RegCM3

Lisa C. Sloan, Mark A. Snyder, Travis O'Brien, and Kathleen Hutchison

Climate Change and Impacts Laboratory

Dept. of Earth and Planetary Sciences

University of California, Santa Cruz

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RegCM3 Model Details

- Model documentation and source code available: http://users.ictp.it/RegCNET/model.html

- Primary reference: Pal et al. 2007, Bulletin of the American Meteorological Society (BAMS)

RegCM3 Model Details

- Hydrostatic equation

- Sigma coordinates in vertical (terrain following)

- Zeng ocean flux parameterization (atm/ocean fluxes)
  - Zeng et al. 1998

- SUBEX large scale precipitation parameterization
  - Pal et al. 2000 (JGR)

- Grell convective precipitation parameterization
  - Fritsch and Chappell closure scheme (1980)

- CCM3 radiation scheme

- BATS1E land surface model

RegCM3 Initialization

- ## Soil moisture
  - Set to initial values specified in landuse type data set at first time step

- ## Atmospheric variables
  - Surface pressure, 3D winds, 3D temperature, 3D humidity
  - Set to initial values of first time step of the boundary condition data (interpolated to RCM grid)

- ## Sea Surface Temperatures (SST)
  - Set to values from GCM driving data

RegCM3 Domain Details

- Horizontal resolution of 50 x 50 km

- Vertical resolution of 18 levels

- Rotated Mercator projection, 130 north-south grid cells, 160 east-west gridcells

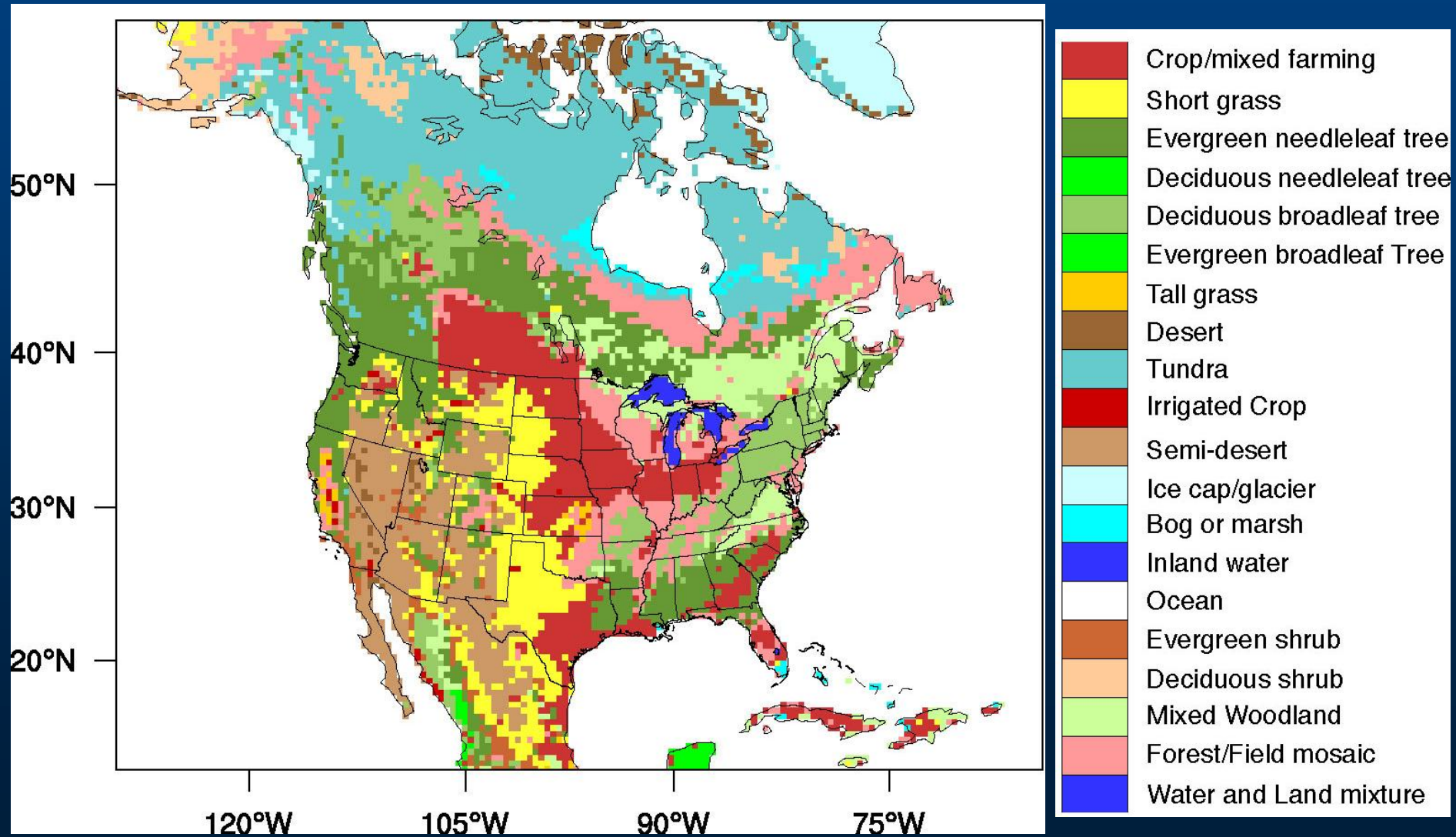- Centered over North America at 47.5 N and 97.0 W

