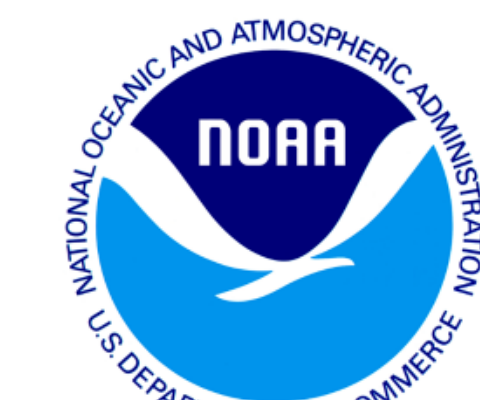
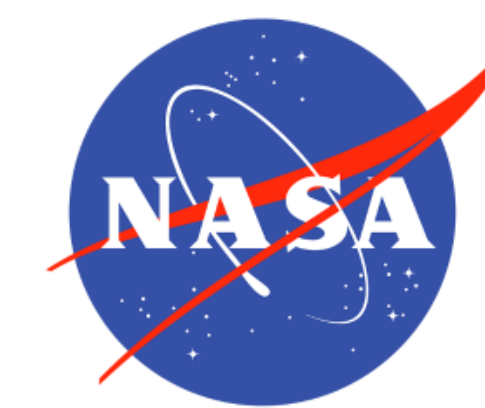




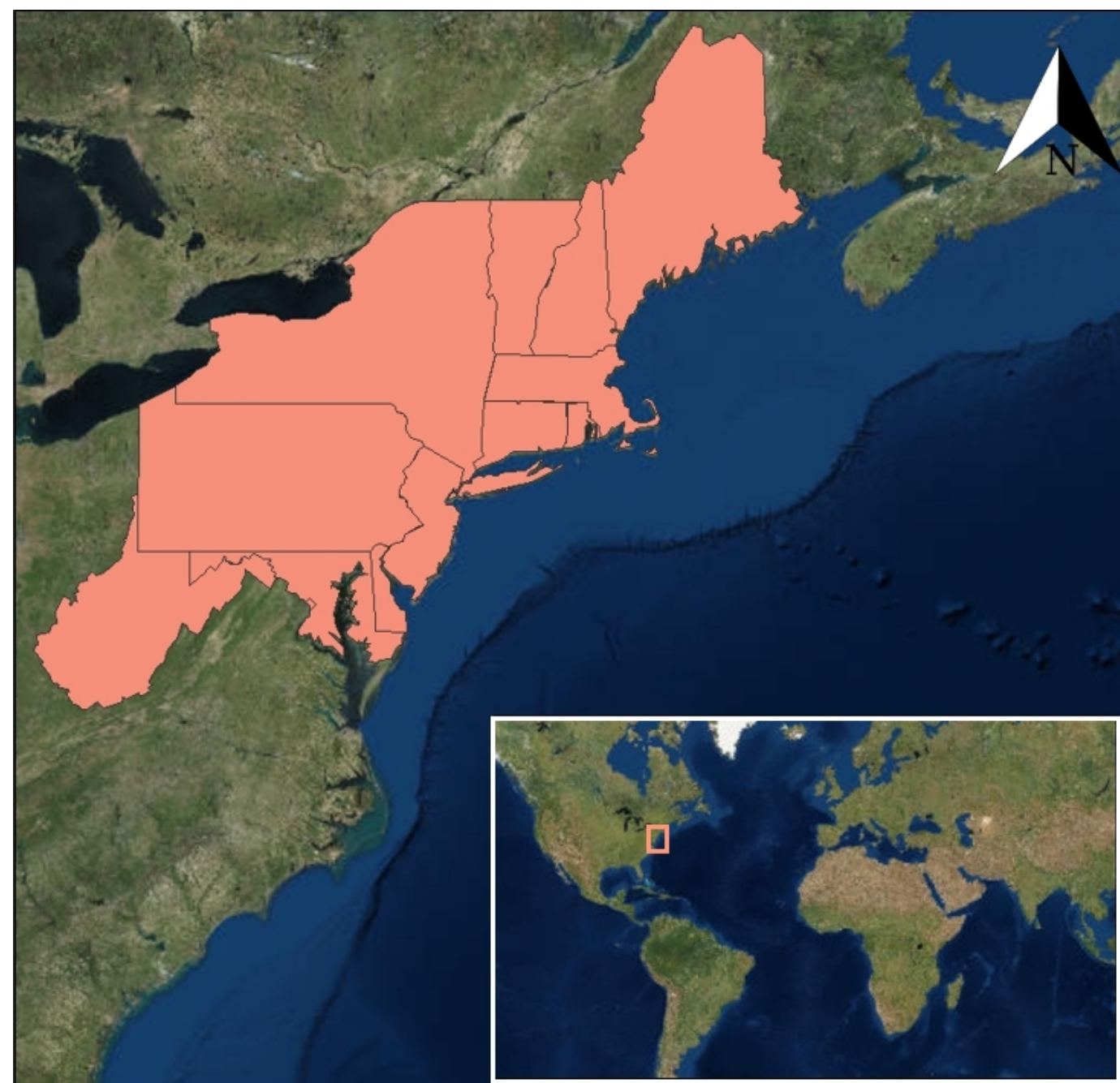
Developing Annual, Seasonal, and Monthly Temperature Indices over the Northeast United States to Represent Temperature Trends Using NASA and NOAA Datasets



