

NCEP-driven NARCCAP results compared to observations for British Columbia

NARCCAP User's Meeting
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Boulder, Colorado

Trevor Murdock
Program Lead, Regional Climate Impacts

Hailey Eckstrand
Research Assistant

Pacific Climate Impacts Consortium

Outline

- About PCIC
- Hydrological impacts collaborations with Ouranos
- BC maps of NCEP driven runs
 - Winter precipitation
 - Winter temperature
- Conclusions?
 - ... yes please!

Pacific Climate Impacts Consortium

www.PacificClimate.org

- Launched 2005
- Focus on regional climate impacts
- Application of research to management, planning, and decision-making
- Partner with research labs, impacts researchers and regional stakeholders

... Pacific Institute for Climate Solutions
www.pics.uvic.ca → *policy & action*

PCIC Themes & NARCCAP

1. Regional Climate Impacts

Regional impact assessments

Quantification of uncertainty

2. Hydrological Impacts

Streamflow

3. *Ocean Influences*

Storm track

4. *Climate Analysis*

Validation against historical climate

Building Resident Expertise (6) 2008 (11) 2009 (17)

Director's Office (5)

President/CEO
Senior Scientist
Administrator
Administrative Assistant
Writer/Editor

Programming Support (3)

Programmer/Analyst
Programmer/Analyst
Research Assistant

Regional Climate Impacts (3)

Climate Scientist
Downscaling Analyst
GIS Technician

Hydrologic Impacts (5)

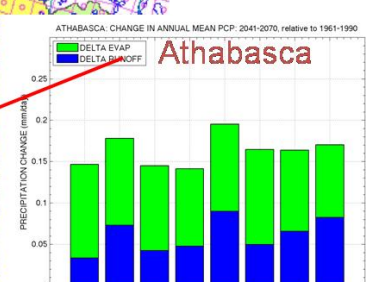
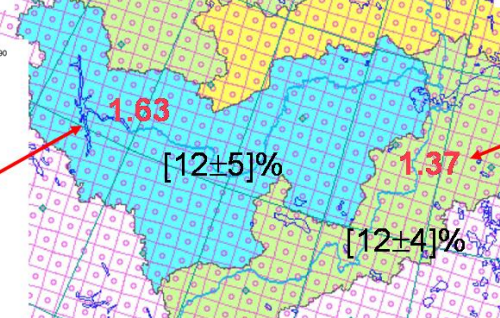
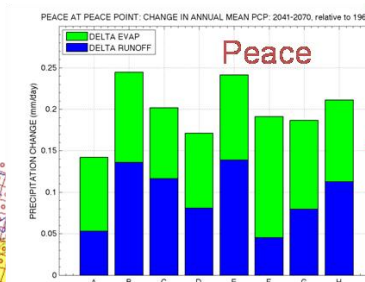
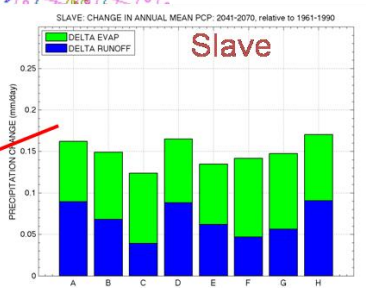
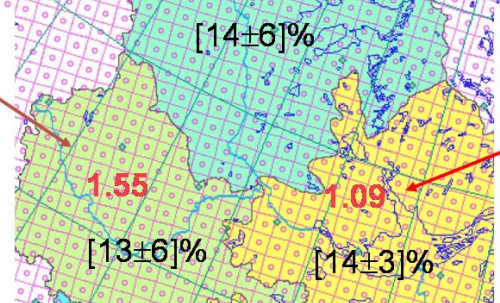
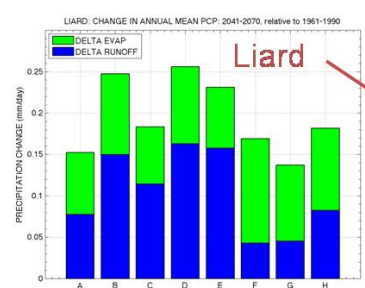
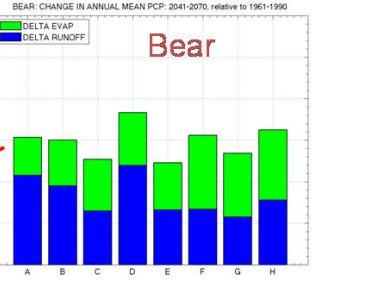
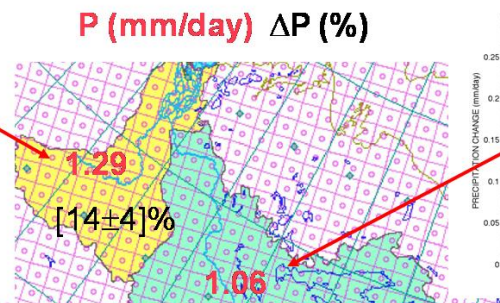
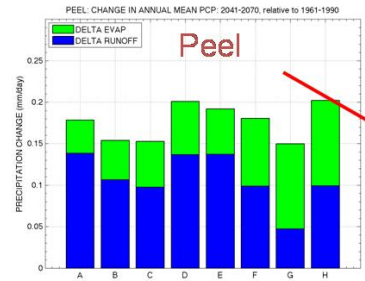
Hydrologist
Hydrologist
Hydrologist
GIS Research Assistant
RCM Diagnostics Analyst

Climate Analysis (1)

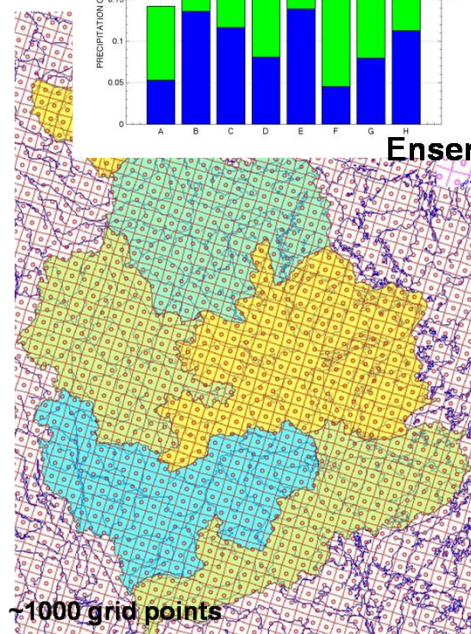
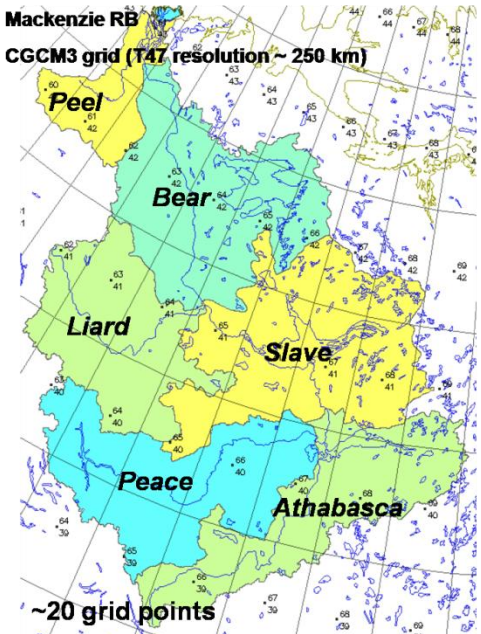
Climatologist

Ocean Influences (0)

Daniel Caya
 Biljana Music
 Marco Braun
 Anne Frigon
 Laxmi Sushama



Ensemble of 8 CRCM simulations



GIS “Automation tool”

Designed to create maps for regional impacts assessments:

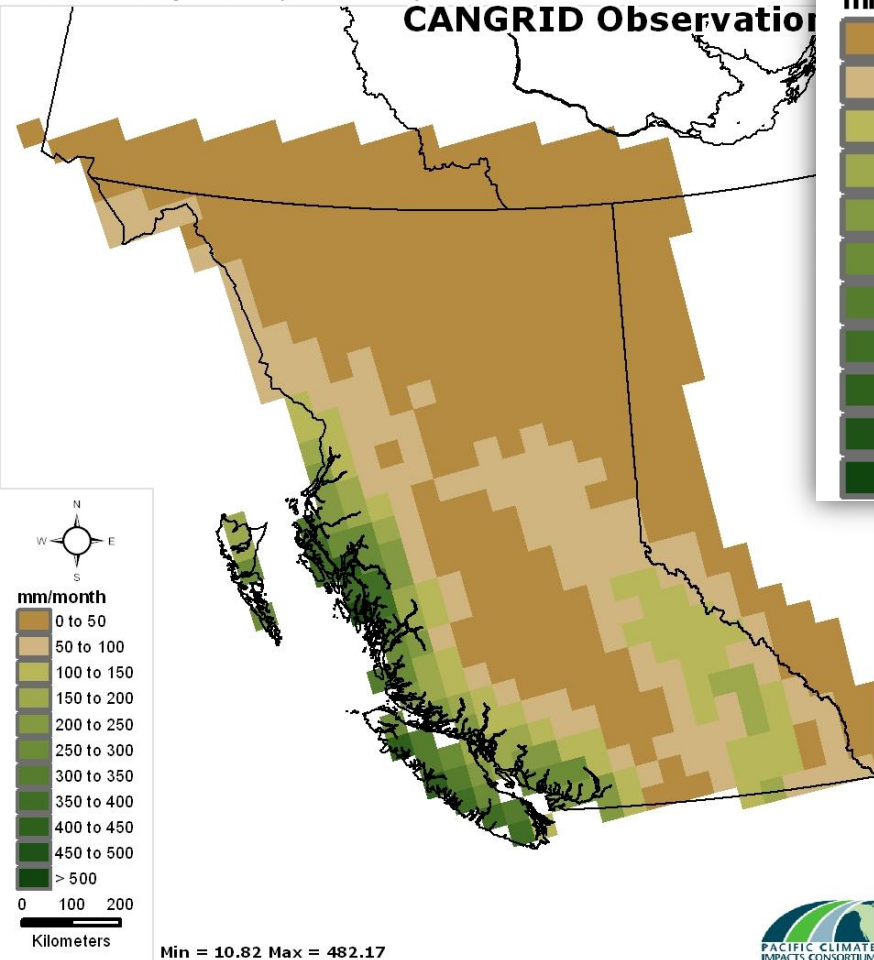
- historical climatology
- historical variability PDO/ENSO/AO, etc.
- historical trends (30, 50, 100-yr)
- future projections:
 - GCMs
 - Delta-method downscaling (draping GCM anomalies over PRISM)
 - RCMs
 - ESCM
- Over North America and custom regions (primarily within BC)

1980-1999 Winter Precipitation Observations CANGRID & NCEP

CANGRID: IDW station observations 50 km resolution:
Zhang, X., Vincent, L.A., Hogg, W.D. and Niitsoo, A., 2000.
Atmosphere-Ocean 38(3)

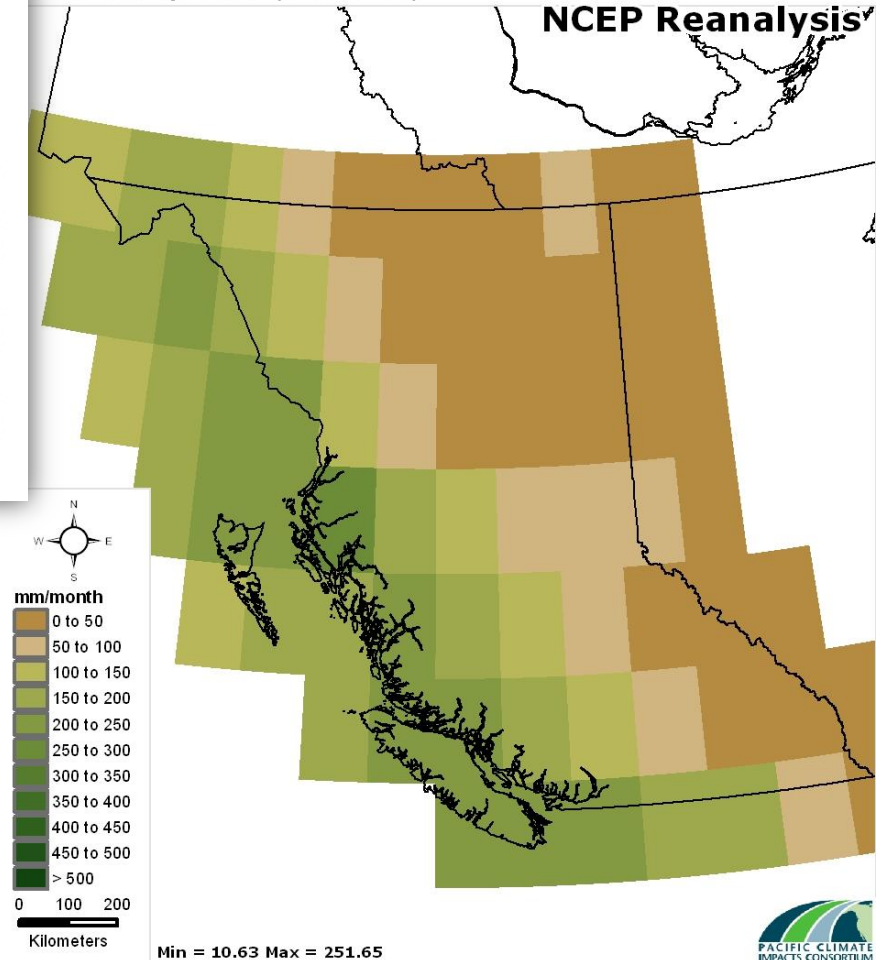
Winter Precipitation (1980-1999)

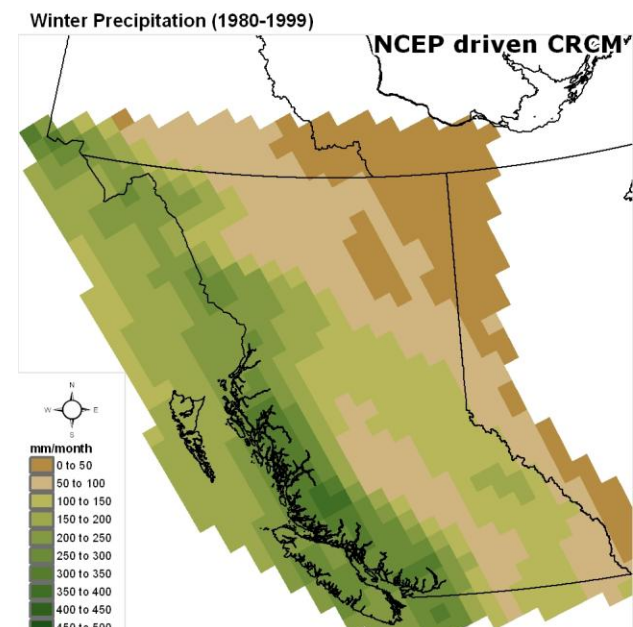
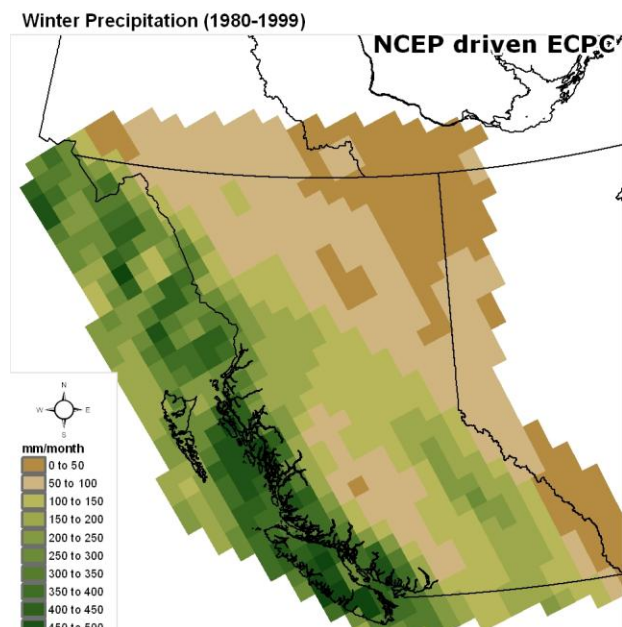
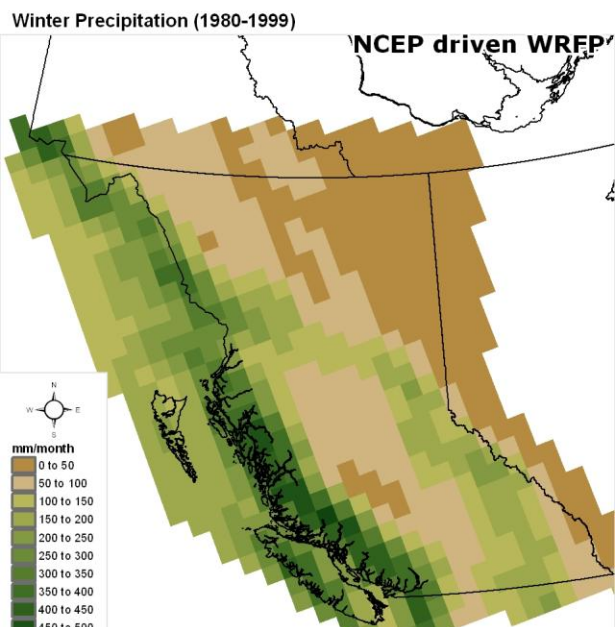
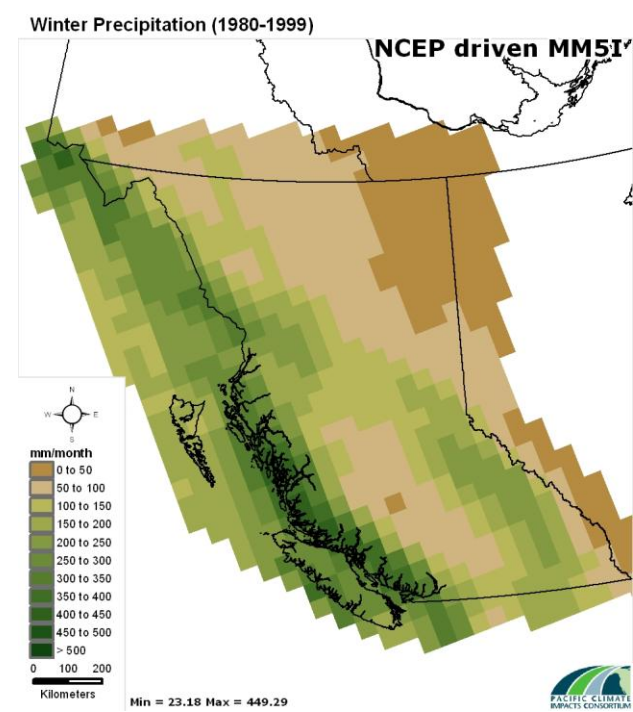
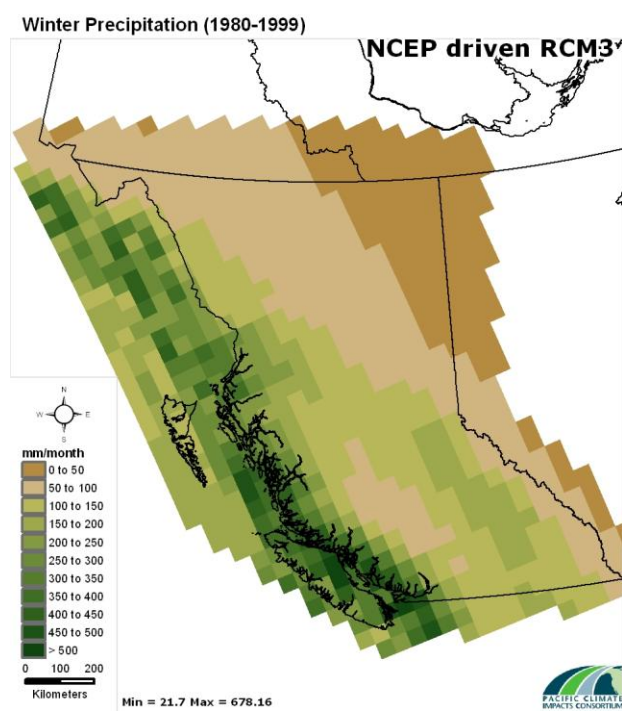
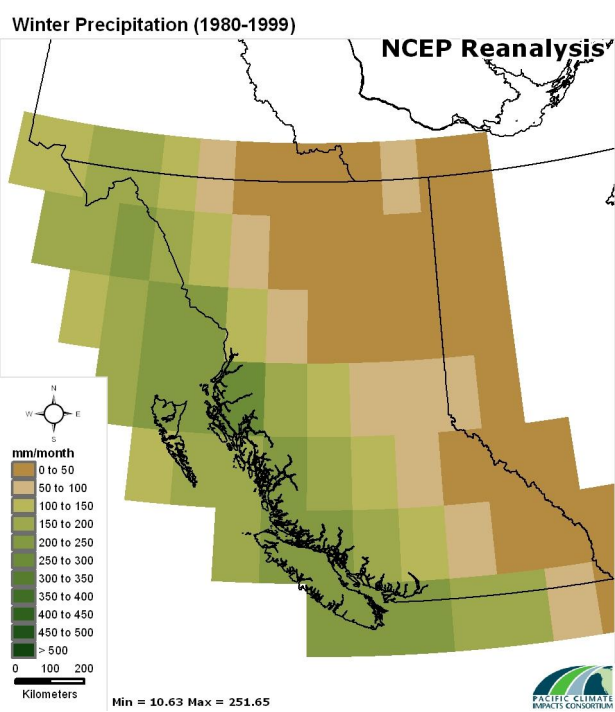
CANGRID Observation



