

# Satellite Data Visualization of Hurricane Barry using VIIRS and GOES-16

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## Motivation

This project focuses on three satellites: Polar orbiting satellites NOAA-20 and Suomi NPP as well as a geostationary satellite called GOES-16.

The NOAA-20 and Suomi NPP satellites both carry the Visible Infrared Imaging Radiometer Suite (VIIRS) instrument, while the GOES-16 satellite carries the Advanced Baseline Imager (ABI) instrument.

Using the data from these sensor instruments as well as various software tools, we will visualize and generate images that captures extreme events such as Hurricane Barry.

These images will help us to visualize and predict the severity and impact of events such as oil spills, forest fires, hurricanes, tornadoes and cyclones. It helps to save the lives of citizens of the United States and the world.

## Objective

The primary goal of this research project was to create images, using the data collected from the VIIRS and GOES satellite instruments, aboard the Suomi NPP and NOAA 20 satellites respectively. This helps us better understand and visualize weather events such as hurricanes in the United Sates.

## Methods

We used two different types of antennas (X-band and L-band) to collect the raw data from the satellite above. The raw telemetry data is pre-processed on a Linux Server using CSPP software to generate Level 1 products stored in HDF5 files (e.g. SVI01 files). We accessed these files remotely using MobaXterm. Using a custom python script, we read and process the data. Our code reads the various information such as latitude, longitude, reflectance (or radiance) values which allows us to re-map the data to a fixed grid and display the images. Our project uses Hurricane Barry which made landfall on July 13<sup>th</sup> as a case study.

## Hardware Systems Used:

- Satellite Receivers/Antenna for collecting data from the satellite (X-Band for NOAA-20 and L-Band antenna for GOES-16)
- Linux Cluster Servers running (CentOS) was used for processing and generating the images.

