North American Regional Climate Change Assessment Program (NARCCAP)

Linda O. Mearns
National Center for Atmospheric Research
and
the NARCCAP TEAM

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National Center for Atmospheric Research

The North American Regional Climate Change Assessment Program (NARCCAP)

Initiated in 2006, it is an international program that will serve the climate scenario needs of the United States, Canada, and northern Mexico.

- **Exploration of multiple uncertainties in regional model and global climate model regional projections.**

- **Development of multiple high resolution regional climate scenarios for use in impacts assessments**.

- **Further evaluation of regional model performance over North America.**

- **Exploration of some remaining uncertainties in regional climate modeling (e.g., importance of compatibility of physics in nesting and nested models).**

- **Program has been funded by NOAA-OGP, NSF, DOE, USEPA-ORD – 4-year program**
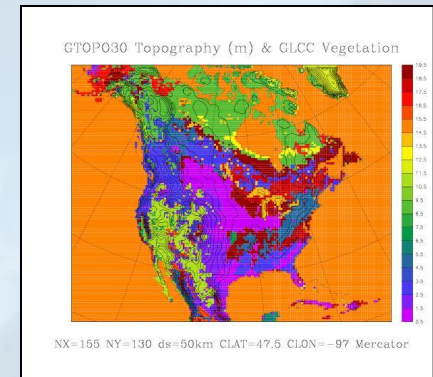
www.narccap.ucar.edu

# NARCCAP - Team

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* Deceased June 2008

NARCCAP Domain
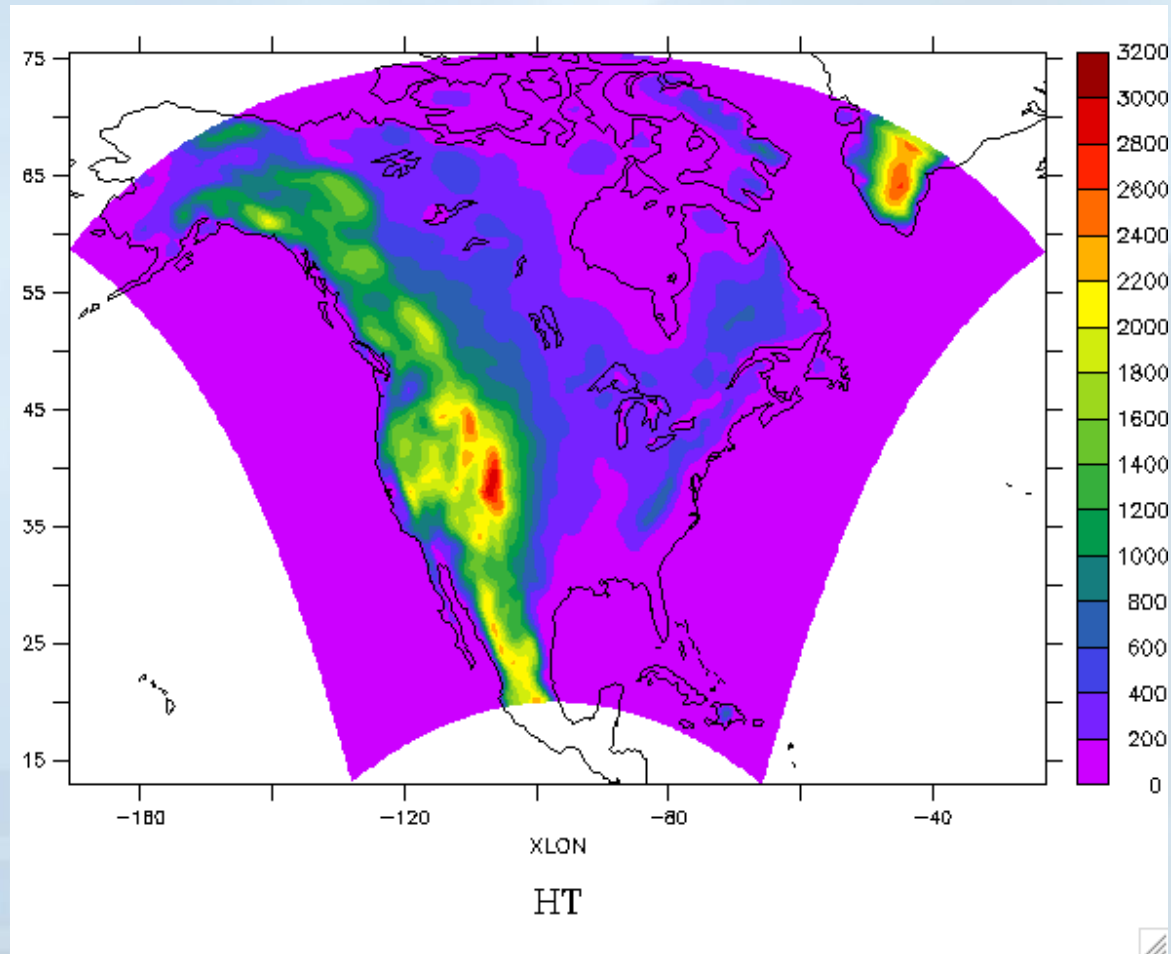
Organization of Program

- **Phase I: 25-year simulations using NCEP-Reanalysis boundary conditions (1979—2004)**

