Analyzing Long-Term Drought Effects on Land Surface Temperature and Vegetation Using National Oceanic Atmospheric Administration Satellite's Data

Cornelius Holmes,
Derek Morris Jr.

Abstract

Analyzing the effects of Drought in the Northeastern North Carolina area with NOAA satellite products to determine a correlation between Land Surface Temperature and Vegetation. The Palmer Drought Severity Index (PDSI) data sets for summer 2002 -2013, provided by the State Climate Office of North Carolina NC CRONOS database, provided evidence that since 2007 the northern coastal plain of North Carolina has been experiencing a long-term summer drought. Summer is defined as the months between late June to late September.

Utilizing Elizabeth City State University's (ECSU) 1.5m L-band SeaSpace ground station the team received live Advanced Very High Resolution Radiometer (AVHRR) imagery from NOAA polar orbiting satellites each day for the month of June. The primary goal of this research was to observe the correlation between land surface temperature (LST) and Normalized Difference Vegetation Index (NDVI) due to long-term drought using NOAA satellite data. In the month of June 2016, the team collected imagery data through the SeaSpace© TeraScan® system and produced LST and NDVI. Various GPS locations were selected in Northeastern North Carolina of different biomes such as swamp lands, grasslands, and farmlands. The team collected and utilized data in the areas of Camden County, Gates County, Pasquotank County, and Perquimans County. Using the SeaSpace Graphical User Interface (GUI) Teravision®, The data points of each product at the various biome locations were analyzed for daily and weekly averages.

Using the GPS locations found in United States Geological Survey (USGS) of the swamps lands, grasslands, and farmlands were entered and saved as survey points in TeraVision's GUI. All of the passes in the month of June that were received and processed into LST and NDVI products at the direct broadcast ground station at ECSU were loaded into TeraVision. The values were then extracted from each of the points and evaluated by their biome specific location for LST and NDVI. With Excel the team conducted analysis for daily trends, regional trends, biome trends, and weekly trends.

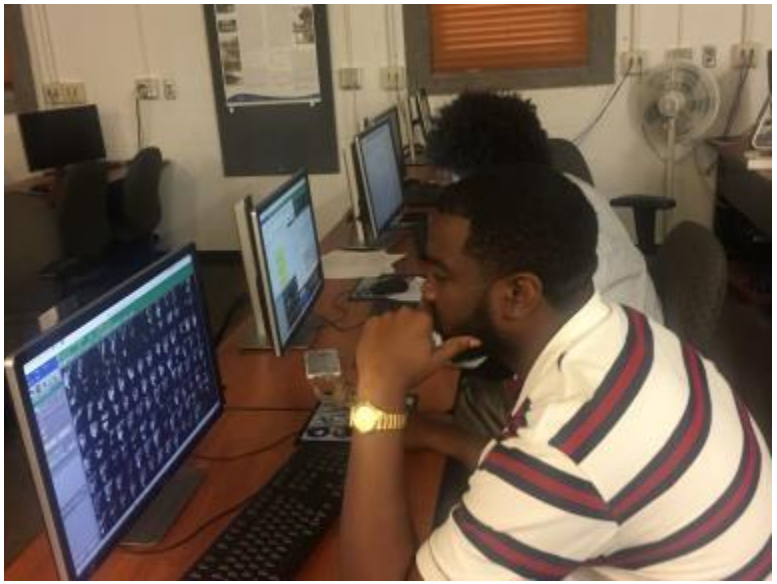
Team Members

- Cornelius Holness

Derek Morris Jr.