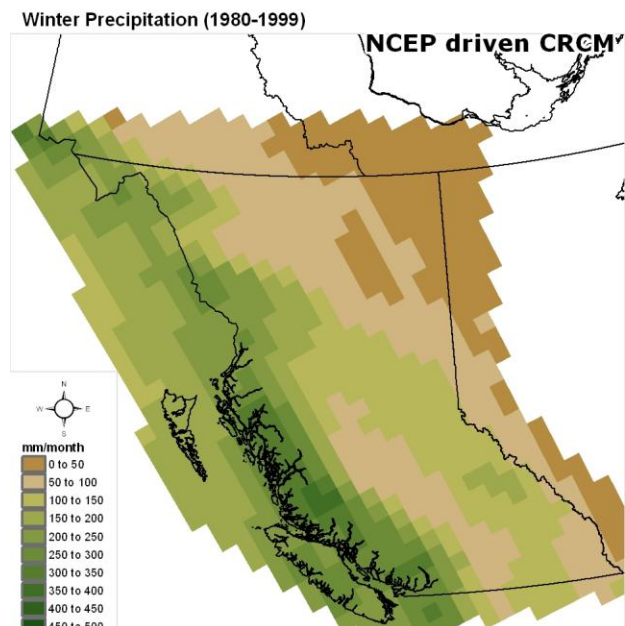
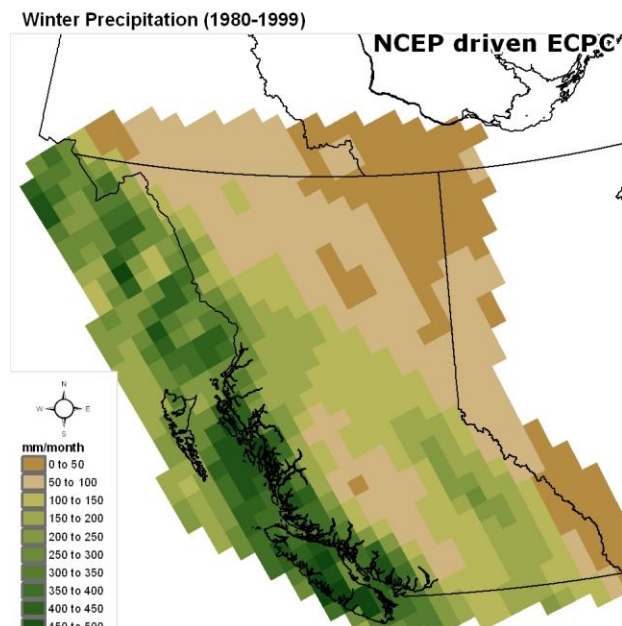
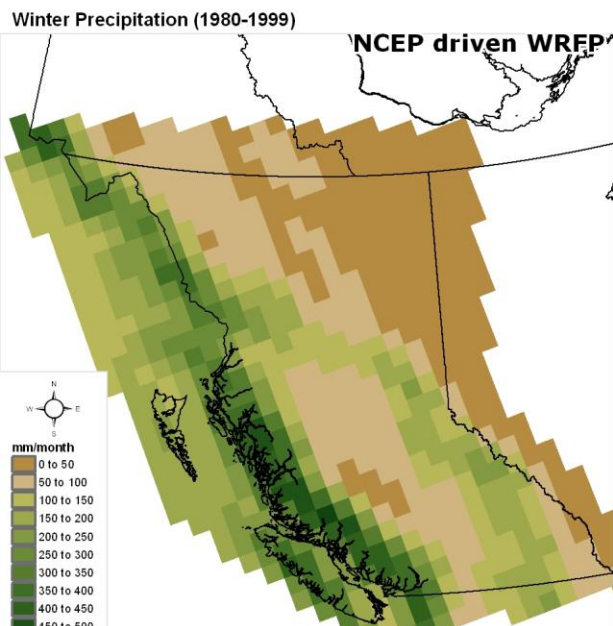
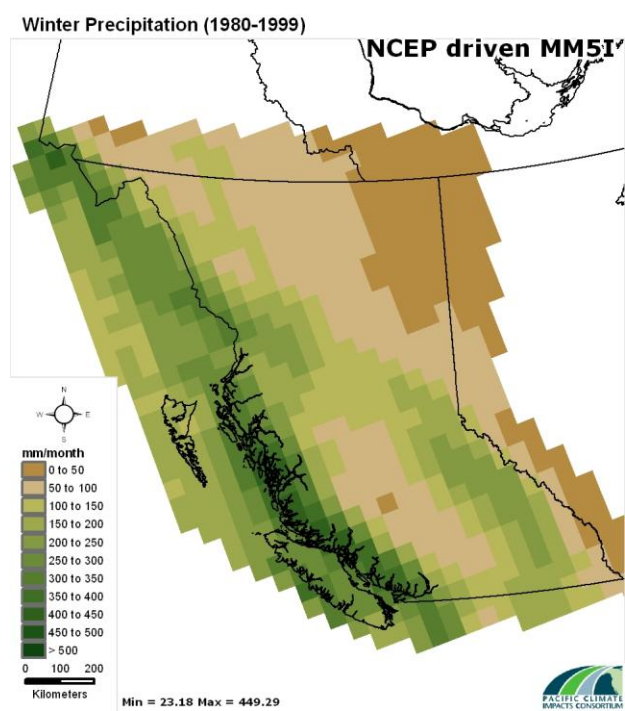
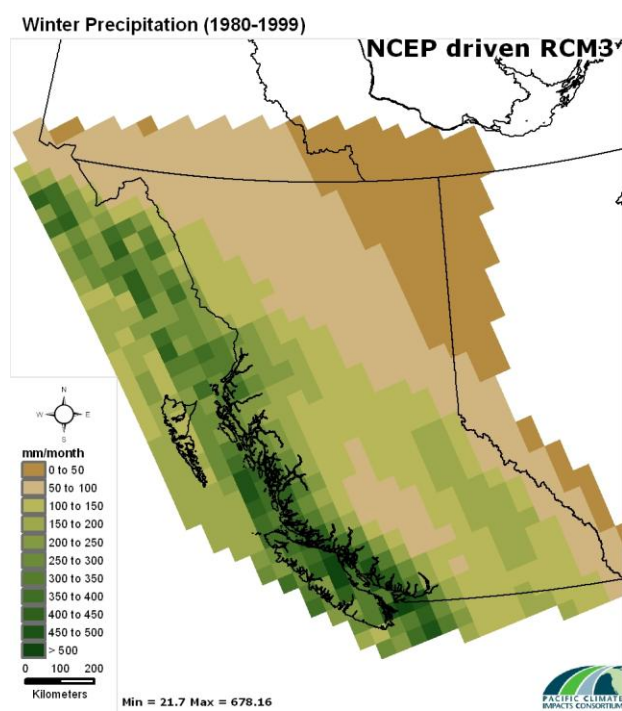
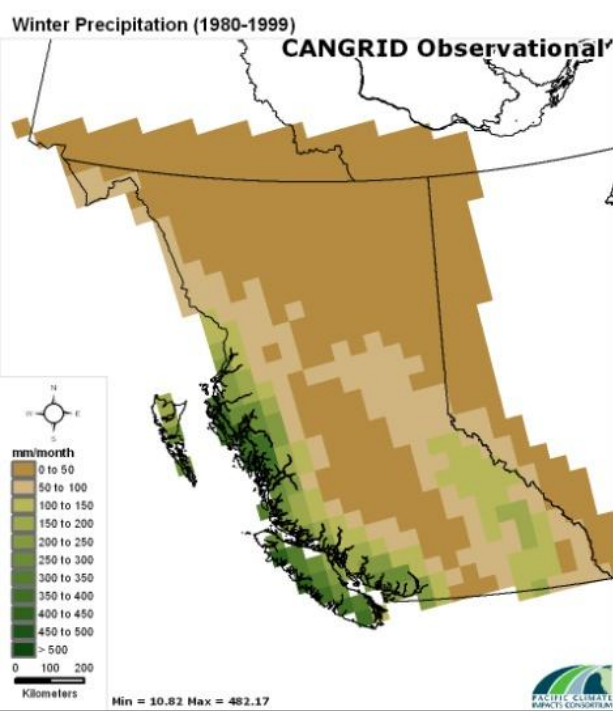
Winter Precipitation (1980-1999)

NCEP Reanalysis

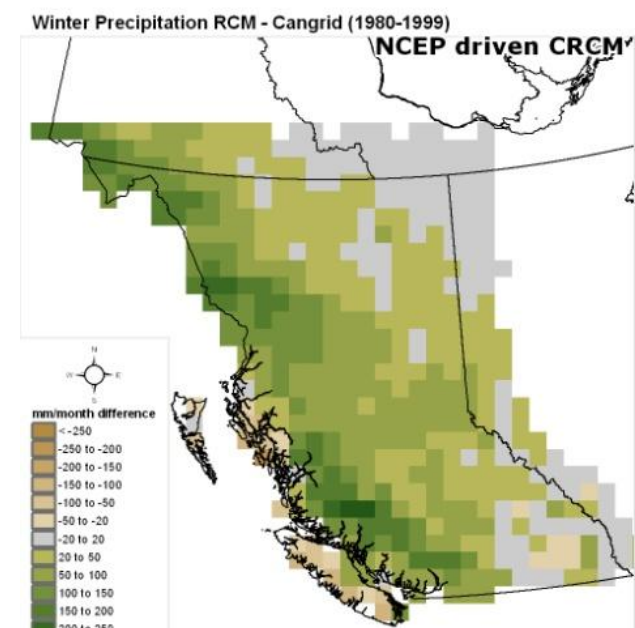
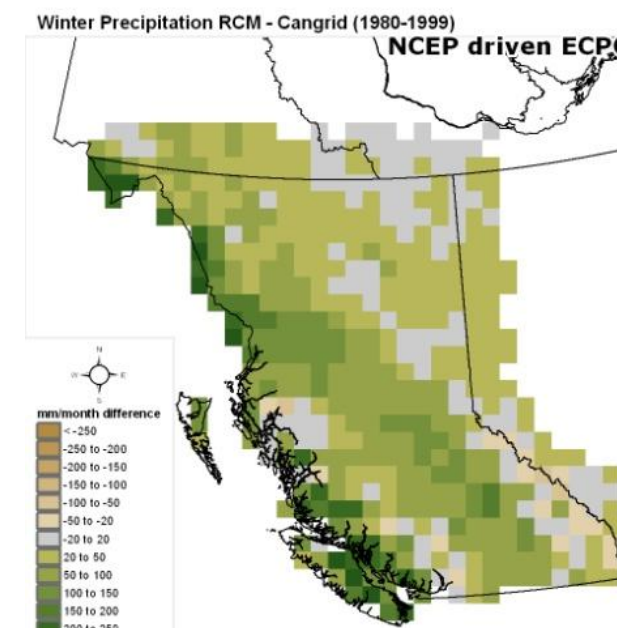
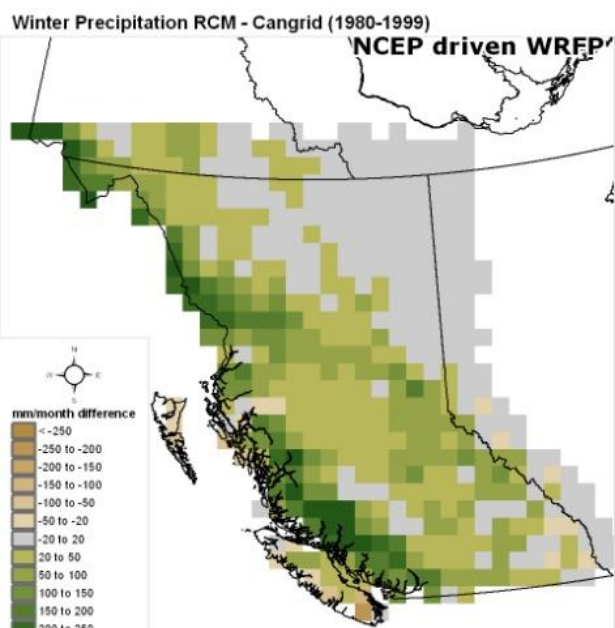
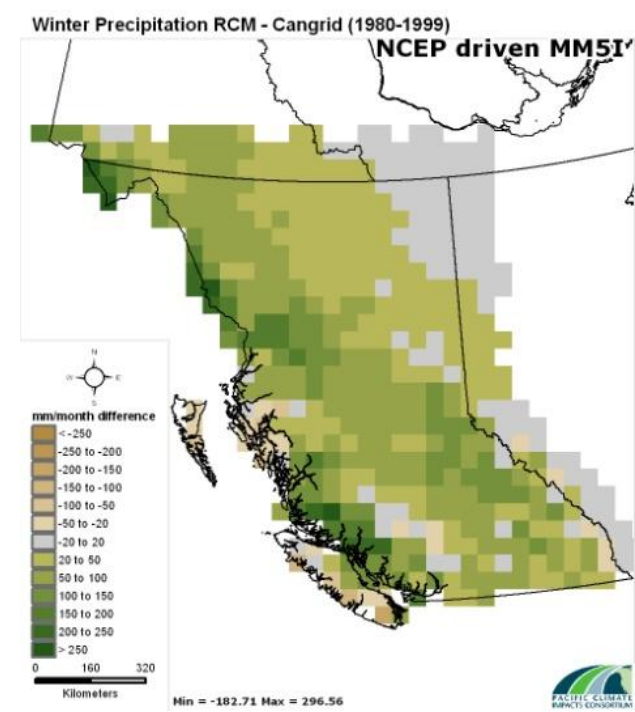
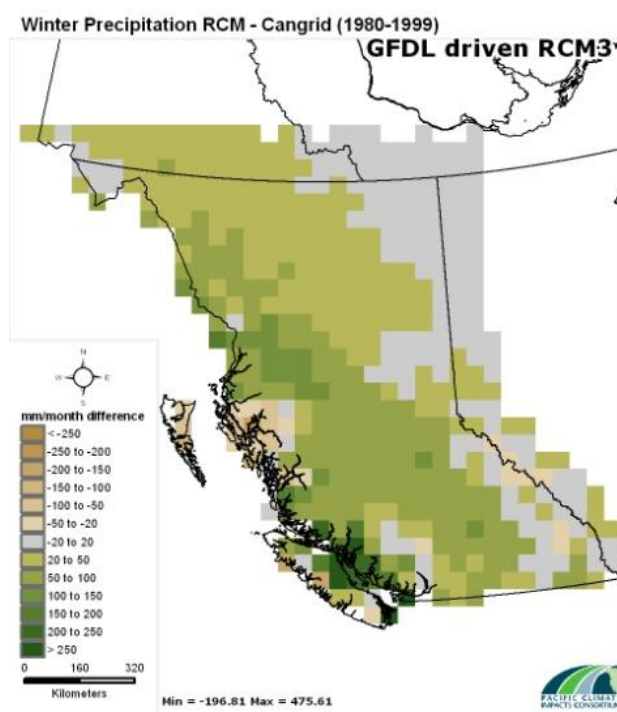
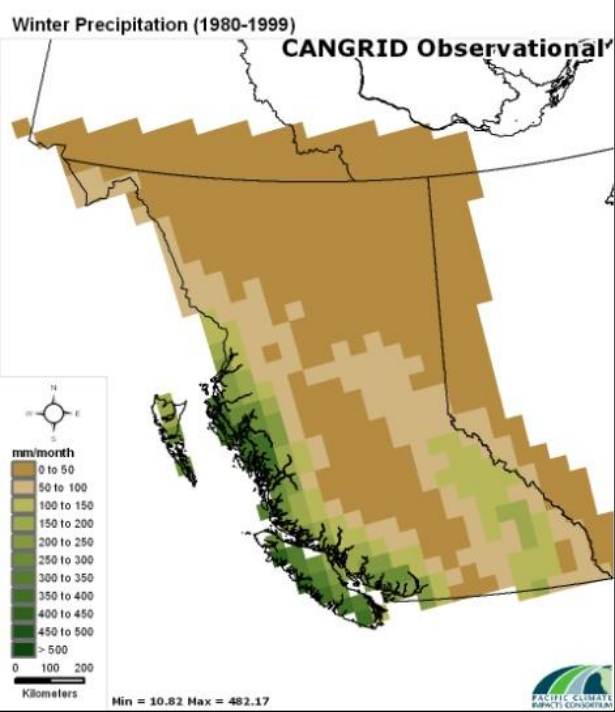




1980-1999 Winter Precipitation Observations NCEP & NCEP driven RCMS

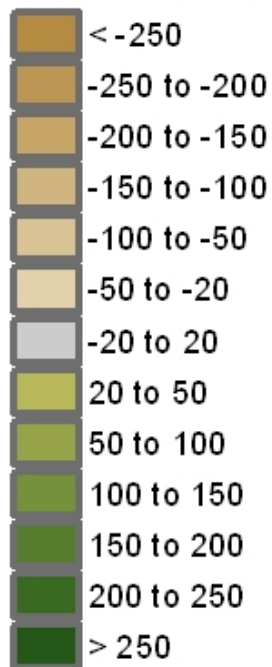


1980-1999 Winter Precipitation Observations CANGRID & NCEP driven RCMS

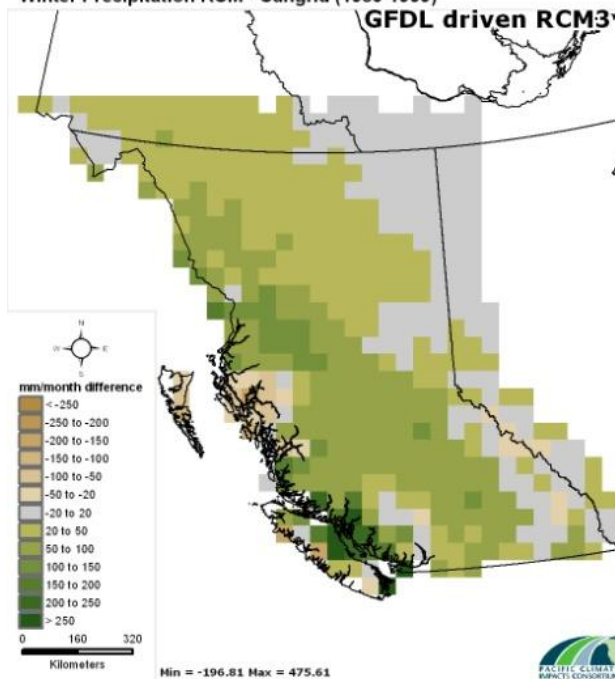


1980-1999 difference: Annual Precipitation NCEP driven RCMs from CANGRID

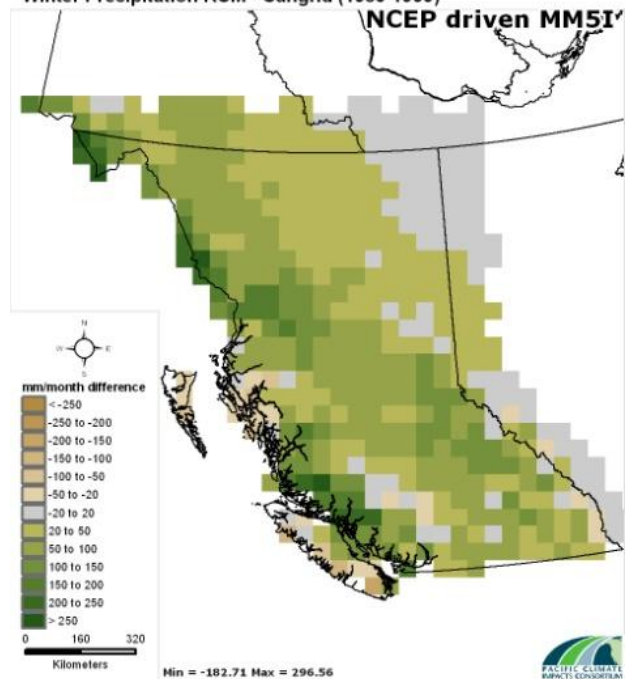
mm/month difference



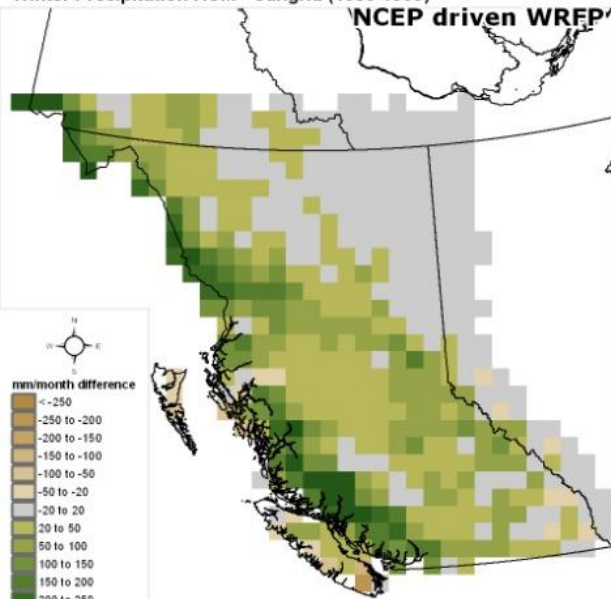
Winter Precipitation RCM - Cangrid (1980-1999)



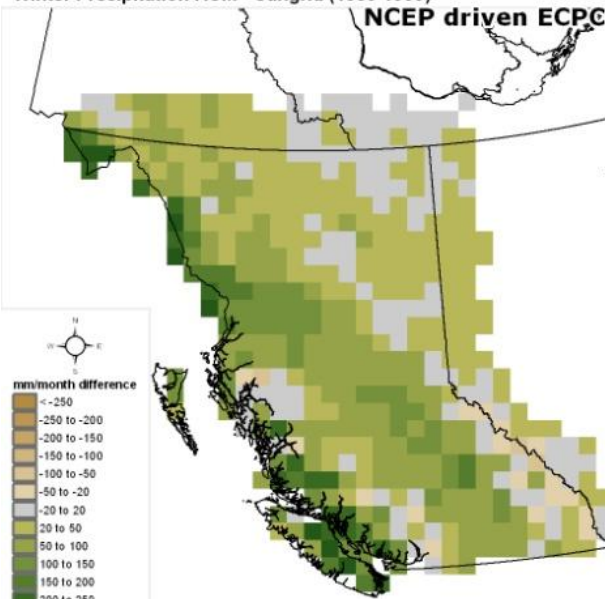
Winter Precipitation RCM - Cangrid (1980-1999)