- **Phase II: Climate Change Simulations**

  - **Phase IIa: RCM runs (50 km res.) nested in AOGCMs current and future**

  - **Phase IIb: Time-slice experiments at 50 km res. (GFDL and NCAR CAM3). For comparison with RCM runs.**

- **Quantification of uncertainty at regional scales – probabilistic approaches**

- **Scenario formation and provision to impacts community led by NCAR.**

- **Opportunity for double nesting (over specific regions) to include participation of other RCM groups (e.g., for NOAA OGP RISAs, CEC, New York Climate and Health Project, U. Nebraska).**

Phase I

NCAR

- All 6 RCMs have completed the reanalysis-driven runs (RegCM3, WRF, CRCM, ECPC RSM, MM5, HadRM3)

- Selected results are shown here for 1980-2004 from six RCMs

- Configuration:
  - common North America domain (some differences due to horizontal coordinates)
  - horizontal grid spacing 50 km
  - boundary data from NCEP/DOE Reanalysis 2
  - boundaries, SST and sea ice updated every 6 hours

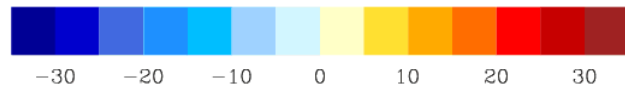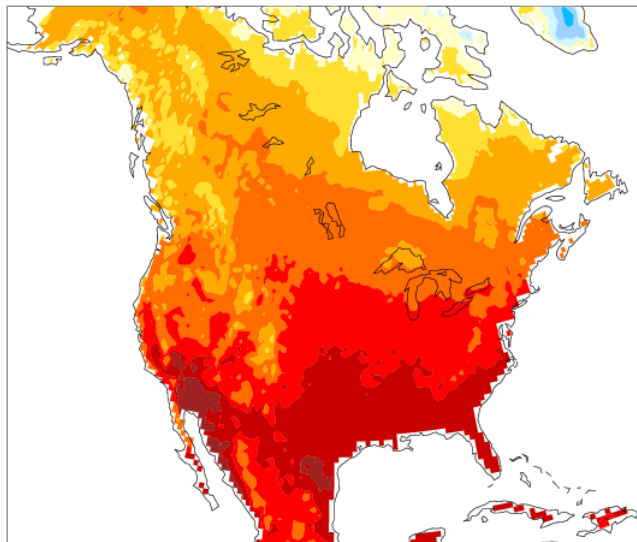UDEL obs., DJF seasonal avg, 1980-2004
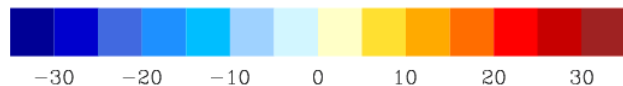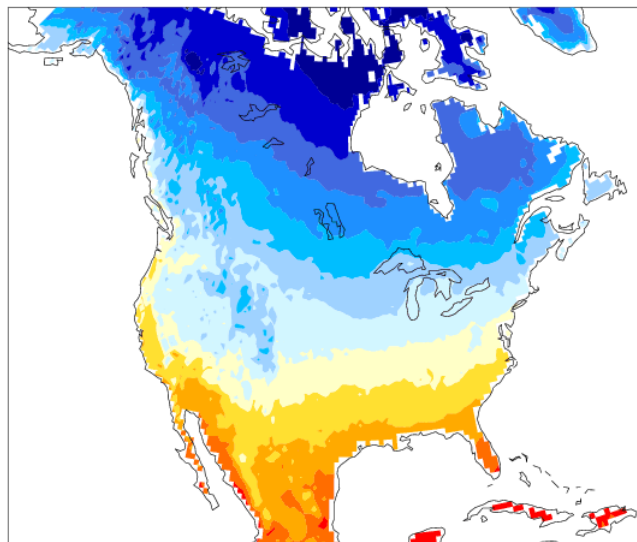
MM5I+NCEP, DJF seasonal avg, 1980-2004
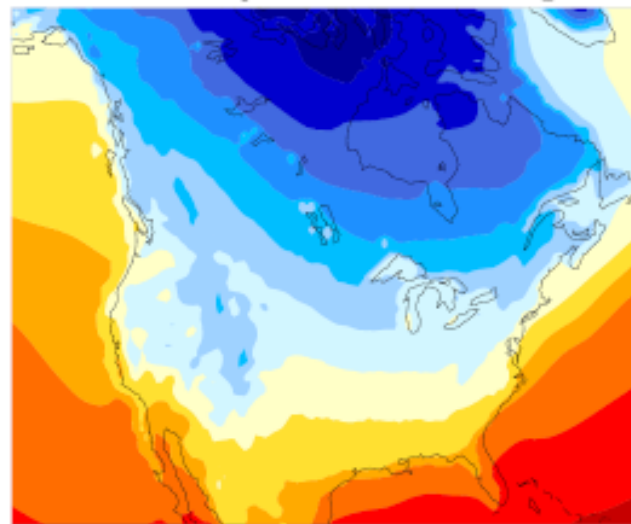
UDEL obs., JJA seasonal avg, 1980-2004

