Mapping Climate Change in the Adirondacks:

A local scale comparison based on two high-resolution gridded data products

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Background

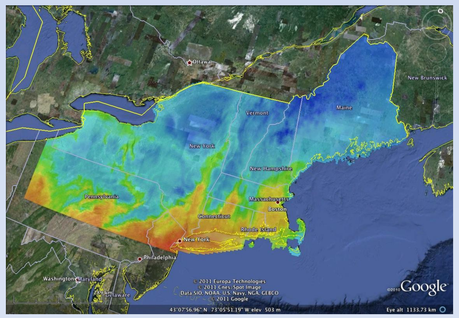
- High-resolution gridded historical climate (GHC) products are being widely used in research and decision-making
- These data allow us to analyze, map and interpret climate change across landscapes at local and regional scales
- Many GHC products available, but little has been done to compare these datasets or their estimates of climate change

Research Questions

- How has the climate changed across the US Northeast landscape? In the climate-sensitive Adirondacks?
- Do different GHC products provide similar estimates of change? Where do these datasets disagree most?

Data Sources

Data Product	Resolution		Domain		Data Sources		Methods
	Temporal	Spatial	Temporal	Spatial	Primary	Secondary	
PRISM (Daly et al. 2002)	Monthly	4 km	1900-present	Contiguous 48 US states	Station records	4km elevation model; geographic facets	Regression models based on elevation, facets, using an expert system with weighting schemes
NRCC (DeGaetano and Belcher 2007)	Daily	2.5 arc sec (4 km at 45N°)	1979-present	US Northeast (NY, VT, NH, ME, MA, RI, CT, PA, NJ)	North American Regional Reanalysis; Coop Network Stations	2.5 arc sec (4km) elevation model	Downscaling of NARR to 4km elevation model; Bias correction within a defined radius using Coop Network stations



Average annual minimum (TMIN) temperatures across the US Northeast, from 1980-2009. Google Earth map based on Northeast Regional Climate Center (NRCC) data[2]

Methods

- Data compiled into netCDF[4] files
- Analyzed using R version 2.8[4]
- Mapped with R, Google Earth

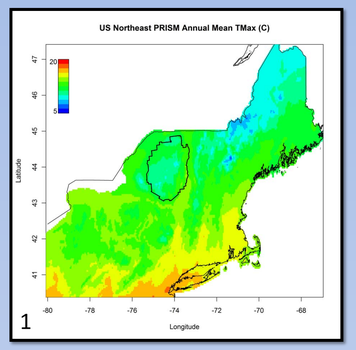
PRISM ←Map 1 | Mean Temperature | NRCC Map 2→

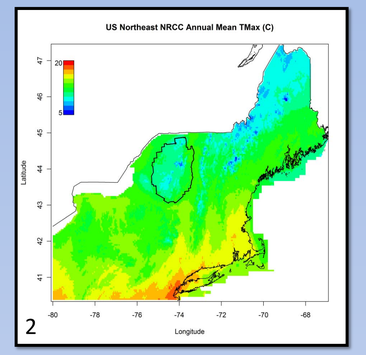
Trend Analysis 1980-2009

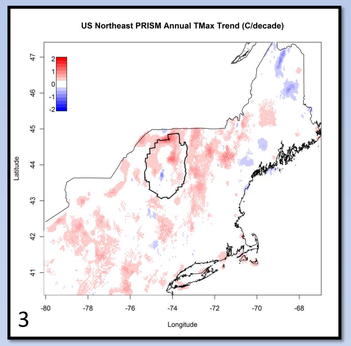
PRISM ←Map 3 | Temperature Trends | NRCC Map 4→

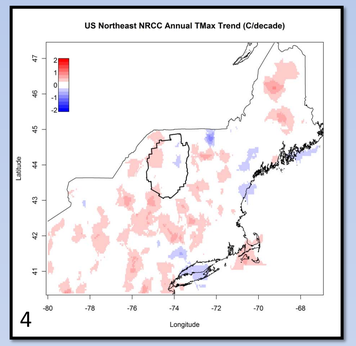
PRISM mean — minus — NRCC mean → Mean Bias → TMax ←Map 5 | TMin Map 6→

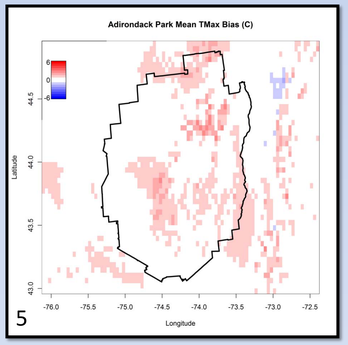
PRISM trend — minus — NRCC trend → Trend Bias → TMax ←Map 7 | TMin Map 8→

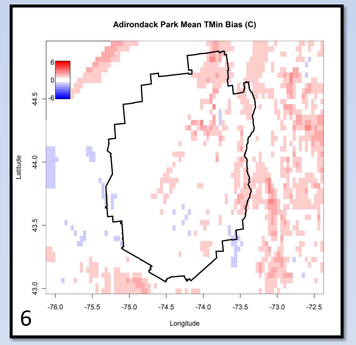


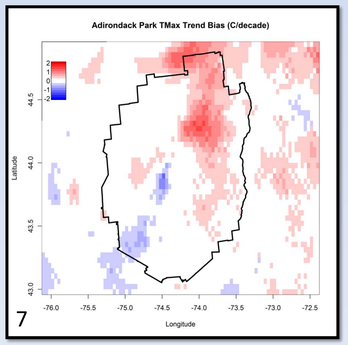


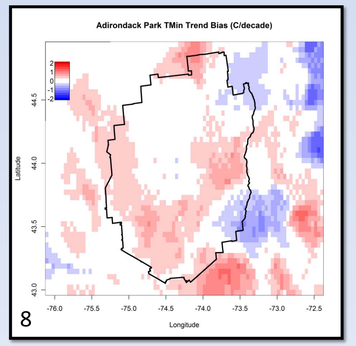






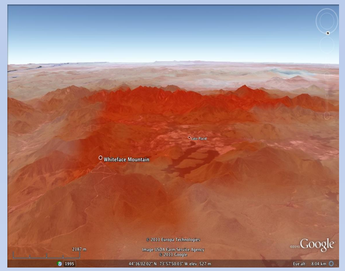






Results

- Trend maps are patchy, with areas of warming and cooling, often in close proximity or adjacent to each other
- Adirondack North Country has been a regional 'hot-spot' in the US Northeast with warming rates up to 2 C per decade
- Largest differences between PRISM and NRCC datasets are located in montane and coastal areas[5]
- PRISM and NRCC disagree strongly on means and trends of maximum temperatures in ADK High Peaks (Maps 3, 4 and 7)
- Map disagreement in High Peaks is likely due to a single station – Lake Placid – which PRISM uses and NRCC omits[5]



View of Catskill Mountains from the northeast, indicating that the uplands are warming more rapidly (appear darker red in color) than the adjacent lowlands and Hudson Valley, based on PRISM data[1].

View of Adirondack High Peaks from the north, indicating rapid warming up to 2°C decade based on PRISM (Map 3), but NRCC (Map 4) predicts little or no change in the same location during the same time period (1980-2009)[4]. Map 7 shows this area of disagreement.

Key Points

- Trend maps raise questions about high-resolution climate data
- Adirondack High Peaks are warming rapidly (PRISM), or not warming at all (NRCC), depending on which dataset is utilized
- Anomalies in GHC data may be due to weather station error[3]
- Use caution when interpreting climate maps at local scales[5]
- Next steps: cross-validation with weather station records and comparison with satellite-derived MODIS temperatures

Works Cited

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