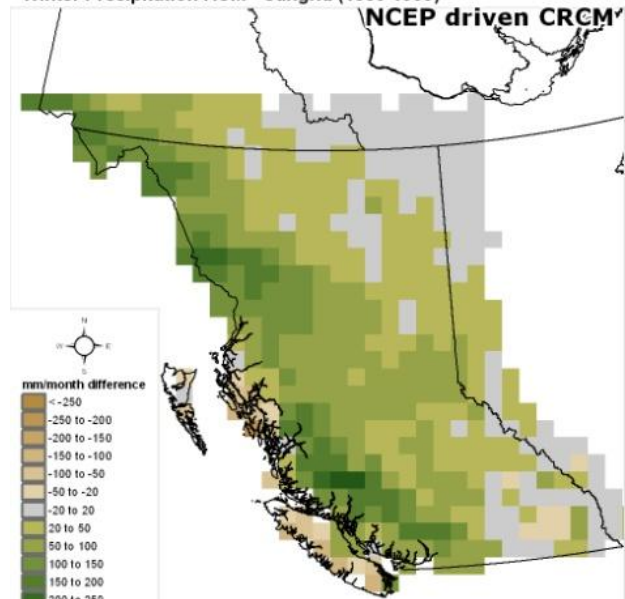
Winter Precipitation RCM - Cangrid (1980-1999)



Winter Precipitation RCM - Cangrid (1980-1999)

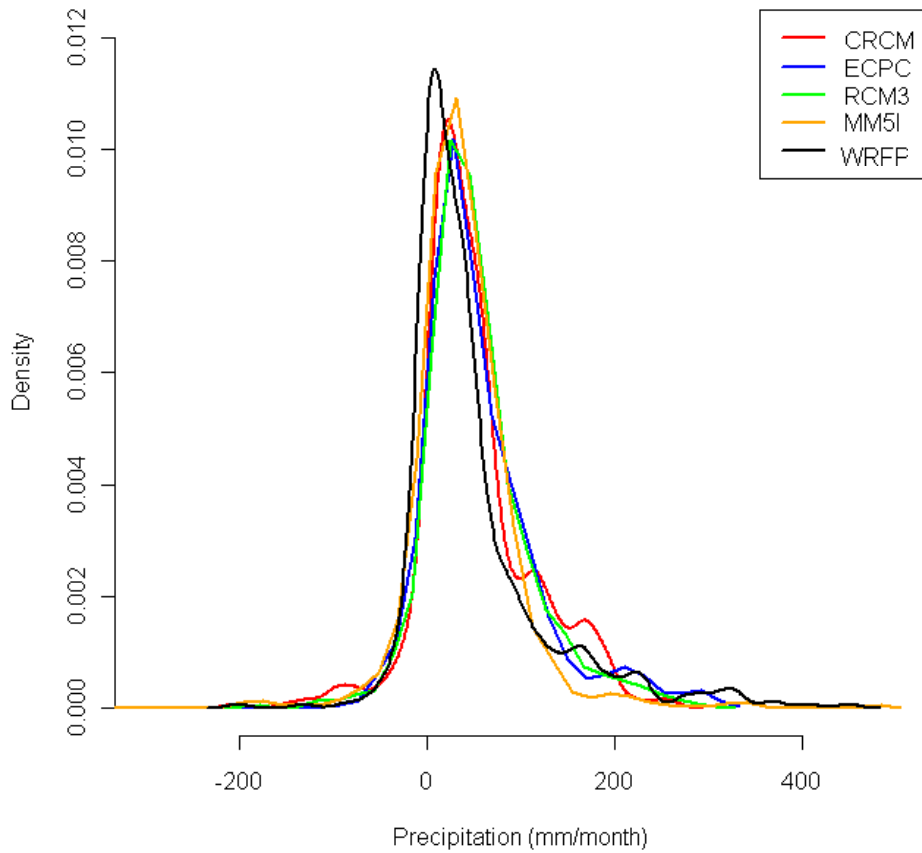


Winter Precipitation RCM - Cangrid (1980-1999)

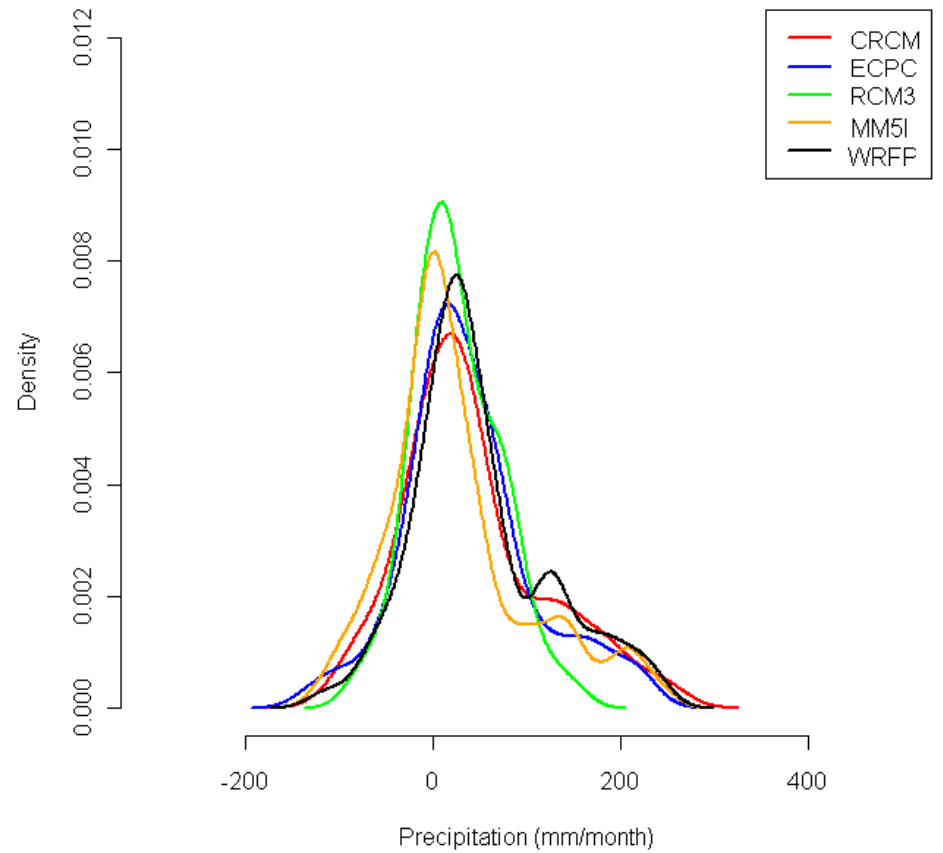


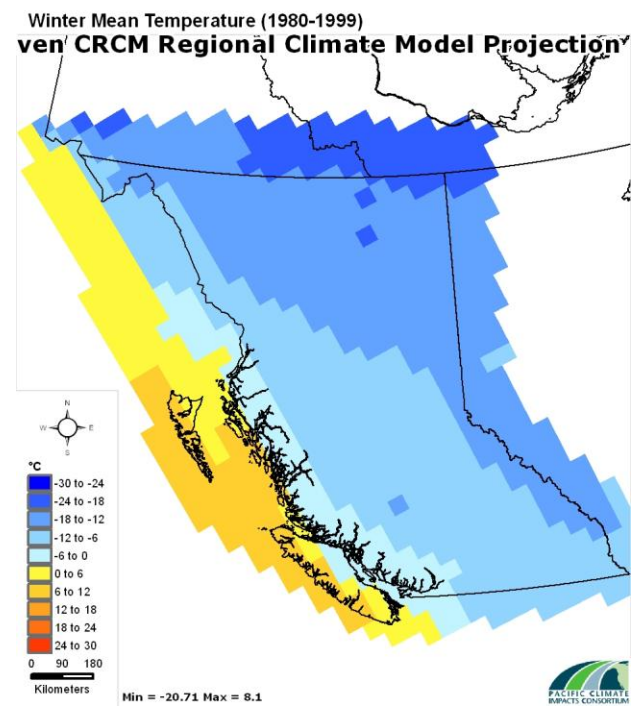
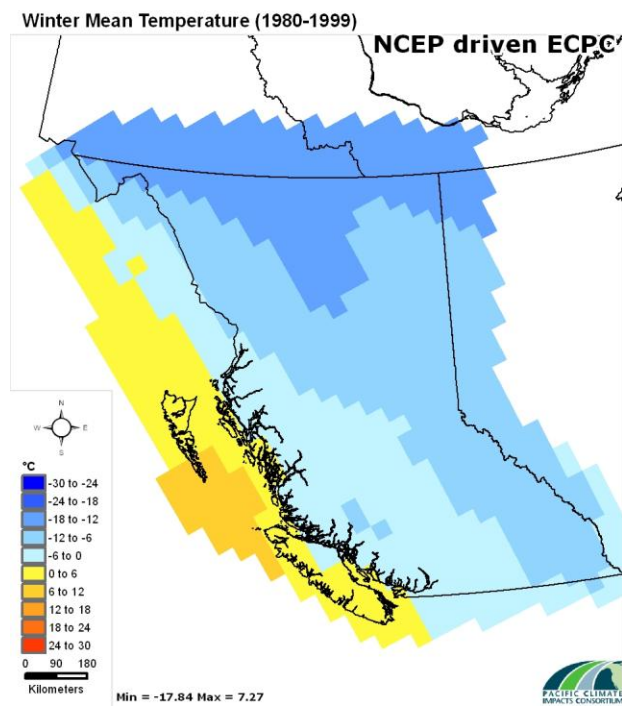
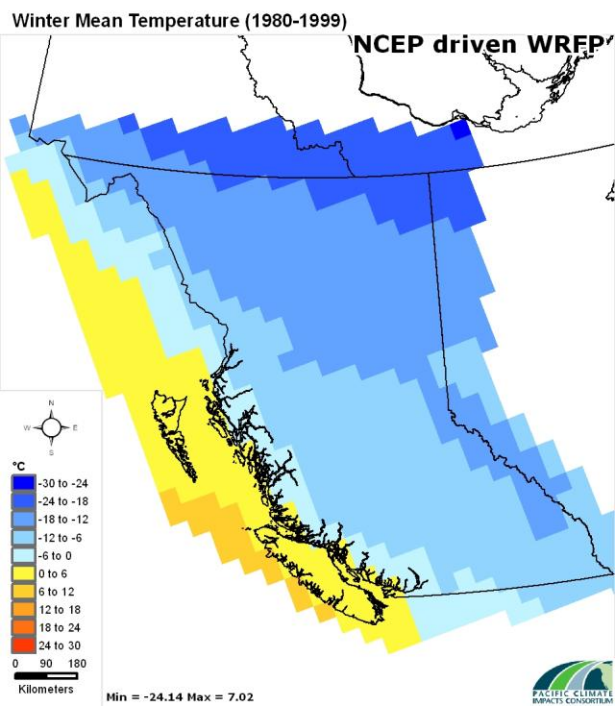
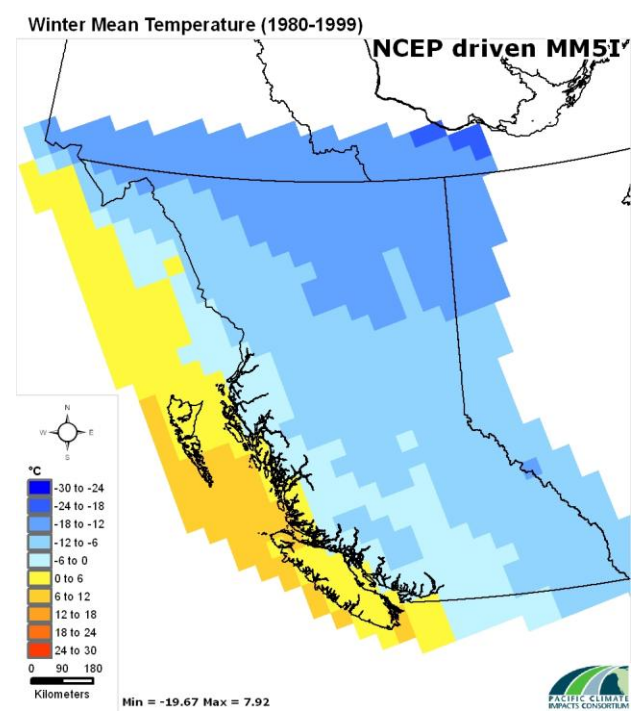
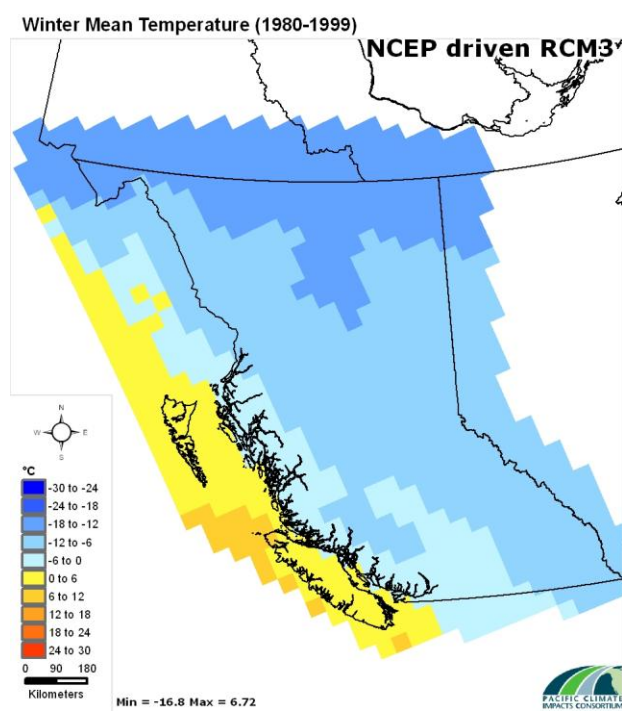
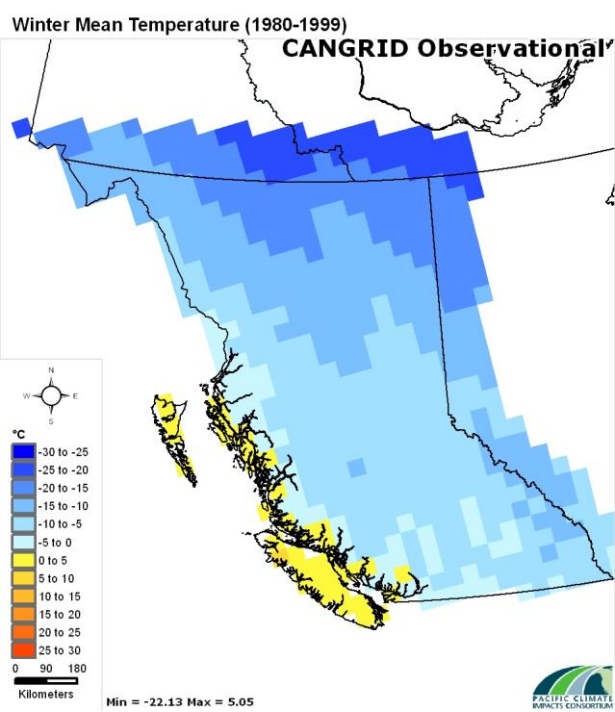
1980-1999 difference: Annual Precipitation NCEP driven RCMs from CANGRID

Histogram of Differences Between Cangrid and NCEP forced RCMs for Winter

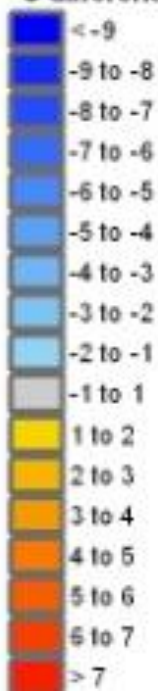


Histogram of Differences Between NCEP Reanalysis and NCEP forced RCMs for Winter



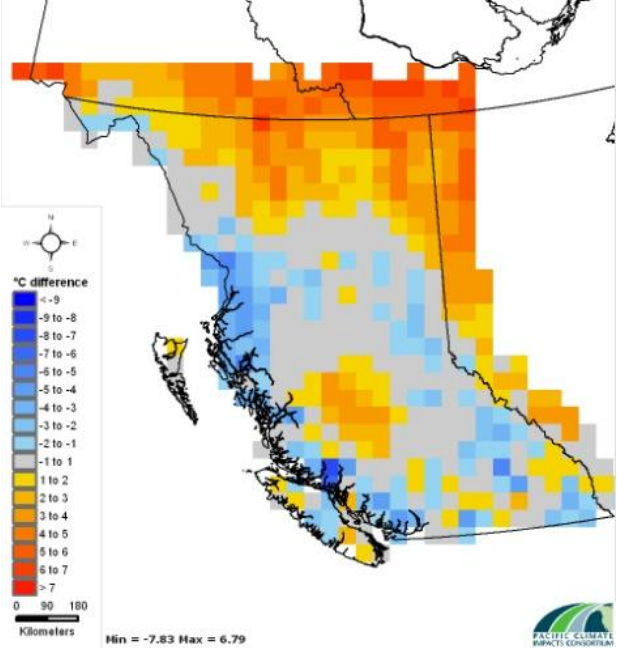


°C difference



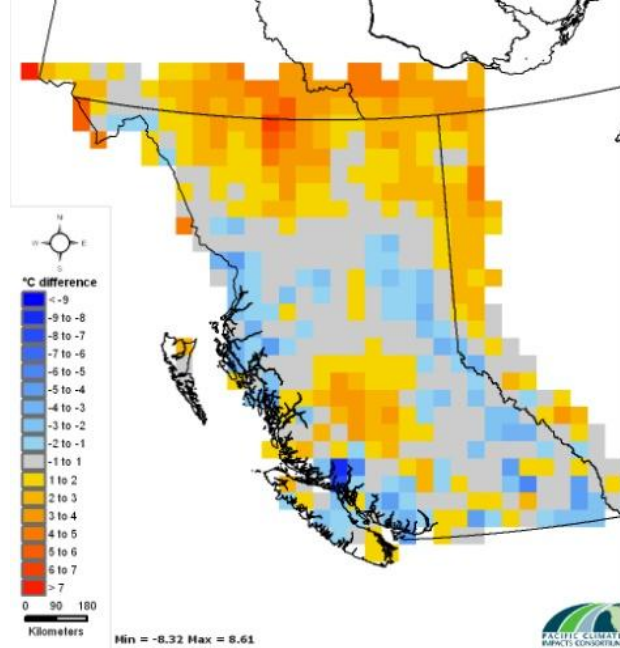
Winter Mean Temperature RCM - Cangrid (1980-1999)

GFDL driven RCM3



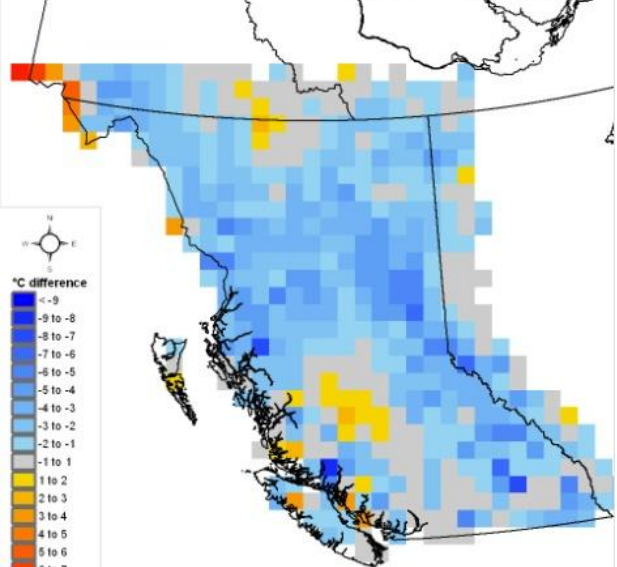
Winter Mean Temperature RCM - Cangrid (1980-1999)

NCEP driven MM5I



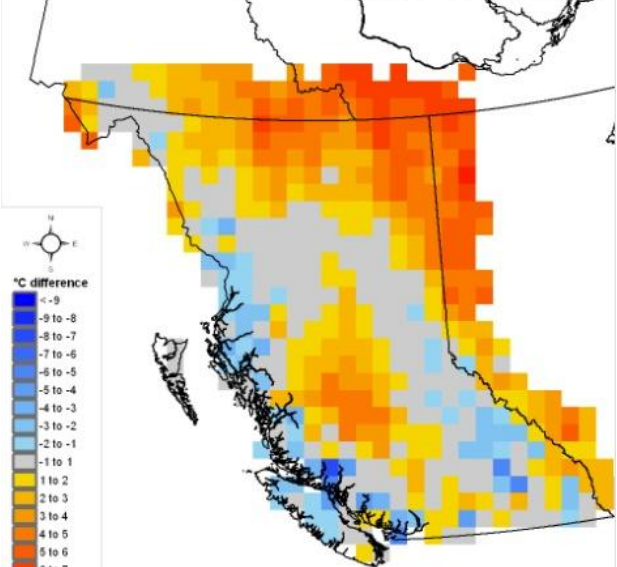
Winter Mean Temperature RCM - Cangrid (1980-1999)

NCEP driven WRFP



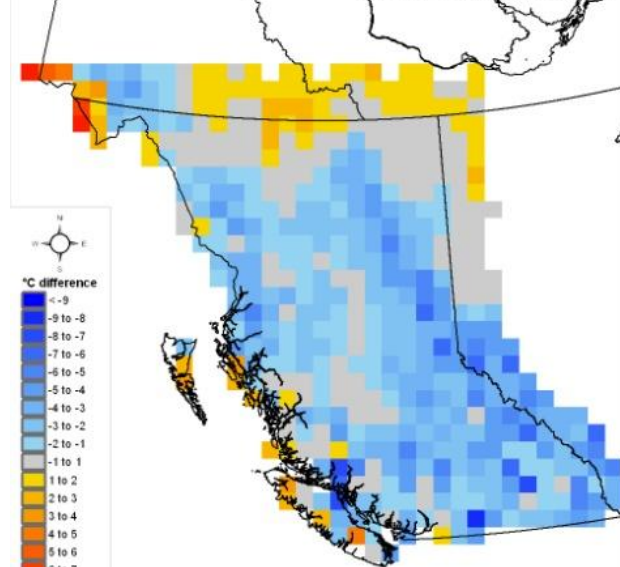
Winter Mean Temperature RCM - Cangrid (1980-1999)