temp   C

CRCM+NCEP, JJA seasonal avg, 1980-2004

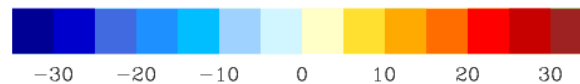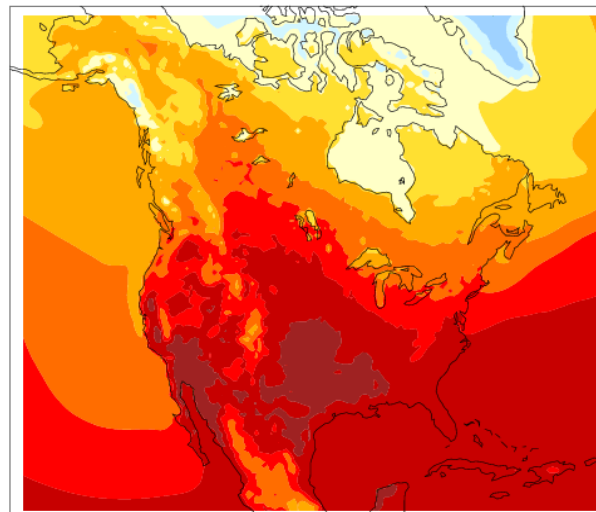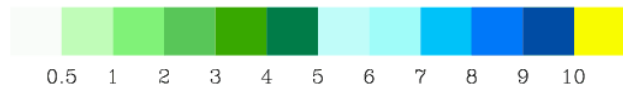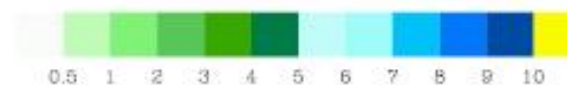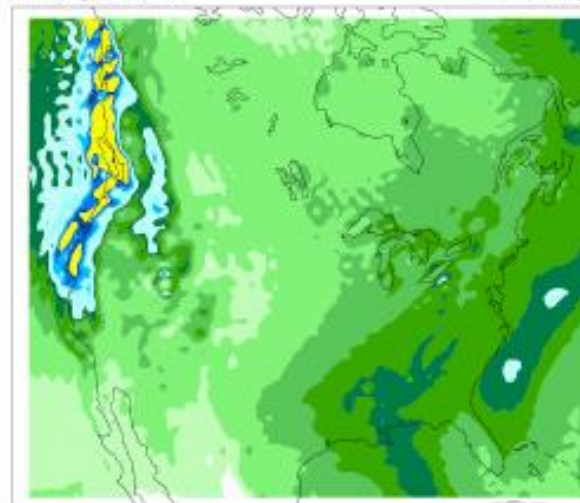Surface Air Temperature   degrees C

UDEL obs., JJA seasonal avg, 1980-2004

temp   C

−30   −20   −10   0   10   20   30
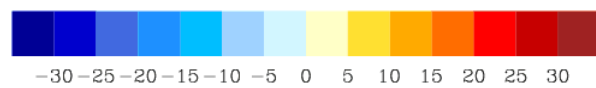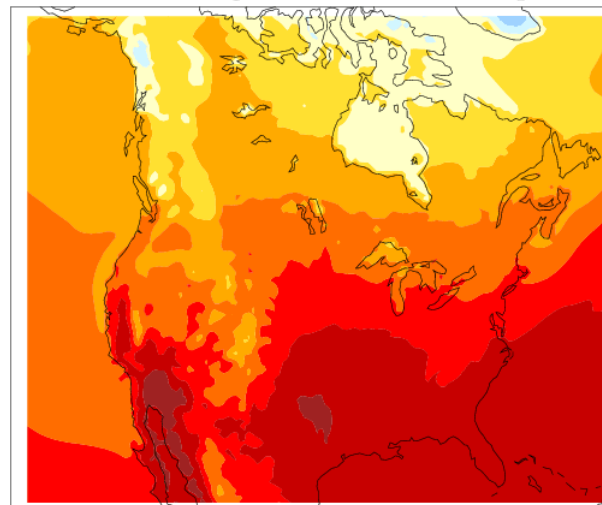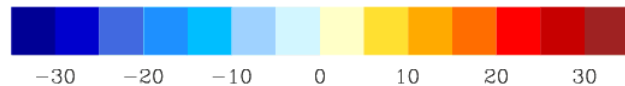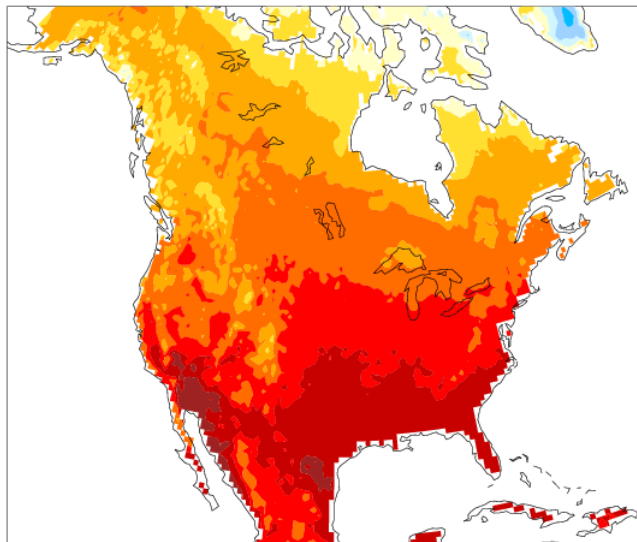
HRM3+NCEP, JJA seasonal avg, 1980-2004