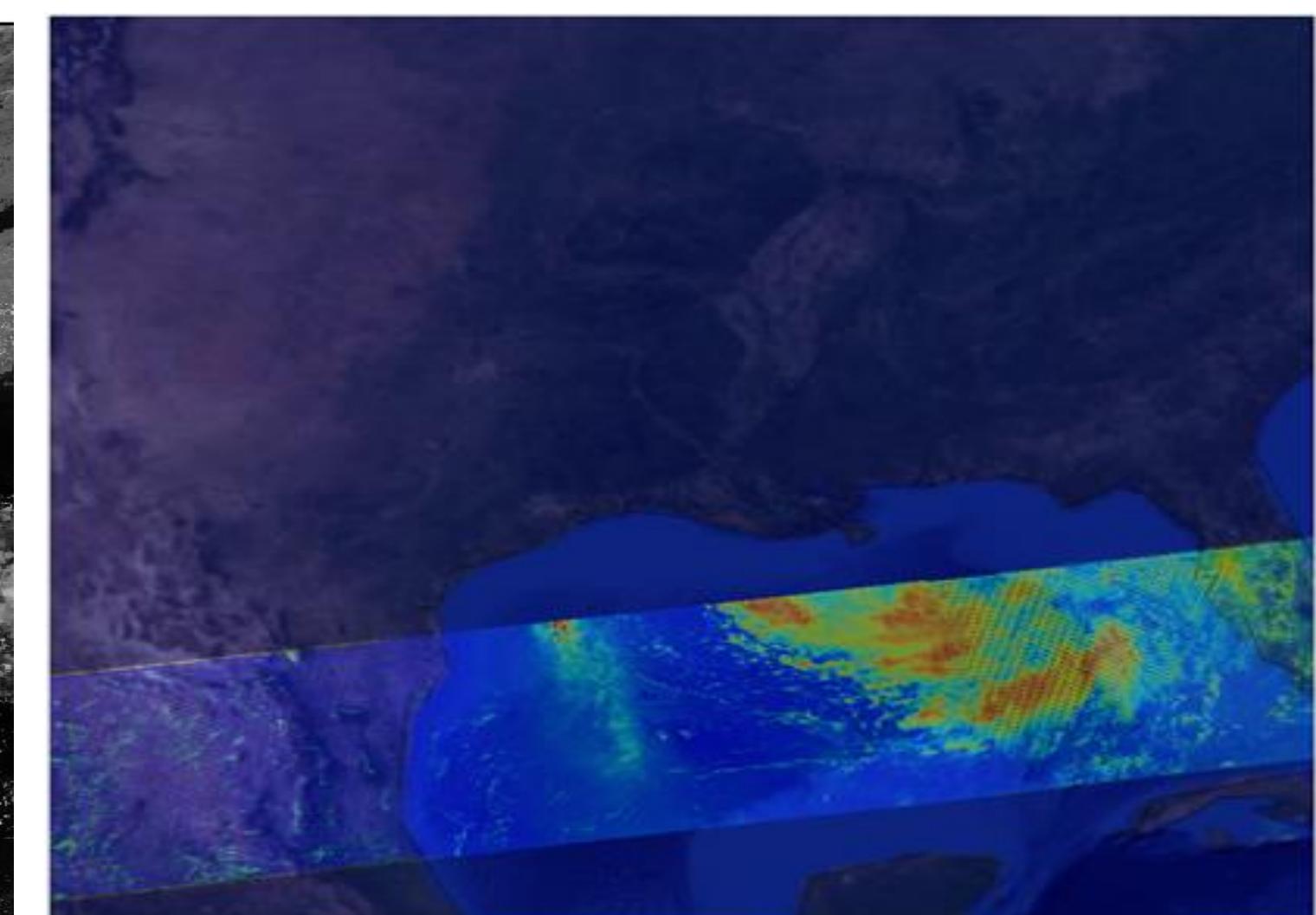
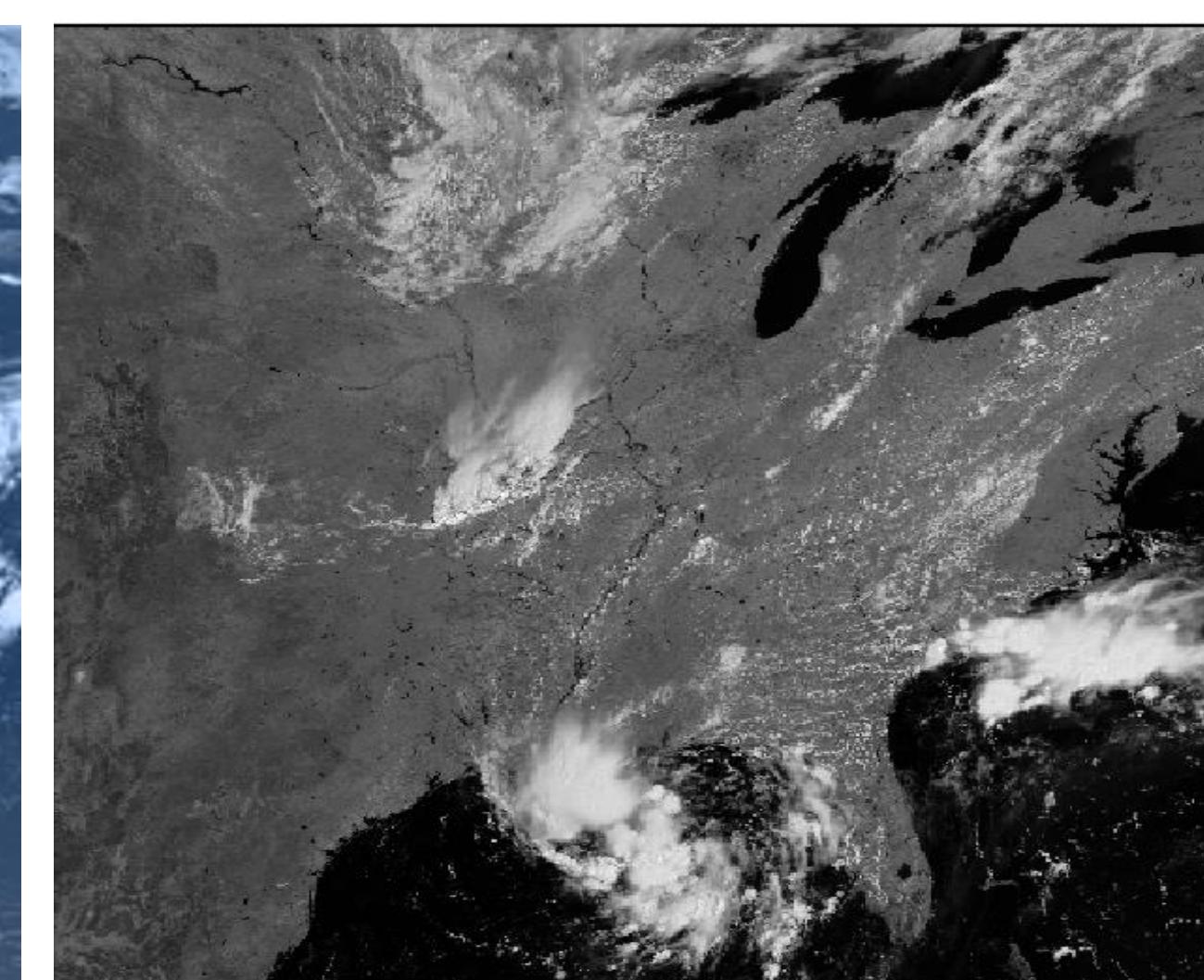
## Software Applications:

