

IPCC overview: reliability of regional projections

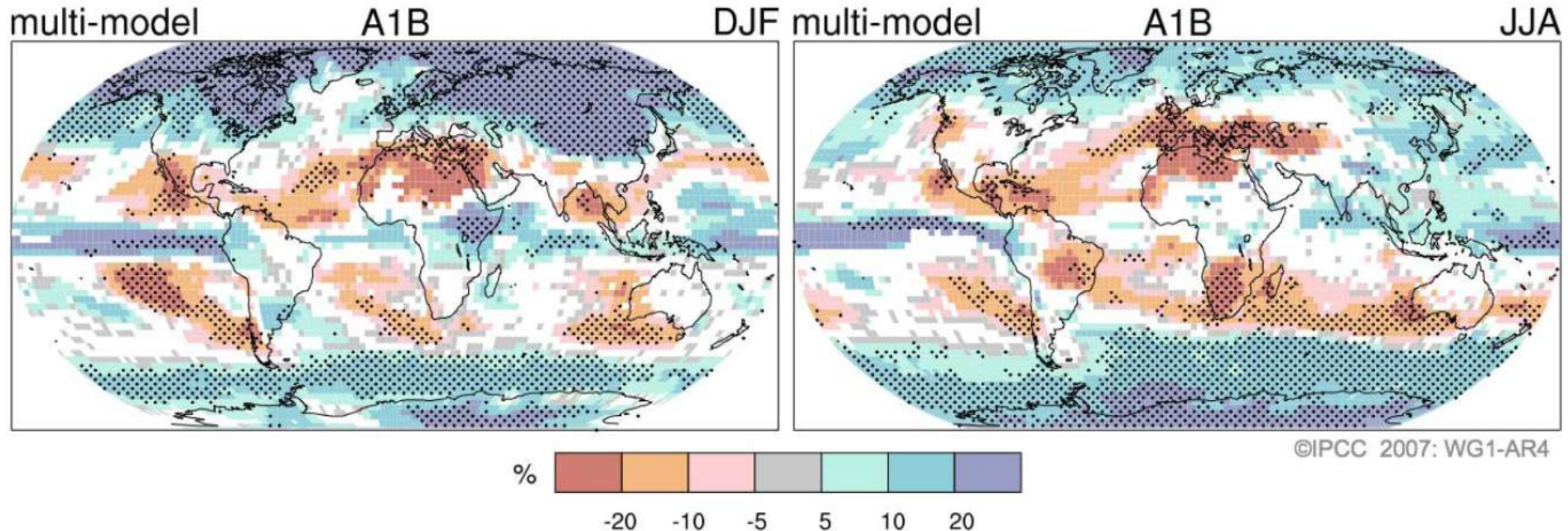
Richard Jones

Met Office Hadley Centre

IPCC regional predictions

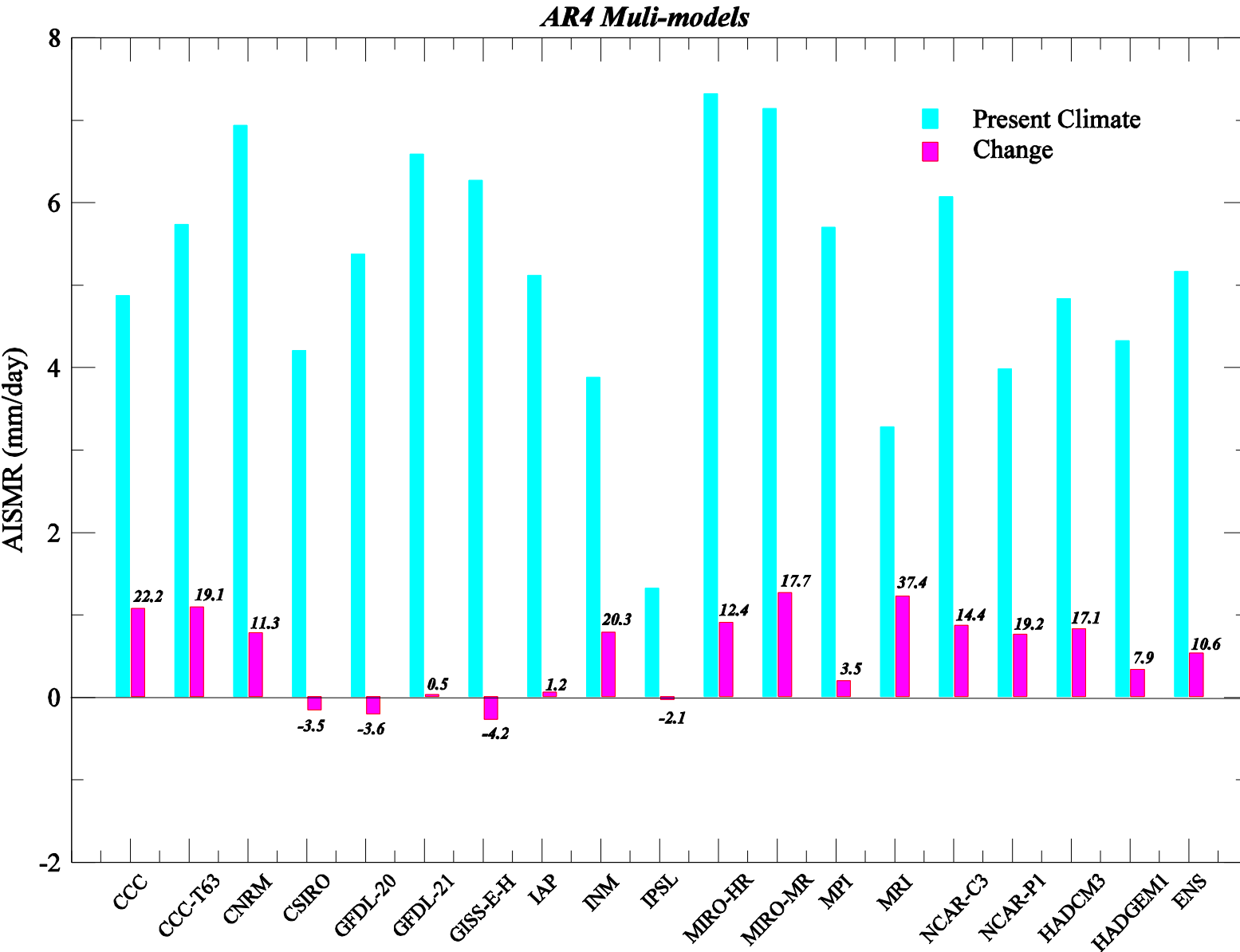
- Significant temperature changes are very likely and patterns of change are becoming clear
- Many statements are made relative to the global average warming which is still uncertain
- Patterns of precipitation change are becoming clear for many areas but little confidence in the magnitude of the changes
- Level of confidence/uncertainty is regionally dependent – key regions have high uncertainty
- Information on extremes and local changes is very patchy

IPCC AR4 summary seasonal precipitation change figure



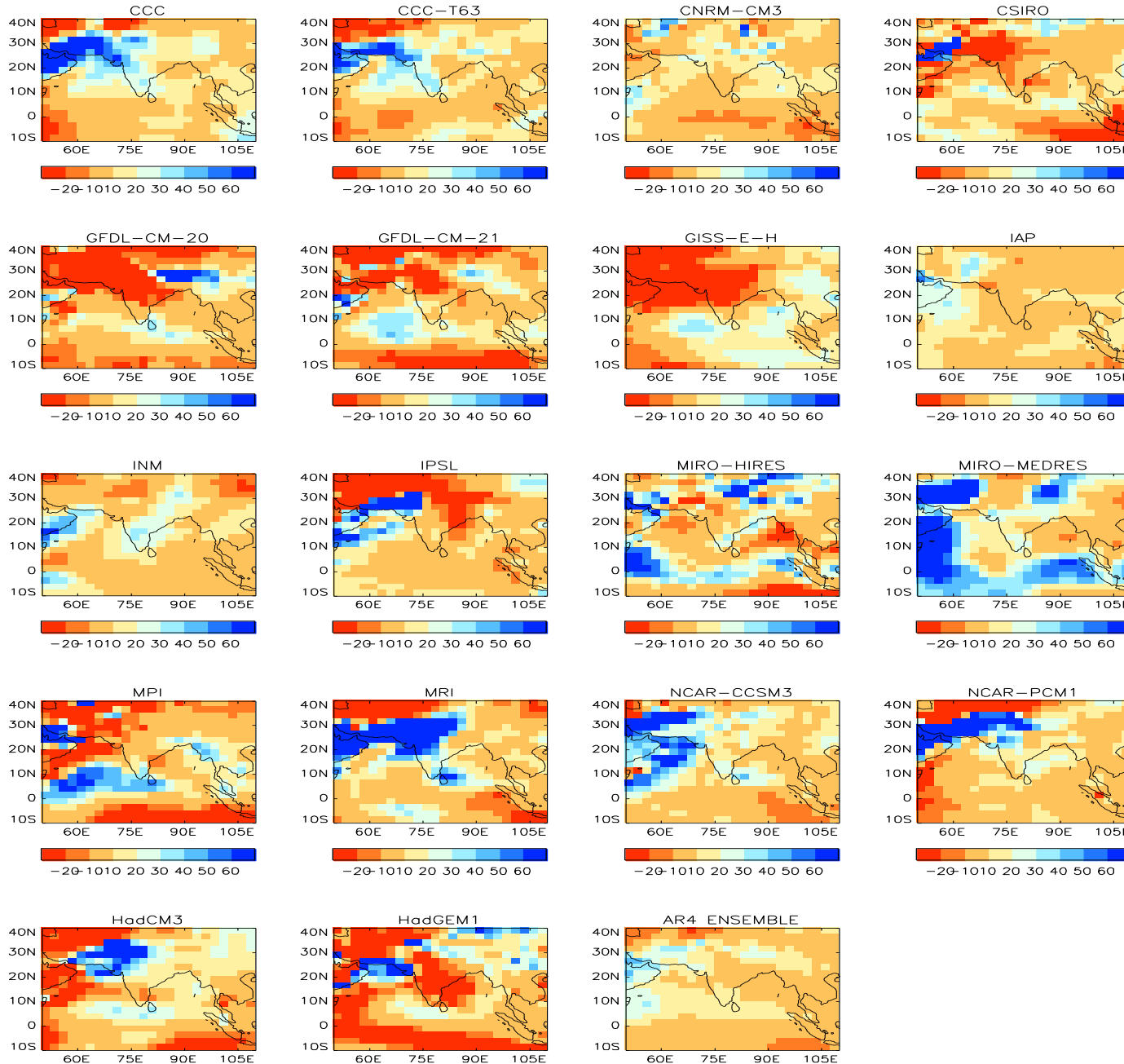
- Model consensus implies a level of reliability
 - but need mechanisms as well
- Lack of consensus implies no information –
 - but assessed at grid-scale thus maybe misleading
- No information on fine temporal or spatial scales

Response of All India rainfall (A1B, 2080s)



- Most models give positive change
- Change often large thus policy relevant
- Support from physical insight

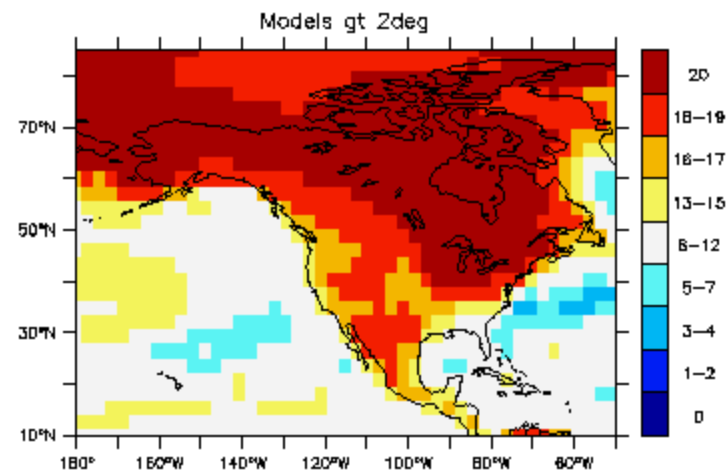
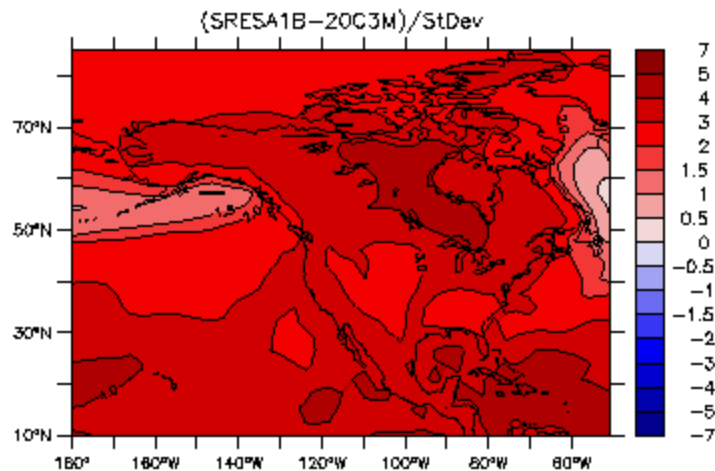
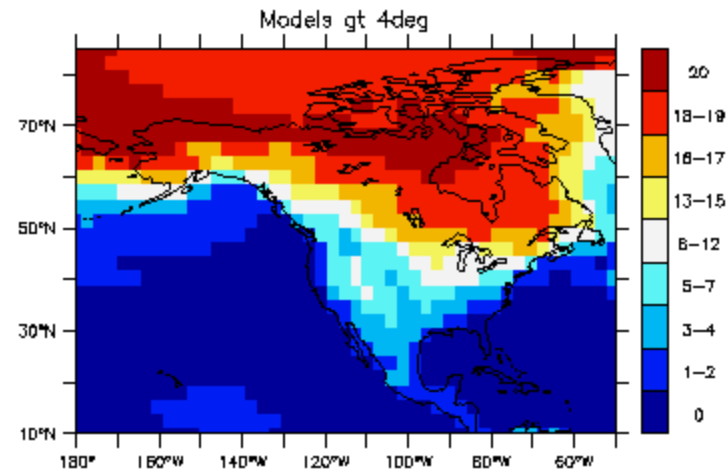
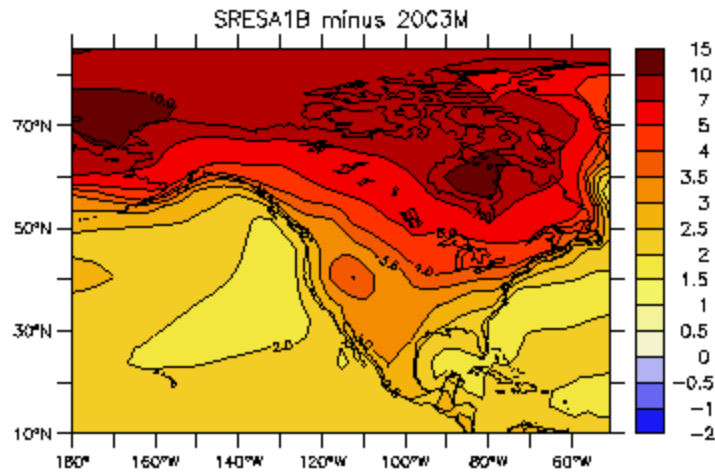
Lack of consensus from model patterns



- Combination of some pattern and sign differences lead to lack of consensus
- How relevant is this if monsoon processes are captured in the models?