Surface Air Temperature   degrees C

−30   −20   −10   0   10   20   30

NCAR

UDEL obs., DJF seasonal avg, 1980-2004

precip   mm/day

0.5   1   2   3   4   5   6   7   8   9   10
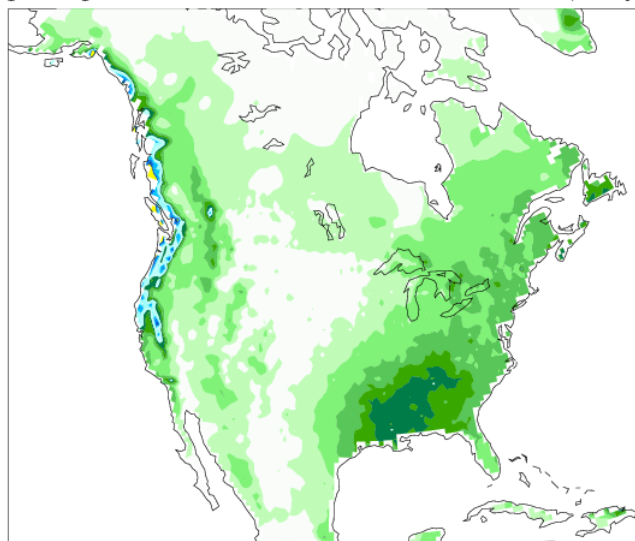
ECPC+NCEP, DJF seasonal avg, 1980-2004

Precipitation   mm/day

0.5   1   2   3   4   5   6   7   8   9   10

NCAR

UDEL obs., JJA seasonal avg, 1980-2004
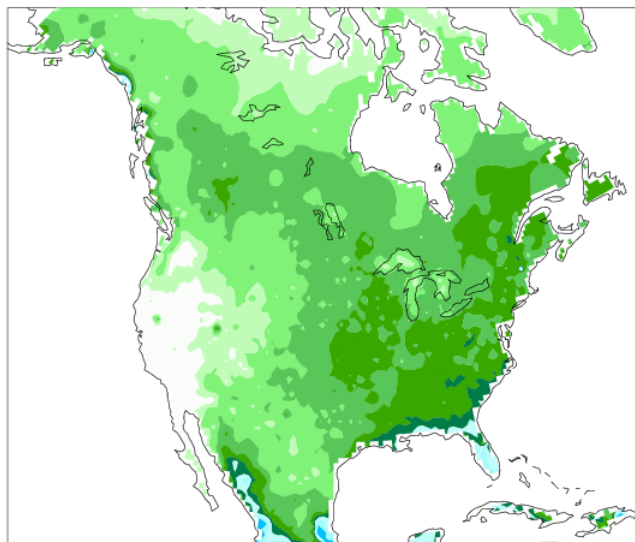
RCM3+NCEP, JJA seasonal avg, 1980-2004
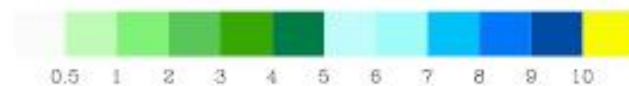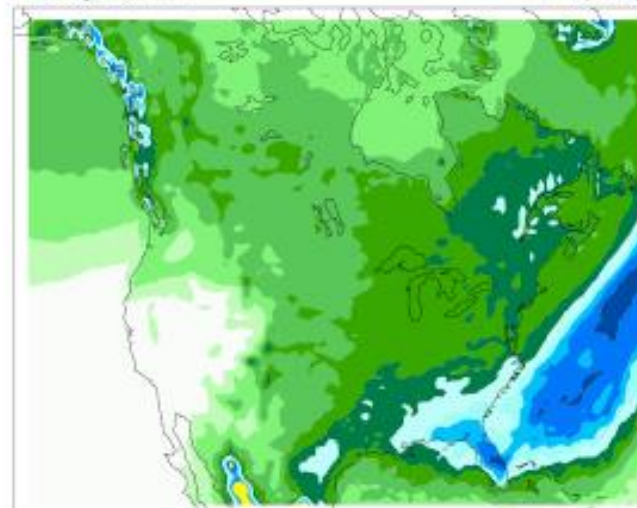
NARCCAP PLAN – Phase II

