SeaSpace Team 2017

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Abstract

According to the State Climate Office of North Carolina, since 2007 the northern coastal plain of North Carolina has been experiencing a long-term summer drought. The team's objective was to analyze how long-term drought in summer months' affected vegetation and land surface temperature in the Pasquotank, Perquimans, Camden and Gates county areas. The team collected imagery data through the SeaSpace TeraScan system in order to produce land surface temperature (LST) and normalized difference vegetation index (NDVI) products. The data products were averaged into monthly and yearly composites so that the team could use TeraVision to depict the differences of values for the products.

Introduction

- Analyze how long-term drought in summer months’ affected vegetation and land surface temperature in the Pasquotank, Perquimans, Camden and Gates county areas.
  - Teravision
  - Polar Orbit
  - TeraScan Rapid Environmental Extreme (TREX)
  - Teravault
  - Uninterruptible Power Source (UPS) Assy

Defining our search area

- Selection of the area of interest
- Survey and collection of data points
- Compilation of the data points into point files
- Reformat of the point files to work with TeraVision and analysis
- Combination of the point files into a singular file

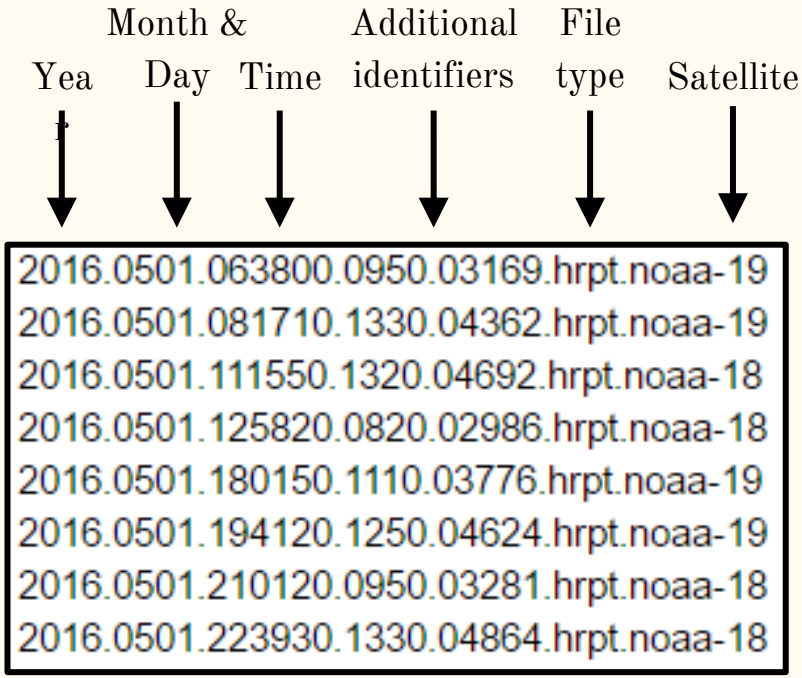
Point file representing some Northeastern NC counties and Biomes

Initial restoration test runs

- First 5 days of september 2016
- Tested to give us an familiarity with the restoration process
- 46 passes in all were restored
- 11 passes yielded both LST and NDVI data
- 1 pass yielded NDVI data but not LST data
- Successfully restored passes suffered from lack of AOI coverage or disruptive weather conditions.

Weather evaluation of possible passes

- Developed a system of checking passes against weather records
- The weather database used was weather underground
- It was used to help filter the passes by the weather conditions
- The time field in the pass file name is in GMT
- The time field in for the weather underground in local time or EST
- Difference from EST to GMT during the times the passes were taken is 4 hours



Poor weather conditions are defined as any period exceeding 2 hours in length that is recorded as being partly cloudy or worse.

2016.0608.074800.1330.03359.hrpt.noaa-19
2016.0608.093000.1000.03333.hrpt.noaa-19
2016.0608.103840.1240.02715.hrpt.noaa-18
2016.0608.112400.0910.01667.hrpt.noaa-15
2016.0608.121920.1210.03374.hrpt.noaa-18
2016.0608.173430.0820.00890.hrpt.noaa-19 - (HH) weather
2016.0608.191150.1330.02051.hrpt.noaa-19 - (HH) weather
2016.0608.220220.1300.03756.hrpt.noaa-18 - (HH) weather
2016.0608.224120.0910.01578.hrpt.noaa-15 - (HH) weather
2016.0608.234420.1050.03299.hrpt.noaa-18

This process was repeated on the passes of every month that the team intended to restore.