NCEP driven ECPC



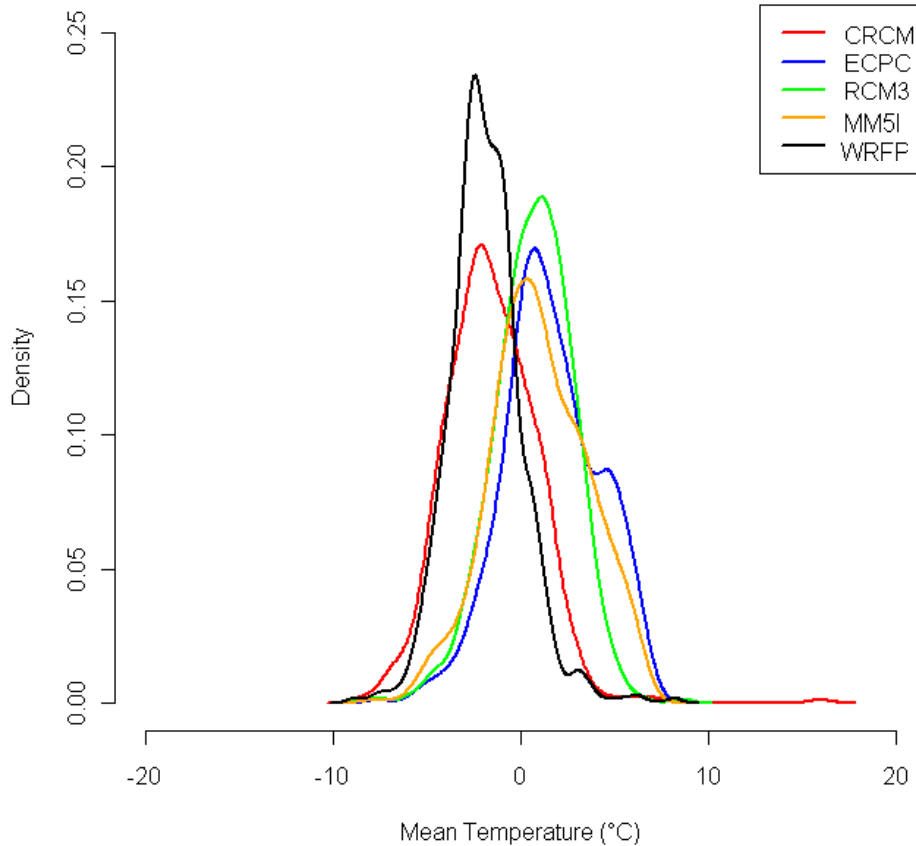
Winter Mean Temperature RCM - Cangrid (1980-1999)

NCEP driven CRCM

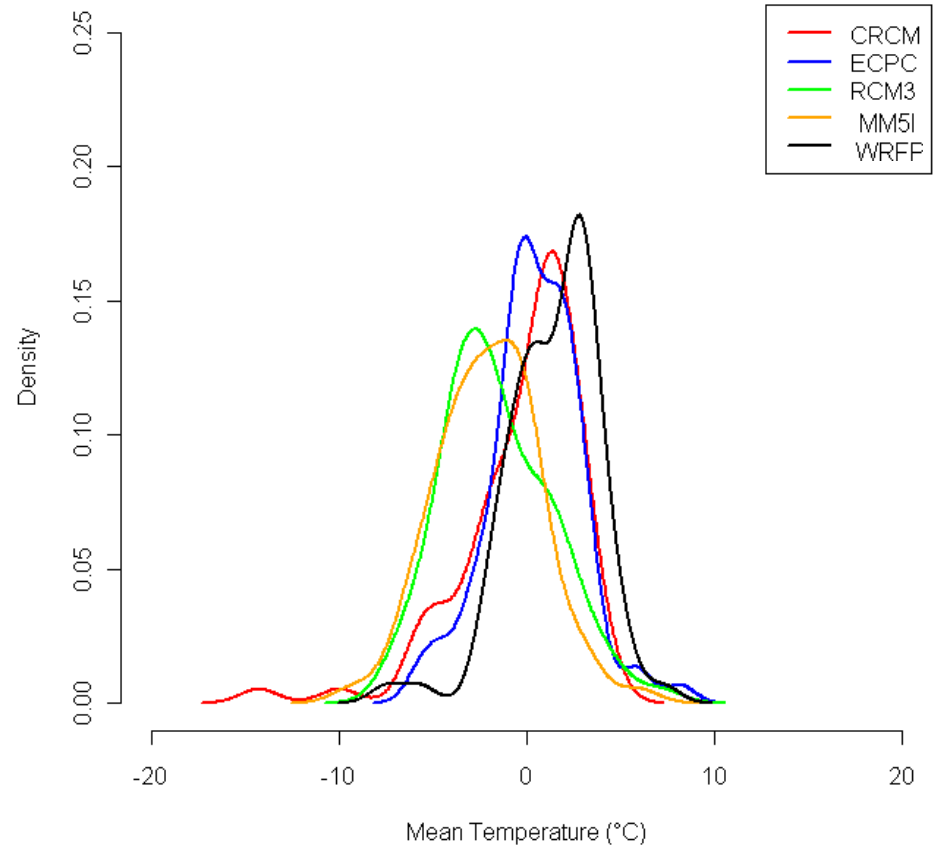


1980-1999 difference: Winter Mean Temperature NCEP driven RCMs from CANGRID

Histogram of Differences Between Cangrid and NCEP forced RCMs for Winter



Histogram of Differences Between NCEP Reanalysis and NCEP forced RCMs for Winter



Summary

- Future plans (depends on resources)...
 - additional historical analysis (multiple observations, GCMs, seasonal cycle, performance metrics, ensemble)
 - future projections
 - further statistical (and maybe dynamical) downscaling
 - impacts (e.g., streamflow - in progress, tree species suitability, pest outbreak, engineering standards, etc.)
- But for now we have maps... that appear to tell us:
 - ?
 - ?
 - ?
 - ?

Summary

- For now we have maps... that appear to tell us:
 - RCMs add realistic improvements in winter precipitation from 2.5° resolution to 50 km
 - Models seem to be redistributing winter precipitation similarly to each other
 - All models generally wetter than CANGRID interpolated station observations, particularly in dry interior plateau
 - For winter temperature all models capture gradients: coast → inland ; south → north; low → high elevation
 - CRCM & WRFP cold biases over much of BC
 - ECPC, MM5I, RCM3 warm biases in northern BC and west-central interior

Questions?

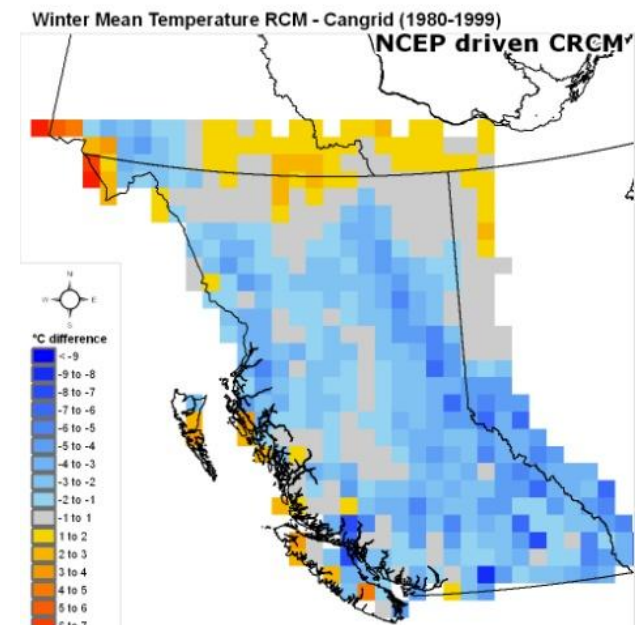
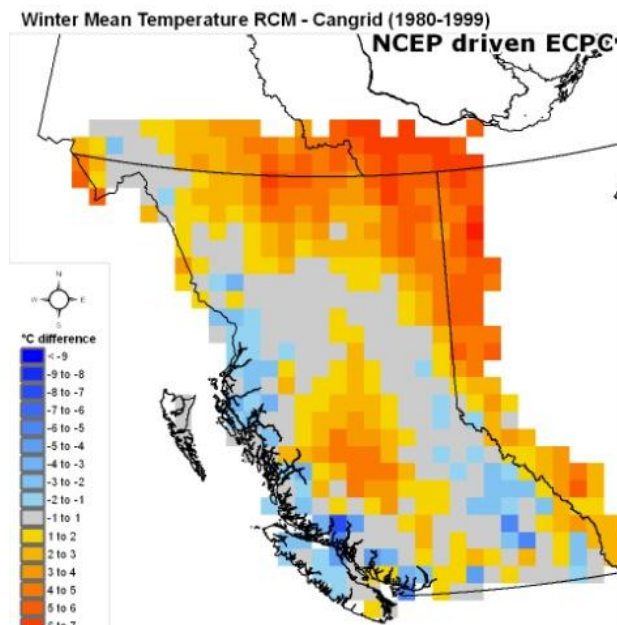
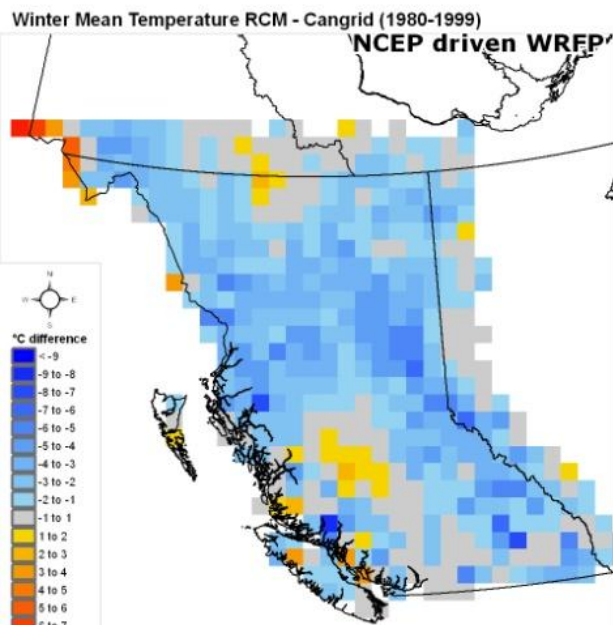
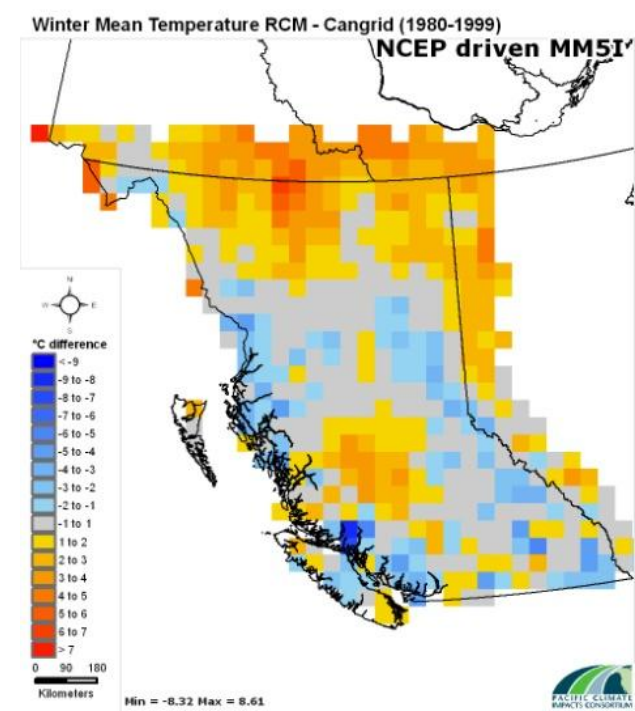
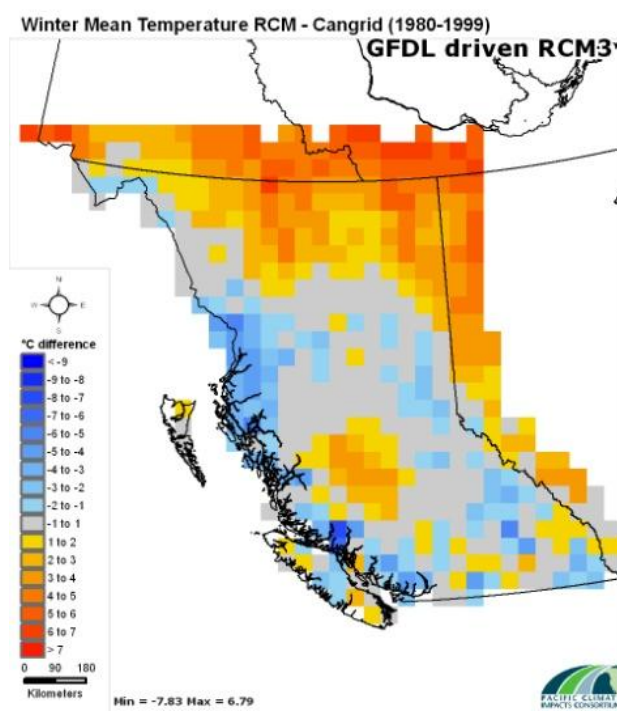
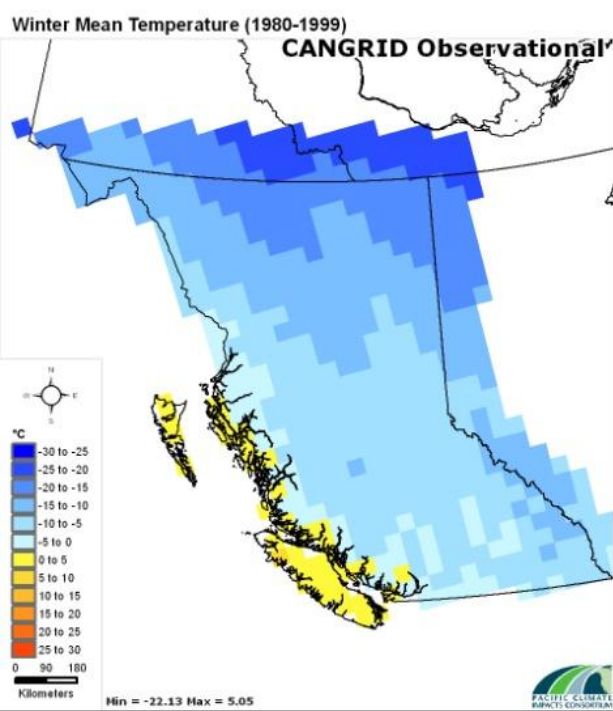


Thank you

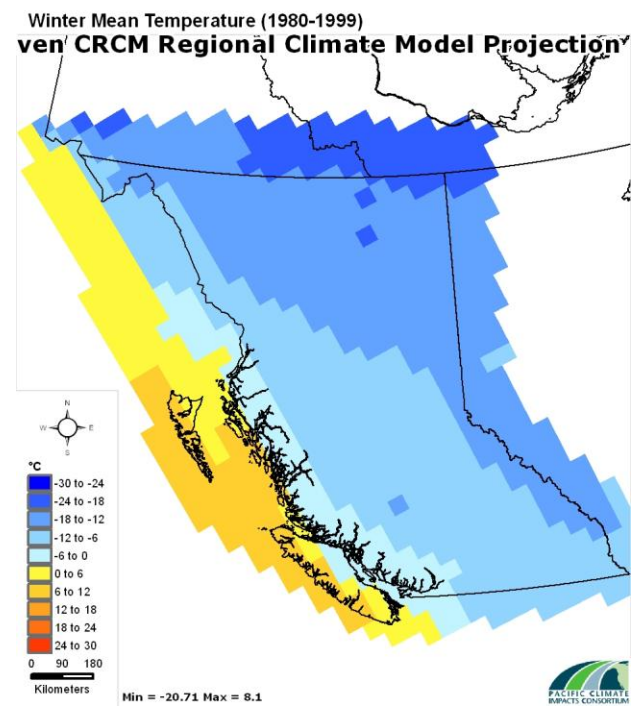
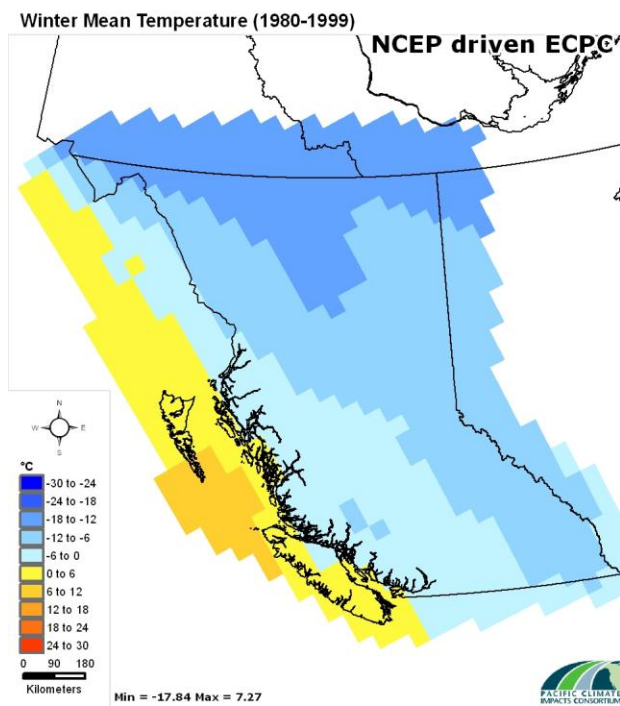
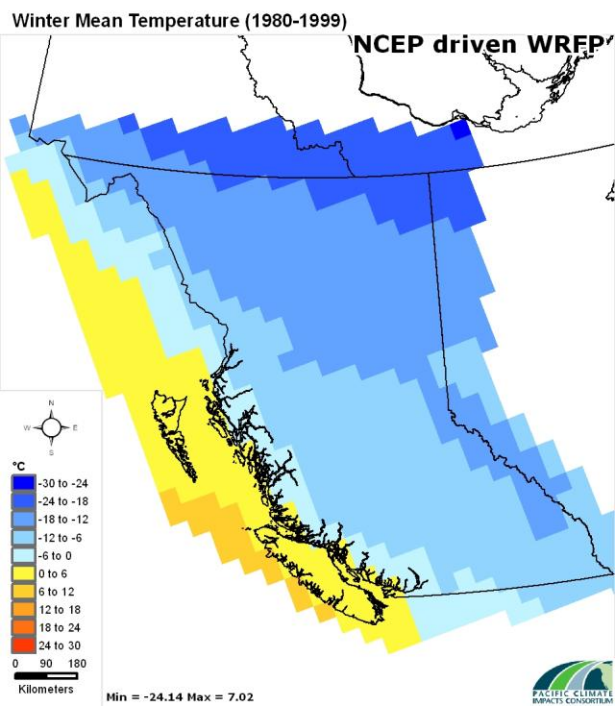
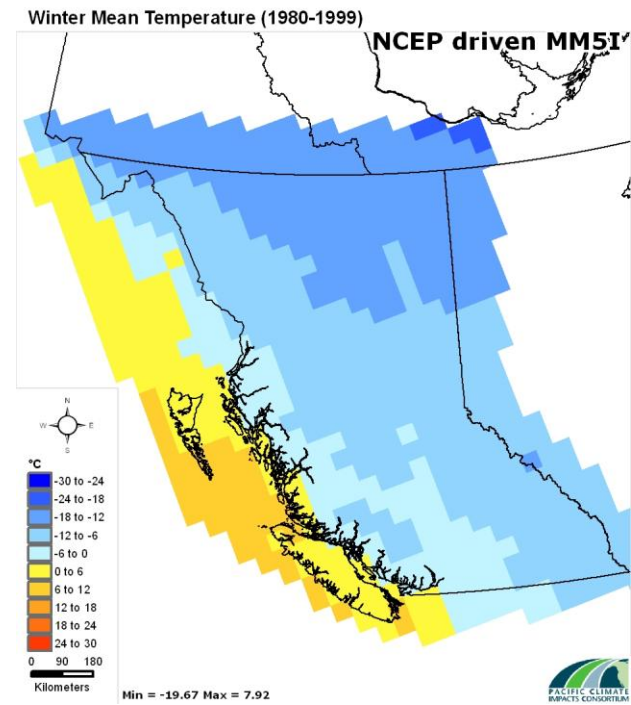
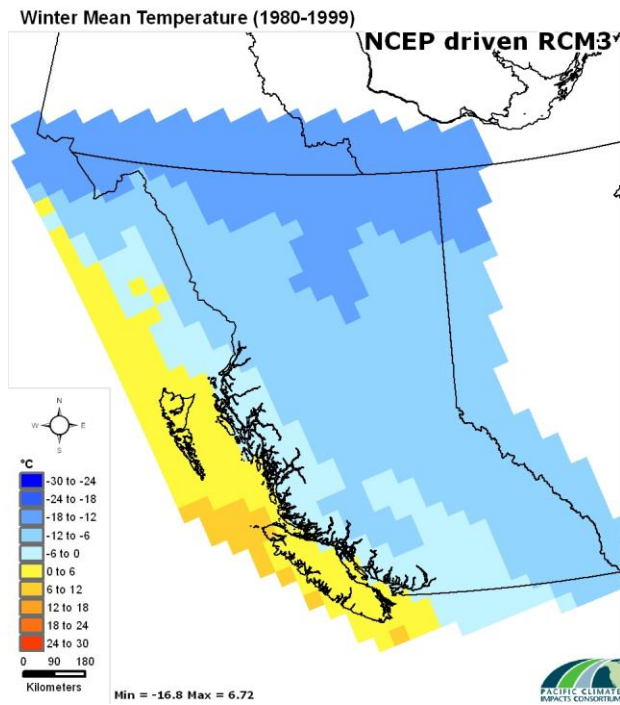
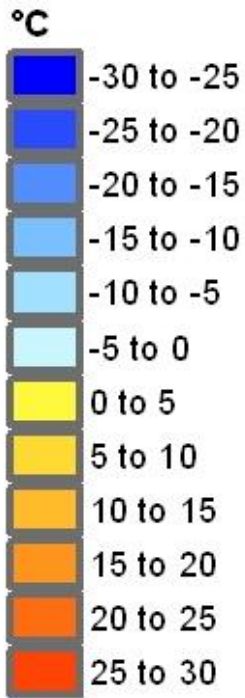
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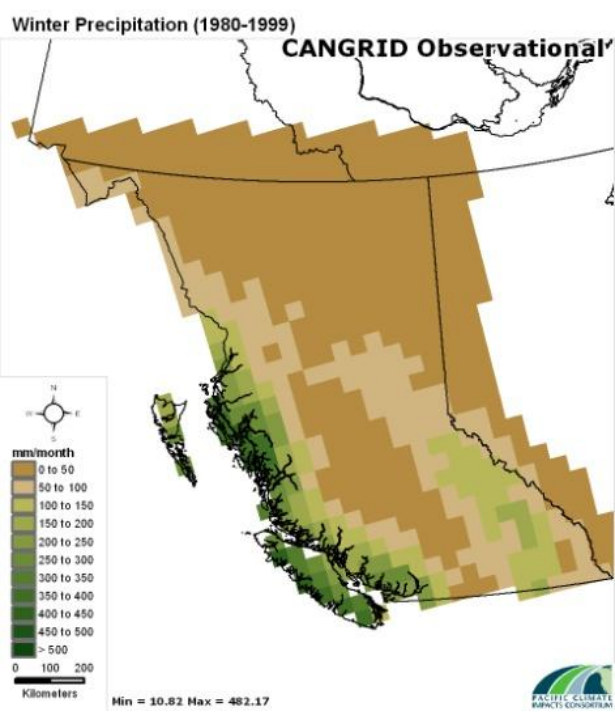
www.PacificClimate.org