- CSPP, Bash,
- MobaXterm for remote access and running our custom codes.
- Python (Basemap, numpy, scipy, matplotlib packages.) was used for reading files and plotting images.

## Results



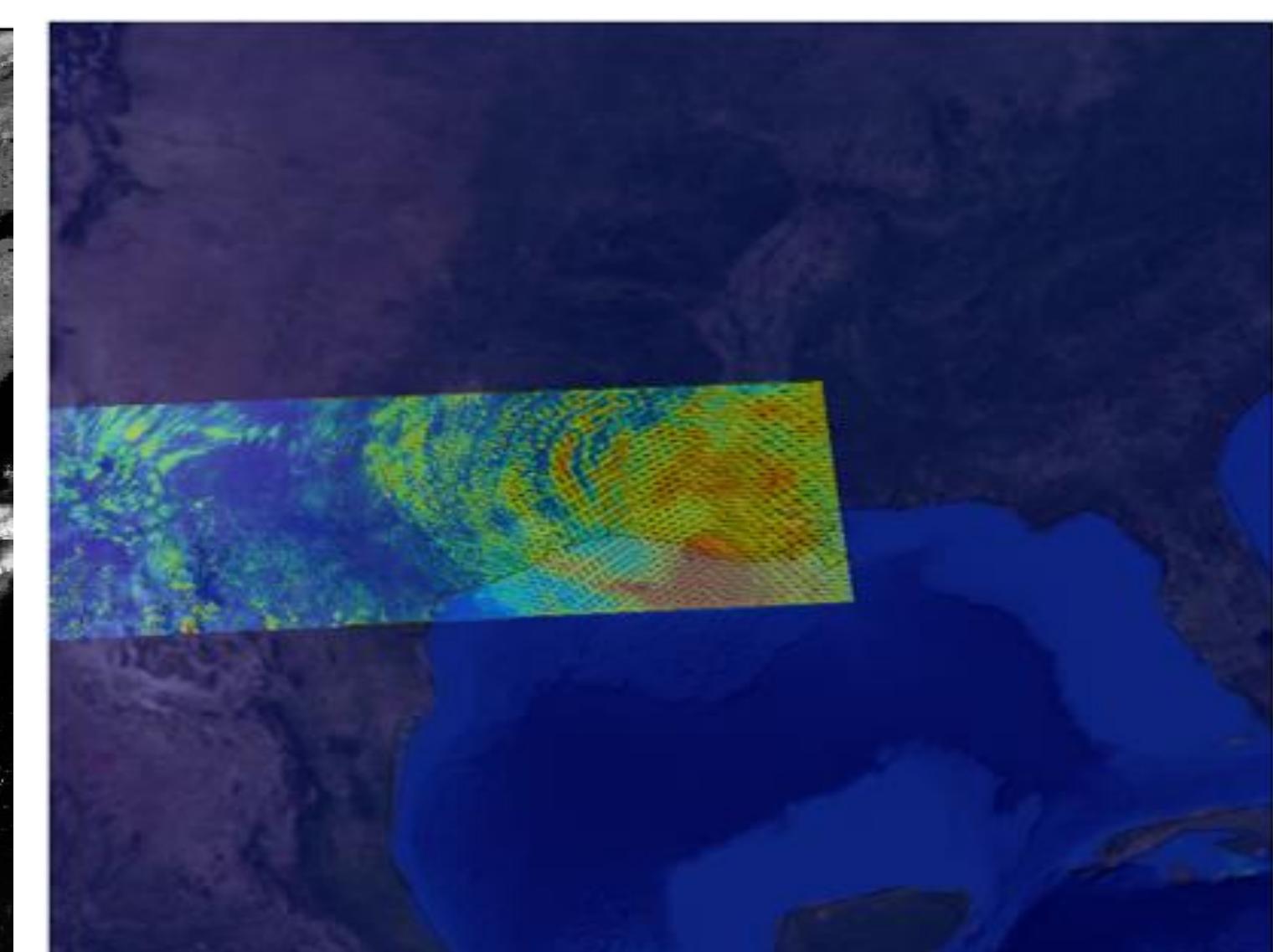
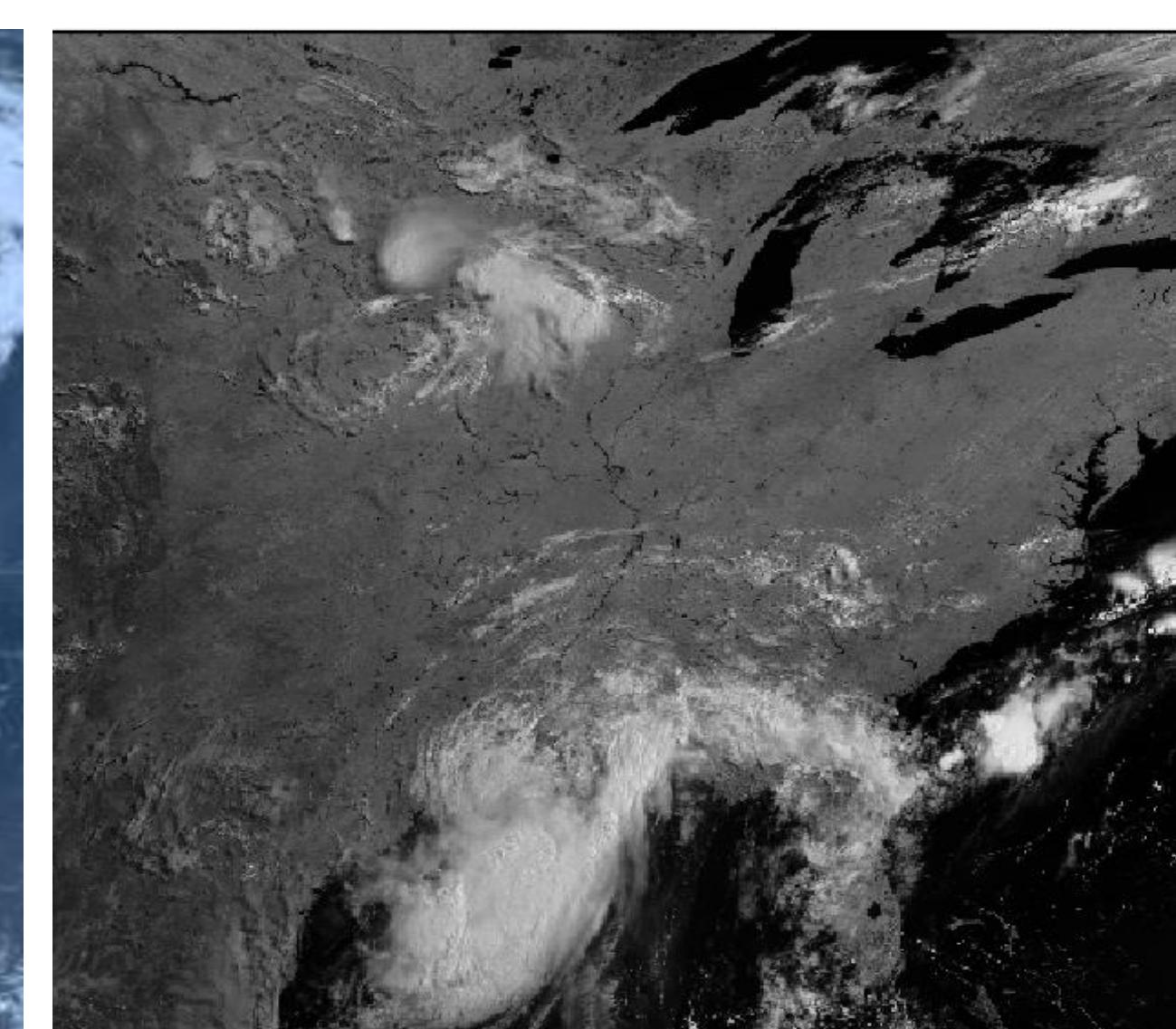
GOES satellite image for the 10<sup>th</sup> of July, at 16:19 UTC. These images show Barry entering the Gulf of Mexico. (Left – RGB TrueColor, Right – Gray scale)



(Above) Corresponding VIIRS satellite image for the 10<sup>th</sup> of July.