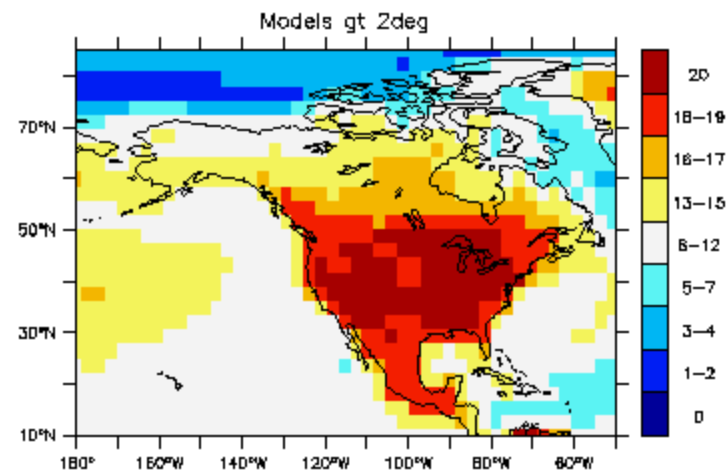
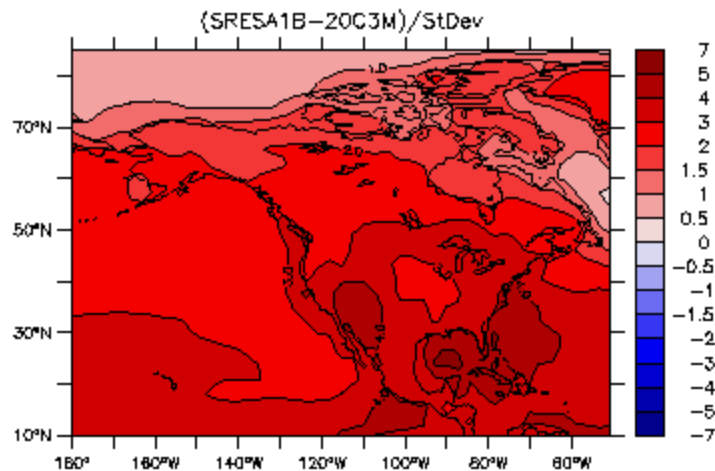
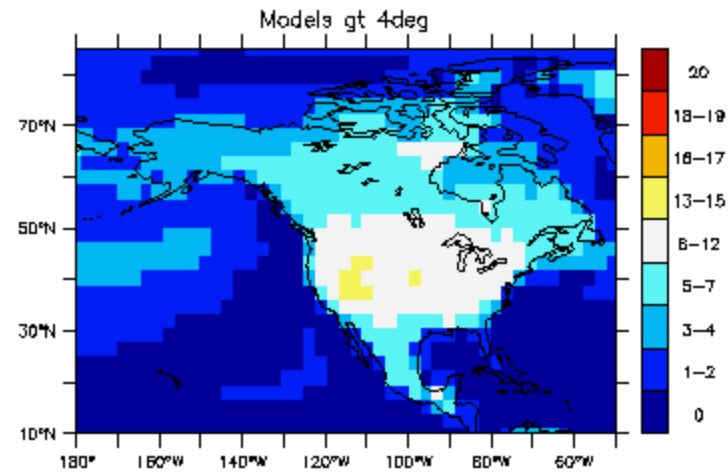
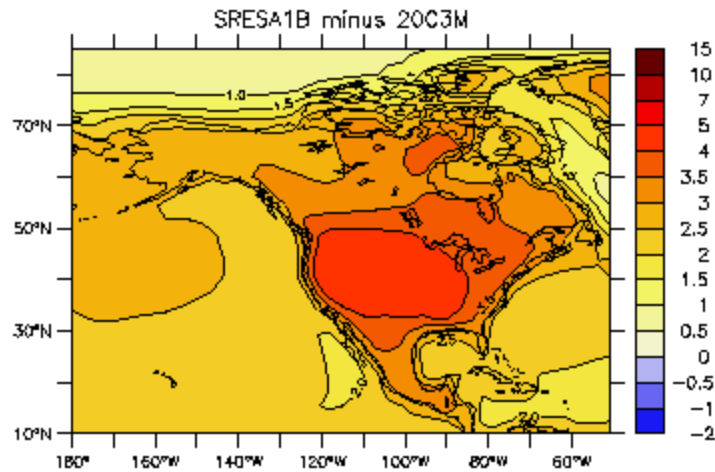
Winter temperature change summary

DJF Surf Temp (degC), COMPOSITE



Summer temperature change summary

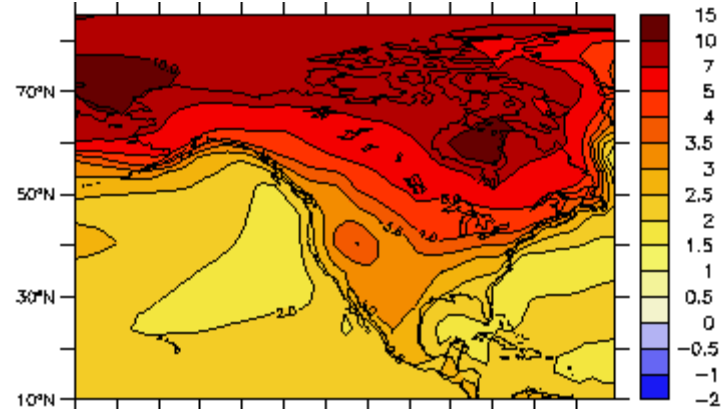
JJA Surf Temp (degC), COMPOSITE



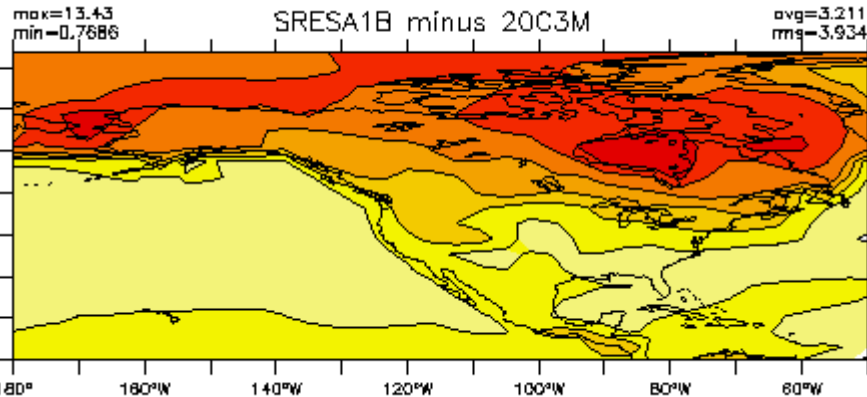
NARCCAP models in an IPCC context

Winter temperature change: NARCCAP models

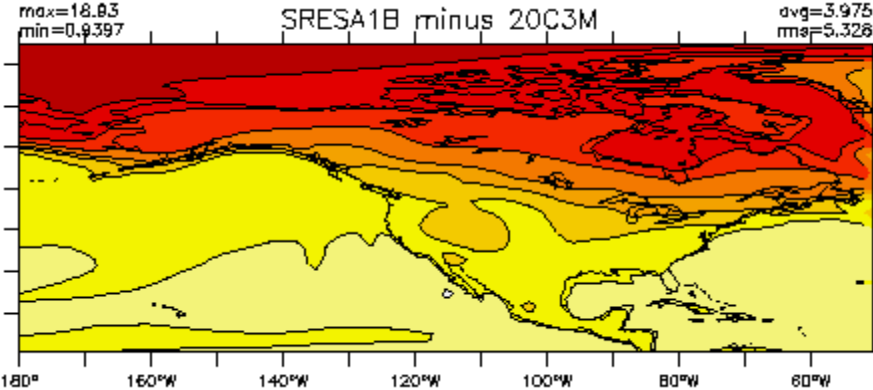
CCCMA



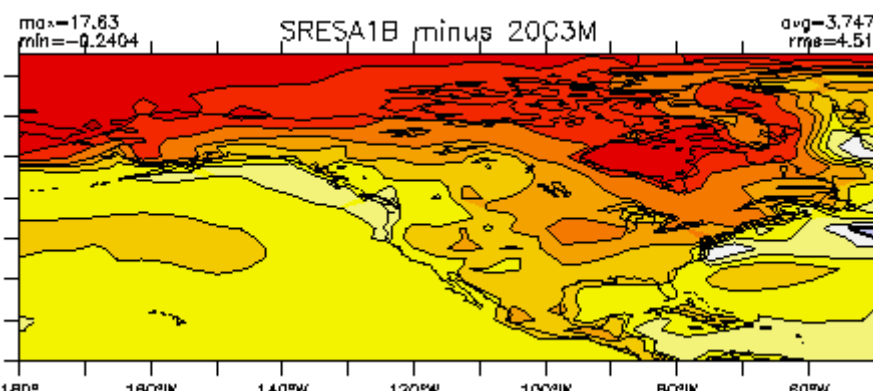
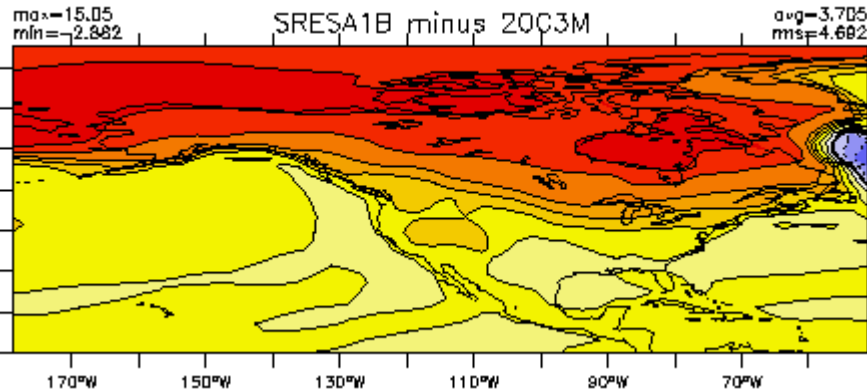
CCSM