NCAR

A2 Emissions Scenario

GFDL
Time slice
50 km

GFDL

CGCM3

HADCM3

CCSM

CAM3
Time slice
50km

1971-2000 current **Provide boundary conditions** 2041-2070 future

MM5
Iowa State/
PNNL

RegCM3
UC Santa Cruz
ICTP

CRCM
Quebec,
Ouranos

HADRM3
Hadley Centre

RSM
Scripps

WRF
NCAR/
PNNL
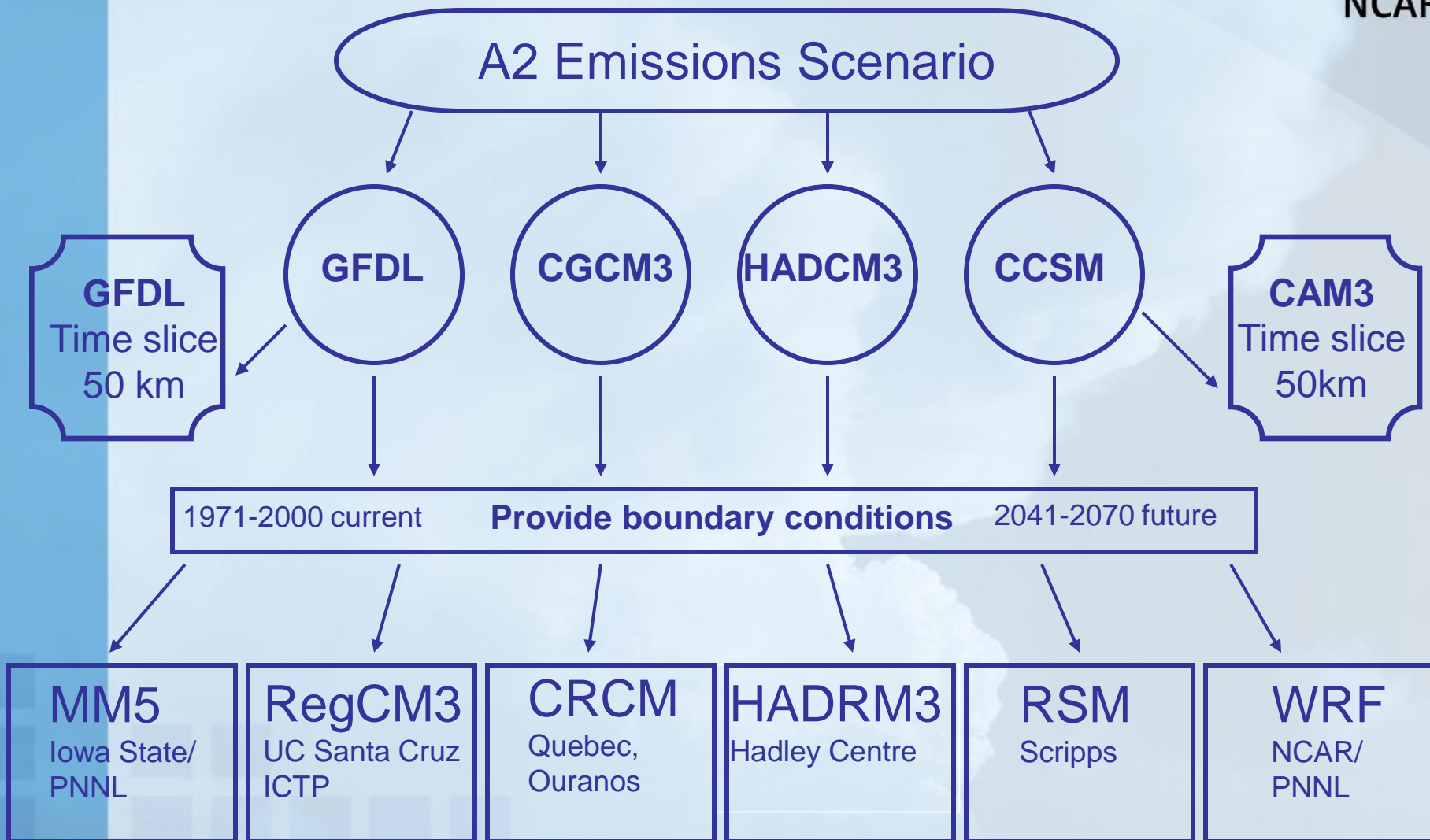
GCM-RCM Matrix

NCAR

AOGCMS

	GFDL	CGCM3	HADCM3	CCSM
MM5			X	X1
RegCM	X1	X		
CRCM		X1		X
HADRM	X		X1	
RSM	X1		X	
WRF		X		X1
***CAM3**				X
***GFDL**	X			

RCMs

1 = chosen first GCM