Overview

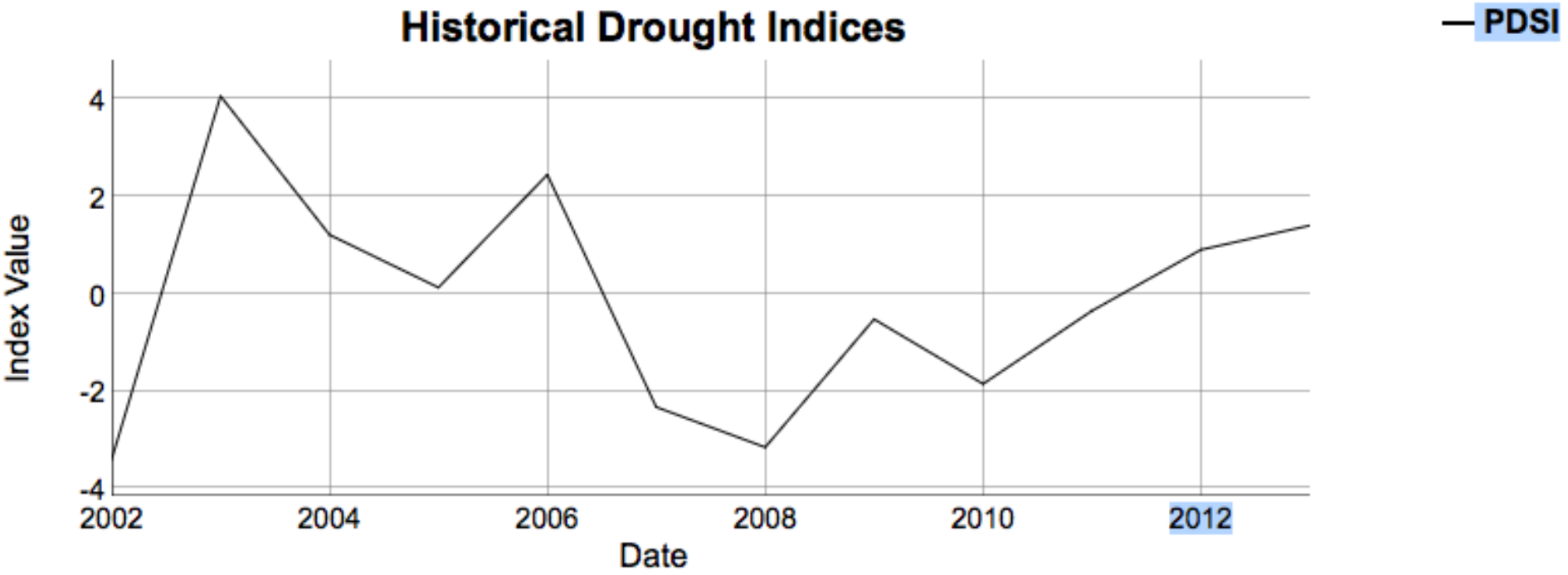
- Objective
- Purpose
- NOAA Satellites
- TeraScan at ECSU/TeraVision
- Methodology
- Analysis
- Results
- Future Work



Objective

- The primary goal of this research was to observe the correlation between land surface temperature (LST) and Normalized Difference Vegetation Index (NDVI) due to long-term drought using NOAA satellite data.