RegCM3 Topography (m)

Surface Elevation (m)

0   600   1200   1800   2400   3000
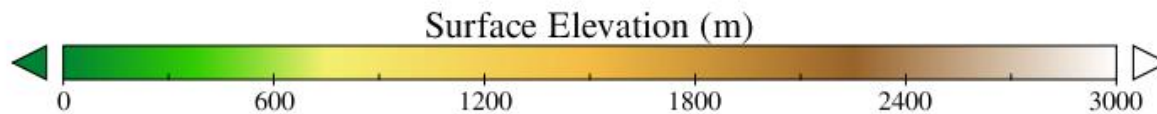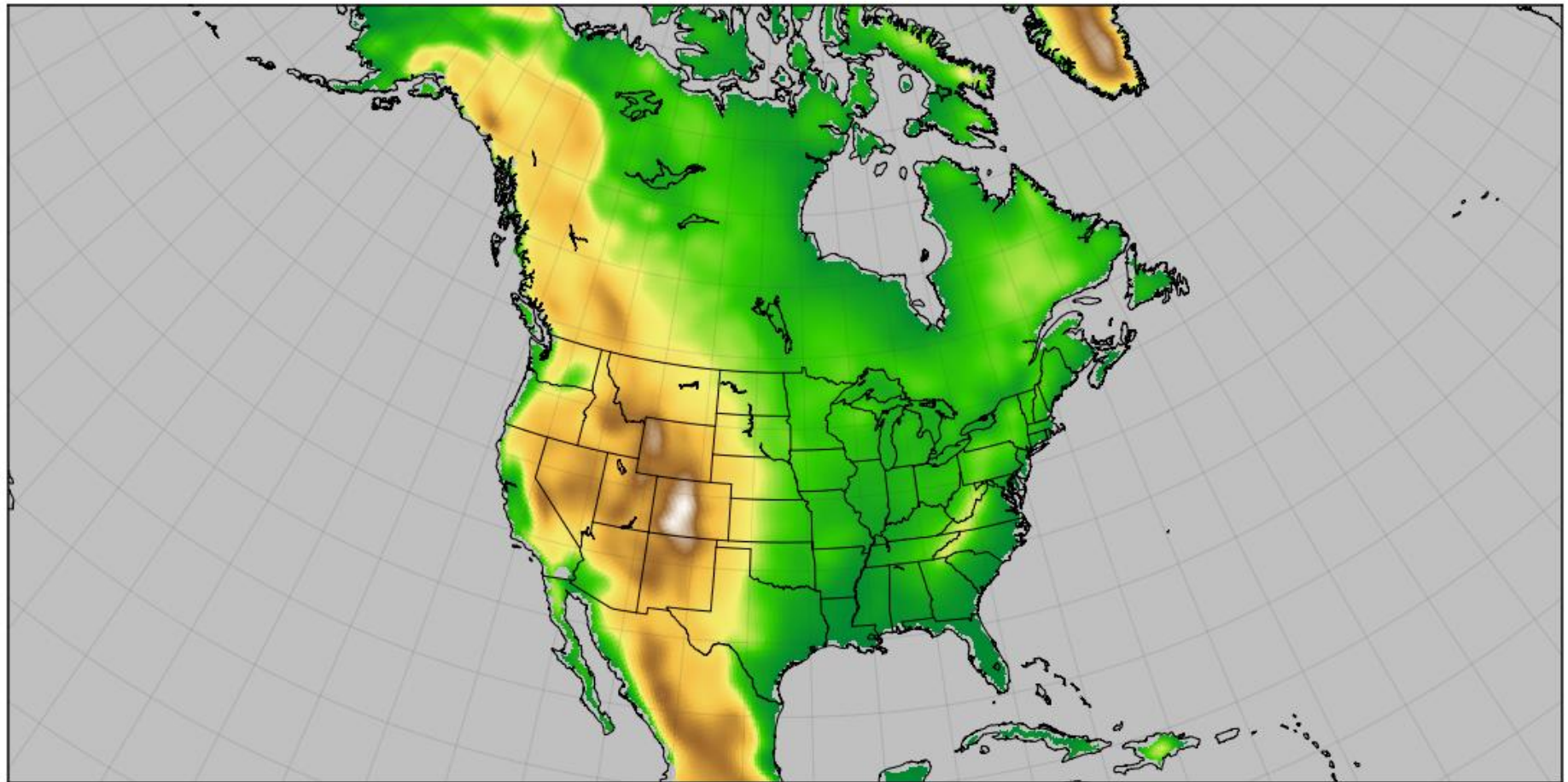
RegCM3 NARCCAP Details