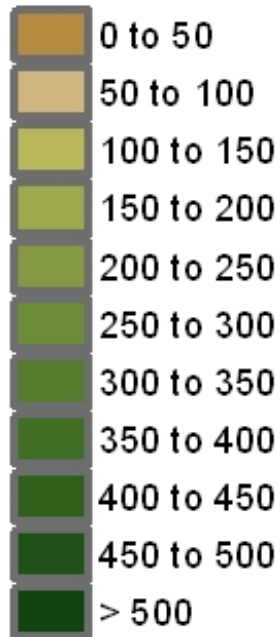


1980-1999 difference: Winter Mean Temperature NCEP driven RCMs from CANGRID

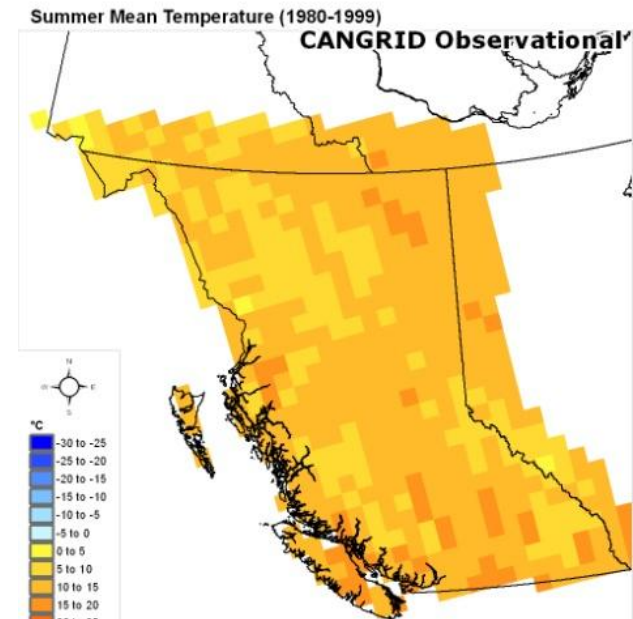
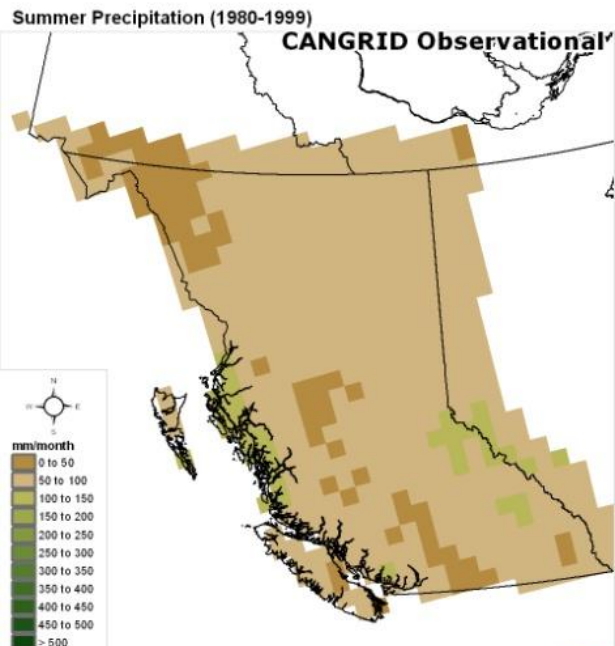
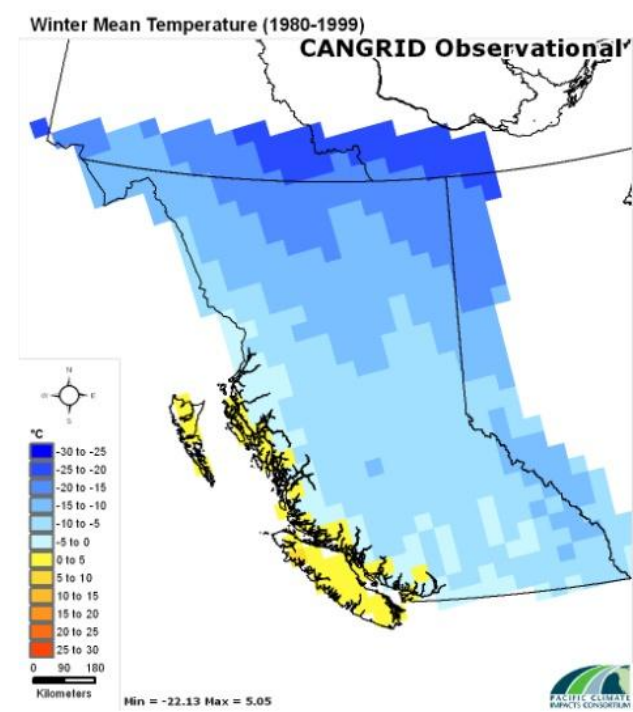
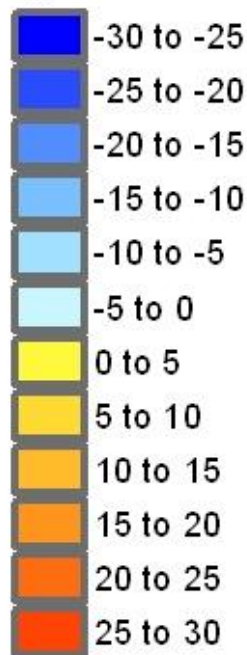




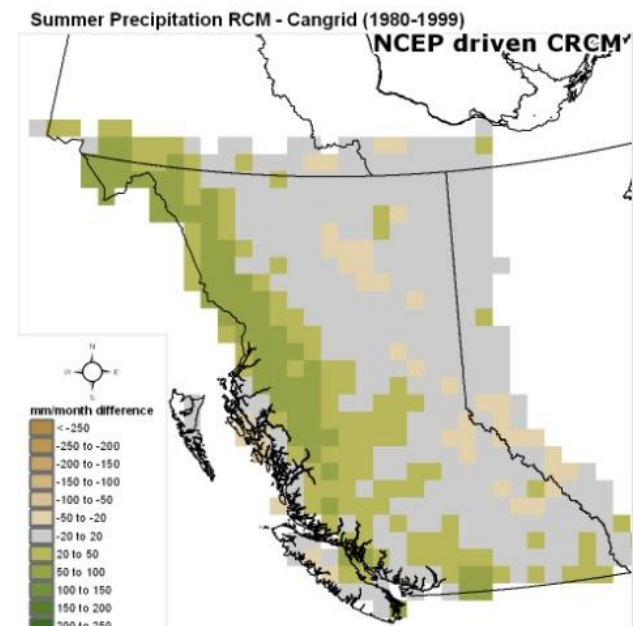
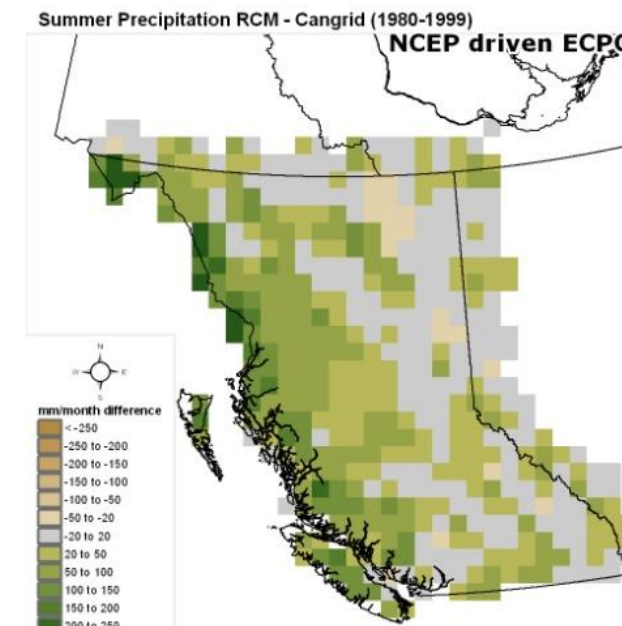
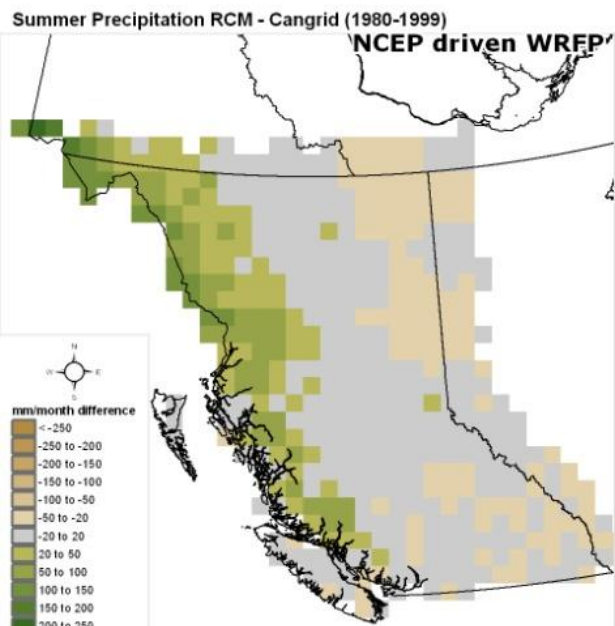
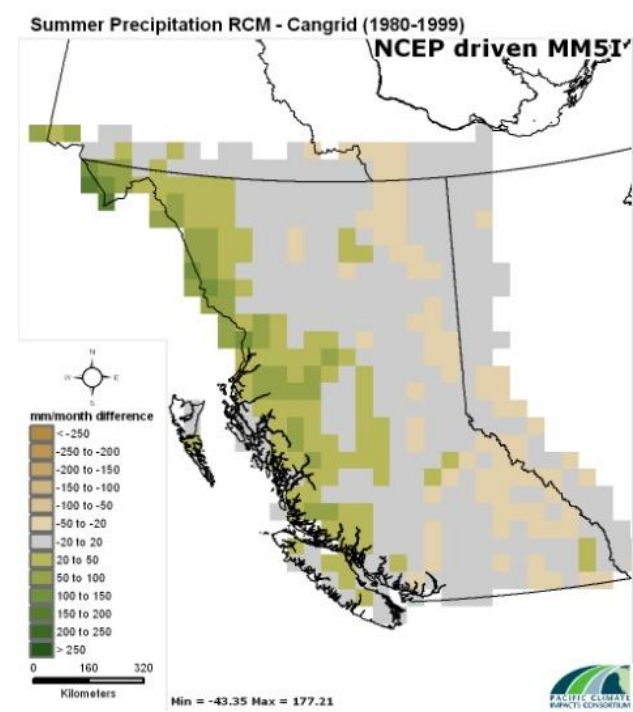
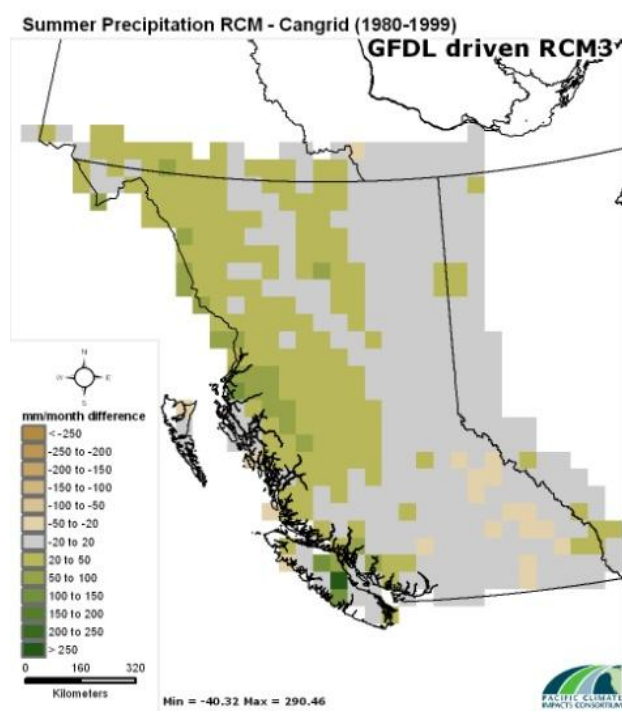
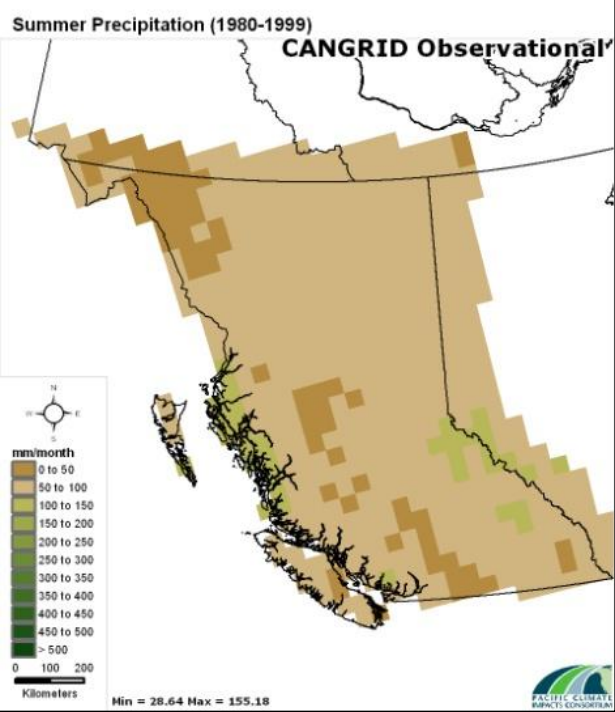
mm/month



°C

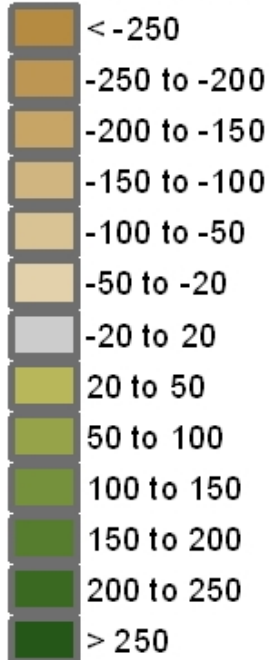


1980-1999 CANGRID observations winter and summer precipitation and temperature



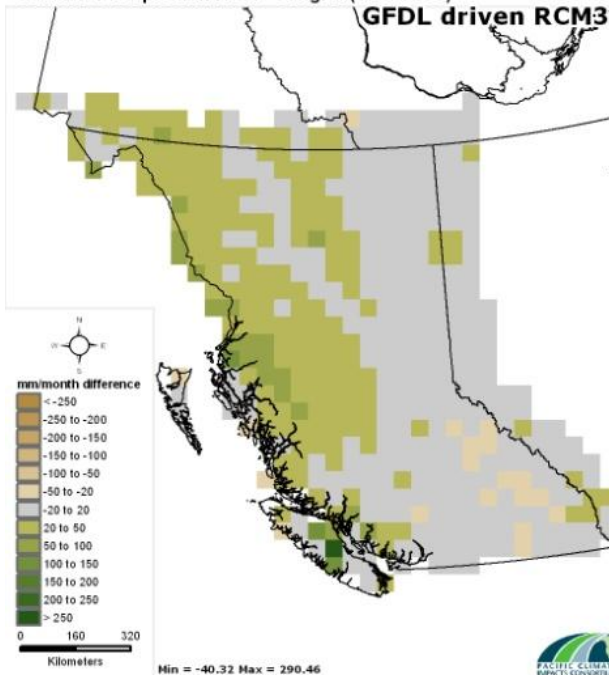
1980-1999 difference: Summer Precipitation NCEP driven RCMs from CANGRID

mm/month difference



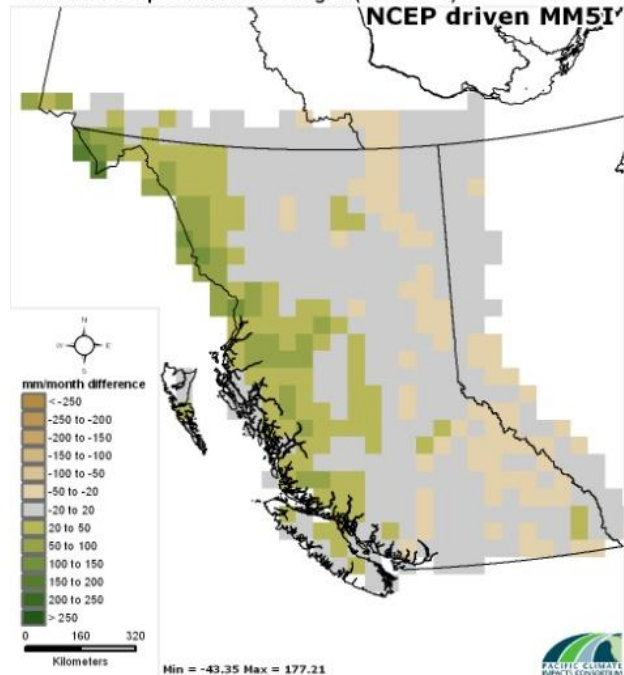
Summer Precipitation RCM - Cangrid (1980-1999)

GFDL driven RCM3^v



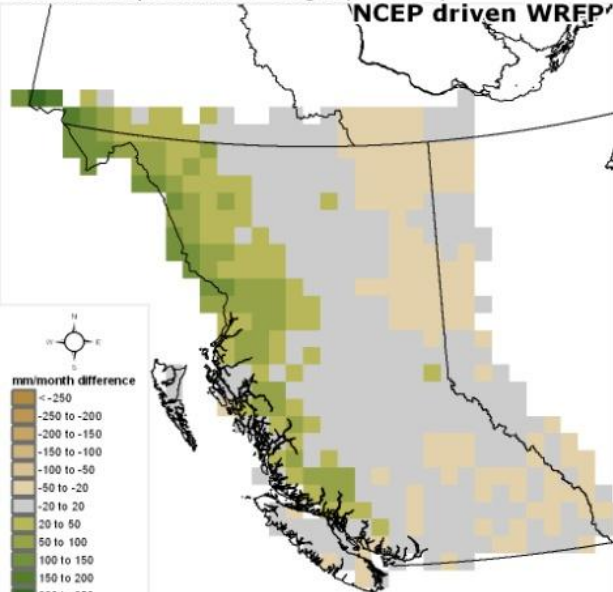
Summer Precipitation RCM - Cangrid (1980-1999)

NCEP driven MM5^v



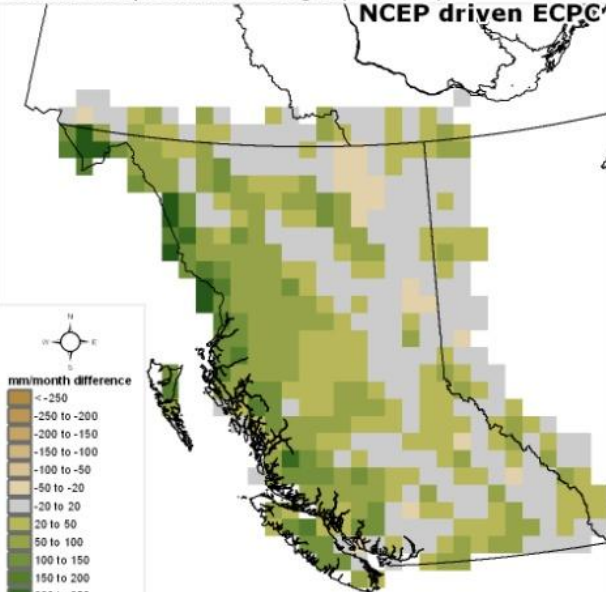
Summer Precipitation RCM - Cangrid (1980-1999)

NCEP driven WRF^v



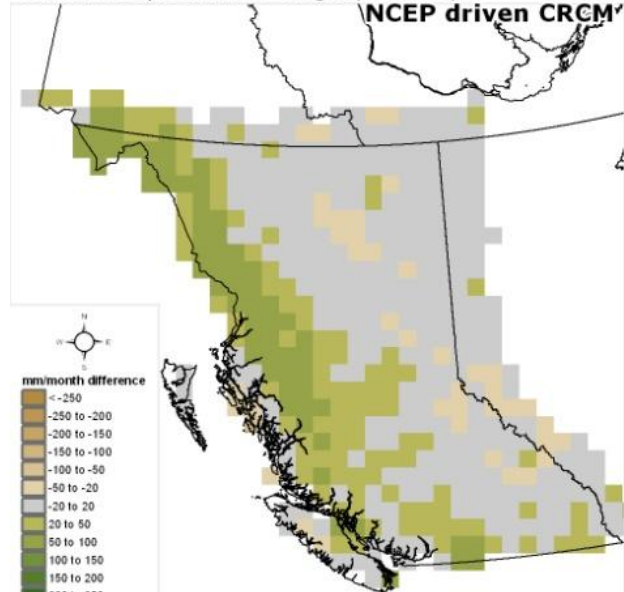
Summer Precipitation RCM - Cangrid (1980-1999)