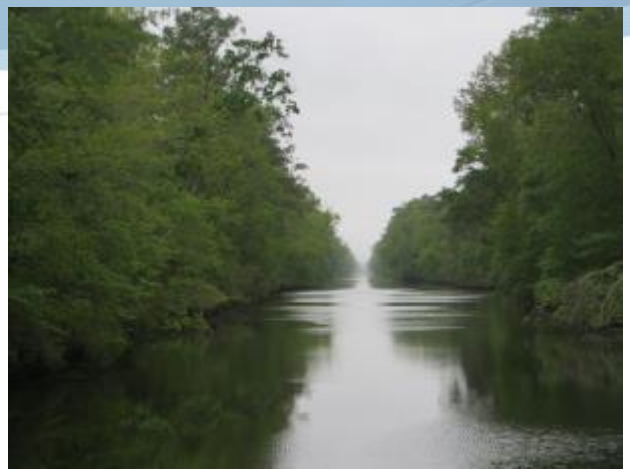
Purpose



http://climate.ncsu.edu/climate/drought/historical

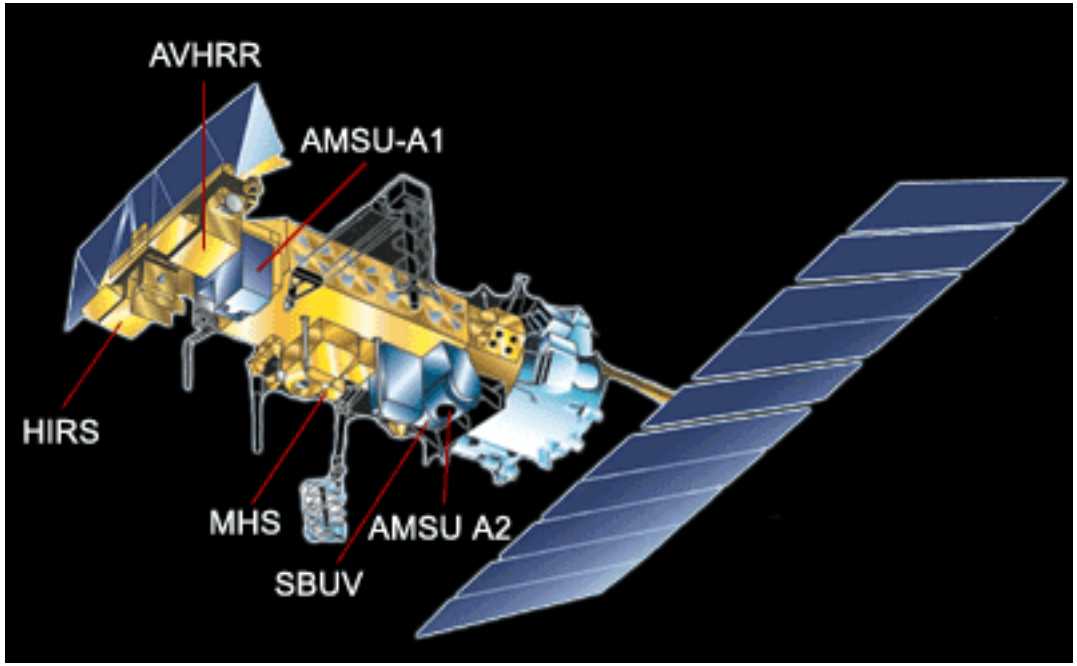
Biomes

- Grassland
- Farmland
- Swamps



NOAA Satellites

- NOAA
- NOAA-15, 18, 19
  - Polar Orbiting



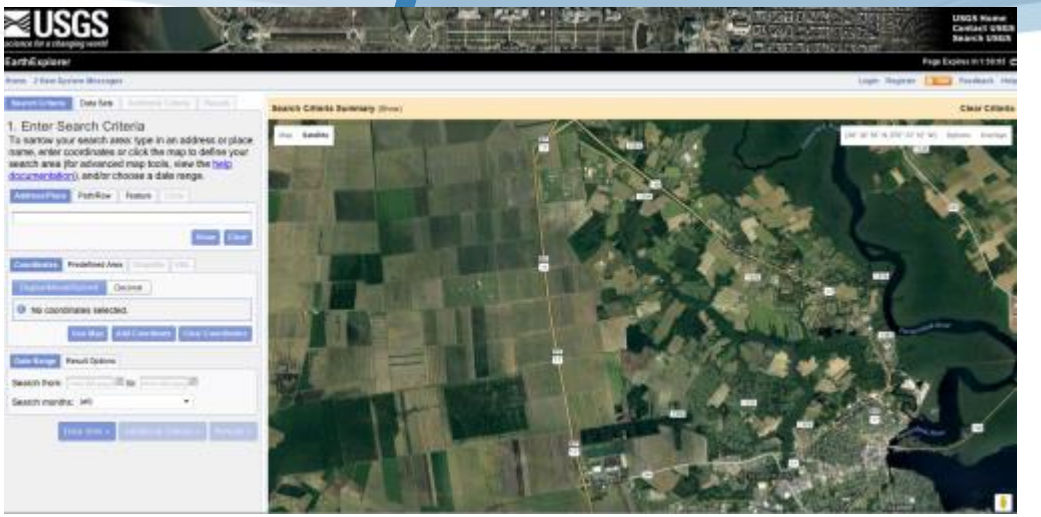
TeraScan at ECSU

- Combination of hardware and software designed for automated reception of data from meteorological and environmental satellites
- 1.5 meter L-Band receiving station was install in 2002
- Major update in 2014
  - TREX-processor
  - Teravault-storage

TeraVision

- GUI used to manipulate any information

Methodology



- GPS Coordinates: .Lat: 36° 19' 34" N, Lon: 076° 21' 47" W Farmland decimal: Lat36.326111

Scripts/Products

```
active: yes
function: hrpt_lst
min_sun_elevation: 10
input_directory: products/tdf/whole_pass/hrp
input_files: 20*.avhrr
output_files: 20*.lst
save_directory: products/tdf/whole_pass/hrpt
save_files: 20*.lst
scrub_max_files:
scrub_max_mbytes:
scrub_age_hours: 480
```

```
[NDVI]
active: yes
function: hrpt_ndvi
min_sun_elevation: 10
input_directory: products/tdf/whole_pass/hrpt
input_files: 20*.avhrr
output_files: 20*.ndvi
save_directory: products/tdf/whole_pass/hrpt
save_files: 20*.ndvi
scrub_max_files:
scrub_max_mbytes:
scrub_age_hours: 480
```