Parameter	Value
Main model timestep	150 seconds
BATS timestep	450 seconds
Radiation timestep	30 minutes
# vertical levels	18
Pressure at model top	50 mb
Spectral nudging?	No
Relaxation technique	Exponential
Sponge zone	12 grid cells on all boundaries
Spin-up time	1 year

BATS1E Land Surface Model

- 20 landuse categories
- 10 minute resolution global topography and vegetation data
  - Interpolated to RCM grid
  - GLCC vegetation data (http://edc2.usgs.gov/glcc/)
- No lake model used in NARCCAP runs*

RegCM3 Land Cover Types

Legend:
- Crop/mixed farming
- Short grass
- Evergreen needleleaf tree
- Deciduous needleleaf tree
- Deciduous broadleaf tree
- Evergreen broadleaf Tree
- Tall grass
- Desert
- Tundra
- Irrigated Crop
- Semi-desert
- Ice cap/glacier
- Bog or marsh
- Inland water
- Ocean
- Evergreen shrub
- Deciduous shrub
- Mixed Woodland
- Forest/Field mosaic
- Water and Land mixture

RegCM3-GFDL Great Lakes issue

- For the GFDL future and historical simulations, initial lake temperatures were assigned using downward-extrapolated air temperature. After the initial time step, the BATS land surface model calculates the temperatures at lake grid points. Grid points designated as lakes use the BATS parameterization for inland water (land use category 14).

RegCM3-GFDL Great Lakes issue

- About BATS land use category 14 (inland water):
  - In the land surface model, BATS, lake grid cells are defined as land use category 14. This land use type is treated in the same way as any other land use type by the land surface model (i.e. fluxes of heat and moisture are calculated, along with other variables). The response of land use category 14 is governed by the parameters in the tables below. The land surface model also keeps category 14 saturated at all time steps, by setting negative values for runoff. This is the best approximation for a water covered grid cell given BATS limitations. For further reference, the RegCM3 source code and documentation are available here: http://users.ictp.it/RegCNET/model.html.

RegCM3-GFDL Great Lakes issue

- Re-run of RegCM3-GFDL cases
  - Take original SST datasets from GFDL, with no values over land, and create new interpolated across land datasets.
  - Use the NCL poisson_grid_fill function to do this (http://www.ncl.ucar.edu/Document/Functions/Built-in/poisson_grid_fill.shtml)
  - Use new SST datasets to create boundary conditions for RegCM3

RegCM3-GFDL Great Lakes issue

- Re-run of RegCM3-GFDL cases
  - Values of SSTs for the Great Lakes are now assigned using the new interpolated SST datasets
  - Re-runs of RegCM3-GFDL historical and future cases are now complete (Historical v2 and Future v2)
  - Seasonal SSTs values now more realistic
  - Upload of data is ongoing

End

Status of Model Runs

- ## RegCM3 – GFDL
  - Historical: complete
  - Future: complete
  - Caveat: The Great Lakes temperatures were set using extrapolated surface air temperature, and updated by BATS land surface model.
  - Caveat: Sea ice not functional in RegCM3
  - Historical v2: complete: new Great Lakes SSTs
  - Future v2: complete: new Great Lakes SSTs

Status of Model Runs

- RegCM3 – CGCM3
  - Historical: complete
  - Future: complete
  - Caveat: The Great Lakes temperatures were set using extrapolated surface air temperature, and updated by BATS land surface model – in this case there is lake temperature data from CGCM3 itself.
  - Caveat: Sea ice not functional in RegCM3