GFDL

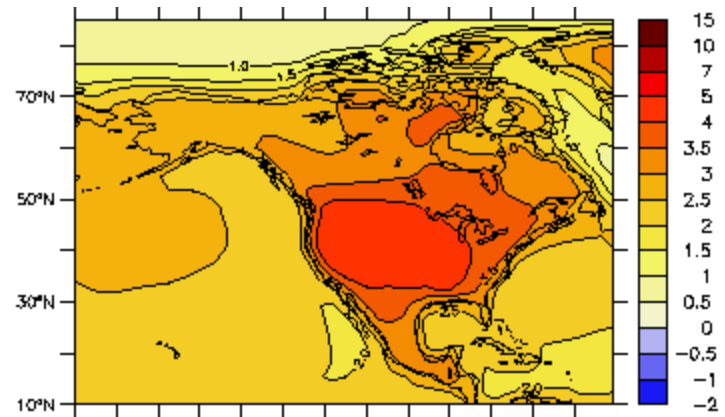


HadCM3

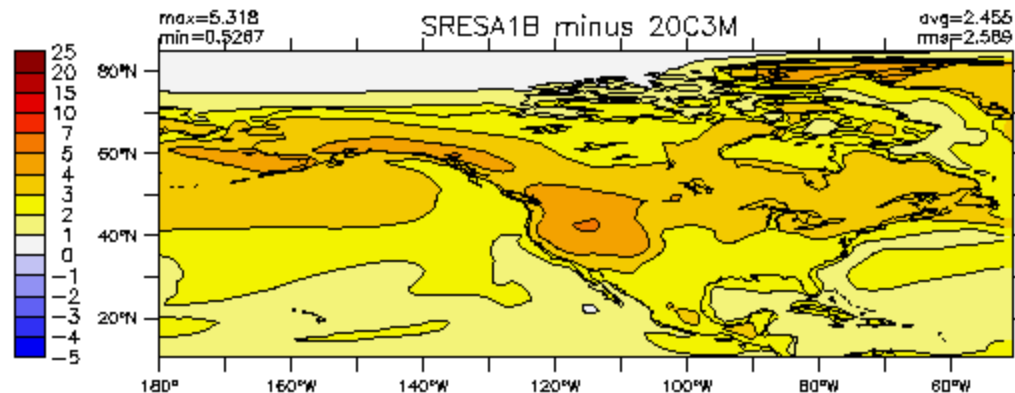


Summer temperature change: NARCCAP models

CCCMA

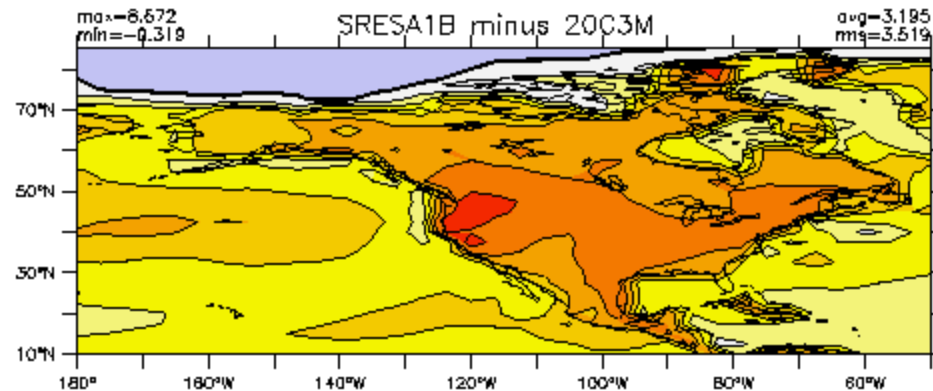


CCSM



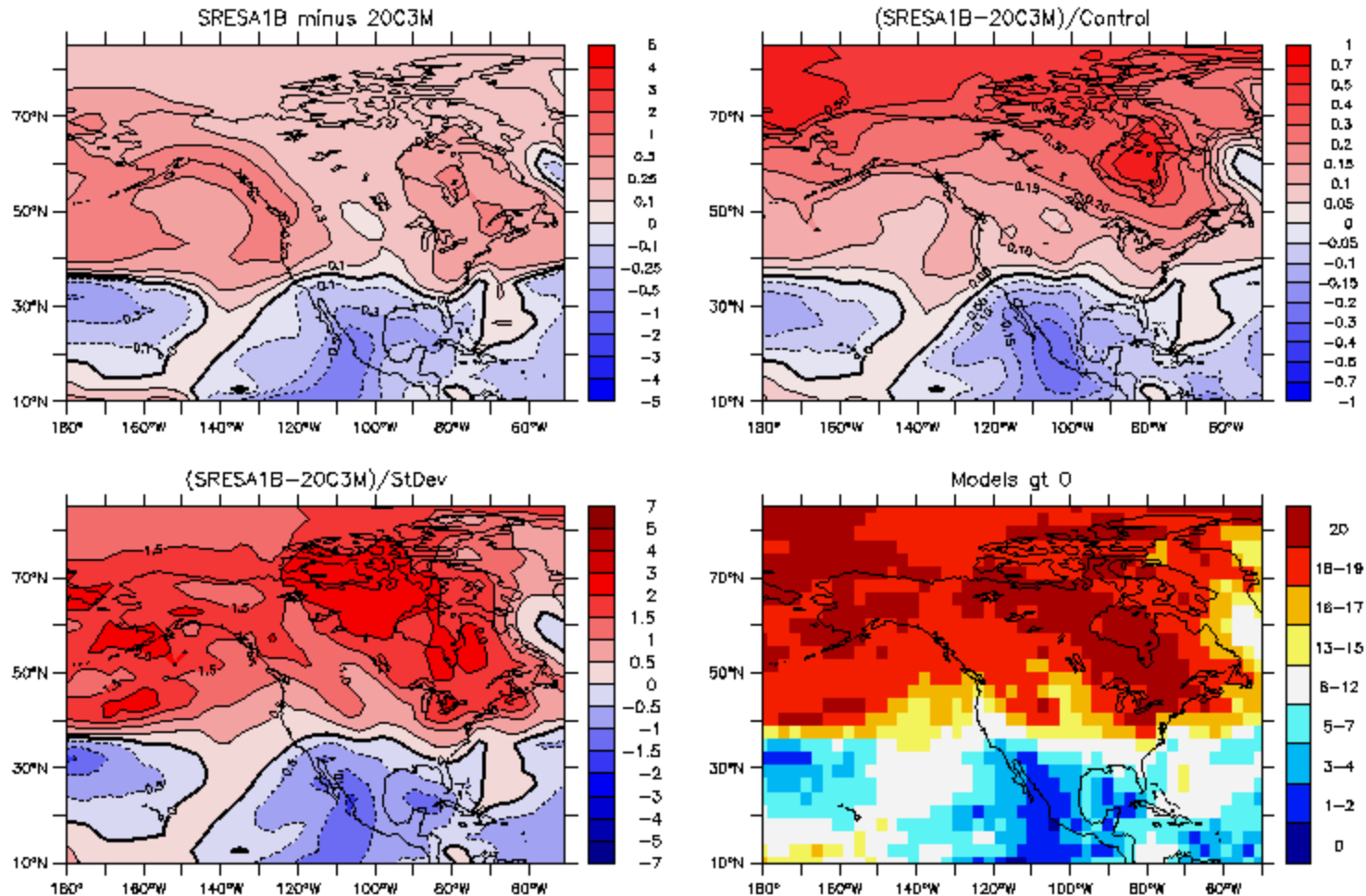
GFDL

HadCM3



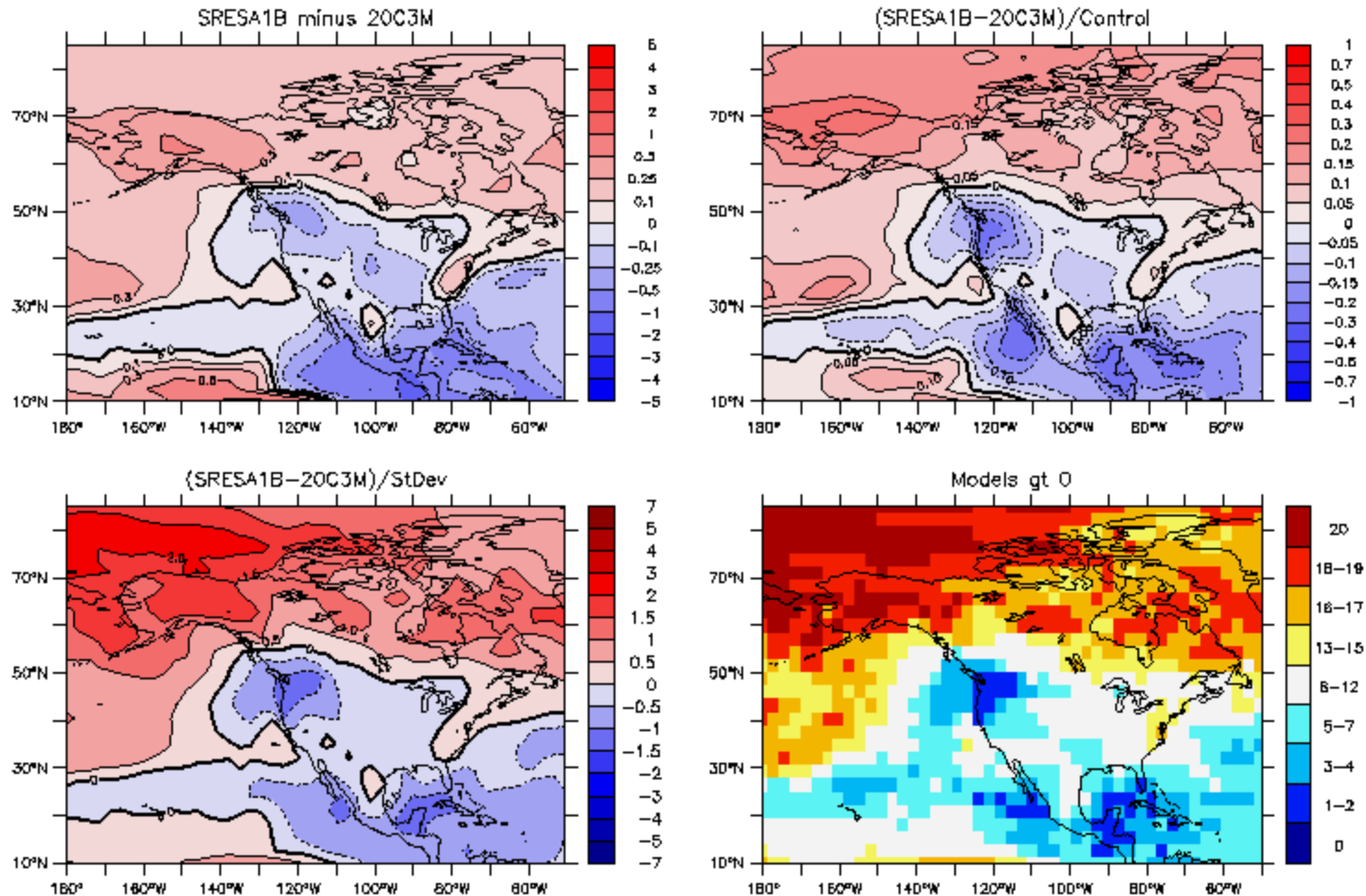
Winter precipitation change summary

DJF Precip (mm/day), COMPOSITE

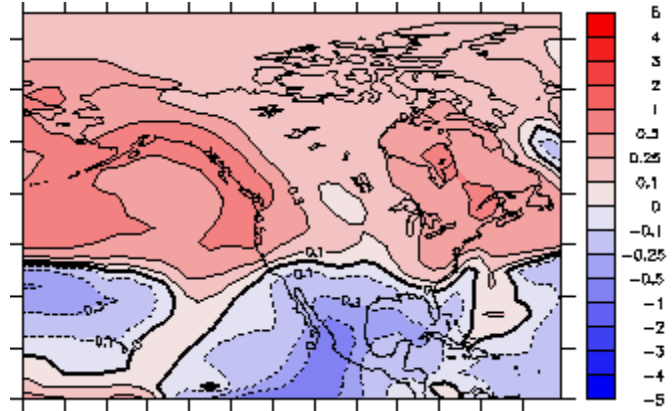


Summer precipitation change summary

JJA Precip (mm/day), COMPOSITE

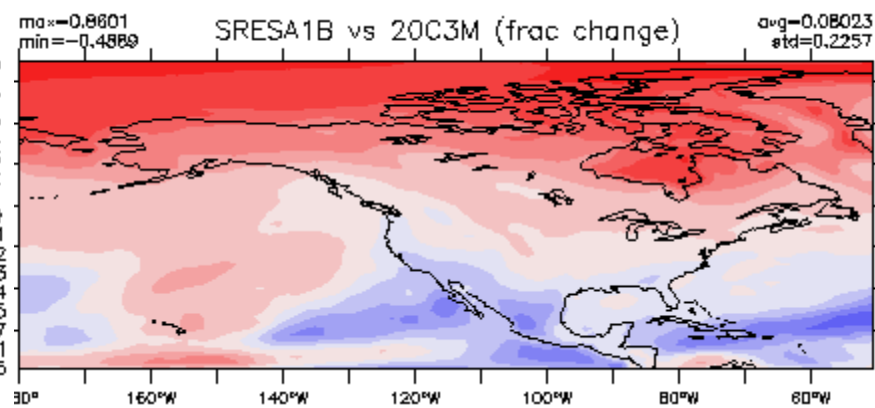
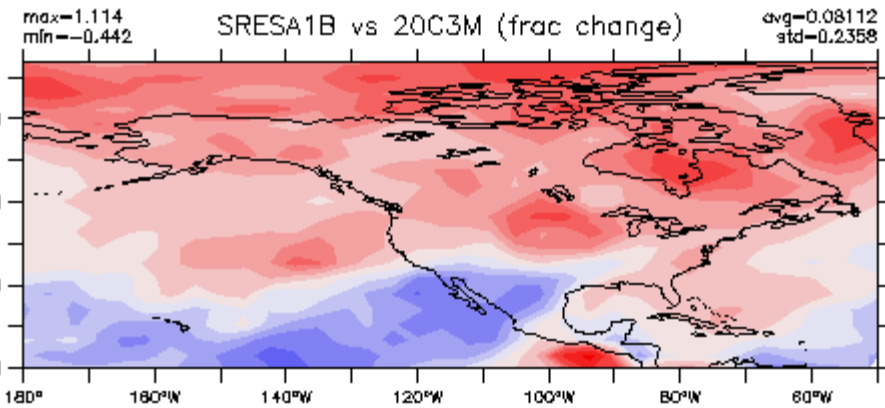


Winter precipitation change: NARCCAP models



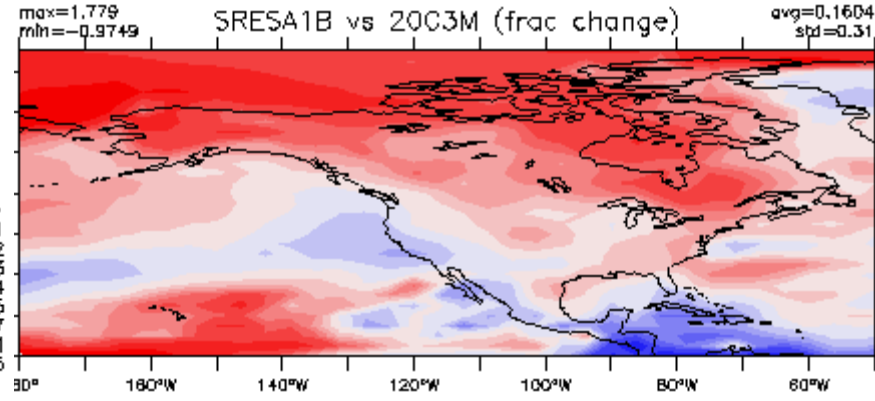
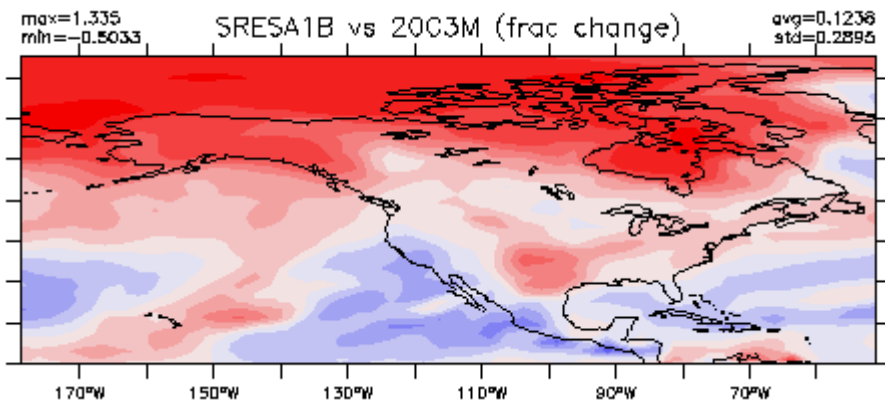
CCCMA