Scripts/Cover Area

```
[Local-LST]
cover_area: Local
cover_percent: 60
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input_files: 20*.lst
remap_variables: *
output_template: %yyyy.%mmdd.%hhmm.%satel.lst
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```
[Local-NDVI]
cover_area: Local
cover_percent: 60
input_directory: products/tdf/whole_pass/hrpt
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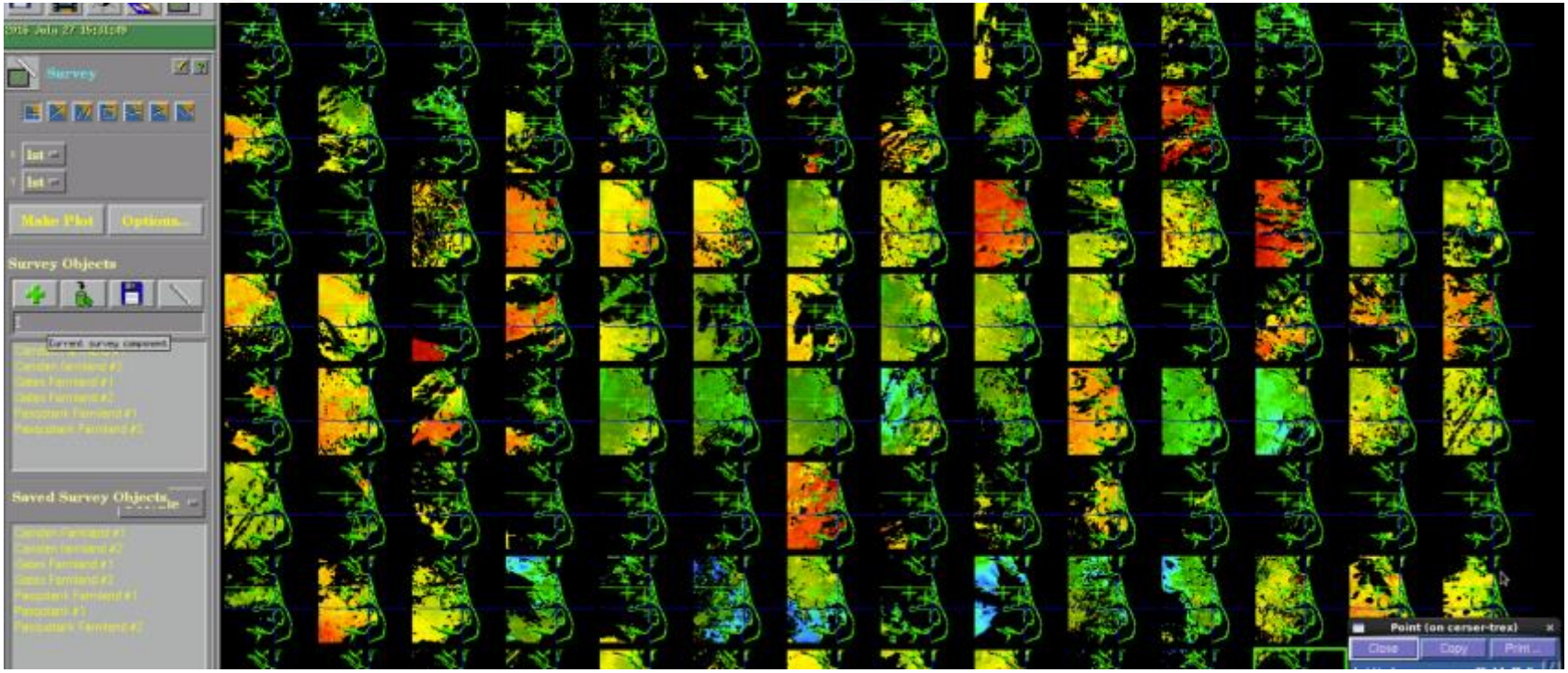
TeraScan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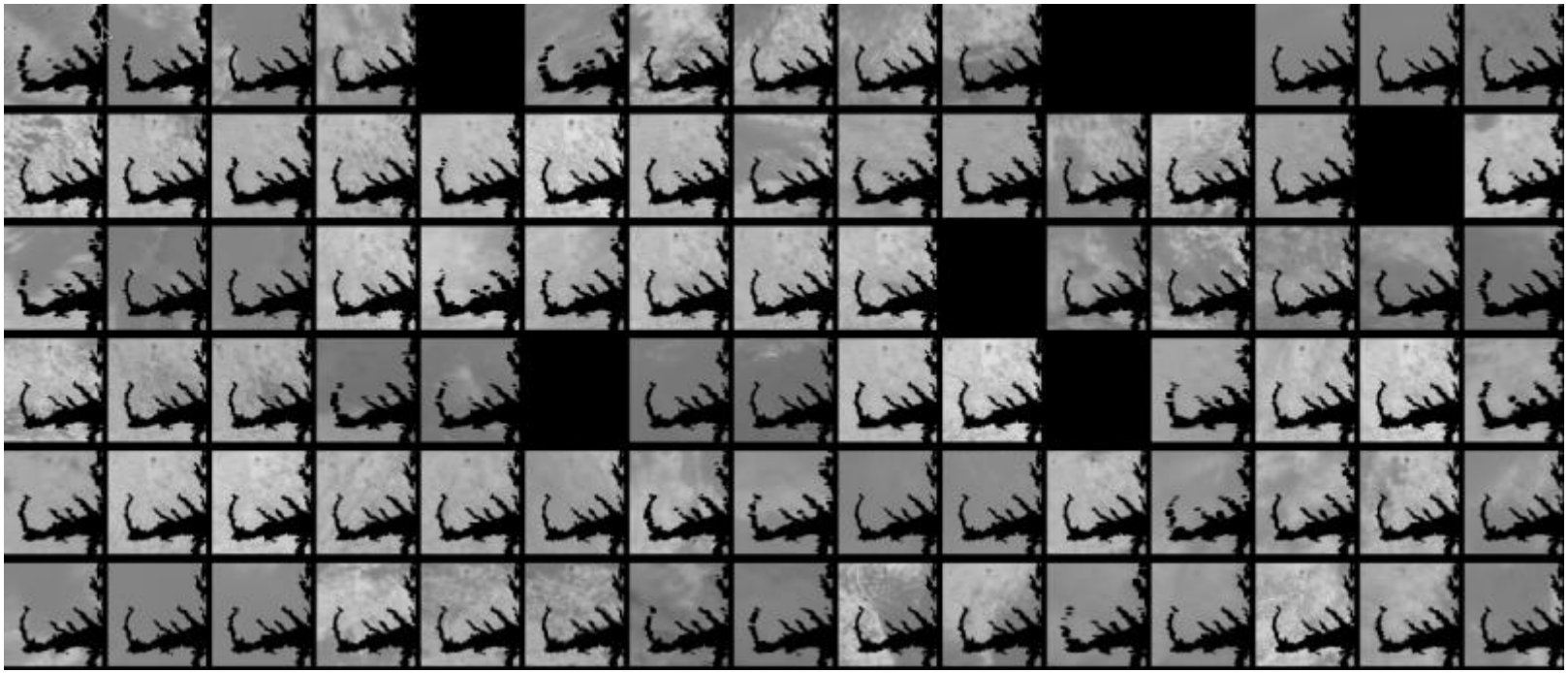

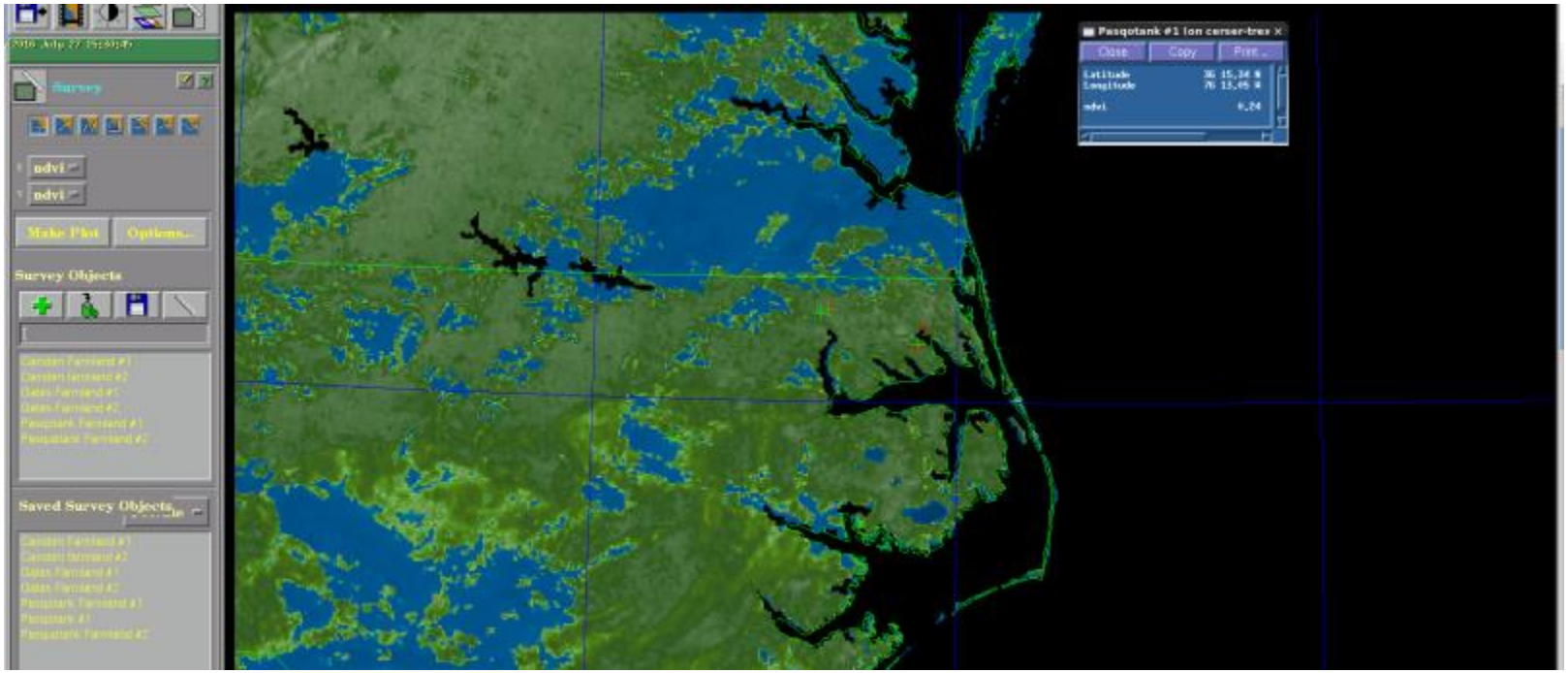