NCEP driven ECPC^v



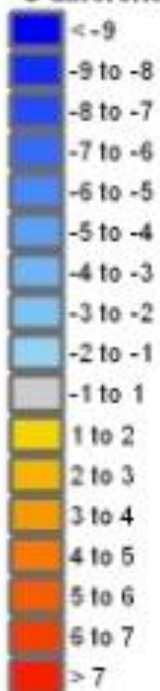
Summer Precipitation RCM - Cangrid (1980-1999)

NCEP driven CRCM^v



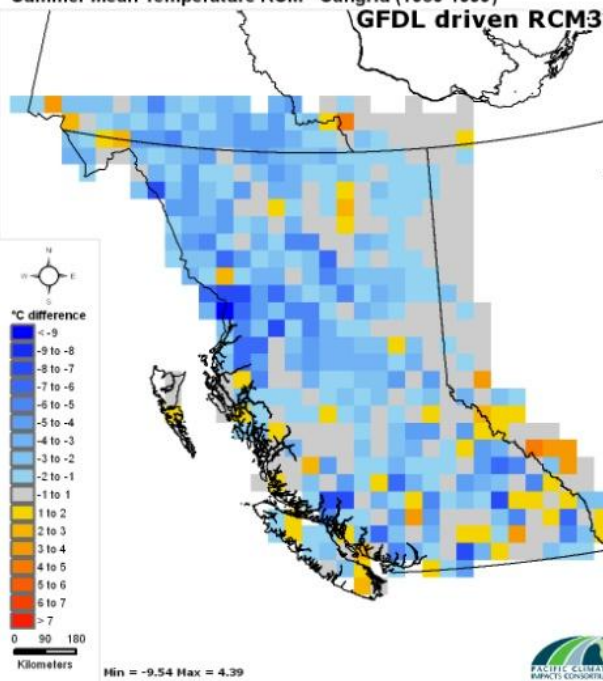
1980-1999 difference: Summer Precipitation NCEP driven RCMs from CANGRID

°C difference



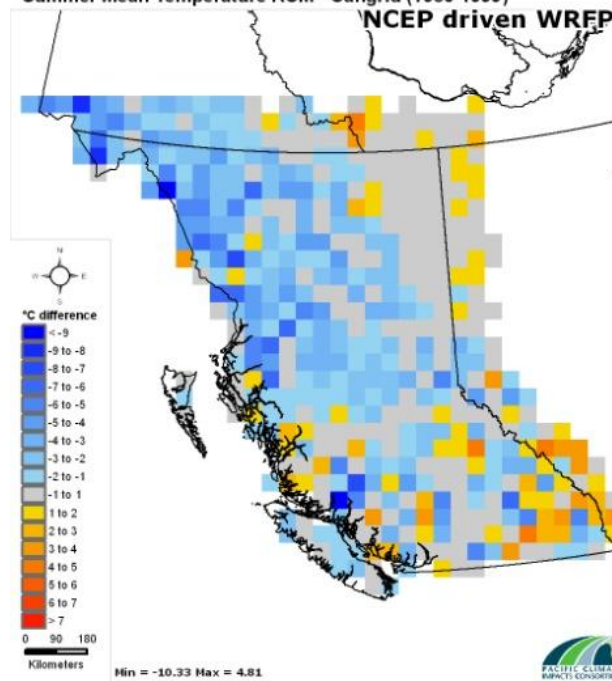
Summer Mean Temperature RCM - Cangrid (1980-1999)

GFDL driven RCM3'



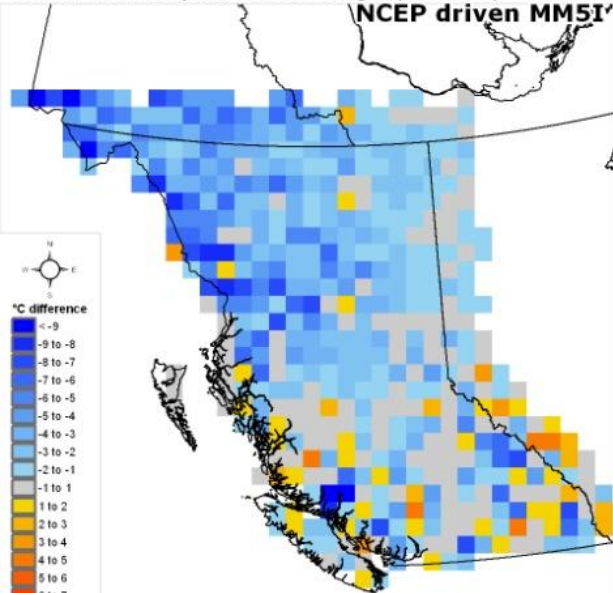
Summer Mean Temperature RCM - Cangrid (1980-1999)

NCEP driven WRFP'



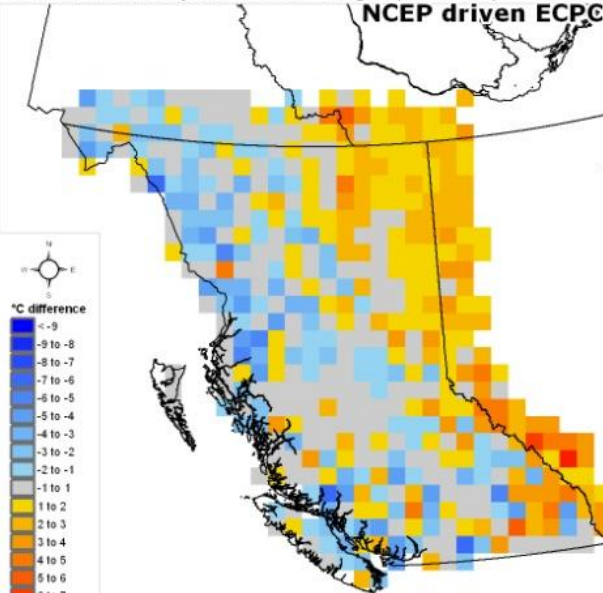
Summer Mean Temperature RCM - Cangrid (1980-1999)

NCEP driven MM5I'



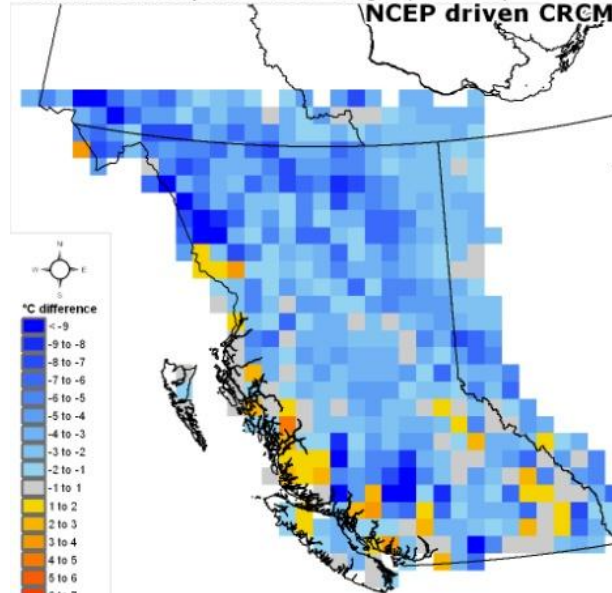
Summer Mean Temperature RCM - Cangrid (1980-1999)

NCEP driven ECPC'



Summer Mean Temperature RCM - Cangrid (1980-1999)

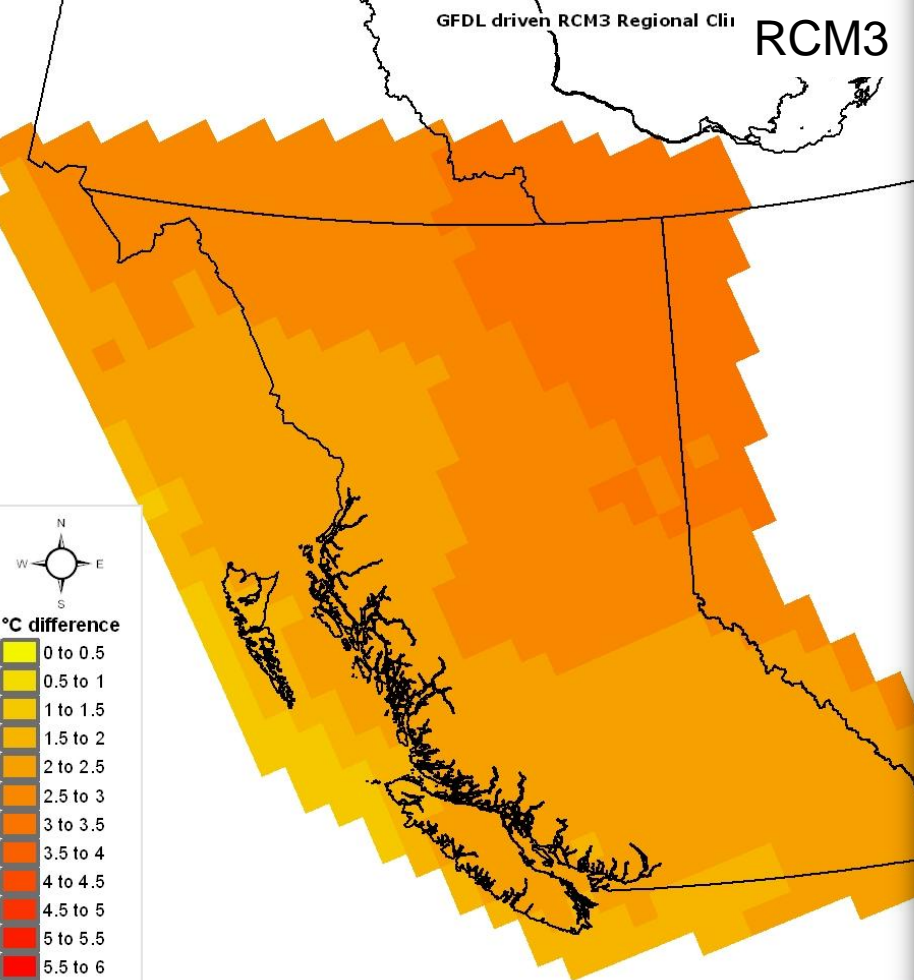
NCEP driven CRCM'



1980-1999 difference: Summer Mean Temperature NCEP driven RCMs from CANGRID

Winter Mean Temperature (2041-2070)

GFDL driven RCM3 Regional Cli
RCM3

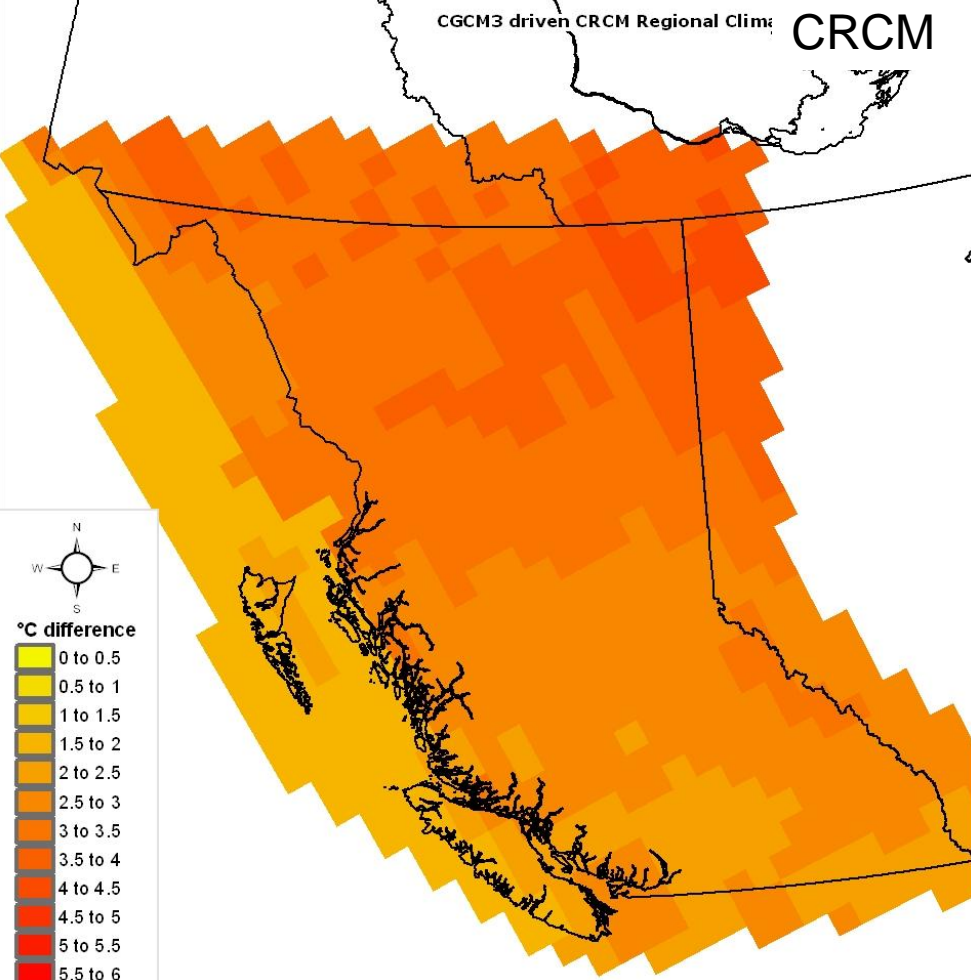


Min = 1.31 Max = 3.27



Winter Mean Temperature (2041-2070)

CGCM3 driven CRCM Regional Clim
CRCM

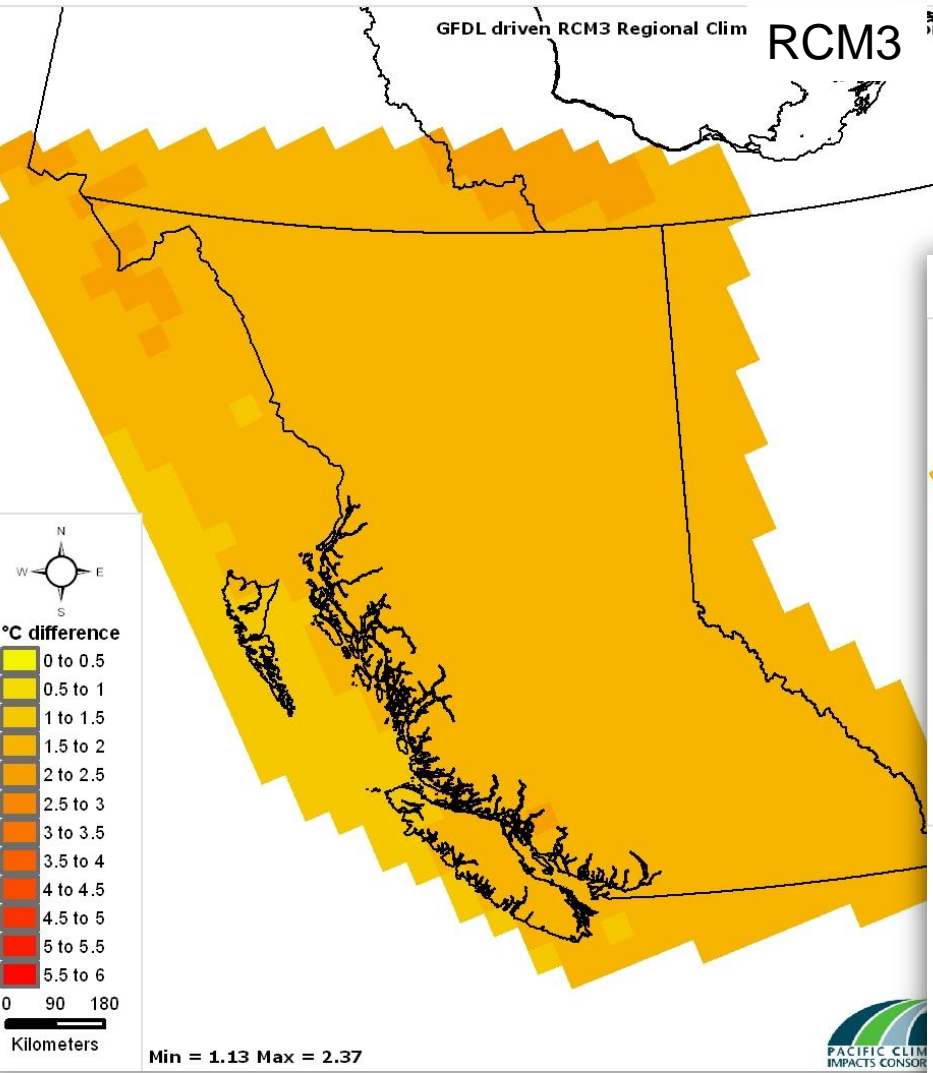


Min = 1.71 Max = 4.31



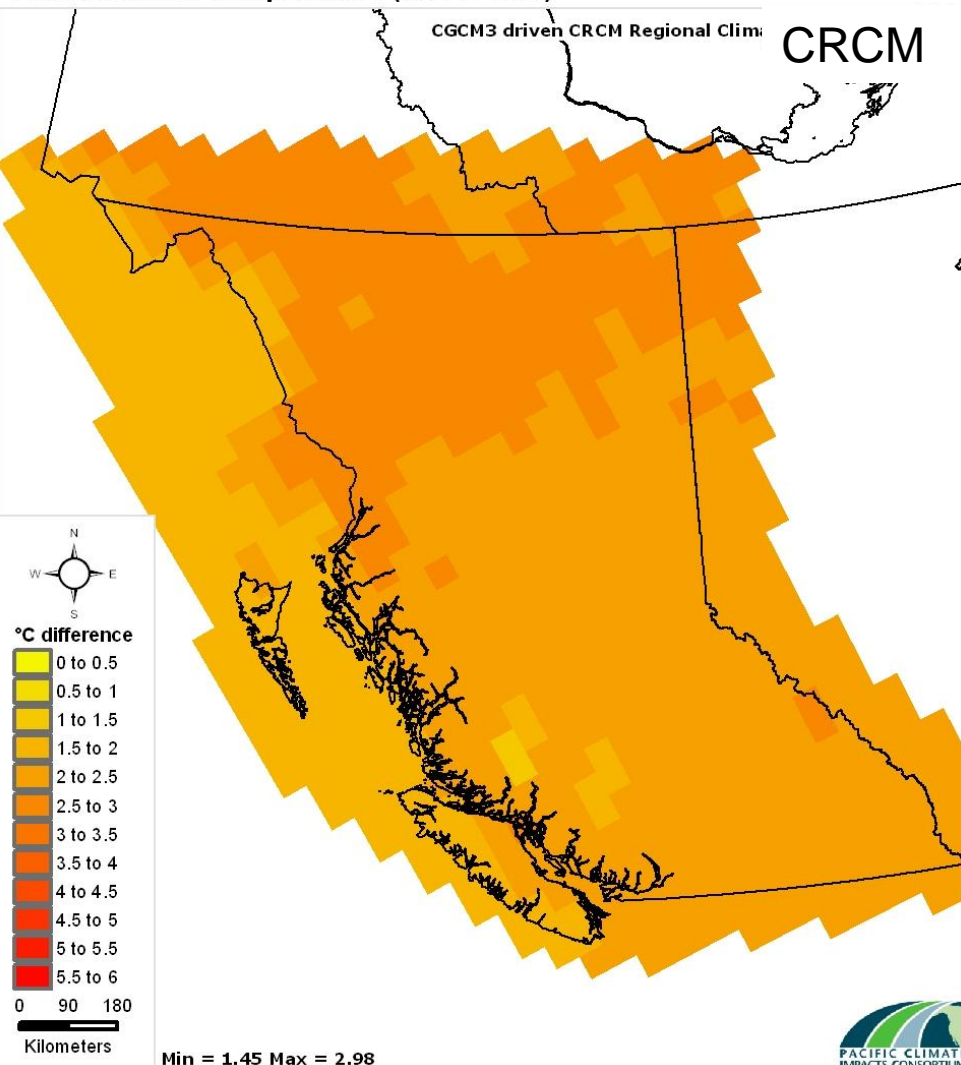
Annual Mean Temperature (2041-2070)

GFDL driven RCM3 Regional Clim RCM3

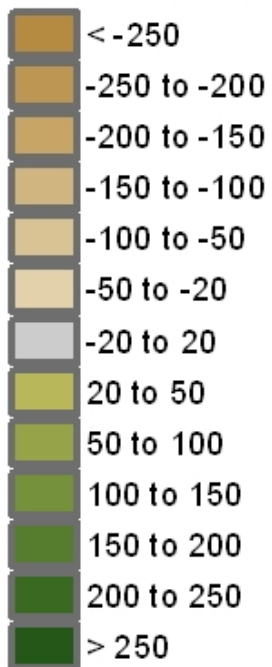


Annual Mean Temperature (2041-2070)