Abstract

Since 1977, every year has been in the top ten warmest years on record when first ranked, reflecting the upward progression of annual global temperatures. However, some years within this time frame, such as 2012, are significantly cooler than surrounding years like 2010 or 2013. The variability of yearly rankings makes it difficult to differentiate the relative warmth or coolness of individual years from the secular trend. This project consists of two parts. First, the team devised a simple algorithm to create monthly, seasonal, and annual temperature scores regionally, within the Northeast US, and globally for the time periods ranging from 1975 to 2016 and 1880 to 2016. The temperature score product allows users to differentiate the relative coolness or warmth of a particular year in regard to the warmth or coolness of surrounding years from the overall temperature rankings. The algorithm also provides context for the temperatures in the Northeast Region, accounting for recent year-to-year fluctuations with respect to longer term trends. Secondly, this project utilized daily Aqua and Terra MODIS Land Surface Temperature (LST) data to provide useful, high-resolution temperature-based metrics to the energy and agriculture industries. This consisted of producing heating, cooling and growing degree days (for energy and agriculture industries respectively) for the Northeast US using satellite derived data. The results from this study, which give users the ability to visualize maps of monthly degree days at a higher spatial resolution than indices previously available, are expected to be distributed to various clients by project partners.

Study Area



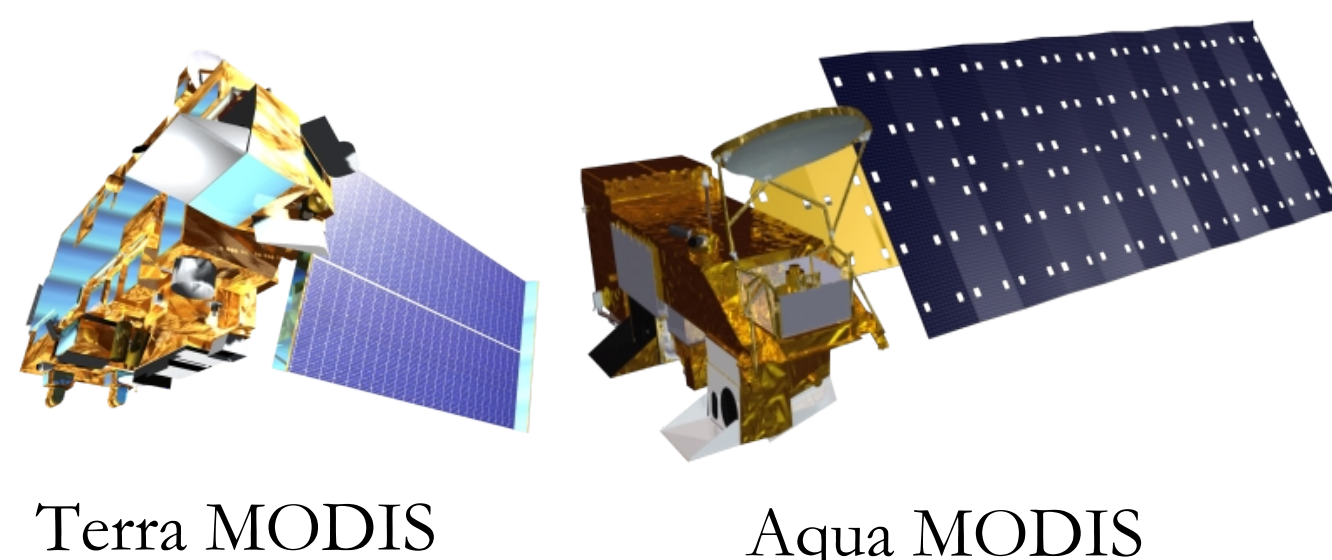
Objectives

- ▶ **Provide** a multitude of end users with an easily digestible perspective of how temperature trends have changed over the last few decades by utilizing information from NASA and NOAA satellite and temperature datasets
- ▶ **Develop** a temperature index specific to the Northeastern United States with a higher spatial resolution than other indices currently being utilized
- ▶ **Compute** heating and cooling degree days using daily LST data and *in situ* temperature data
- ▶ **Create** a product for the end users that has the potential to expand to a diverse set of end users to utilize the data

Project Partners

- ▶ Ellen Mecray, Director, **NOAA Regional Climate Services**
- ▶ Karin Gleason, Meteorologist, **NOAA National Center for Environmental Information, Climate Monitoring Branch**