Hourly Weather History & Observations

Time (EDT)	Temp.	Dew Point	Humidity	Pressure	Visibility				Conditions
12:54 AM	72.0 °F	64.0 °F	76%	29.70 in	10.0 mi				Clear
1:54 AM	68.0 °F	64.9 °F	90%	29.72 in	10.0 mi				Scattered Clouds
2:54 AM	68.0 °F	64.0 °F	87%	29.73 in	10.0 mi				Clear
3:54 AM	69.1 °F	62.1 °F	78%	29.73 in	10.0 mi				Clear
4:54 AM	64.9 °F	61.0 °F	87%	29.75 in	10.0 mi				Clear
5:54 AM	63.0 °F	61.0 °F	93%	29.77 in	10.0 mi				Clear
6:54 AM	66.9 °F	63.0 °F	87%	29.78 in	10.0 mi				Clear
7:54 AM	71.1 °F	60.1 °F	68%	29.78 in	10.0 mi				Clear
8:54 AM	73.9 °F	57.0 °F	55%	29.79 in	10.0 mi				Clear
9:54 AM	75.9 °F	57.0 °F	52%	29.80 in	10.0 mi				Clear
10:54 AM	77.0 °F	55.9 °F	48%	29.79 in	10.0 mi	West	13.8 mph	-	N/A	Clear
11:54 AM	77.0 °F	55.0 °F	47%	29.80 in	10.0 mi	West	11.5 mph	21.9 mph	N/A	Partly Cloudy
12:54 PM	78.1 °F	53.1 °F	42%	29.79 in	10.0 mi	WNW	15.0 mph	24.2 mph	N/A	Partly Cloudy
1:54 PM	78.1 °F	54.0 °F	43%	29.78 in	10.0 mi	West	12.7 mph	-	N/A	Partly Cloudy
2:54 PM	79.0 °F	52.0 °F	39%	29.78 in	10.0 mi	West	18.4 mph	26.5 mph	N/A	Partly Cloudy
3:54 PM	80.1 °F	52.0 °F	38%	29.78 in	10.0 mi	West	19.6 mph	26.5 mph	N/A	Scattered Clouds
4:54 PM	78.1 °F	50.0 °F	37%	29.78 in	10.0 mi	West	16.1 mph	24.2 mph	N/A	Partly Cloudy
5:54 PM	77.0 °F	48.9 °F	37%	29.80 in	10.0 mi	West	18.4 mph	24.2 mph	N/A	Partly Cloudy
6:54 PM	77.0 °F	51.1 °F	40%	29.82 in	10.0 mi	WNW	10.4 mph	-	N/A	Scattered Clouds
7:54 PM	73.9 °F	48.0 °F	40%	29.85 in	10.0 mi	NW	8.1 mph	-	N/A	Clear
8:54 PM	70.0 °F	46.9 °F	44%	29.88 in	10.0 mi	NW	8.1 mph	-	N/A	Clear
9:54 PM	69.1 °F	46.0 °F	44%	29.92 in	10.0 mi	NW	4.6 mph	-	N/A	Clear
10:54 PM	66.9 °F	52.0 °F	59%	29.95 in	10.0 mi	NNE	6.9 mph	-	N/A	Clear
11:54 PM	62.1 °F	53.1 °F	72%	29.96 in	10.0 mi	Calm	Calm	-	N/A	Clear

11:54 AM	Partly Cloudy
12:54 PM	Partly Cloudy
1:54 PM	Partly Cloudy
2:54 PM	Partly Cloudy
3:54 PM	Scattered Clouds
4:54 PM	Partly Cloudy
5:54 PM	Partly Cloudy
6:54 PM	Scattered Clouds

Formal restoration of passes

- Connect to the T-Rex
- Navigate to the directory where archived passes are stored
- Select a pass and use the restore_pass command on it
    - Example: restore_pass 2015.0601.221950.0910.01940.hrpt.noaa-15
- Enter the slot number on the pass disk you wish to use
- Run the run_ingest command with the pass disk slot you picked
    - Example (assuming you pick disk slot 144): run_ingest 144
- After several minutes check the LST and NDVI folders for results
- Record the presence or absence of said results

Sample

- Why?
- What's Input?
- What's Output?

```
[teradm@cerser-trex AOI]$ sample
in/out files    : char(255) ?
2015.0504.1911.noaa-19.ndvi
2015.0504.1911.noaa-19.ndvi.pts
point_file      : char(255) ? NENC.tdf
points_are  : char(  8) ? [points]
include_vars    : char(255) ? []
output_coords  : char(  3) ? [no] yes
```

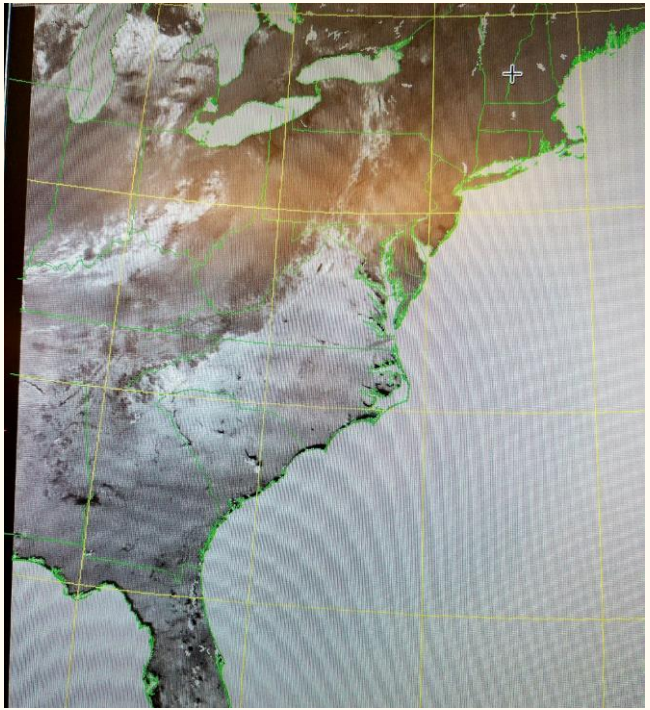
Expasc

- Why?
- What's Input?
- What's Output?

```
[teradm@cerser-trex AOI]$ expasc
in/out files    : char(255) ?
2015.0504.1911.noaa-19.ndvi.pts
2015.0504.1911.noaa-19.ndvi.txt
include_vars    : char(255) ? []
all_same_dim    : char(  3) ? [yes]
list_dims       : char(  3) ? [yes]
```

Results

- Successful LST and NDVI data were retrieved by restoring passes and running ingest
- The data was moved to the appropriate directory and saved in desired file formats
- May 2015 and 2016 were completed
- Sample and Expasc commands were used to convert the final data into the required file format



Typical NDVI image sample from retrieved NDVI data

Future Works

- Finish the processing of the 2015 and 2016 into readable raw data
- Create a Python program capable of interpreting the raw LST & NDVI data into a format compatible with analysis

Acknowledgements

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Questions?