CCSM



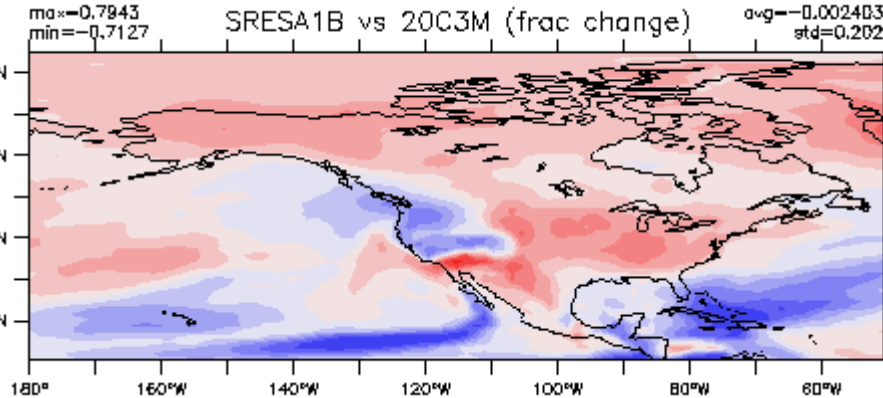
GFDL

HadCM3

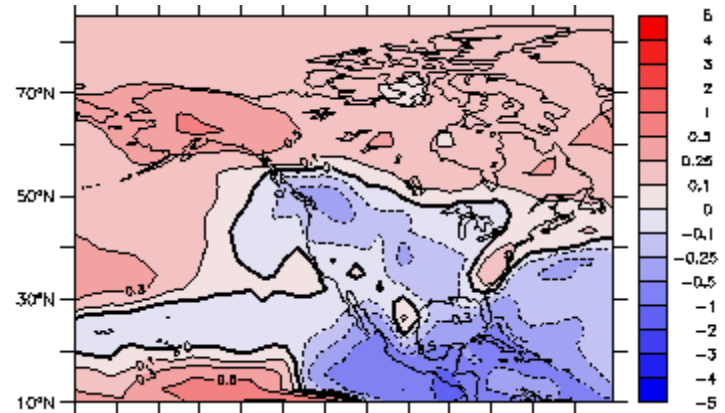
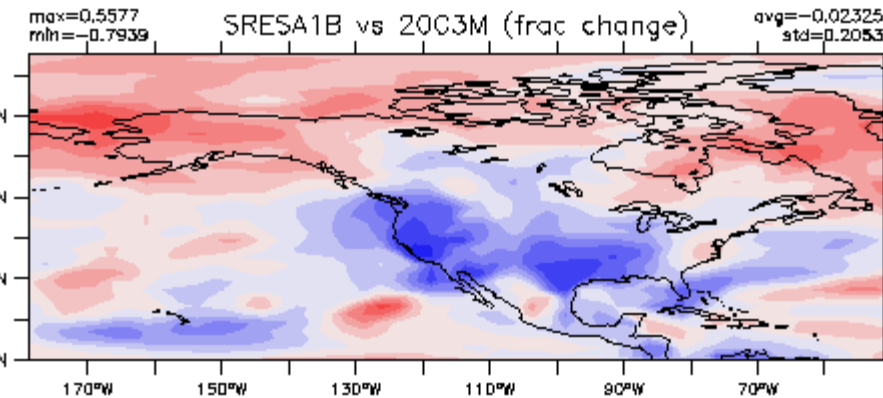


Summer precipitation change: NARCCAP models

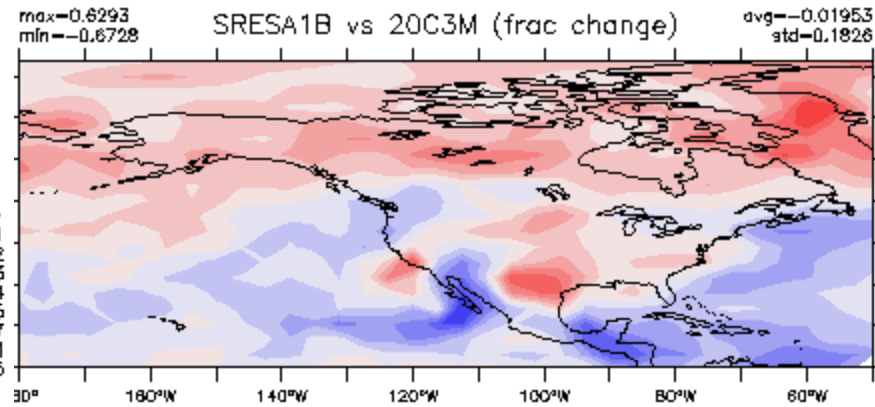
CCCMA



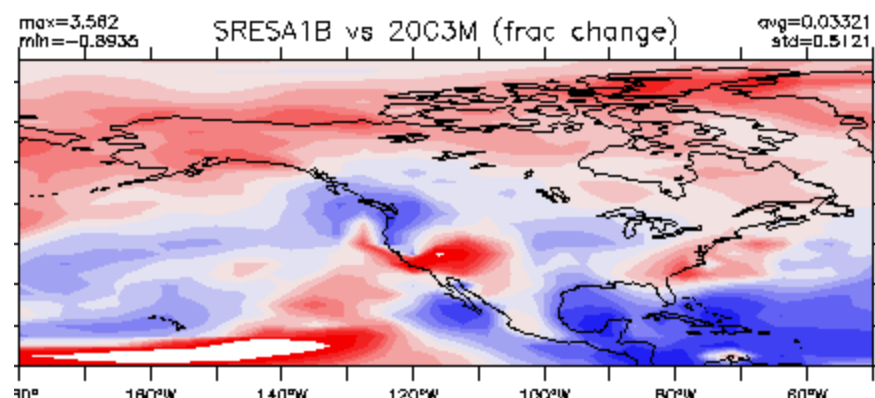
GFDL



CCSM



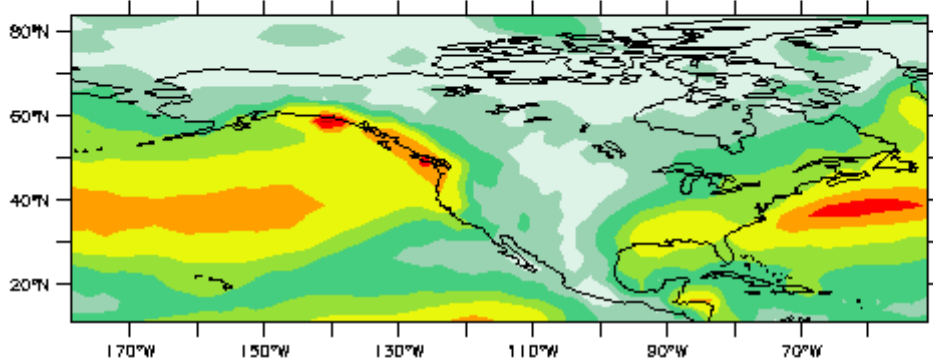
HadCM3



Precipitation validation - CCCMA

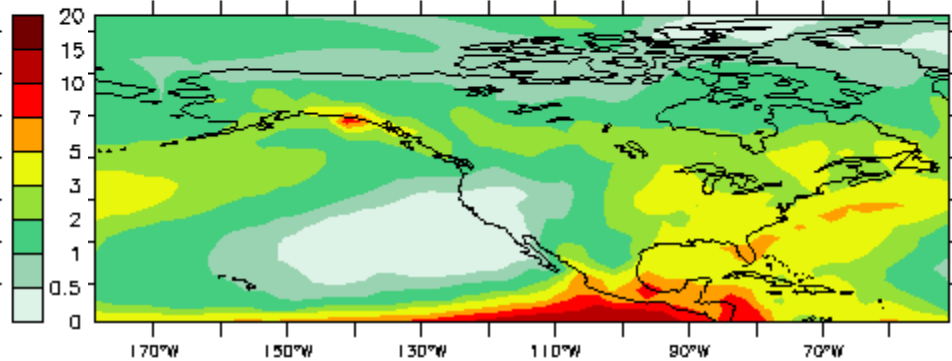
DJF Precip (mm/day), CGCM3.1.T47

max=10.87
min=0.03045
CMAP
avg=2.178
std=1.652



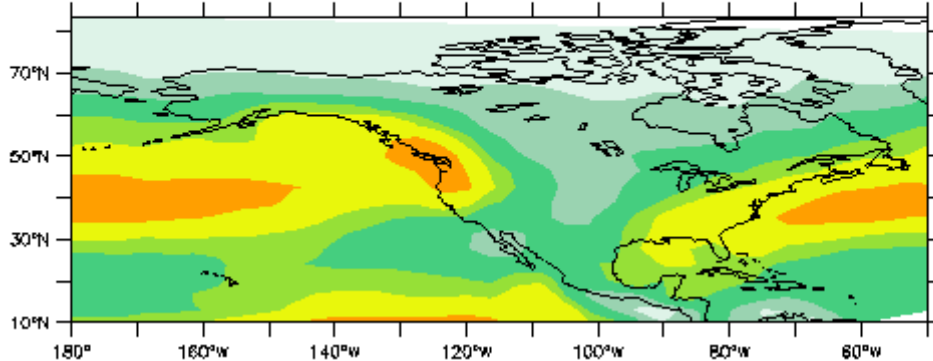
JJA Precip (mm/day), CGCM3.1.T47

max=15.11
min=0.03662
CMAP
avg=2.456
std=2.164



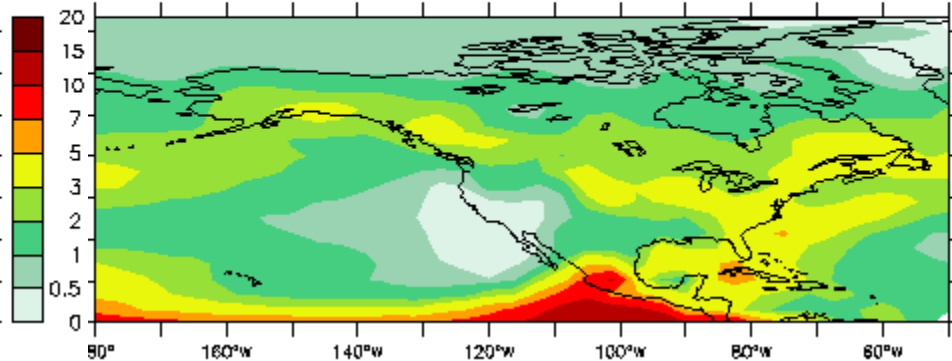
DJF Precip (mm/day), 20C3M

max=6.775
min=0.1854
20C3M
avg=2.32
std=1.598



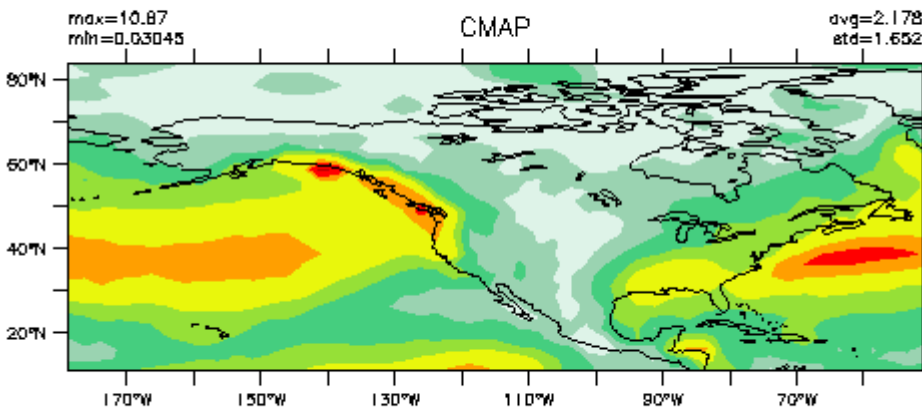
JJA Precip (mm/day), 20C3M

max=15.42
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20C3M
avg=2.376
std=2.039

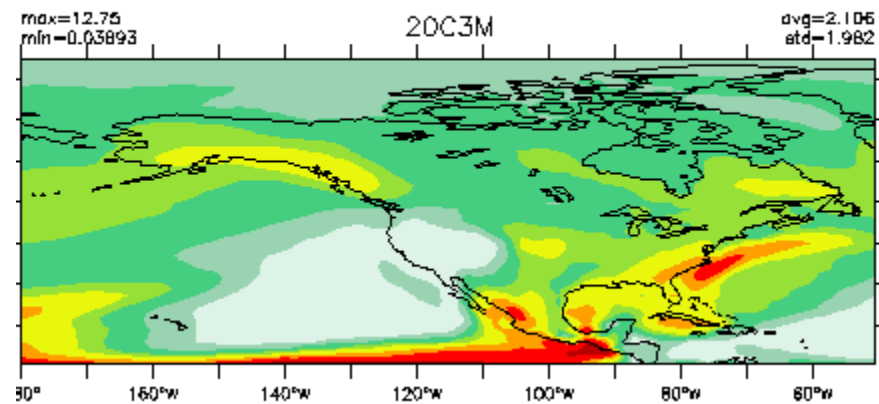
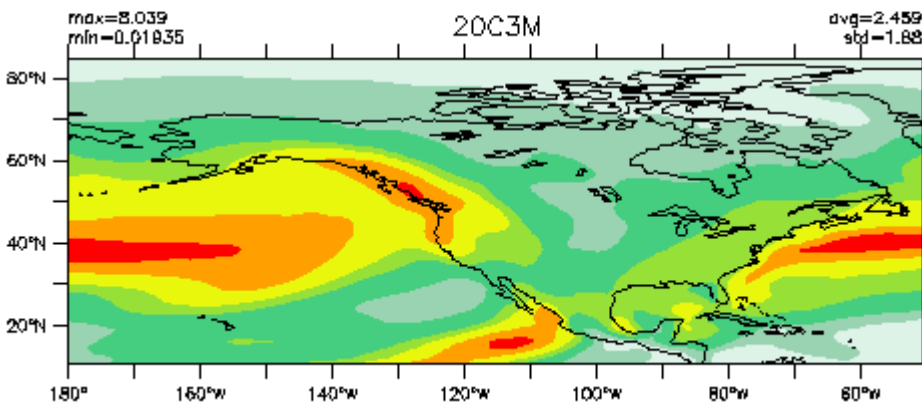
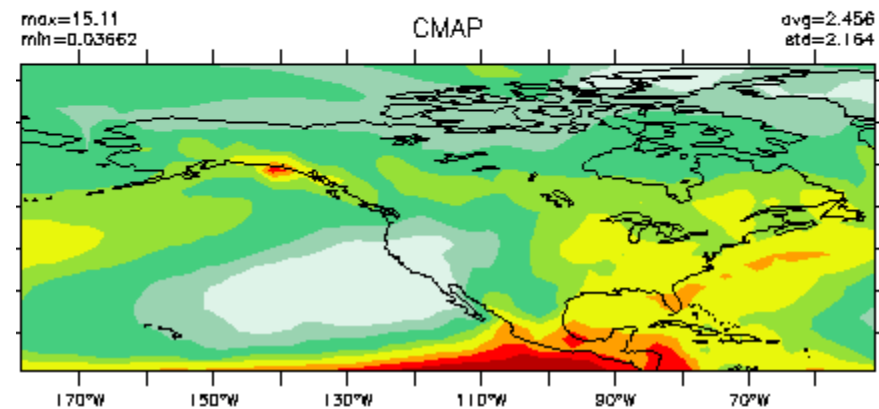