*= time slice experiments
Red = run completed

Phase IIa Results
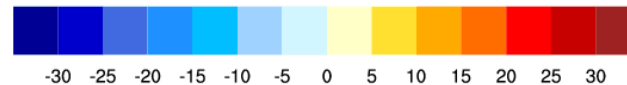
WRF-CCSM3

UDEL obs., JJA seasonal avg, 1980-2004
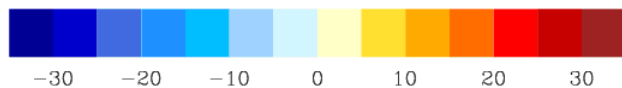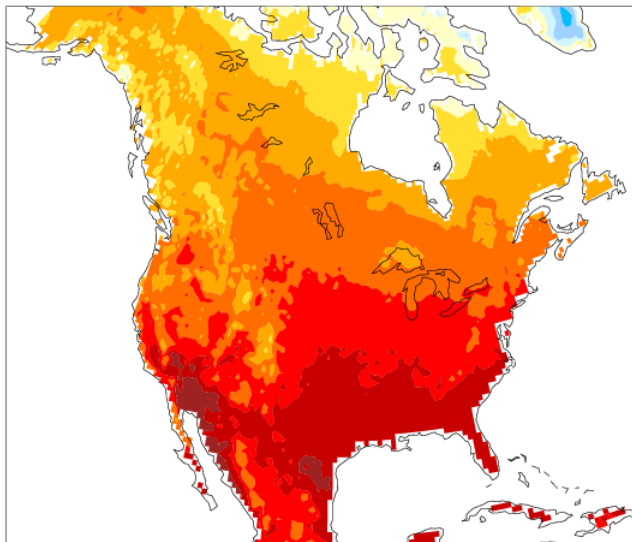
WRFP+NCEP, JJA seas. avg, 1980-1999
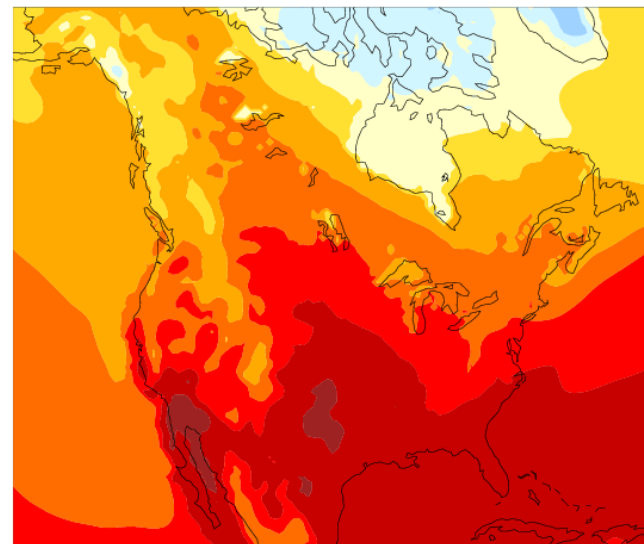
CCSM, JJA seas. avg, 1980-1999
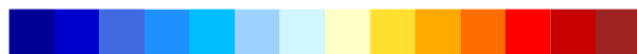
Surface Air Temperature
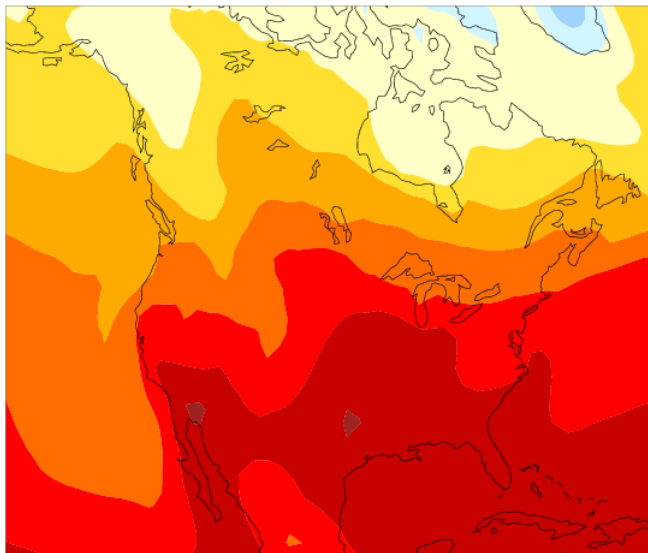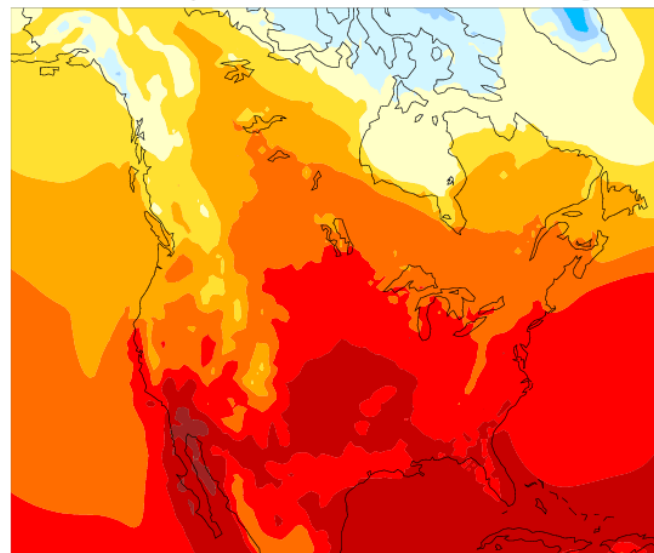
degrees C