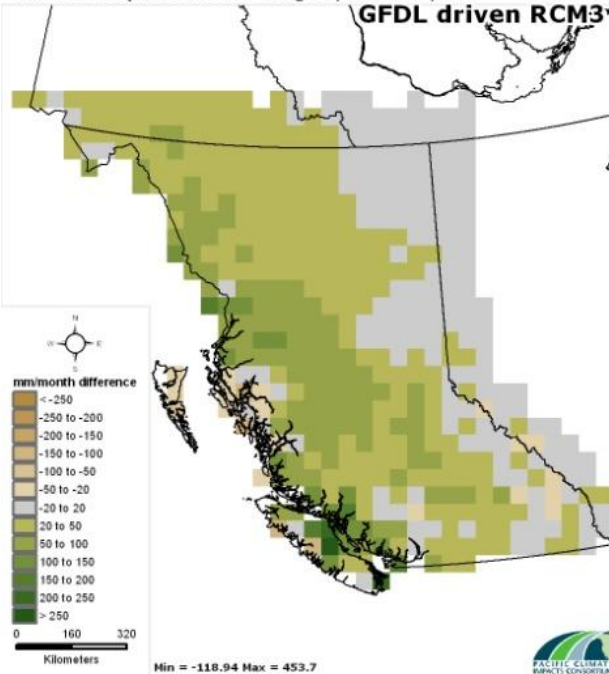
CGCM3 driven CRCM Regional Clim CRCM



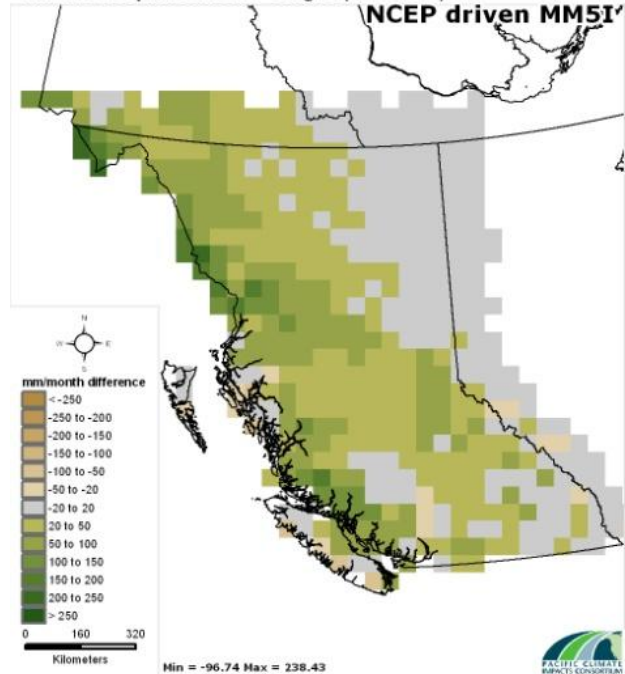
mm/month difference



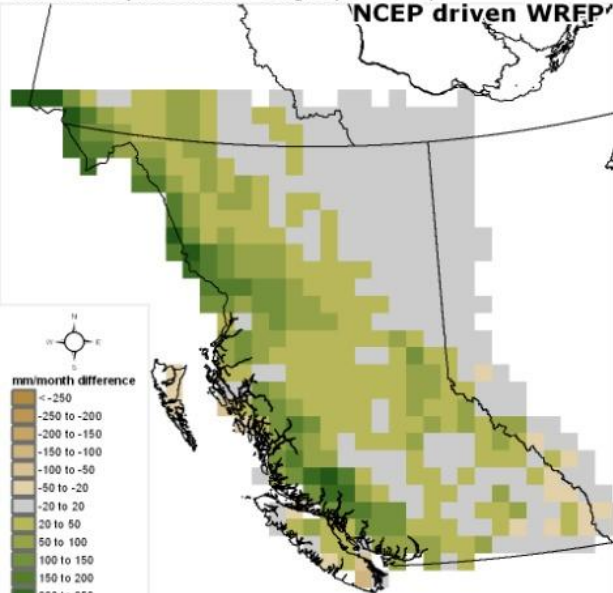
Annual Precipitation RCM - Cangrid (1980-1999)



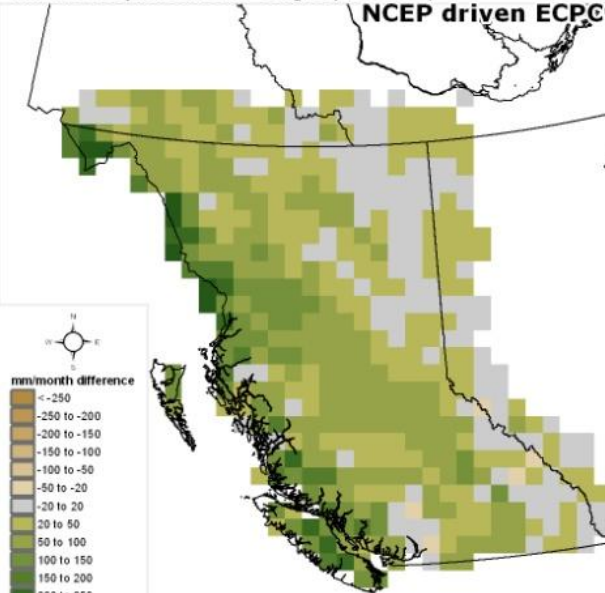
Annual Precipitation RCM - Cangrid (1980-1999)



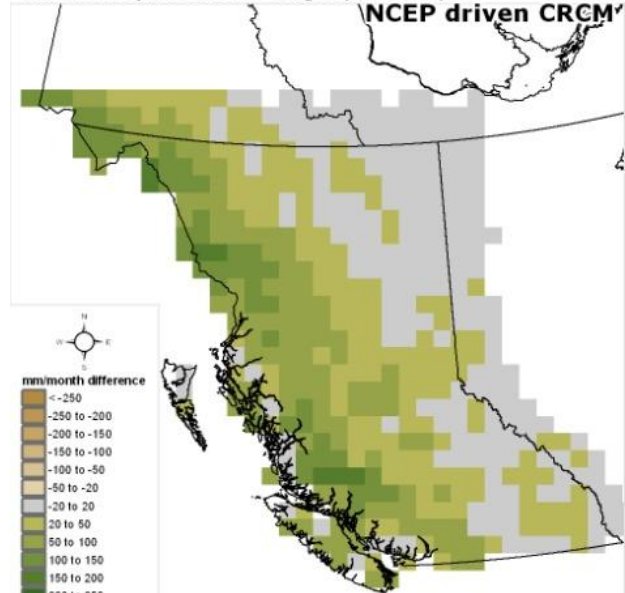
Annual Precipitation RCM - Cangrid (1980-1999)



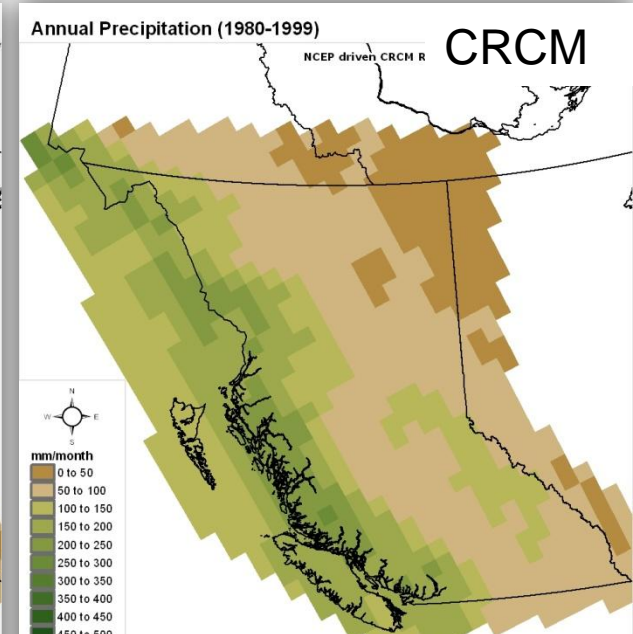
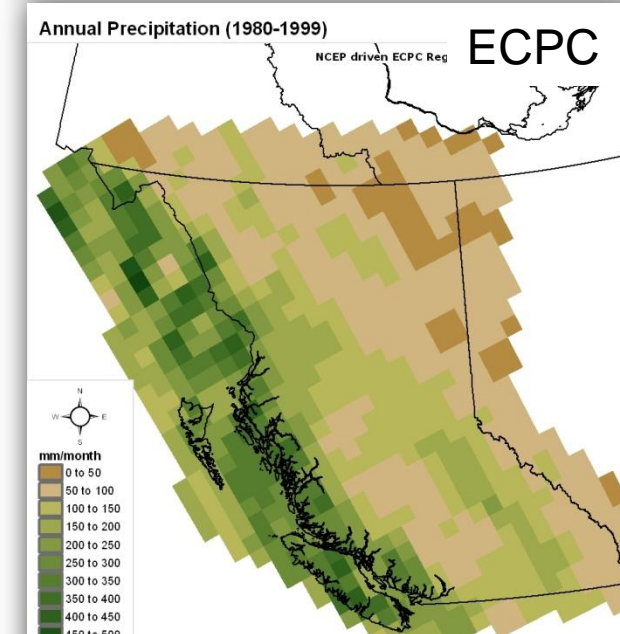
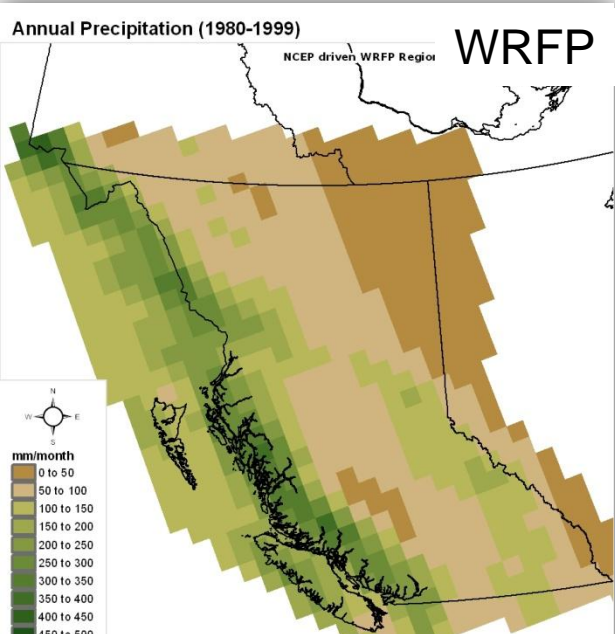
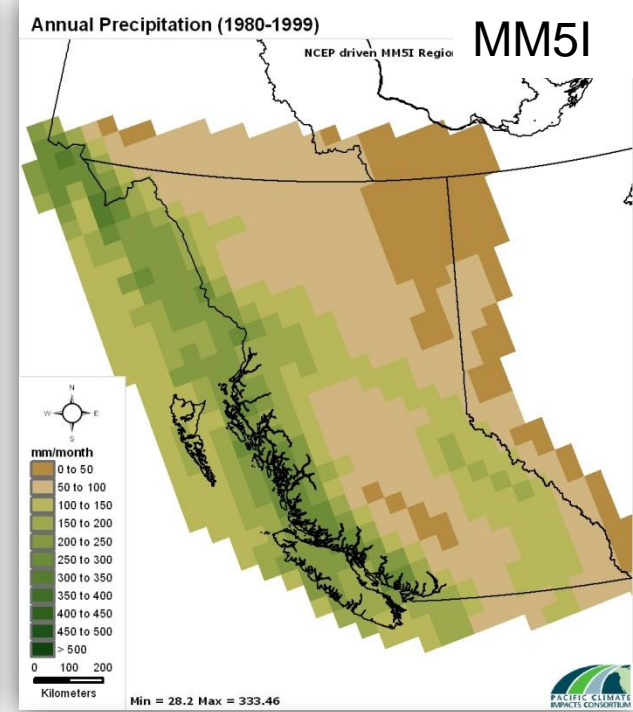
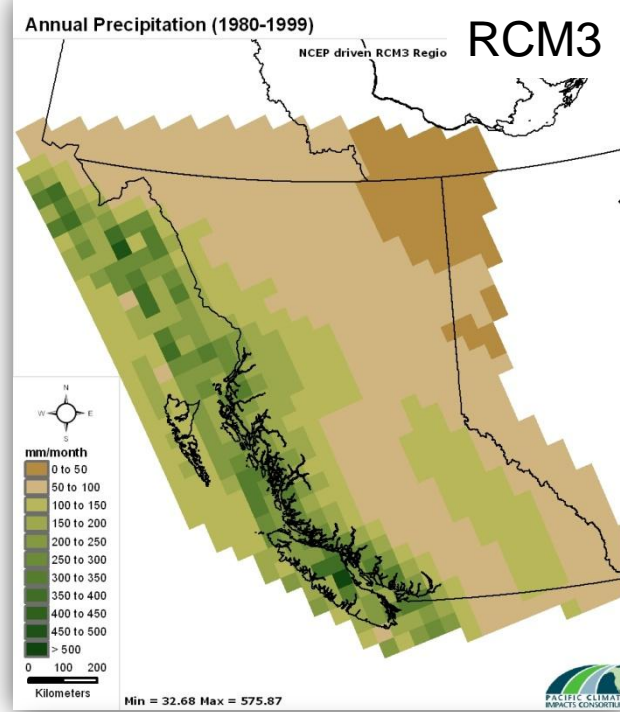
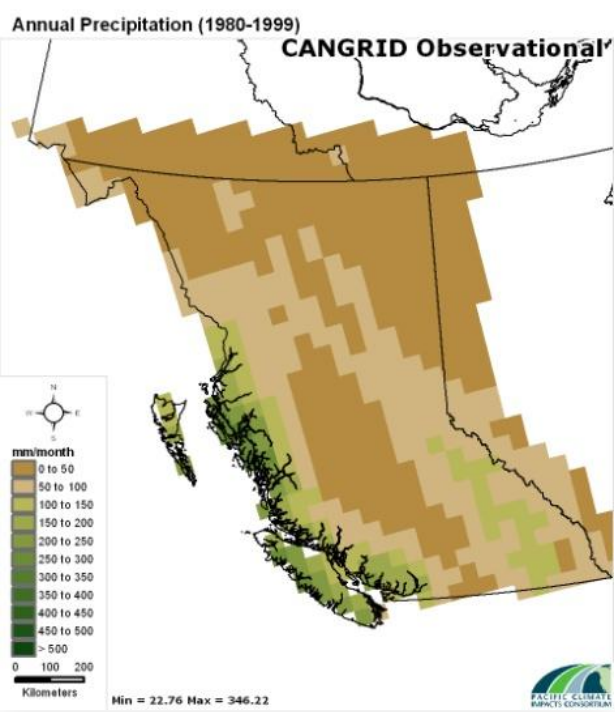
Annual Precipitation RCM - Cangrid (1980-1999)



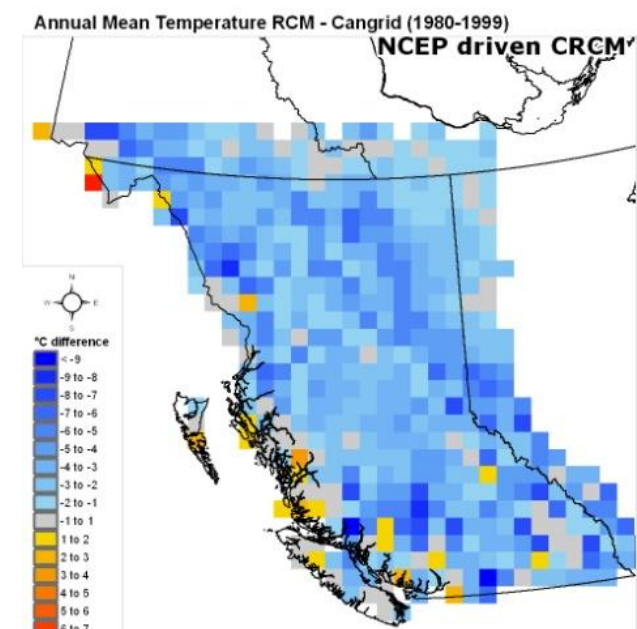
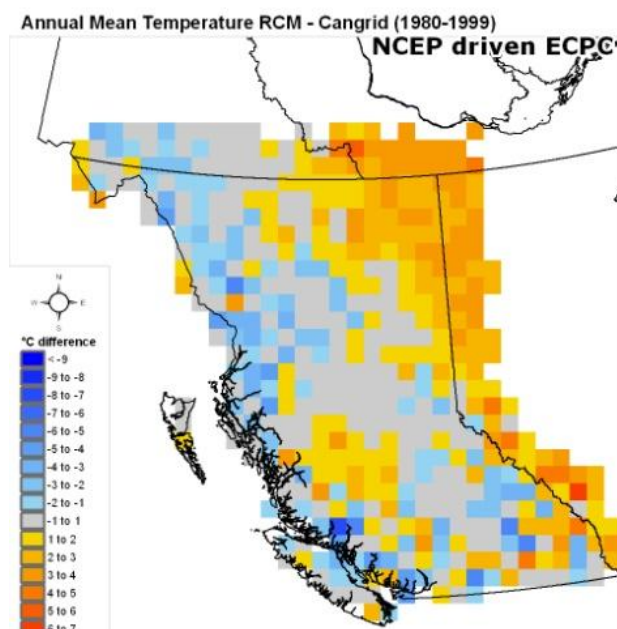
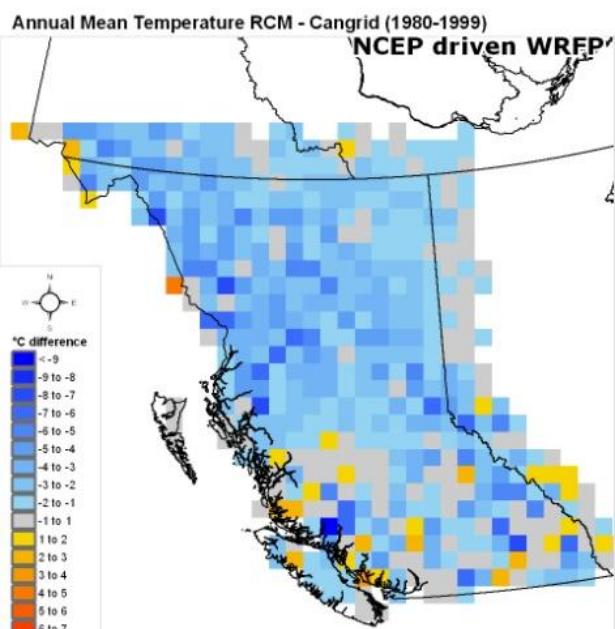
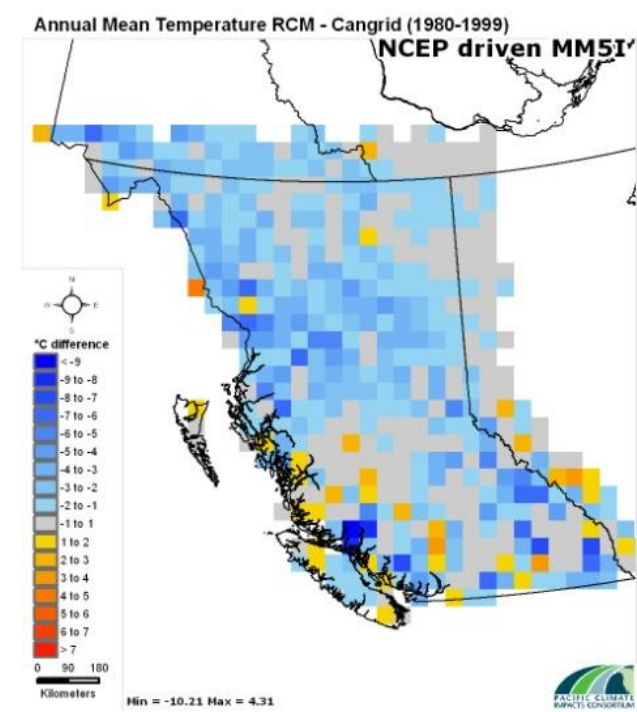
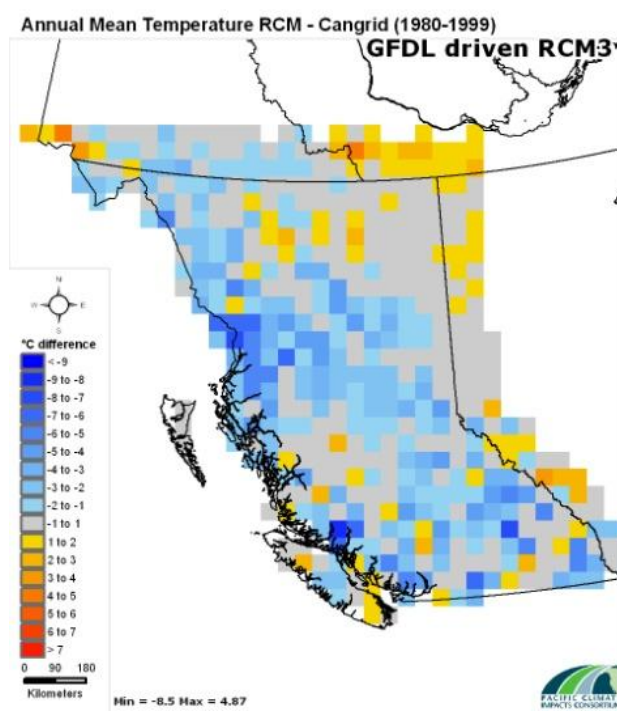
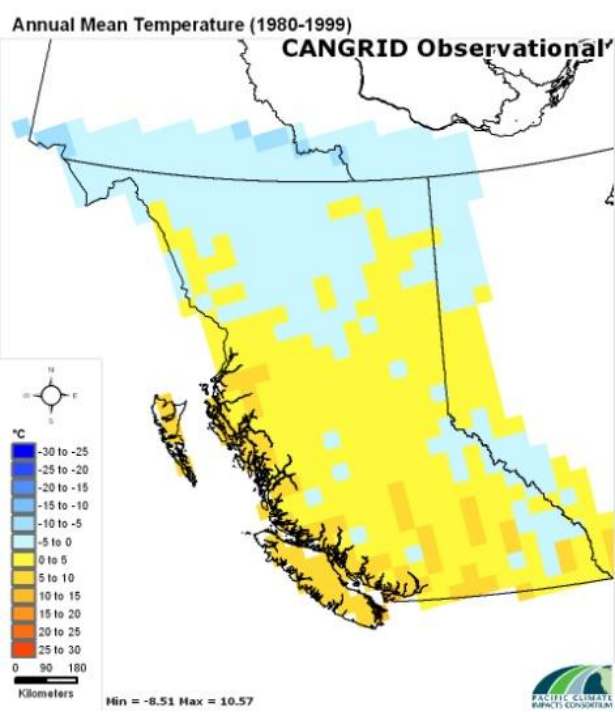
Annual Precipitation RCM - Cangrid (1980-1999)