Precipitation validation - CCSM

DJF Precip (mm/day), CCSM3



JJA Precip (mm/day), CCSM3



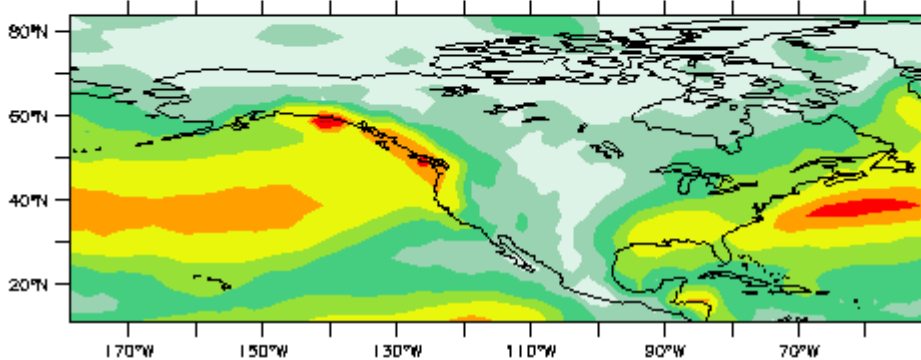
Precipitation validation - GFDL

DJF Precip (mm/day), GFDL-CM2.1

max=10.87
min=0.03045

CMAP

avg=2.178
std=1.652

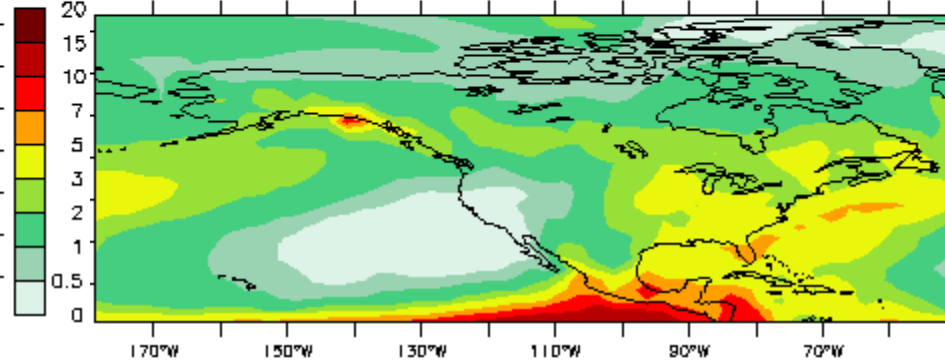


JJA Precip (mm/day), GFDL-CM2.1

max=15.11
min=0.03662

CMAP

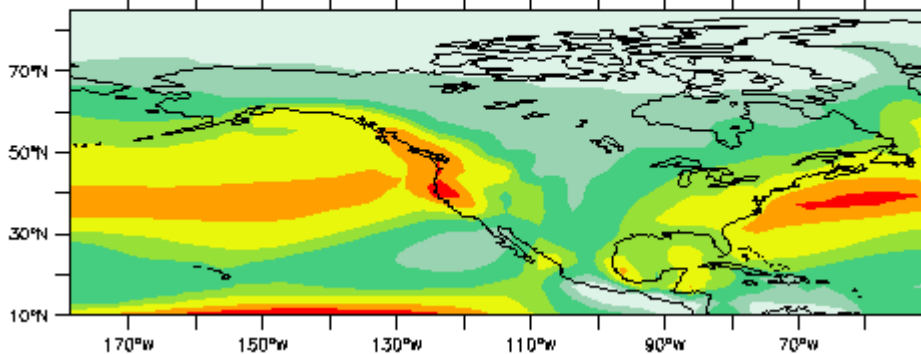
avg=2.456
std=2.164



max=11.86
min=0.01138

20C3M

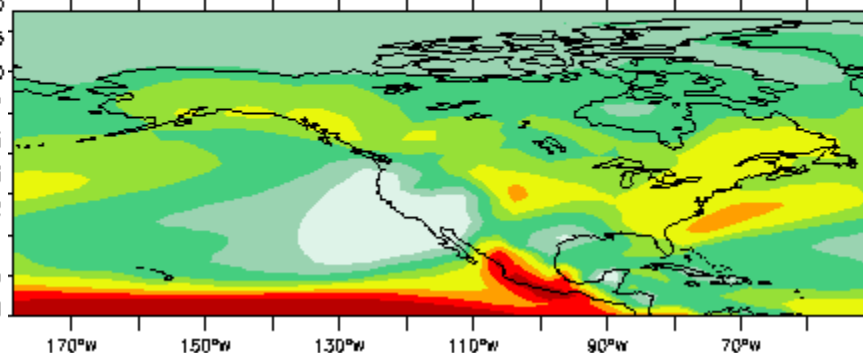
avg=2.465
std=1.796



max=14.62
min=0.03868

20C3M

avg=2.735
std=2.669



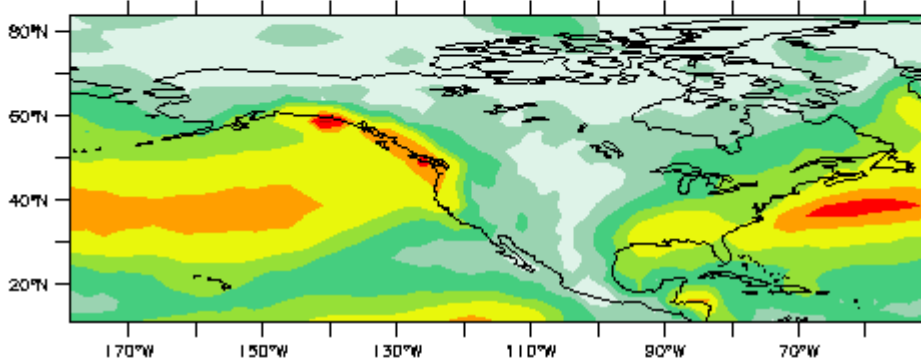
Precipitation validation – HadCM3

DJF Precip (mm/day), UKMO–HadCM3

max=10.87
min=0.03045

CMAP

avg=2.178
std=1.652

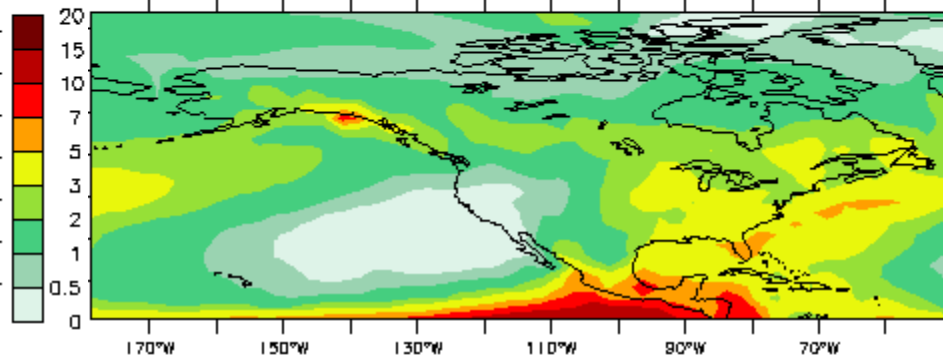


JA Precip (mm/day), UKMO–HadCM3

max=15.11
min=0.03662

CMAP

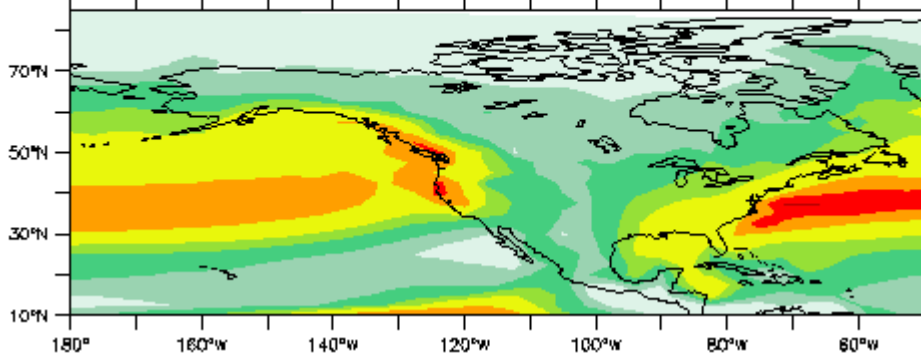
avg=2.456
std=2.164



max=10.15
min=0.02457

20C3M

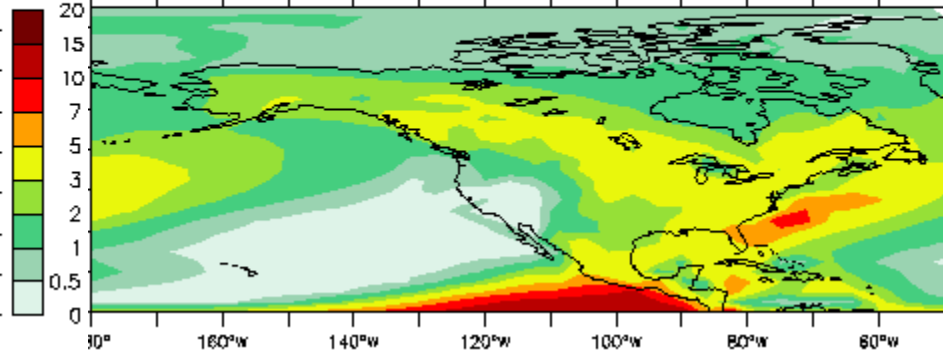
avg=2.285
std=1.971



max=15.81
min=0.007596

20C3M

avg=2.286
std=2.177

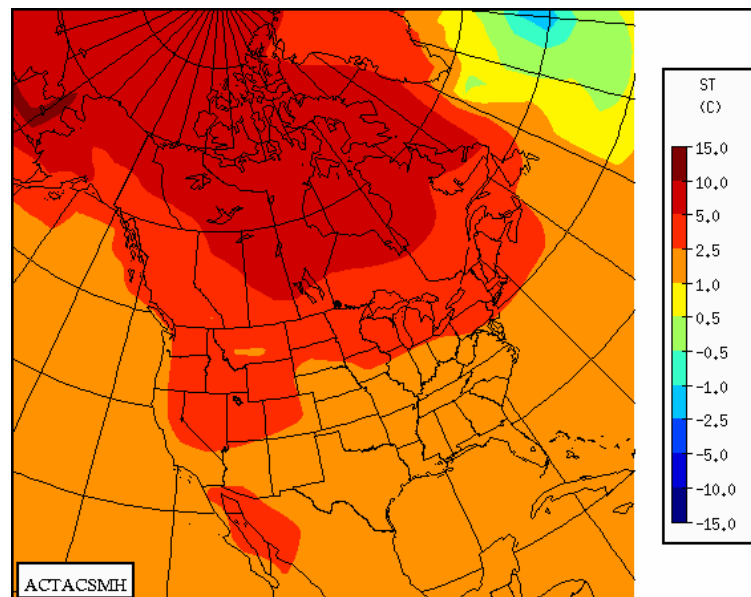
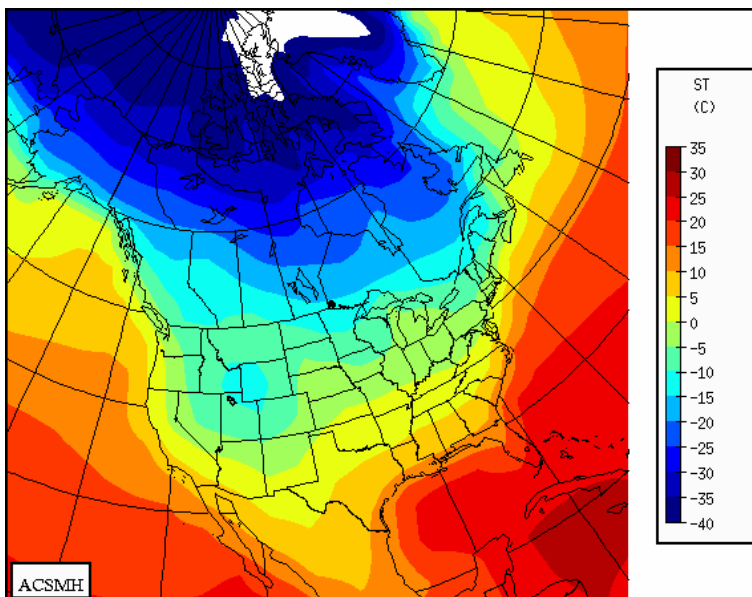


CCM3 winter responses

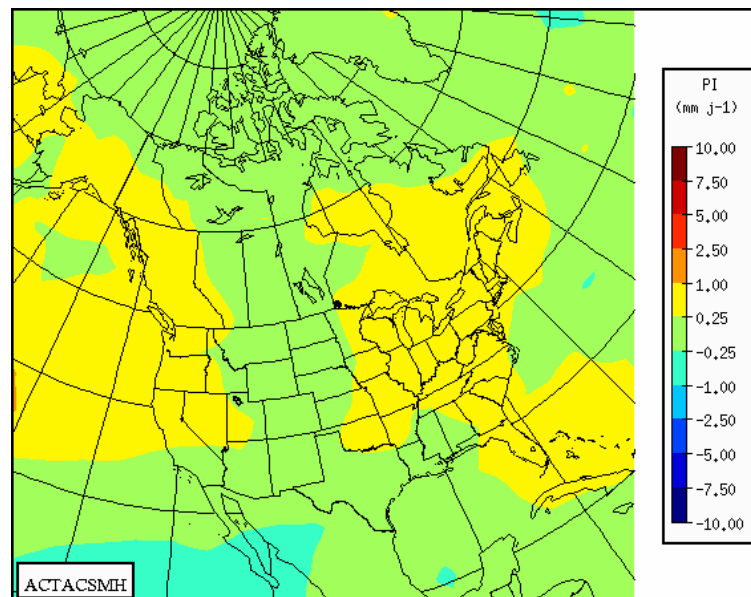
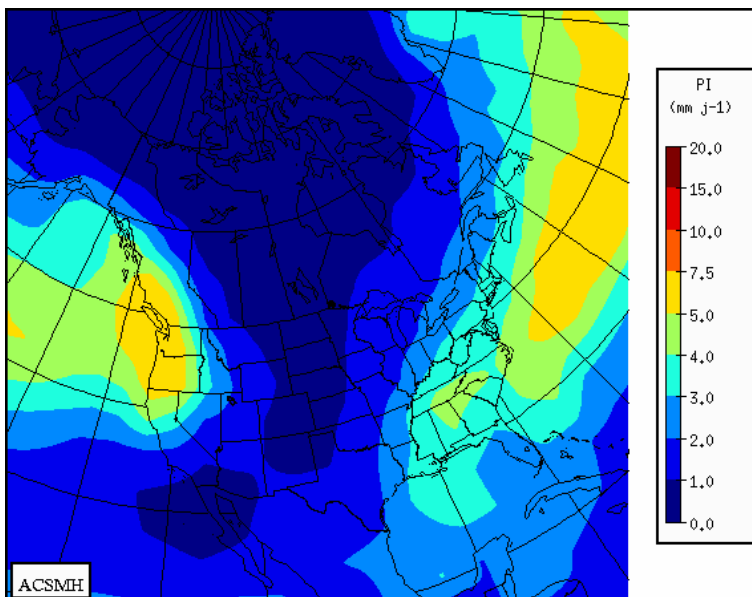
(1961-90)

(2041-70) - (1961-90)

2m T



Precip.