WRFP+CCSM, JJA seas. avg, 1980-1999

Surface Air Temperature

degrees C
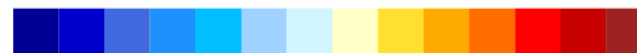
Phase IIb Results

Time Slice Experiments
GFDL AM2.1 and CCSM3 CAM3

Near Surface Air Temperature, deg C, JJA
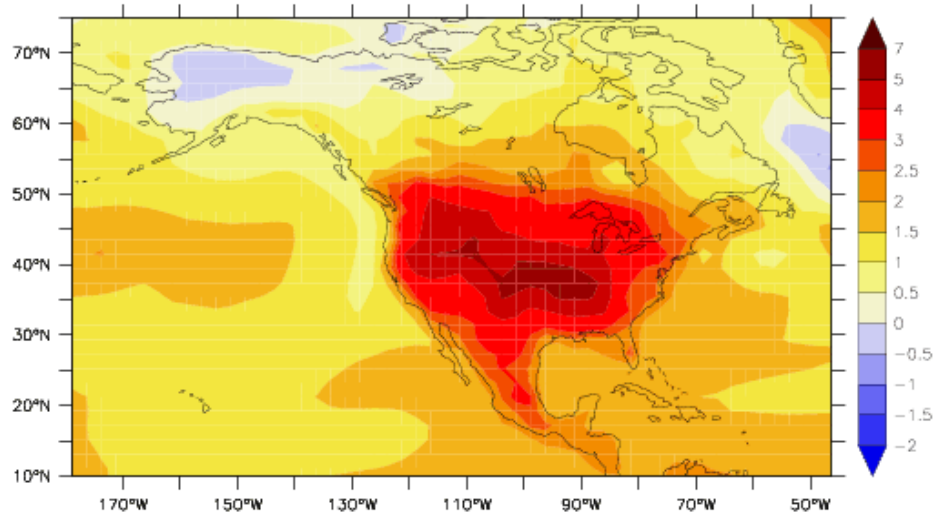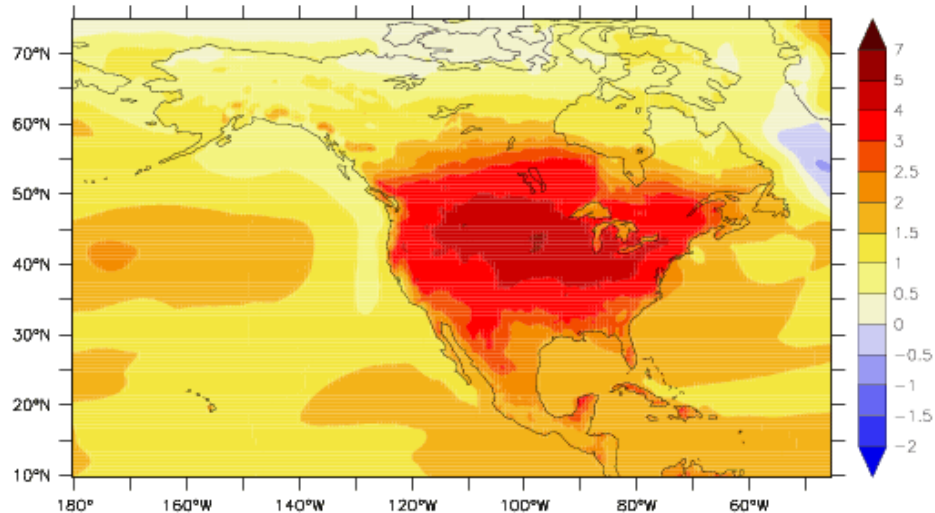
GFDL CM2.1