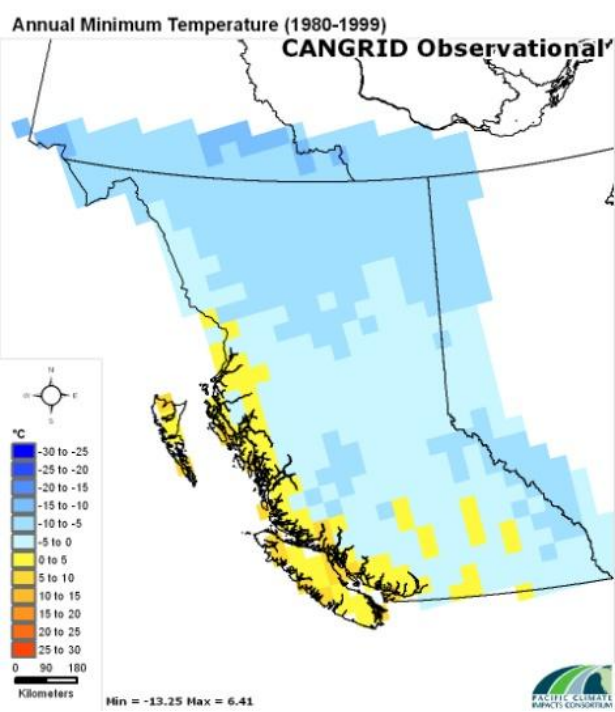
1980-1999 difference: Annual Precipitation NCEP driven RCMs from CANGRID



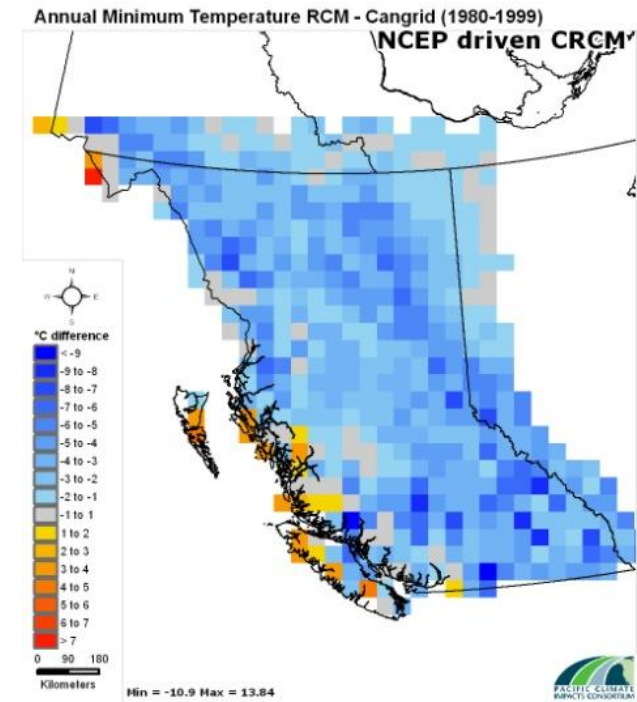
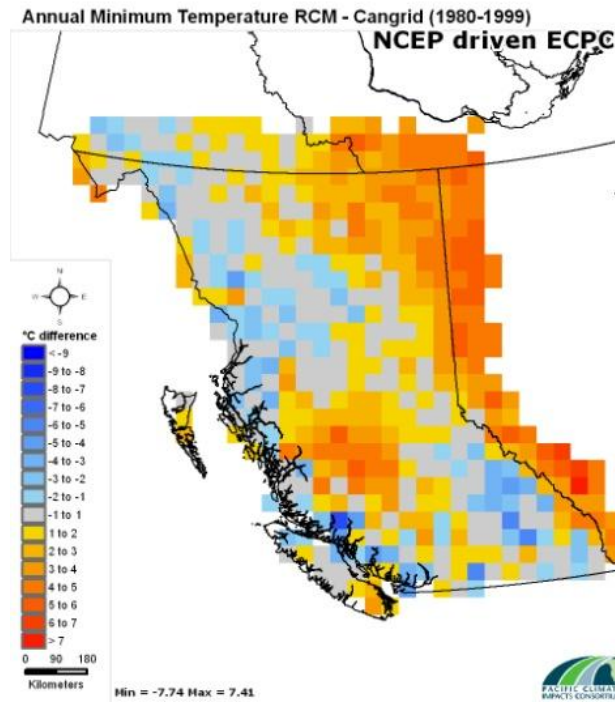
1980-1999 CANGRID Observations & Annual Precipitation NCEP driven RCMs

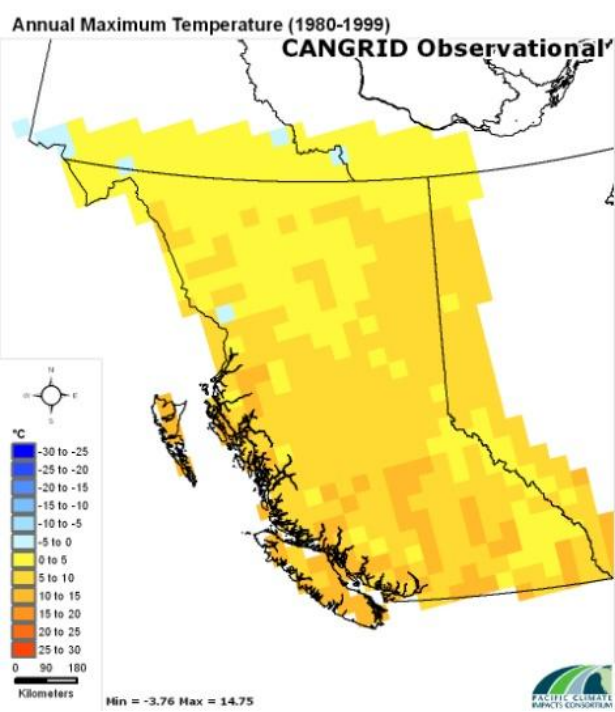


1980-1999 difference: Annual Mean Temperature NCEP driven RCMs from CANGRID

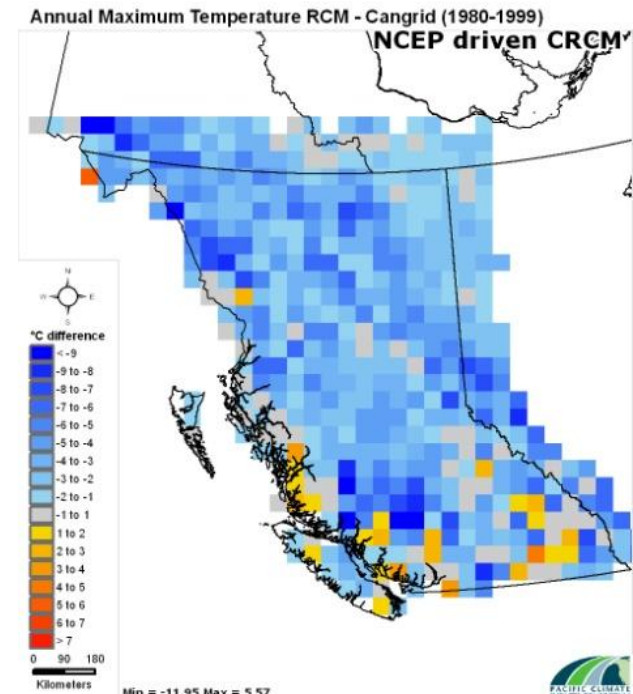
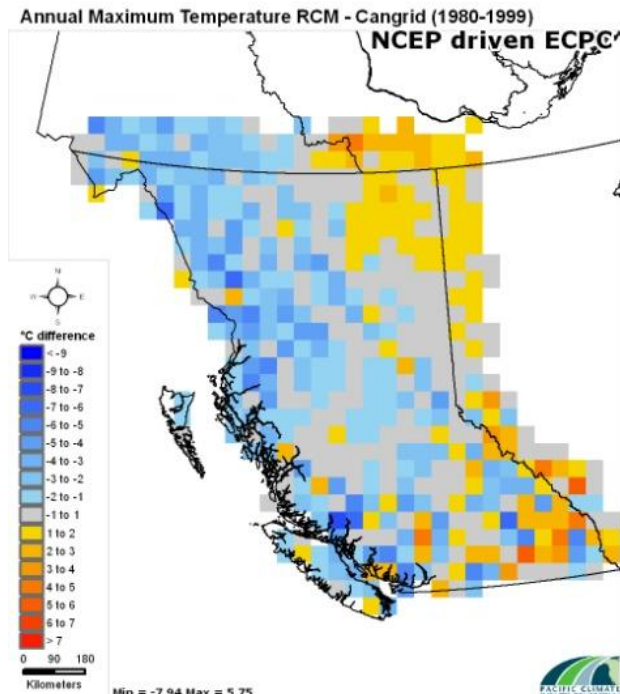


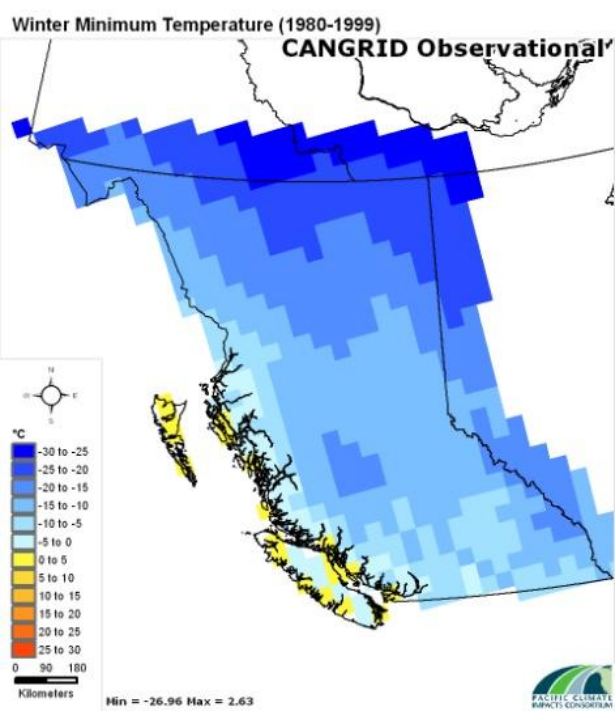
Minimum Temperature



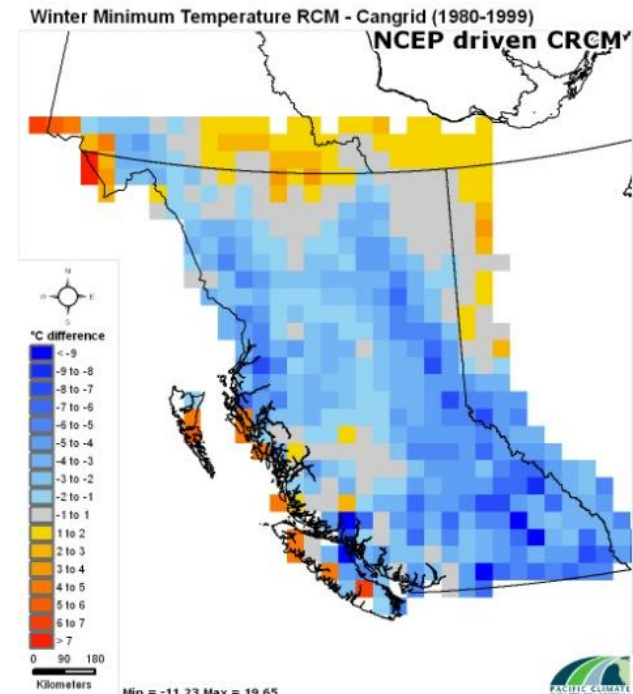
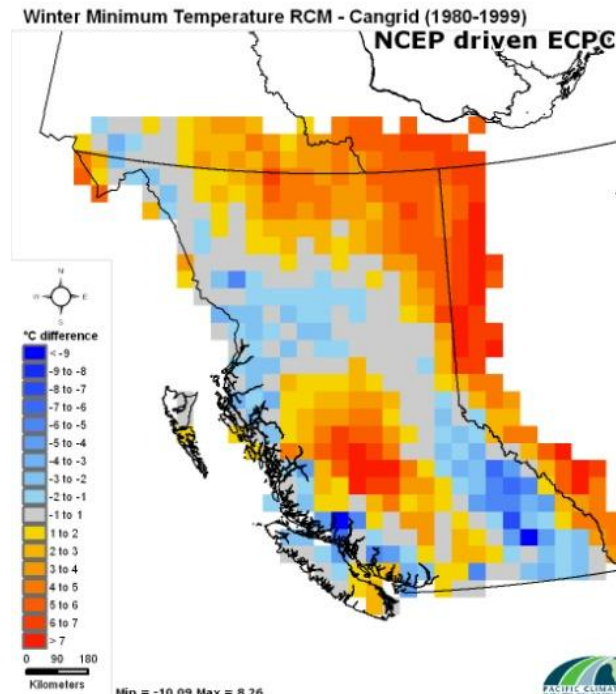


Maximum Temperature

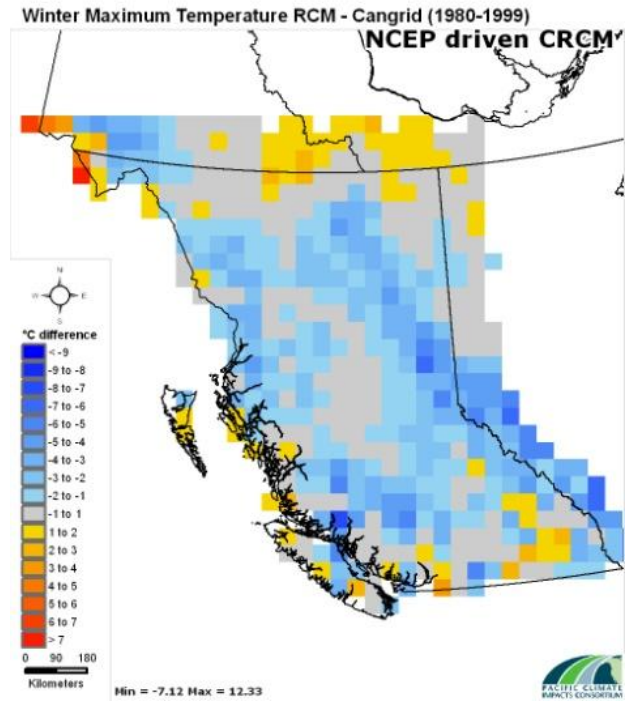
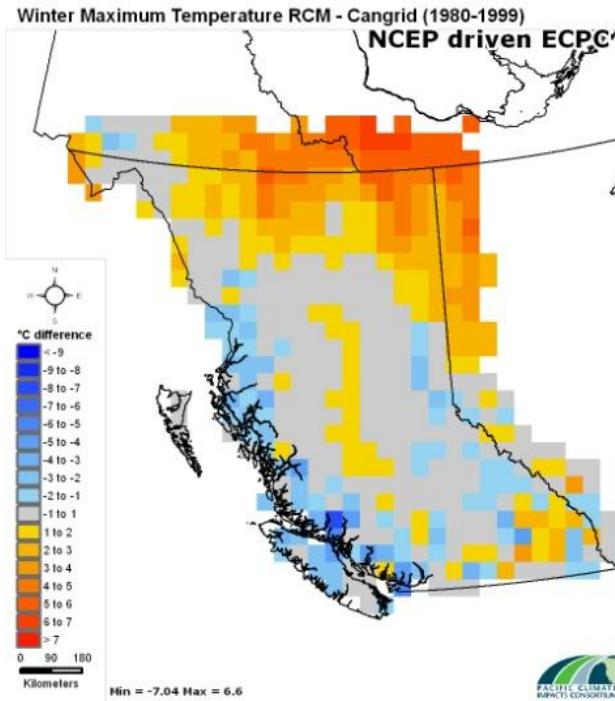
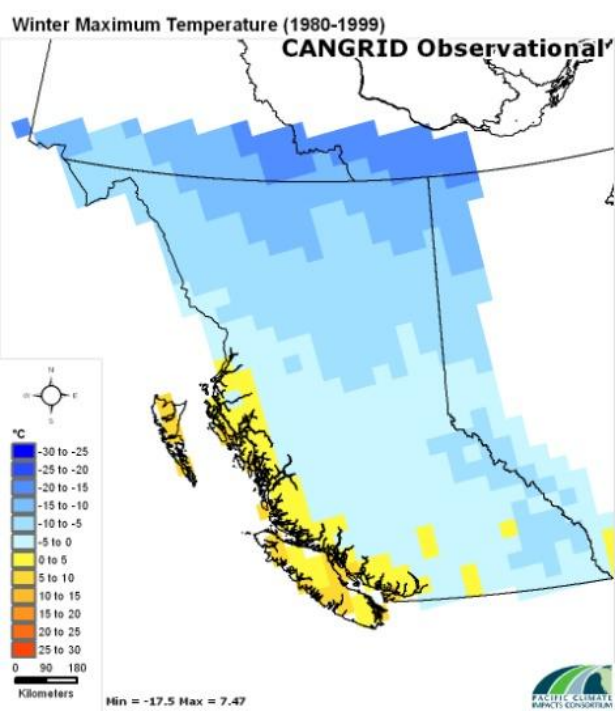


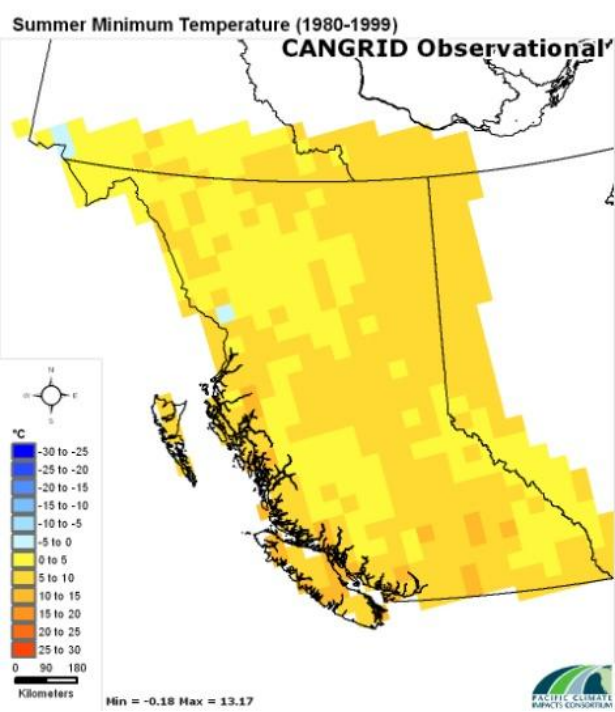


Minimum Temperature

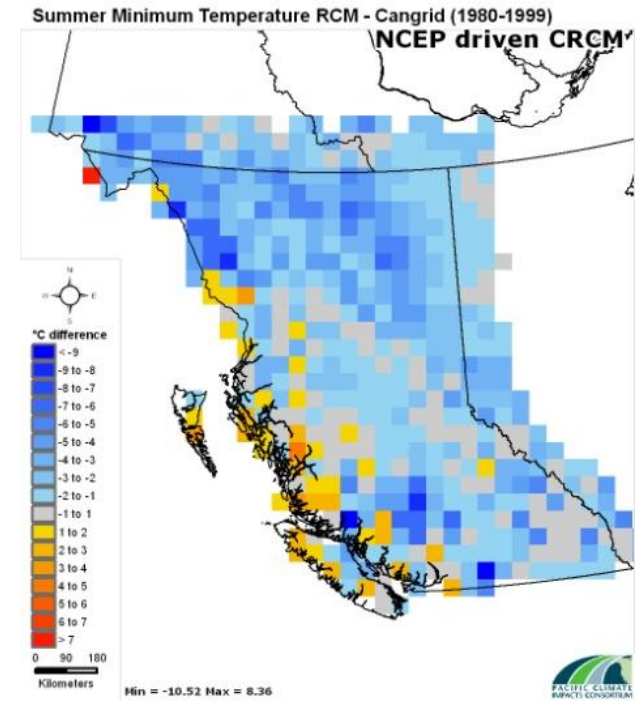
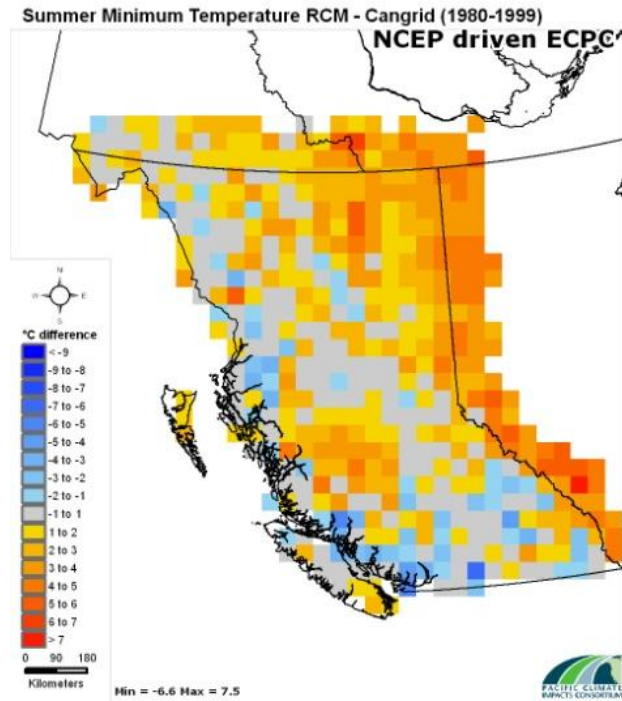


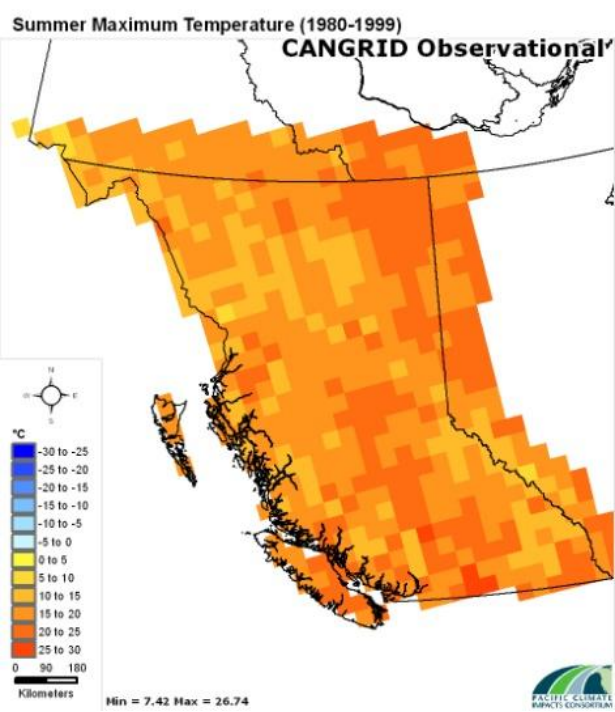
Maximum Temperature





Minimum Temperature





Maximum Temperature

