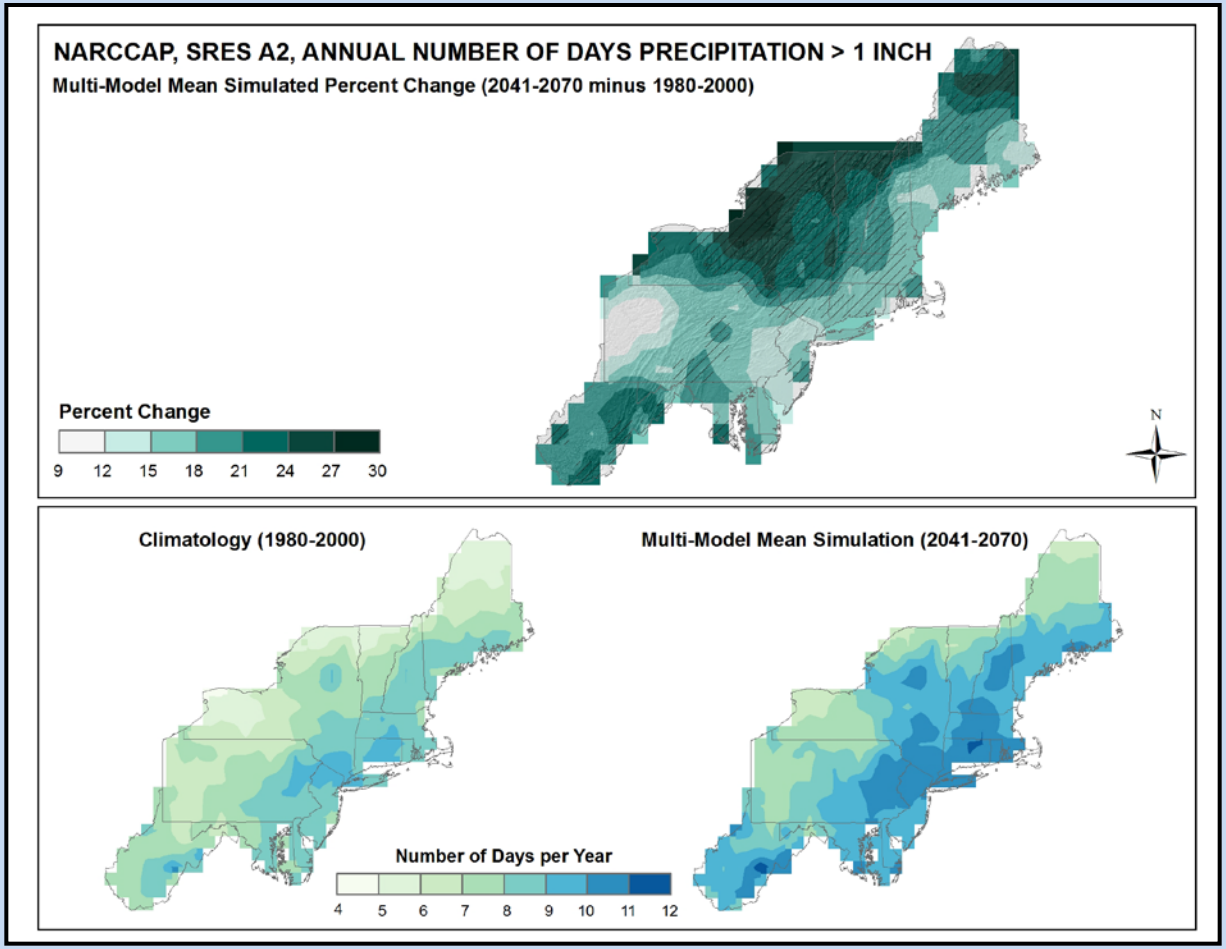

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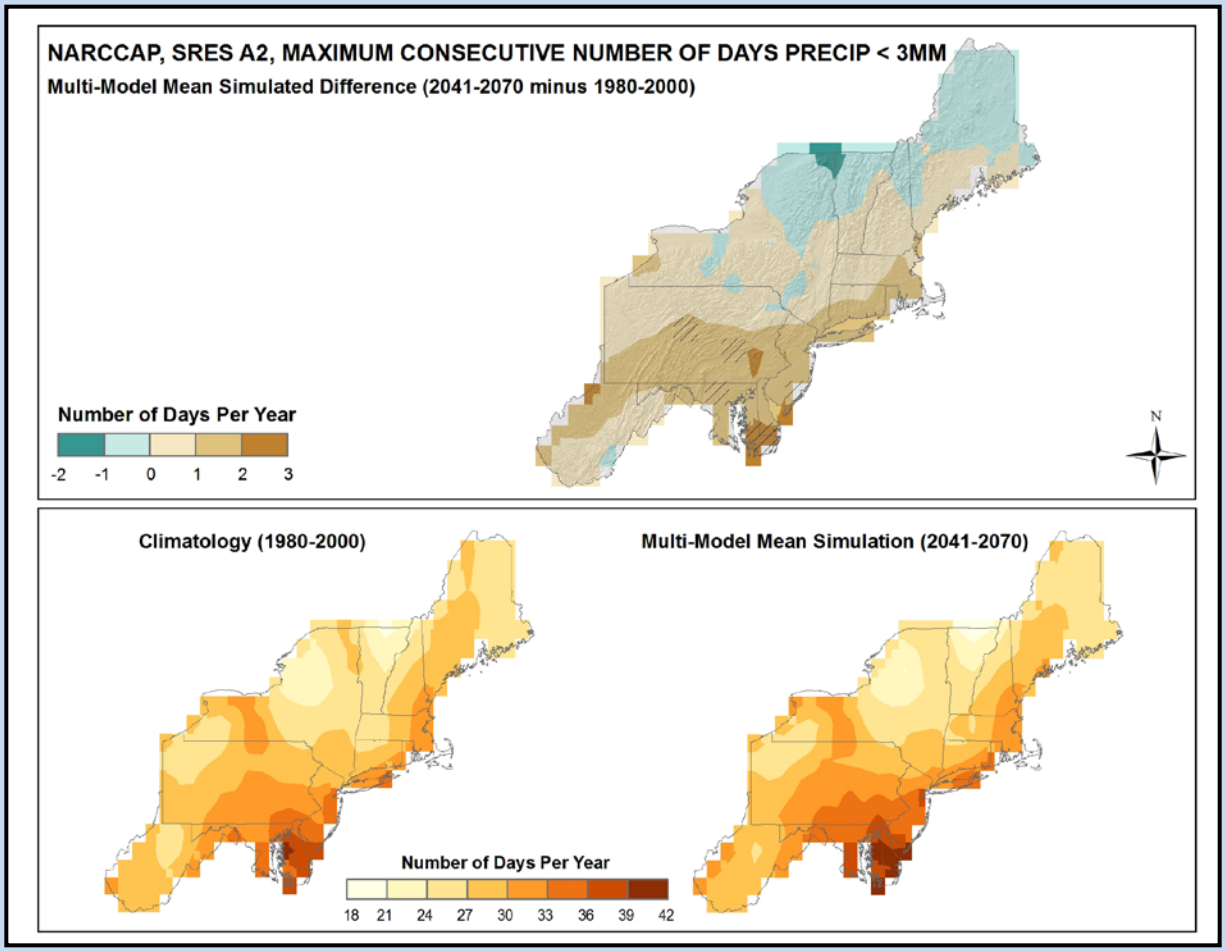

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Derived Precipitation Variables

Variable	NARCCAP	SD
• #days > 1 inch	+21% (+/-7)	+21%
• #days > 2 inches	+41% (+/-24)	+40%
• #days > 3 inches	+56% (+/-45)	+53%
• #days > 4 inches	+65% (+/-70)	+79%
• Max run days < 0.1 inch	+1 days (+/-2)	+1 days

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Acknowledgements

- Linda Mearns and Seth McGinnis – NARCCAP
- Art DeGaetano and Bill Noon – NARCCAP
- Michael Wehner – CMIP3
- Jay Hnilo – CMIP3
- Greg Dobson – maps
- Laura Stevens, Scott Stevens – BCSD daily

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