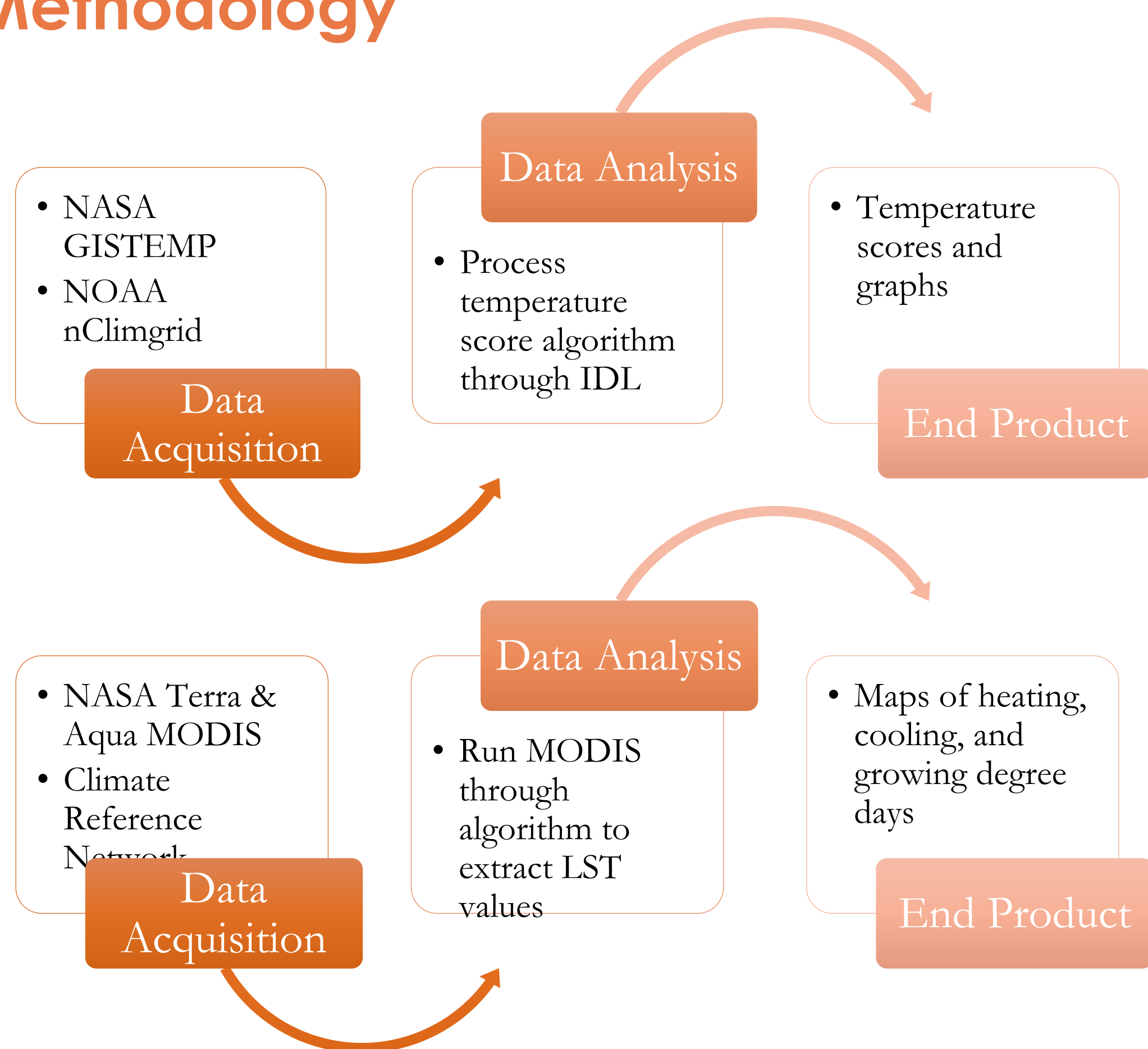
Earth Observations



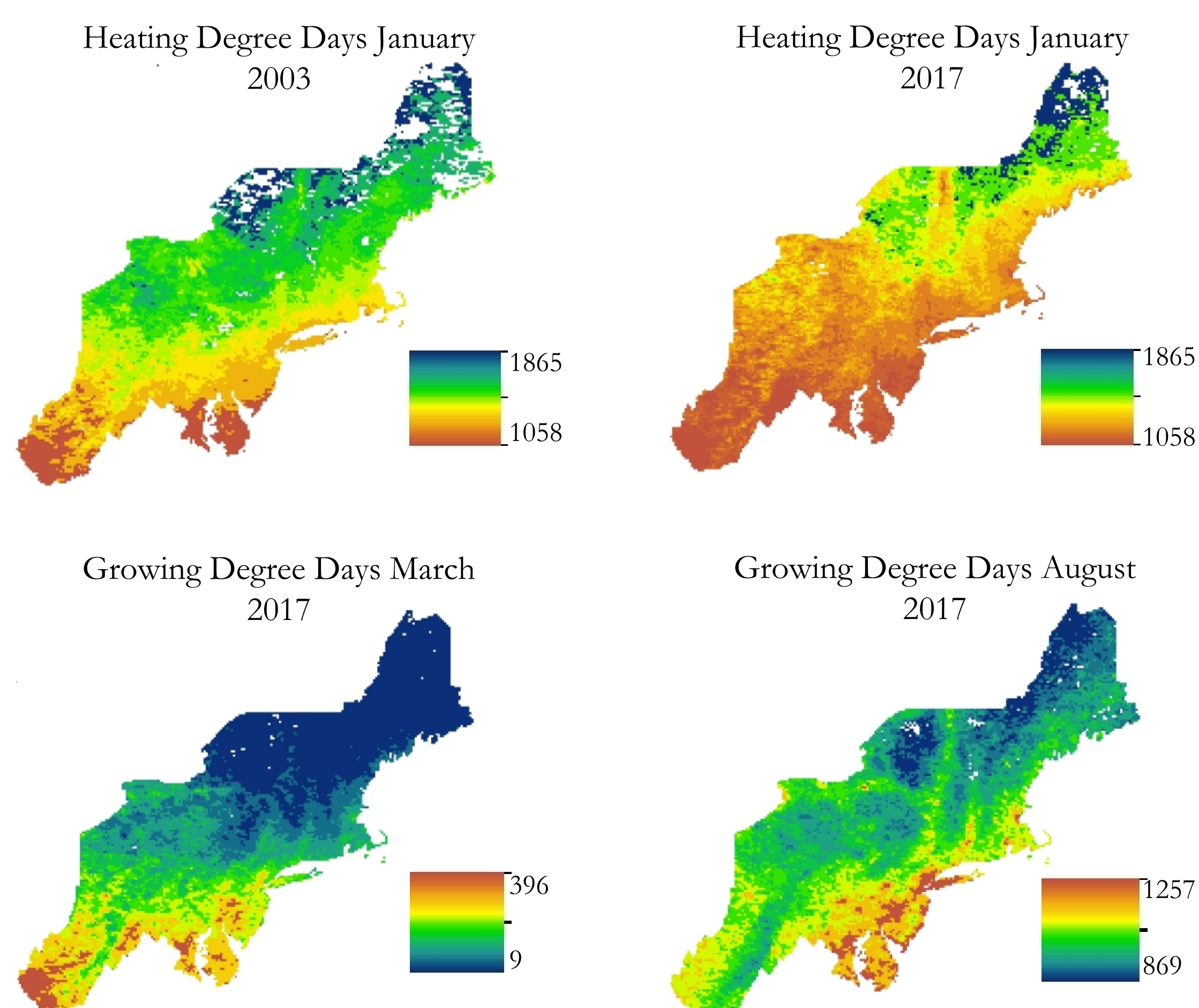
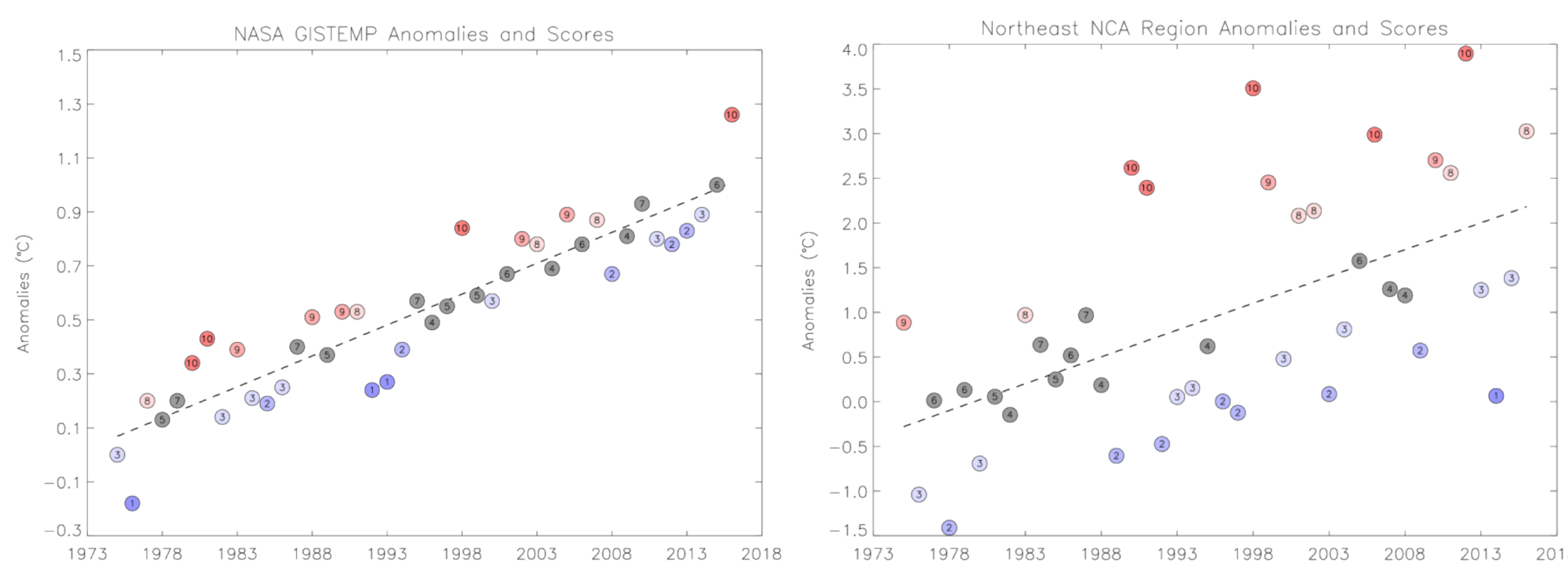
Terra MODIS

Aqua MODIS

Methodology



Results



Conclusions

- ▶ Recent Northeast temperature trends as characterized by the running ranks and temperature scores have exhibited a great degree of oscillation between two extreme readings rather than clustering near the median.
- ▶ Land Surface Temperature data from MODIS is capable of providing higher spatial resolution temperature information.
- ▶ End users will use temperature scores for context and future state of the climate reports. Degree days will also be operationalized within the agriculture and energy sectors.

Team Members



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Acknowledgements

We would like to thank our science advisors, **Anthony Arguez** and **Anand Inamdar**, as well as our center leads, **Alec Courtright** and **Jonathan O'Brien** for their help and guidance in this project. We would also like to acknowledge all of the NCEI employees, our partners, and fellows who helped us along the way.

North Carolina – NCEI
2017

Northeast US Cross-Cutting

