NARCCAP: Regional Climate Change Modeling for Impacts and Analysis

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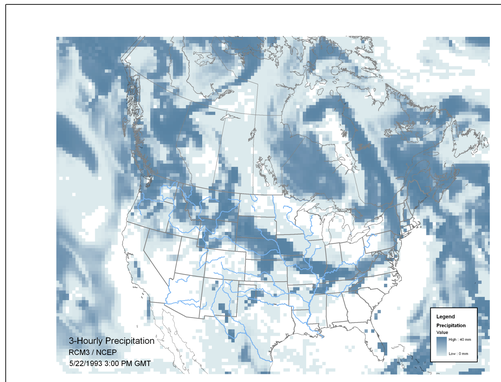
ABSTRACT

The North American Regional Climate Change Assessment Program (NARCCAP) is an international program to produce high resolution climate change scenarios and investigate uncertainties in regional scale projections of future climate by nesting multiple regional climate models (RCMs) within multiple atmosphere-ocean general circulation models (AOGCMs) forced with the A2 SRES scenario and with historical data over a domain covering the conterminous United States and most of Canada and Northern Mexico.

The resulting 60+ TB of data will be archived for distributed storage and made available to global change impacts researchers worldwide via the Earth System Grid (ESG). To ensure that the final product is usable by the impacts community, GIS practitioners, climate analysts, modelers, policy-makers, and other end users, data is stored in NetCDF format adhering to the CF metadata standard, making it fully compatible with many popular analysis programs, including ArcGIS, Matlab, IDL, and R.

IMPACTS-ORIENTED

NARCCAP data is organized with an eye toward usability by impacts practitioners. Variables important to impacts research have been prioritized for archiving and distribution. CF-compliant NetCDF data can be imported directly into ArcGIS and exported to plain-text files readable by spreadsheet programs. The NARCCAP website has a variety of support materials and continues to grow.



Severe Weather Event: This map shows precipitation for a 3-hour period on the morning of May 22nd, 1993. On this day, heavy storms caused severe flooding in Sioux Falls, South Dakota. NARCCAP data can be imported directly into GIS.

NARCCAP AT A GLANCE

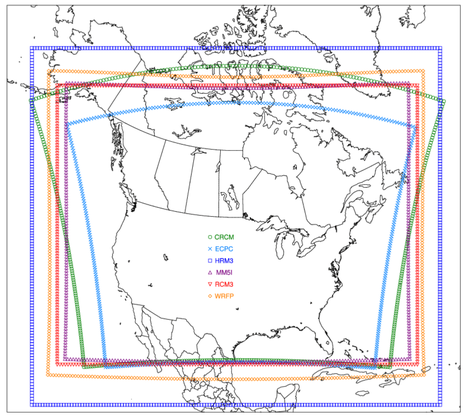
- 4 different AOGCMs driving 6 different RCMs
- 50 km spatial resolution
- 3 hourly temporal resolution
- 52 output variables
- 2 high-resolution GCM timeslice experiments
- Future scenario: A2 SRES emissions

RCM \ GCM	Phase I	Phase II			
	NCEP	GFDL	CGCM3	HADCM3	CCSM
CRCM	X		X		X
ECPC	X	X		X	
HRM3	X	X		X	
MM5I	X			X	X
RCM3	X	X	X		
WRFP	X		X		X

Phase I: RCMs are driven by historical (1979-2003) observed (NCEP2 reanalysis) data
Phase II: Each RCM is driven by 2 GCMs for current (1968-2000) and future (2038-2070) scenarios

MAP PROJECTIONS AND SPATIAL DOMAIN

NARCCAP RCM Domains



Although each RCM models the same spatial domain, differences in the map projection used and the depth of the model's "sponge zone" (where the forcings are applied) create differences in the effective coverage area. The NARCCAP team has developed tools for interpolating data between model grids.

Map Projections	
CRCM	Polar Stereographic
ECPC	Polar Stereographic
HRM3	Rotated Pole
MM5I	Lambert Conformal
RCM3	Transverse Mercator
WRFP	Lambert Conformal

NARCCAP GOALS

- 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).
- Creation of greater collaboration between US and Canadian climate modeling groups, as well as with the European modeling community.
- Quantification of uncertainty across all models.

Seasonal Climatology: These plots show summer and winter seasonal averages of temperature and precipitation for 5 of the NCEP-driven runs, as well as observed data from the University of Delaware dataset for the same 25-year time period.