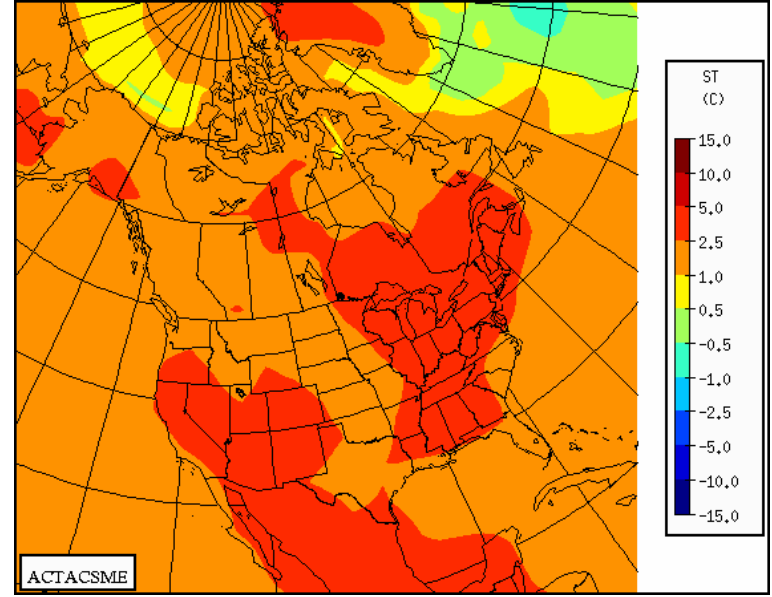
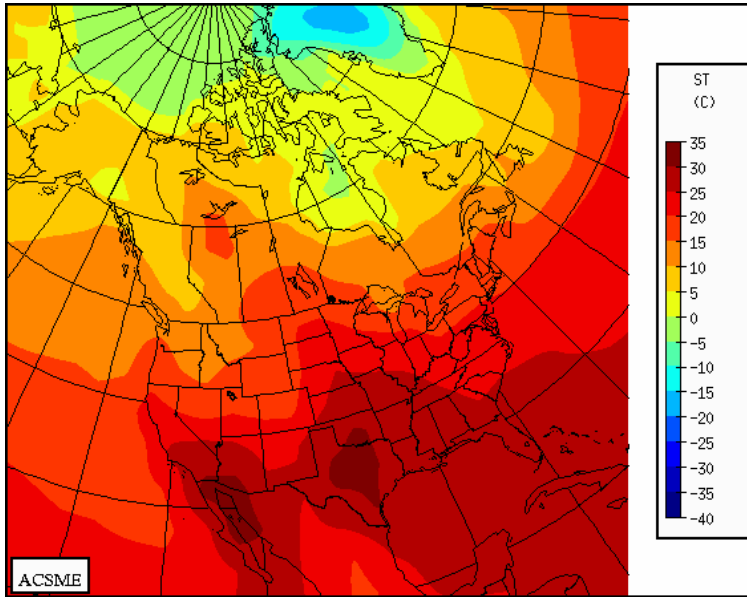


CCM3 summer responses

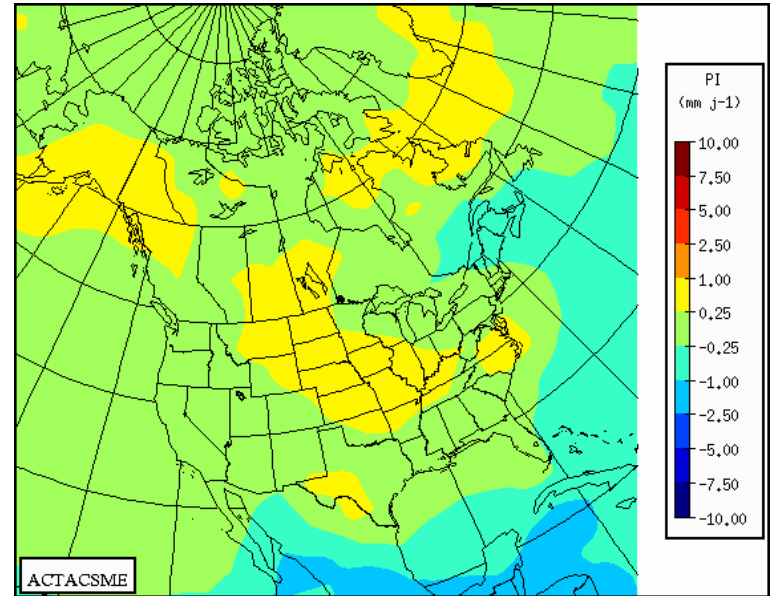
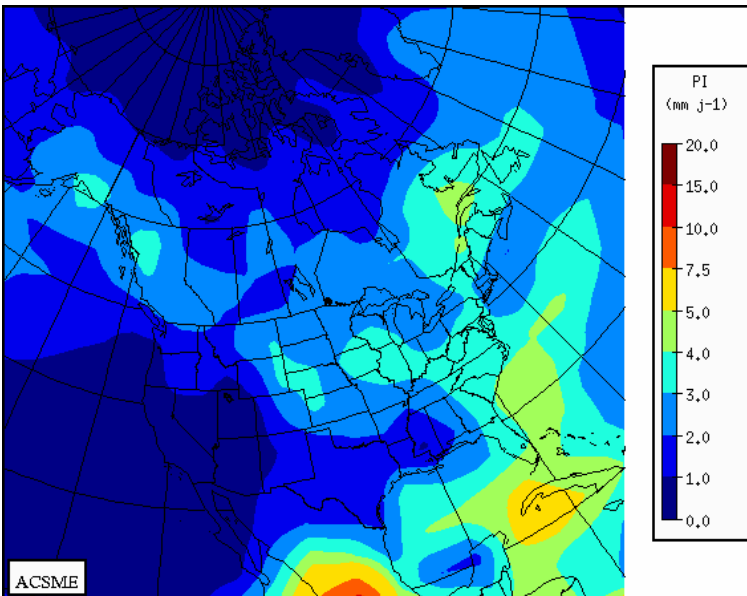
(1961-90)

(2041-70) - (1961-90)

2m T



Precip.

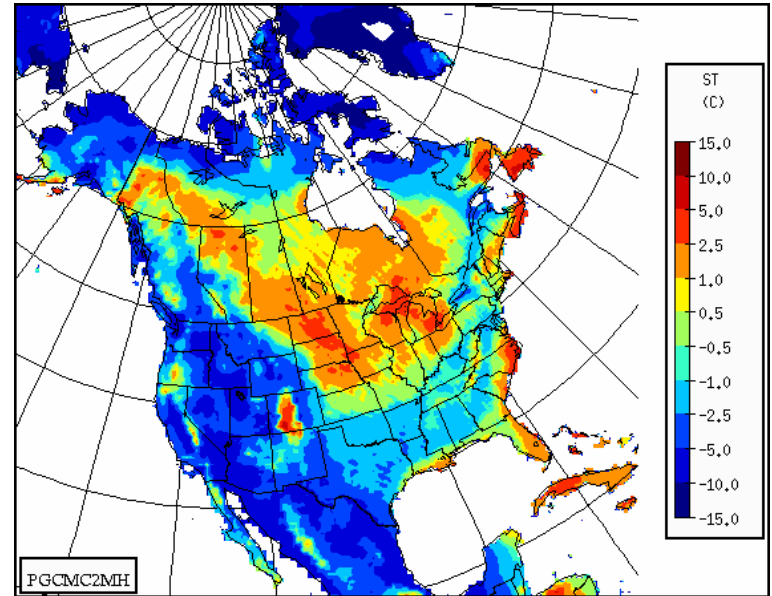
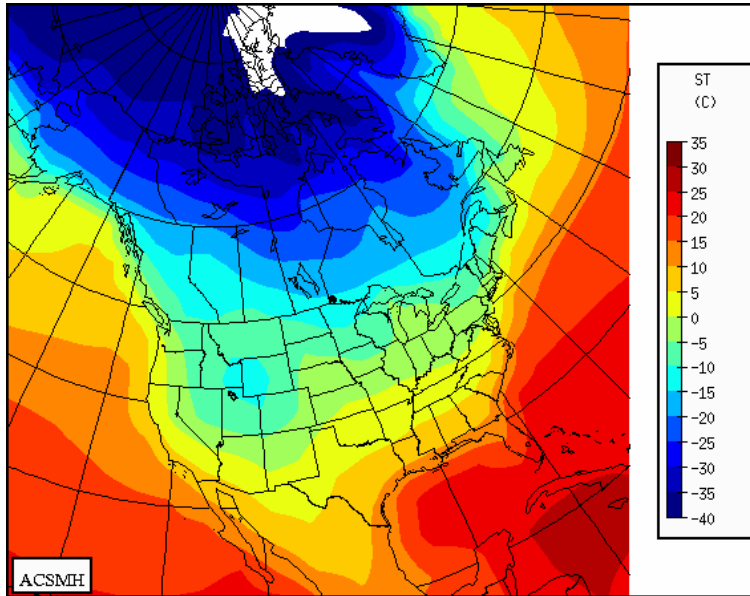


CCCMA winter biases

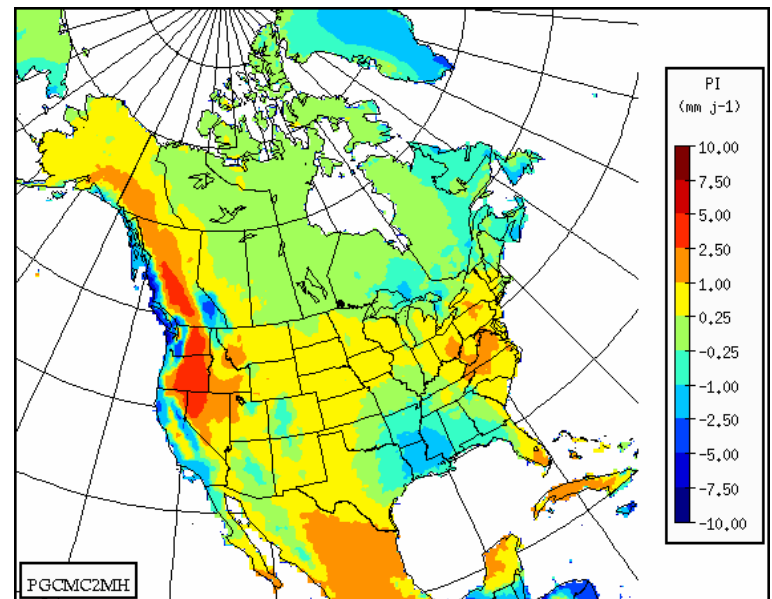
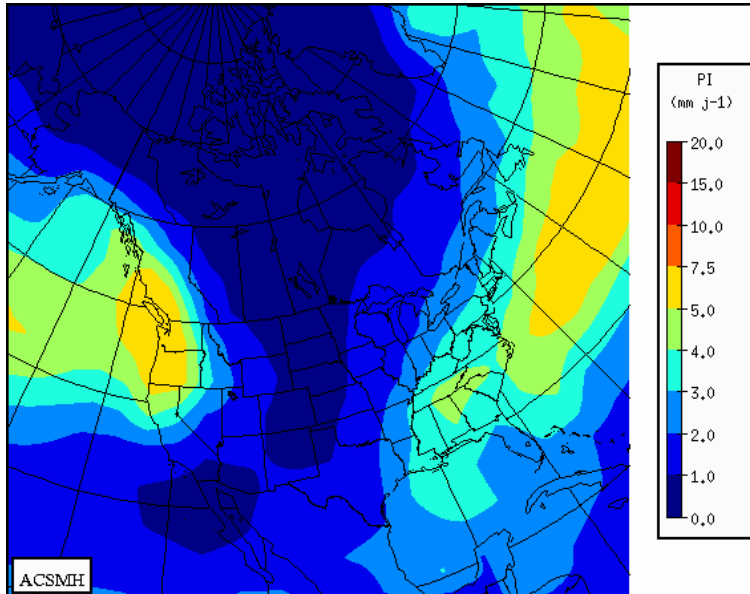
(1961-90)

CGCM3-CRU2

2m T



Precip.

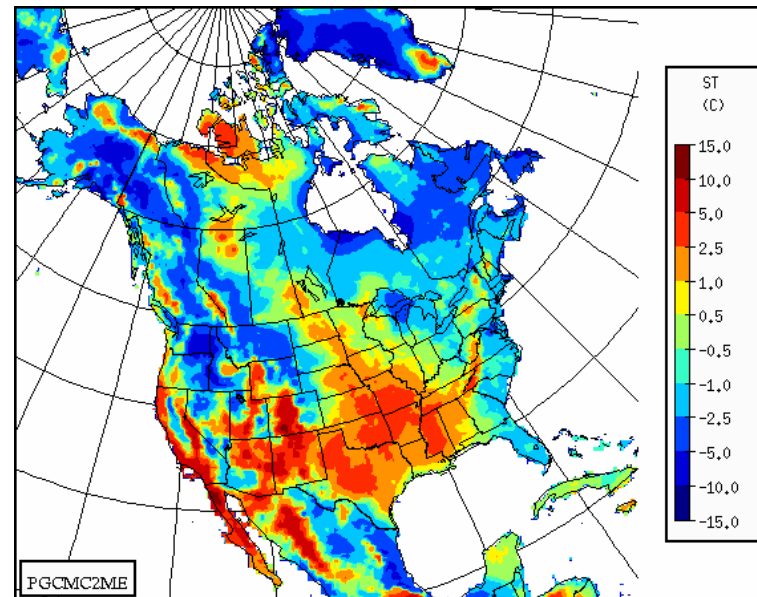
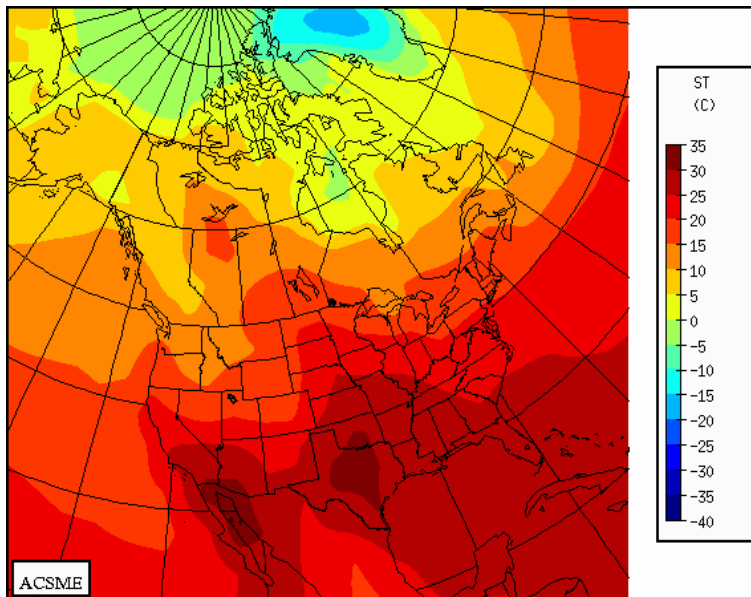