GFDL AM2.1

Future-current Summer Temperatures

NCAR CCSM3
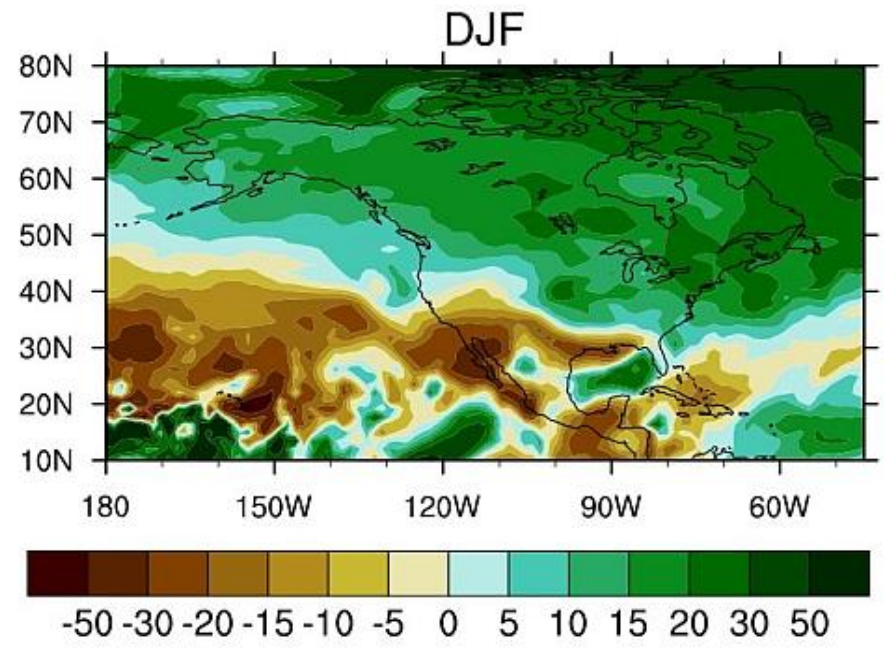
NCAR CAM3

Winter Precipitation % difference -- future vs. current
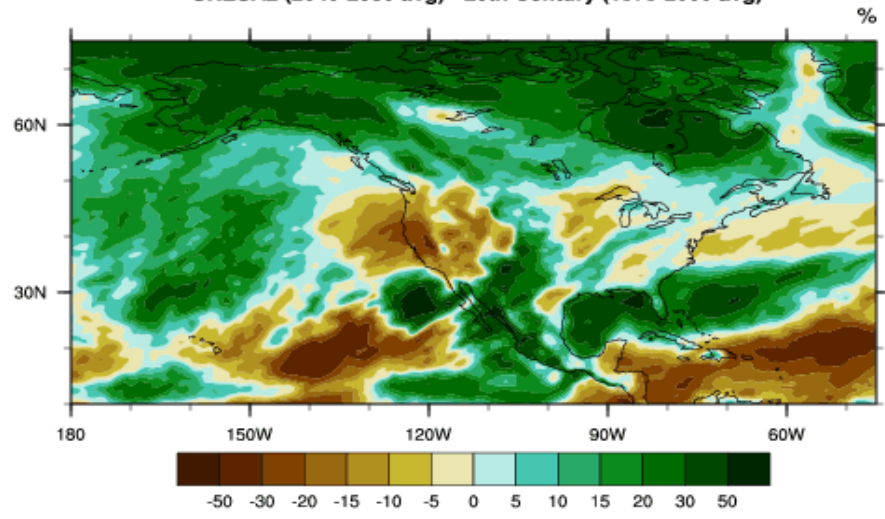
NARCCAP Project Timeline
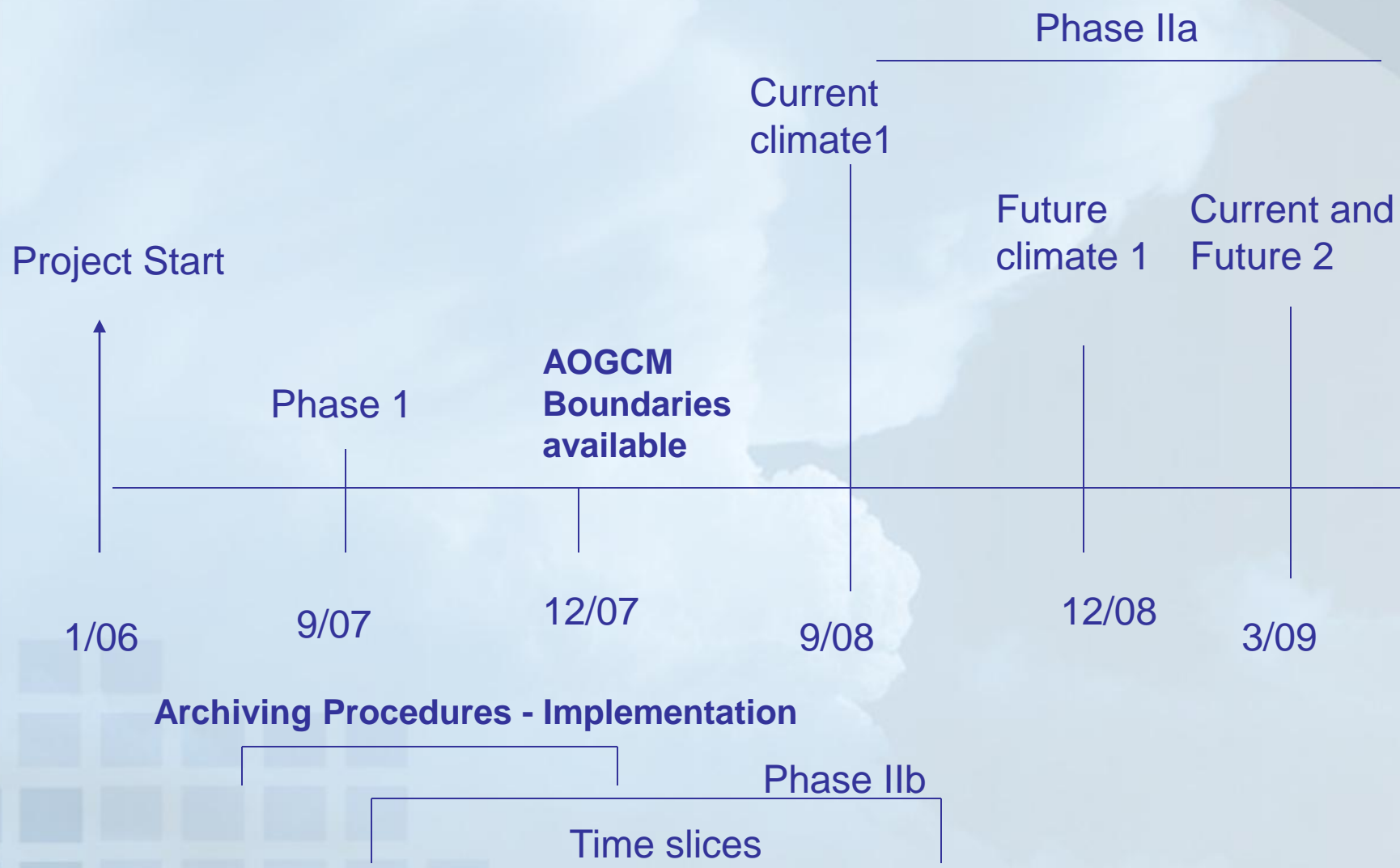
The NARCCAP User Community

Three user groups:

- Further dynamical or statistical downscaling

- Regional analysis of NARCCAP results

- Use results as scenarios for impacts studies

www.narccap.ucar.edu

To sign up as user, go to web site – contact Seth McGinnis,

mcginnis@ucar.edu

End