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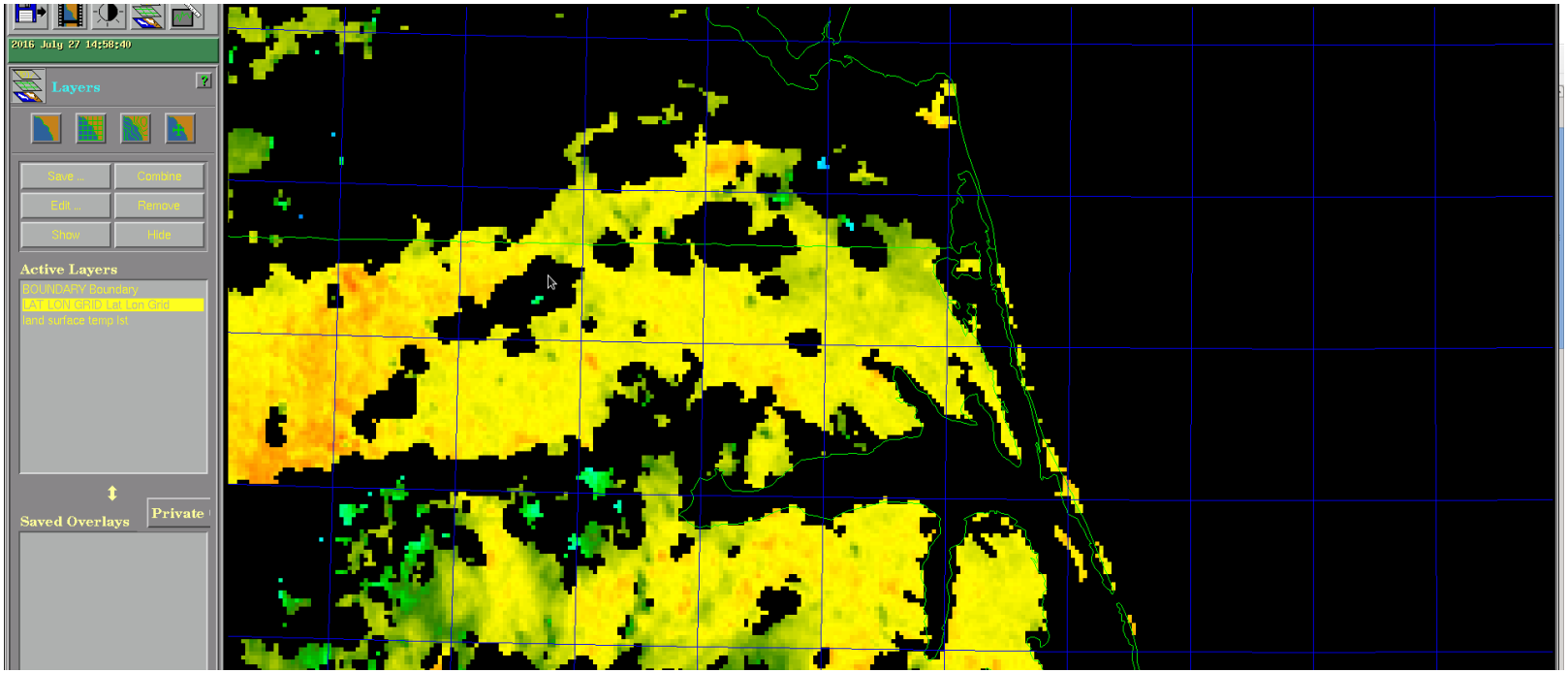
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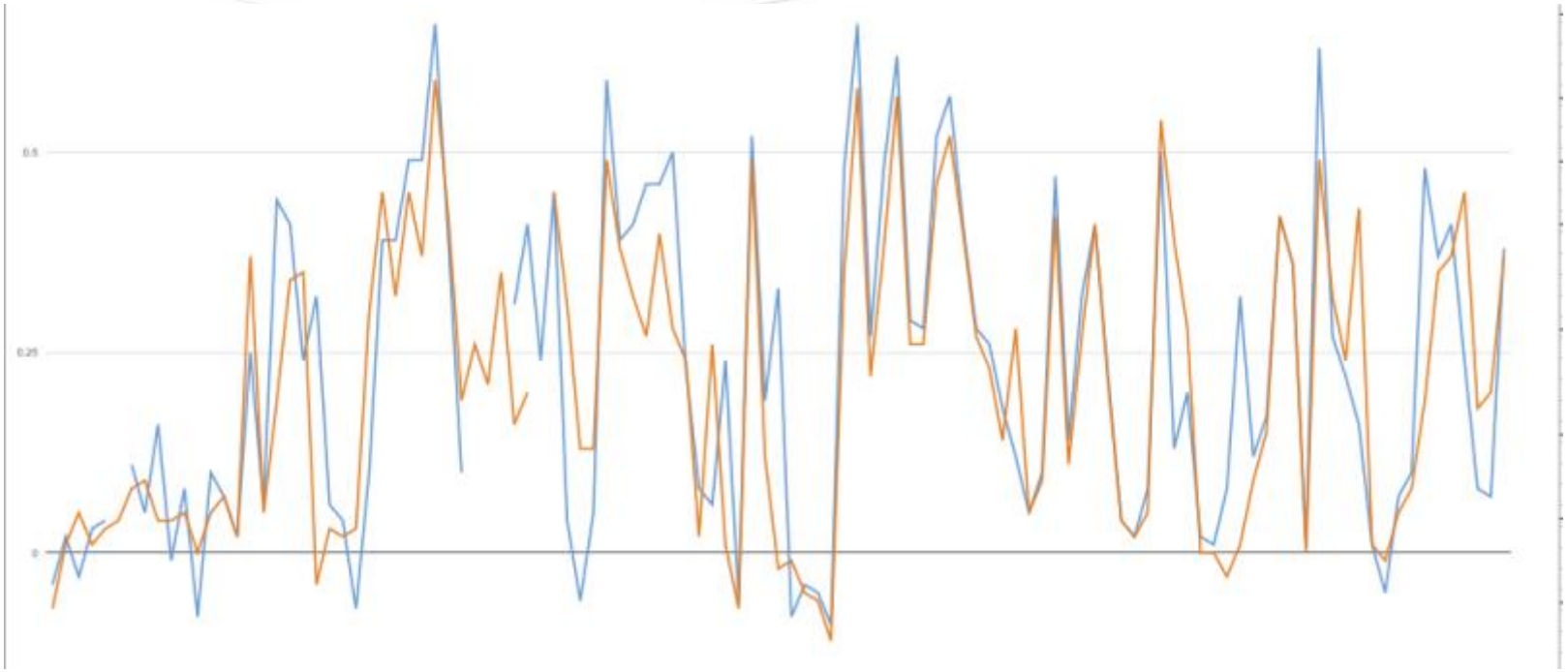
Private

Results



Analysis

- Pasquotank County grassland NDVI and LST graphs
- Farmland biomes vegetation an LST
- County averages of LST

Future Work

- Find an alternative way to automate the data points using Python programming software.

Acknowledgements

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- Mr. Andrew Brumfield for his guidance, contributions, and help with completing this research.

Questions?