CCCMA summer responses

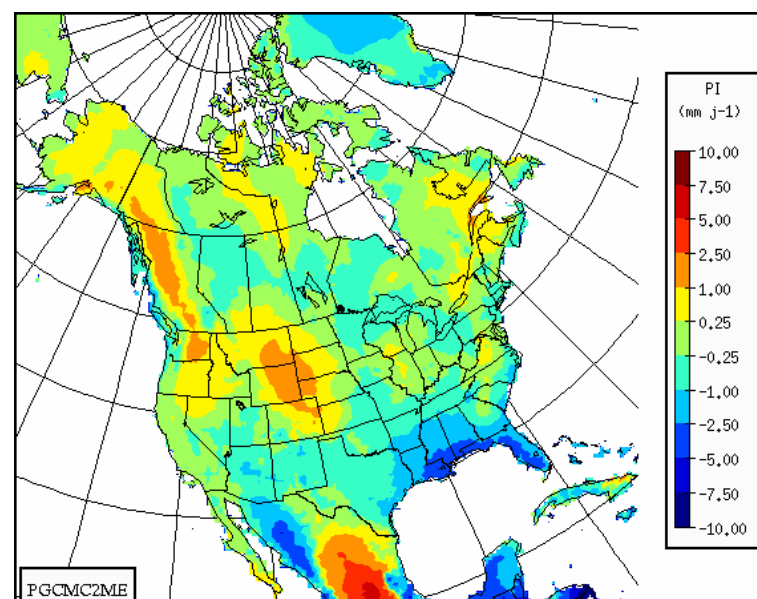
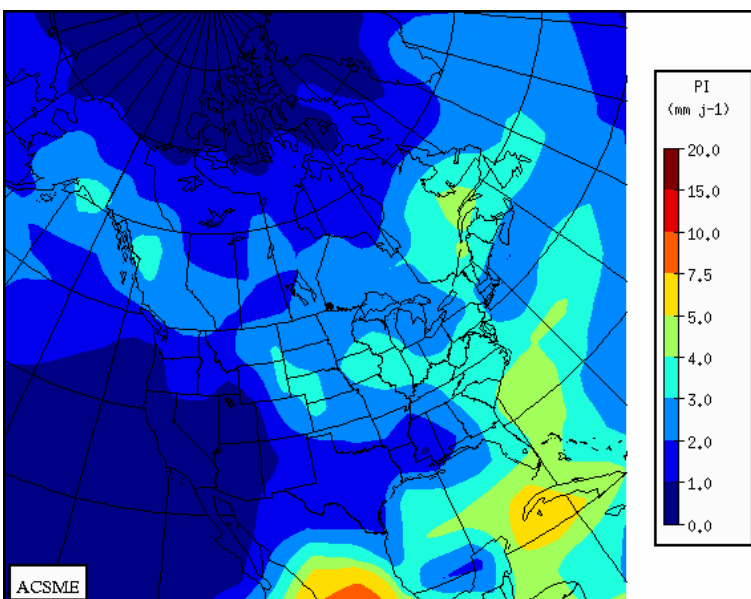
(1961-90)

CGCM3 - CRU2

2m T

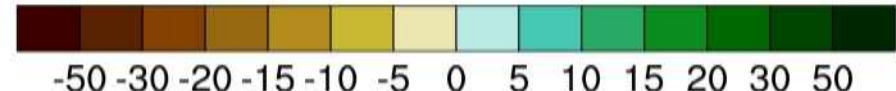
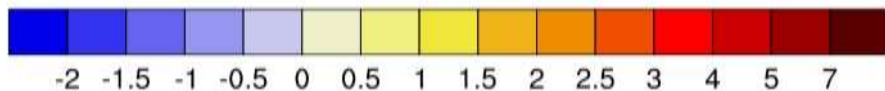
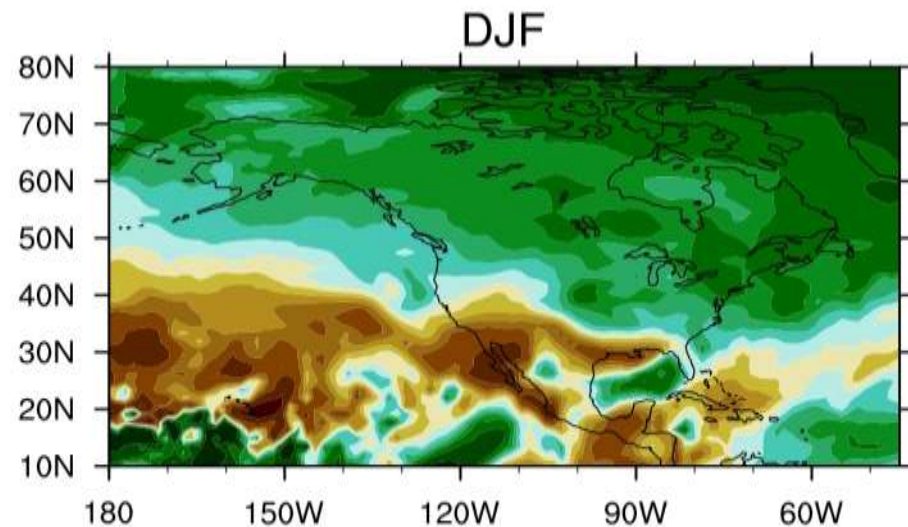
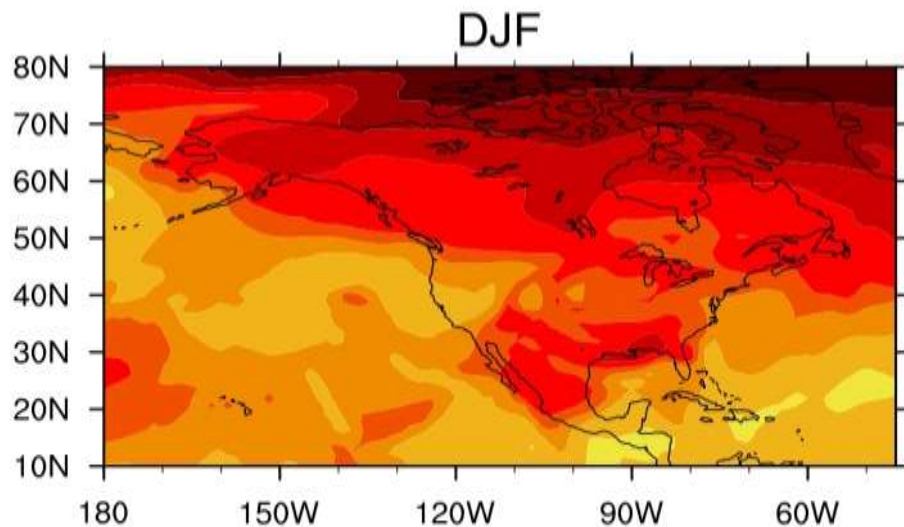
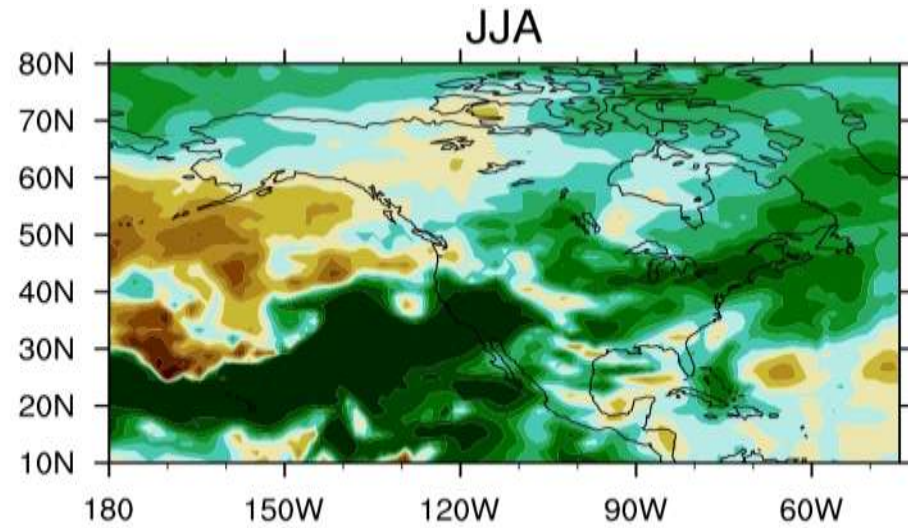
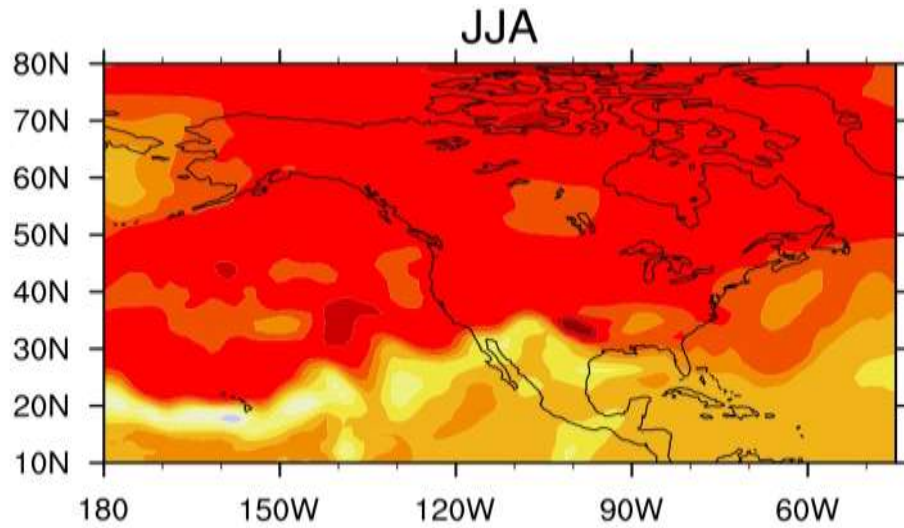


Precip.

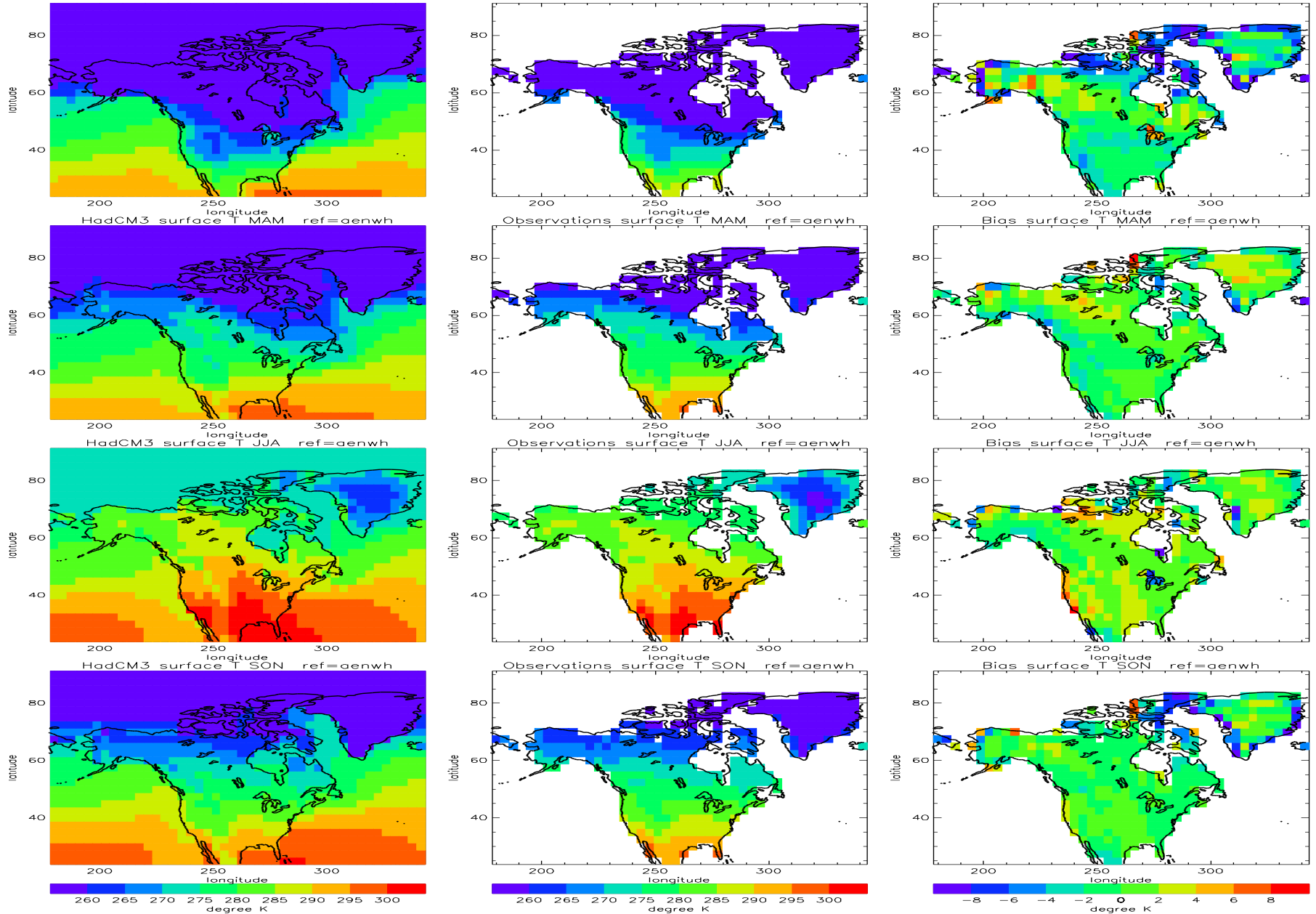


CCSM response summary: 2050s – 1980s

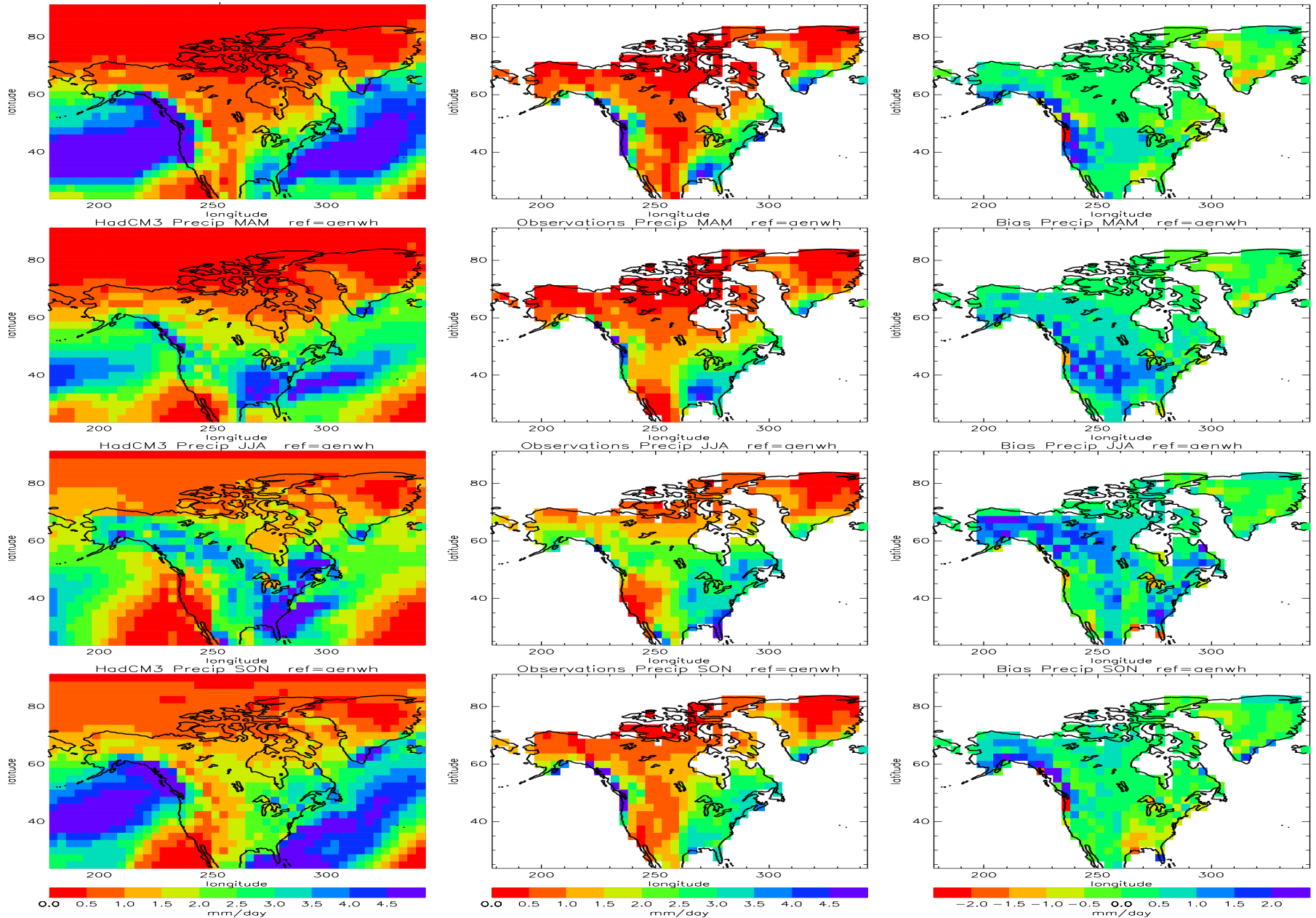
Temperature and precipitation



HadCM3 temperature : model, obs, bias



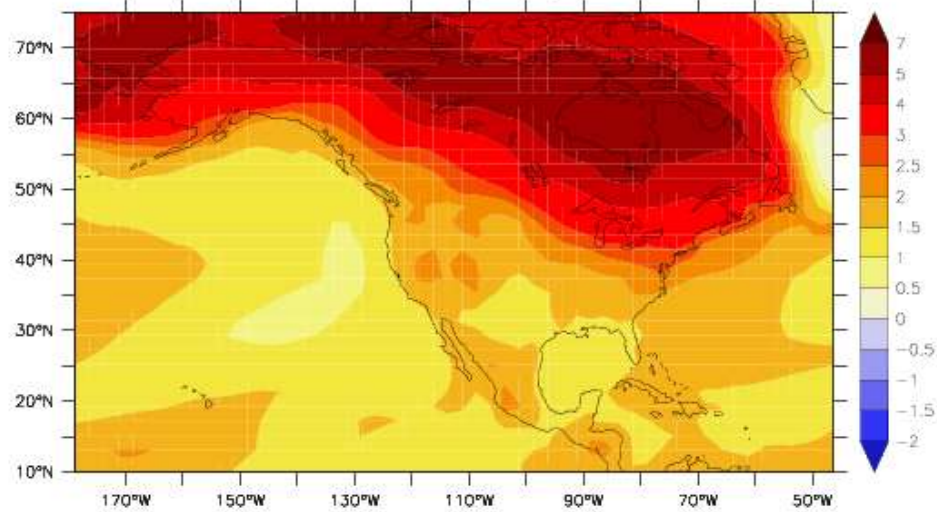
HadCM3 precipitation: model, obs, bias



GFDL model response (low/high resolution) winter and summer surface air temperature

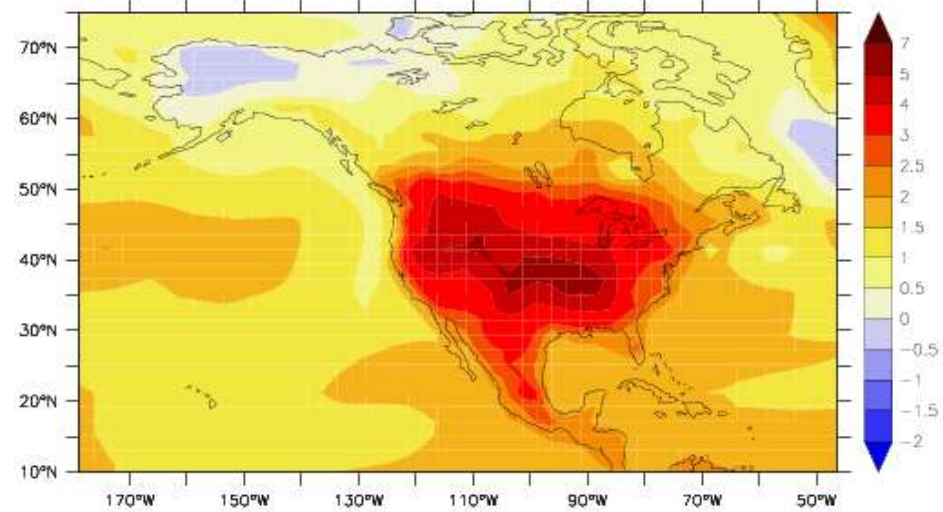
Near Surface Air Temperature, deg C, DJF

CM2.1 (M45)

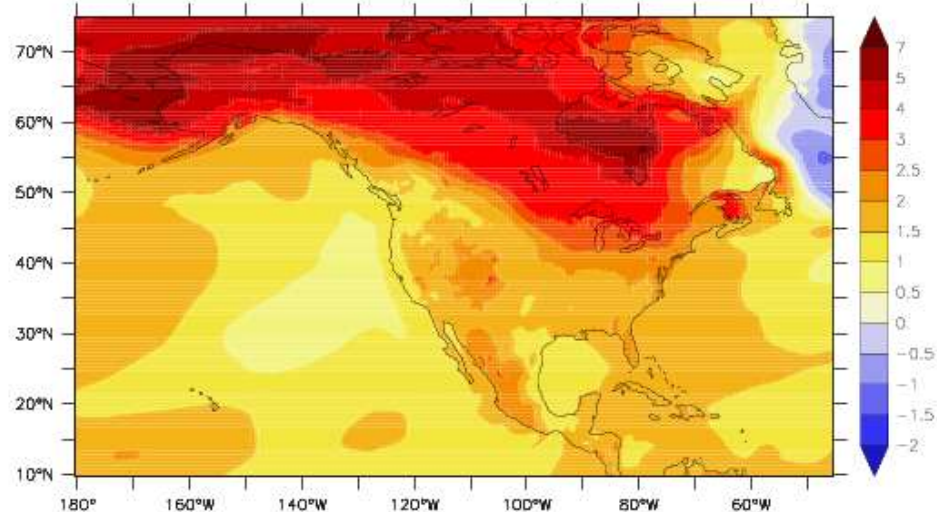


Near Surface Air Temperature, deg C, JJA

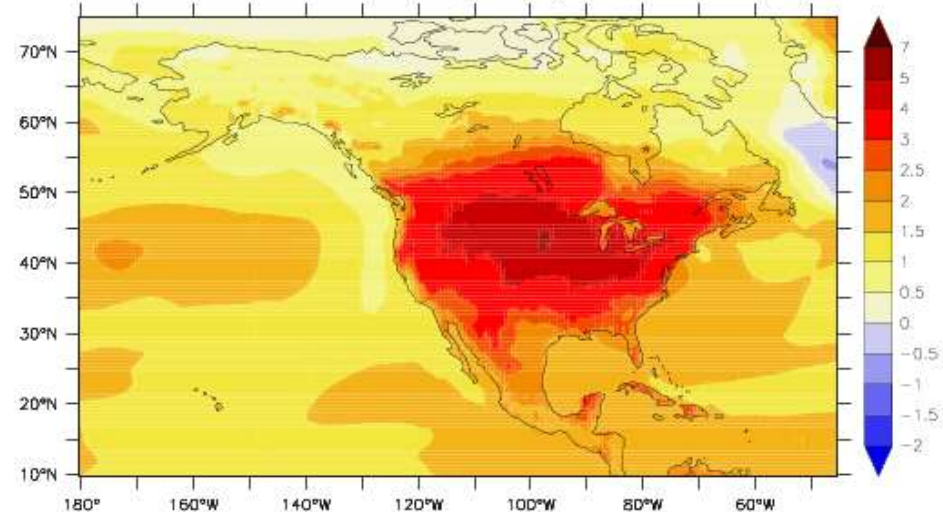
CM2.1 (M45)



AM2.1 (M180)



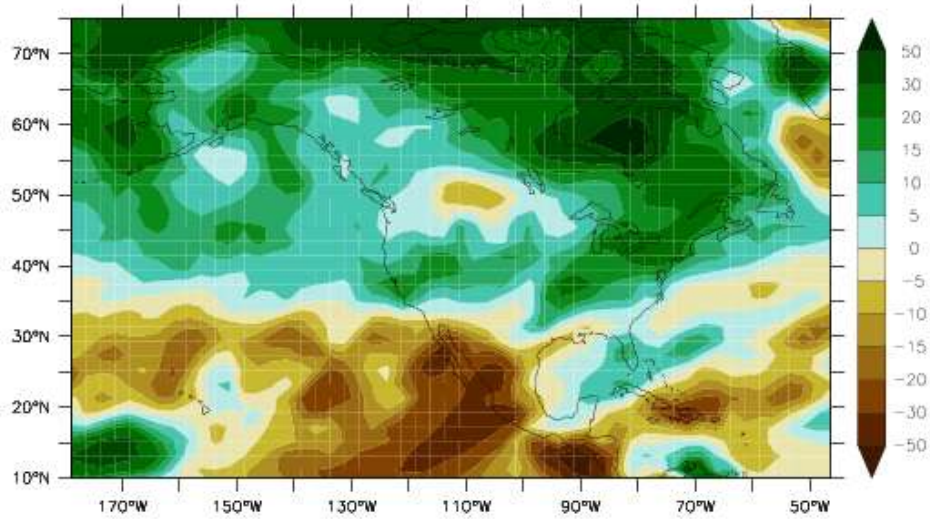
AM2.1 (M180)



GFDL model response (low/high resolution) winter and summer precipitation

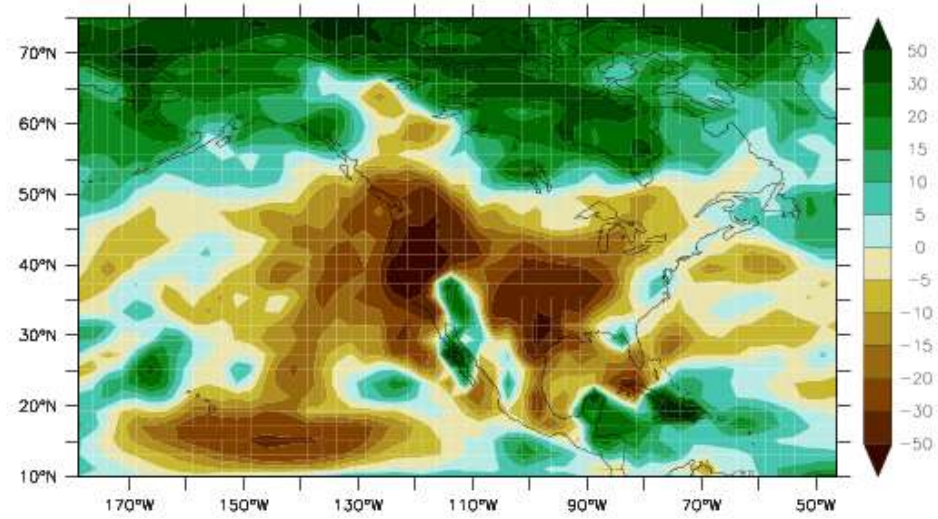
Precipitation Response, percent, DJF

CM2.1 (M45)

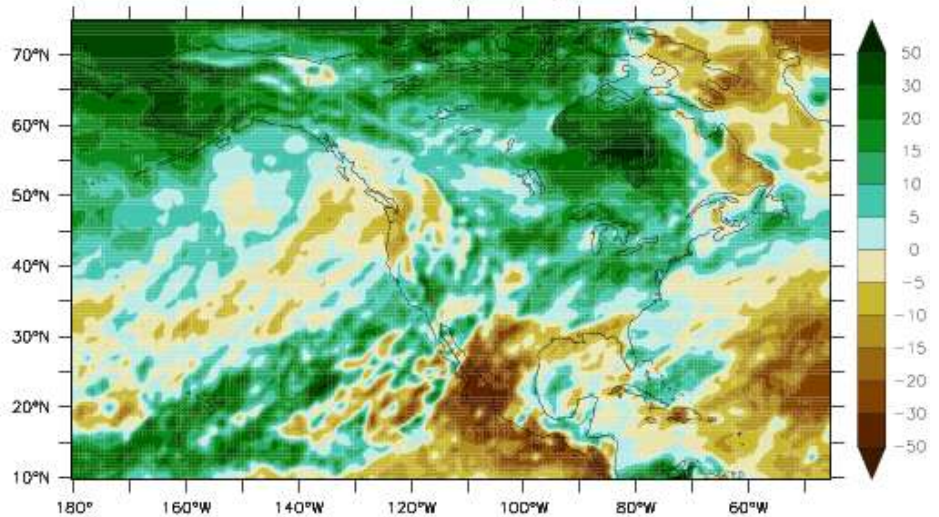


Precipitation Response, percent, JJA

CM2.1 (M45)



AM2.1 (M180)



AM2.1 (M180)