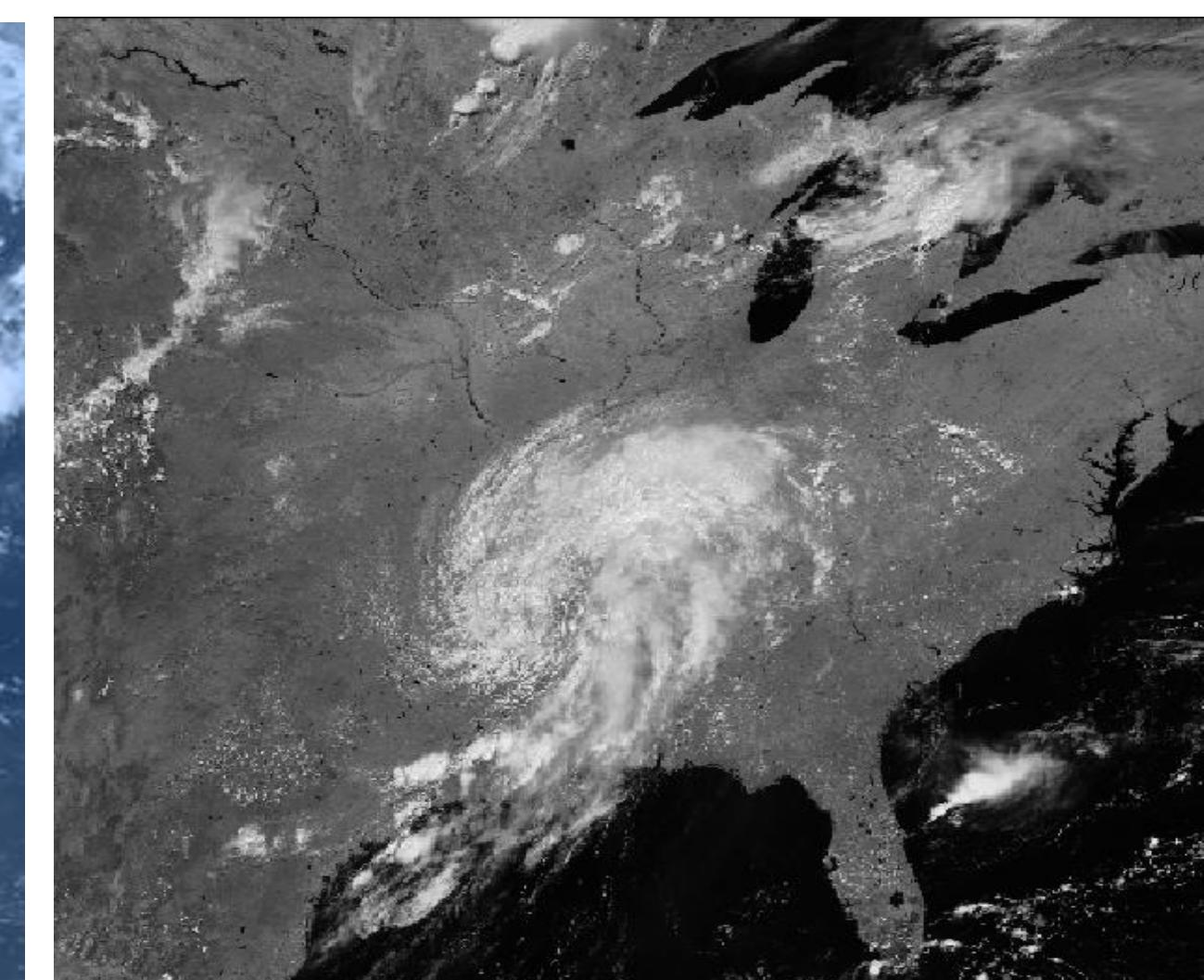
GOES satellite images for the 13<sup>th</sup> of July at 14:34 UTC. These show Barry making significant landfall in Louisiana. (Left – RGB TrueColor, Right – Gray scale)



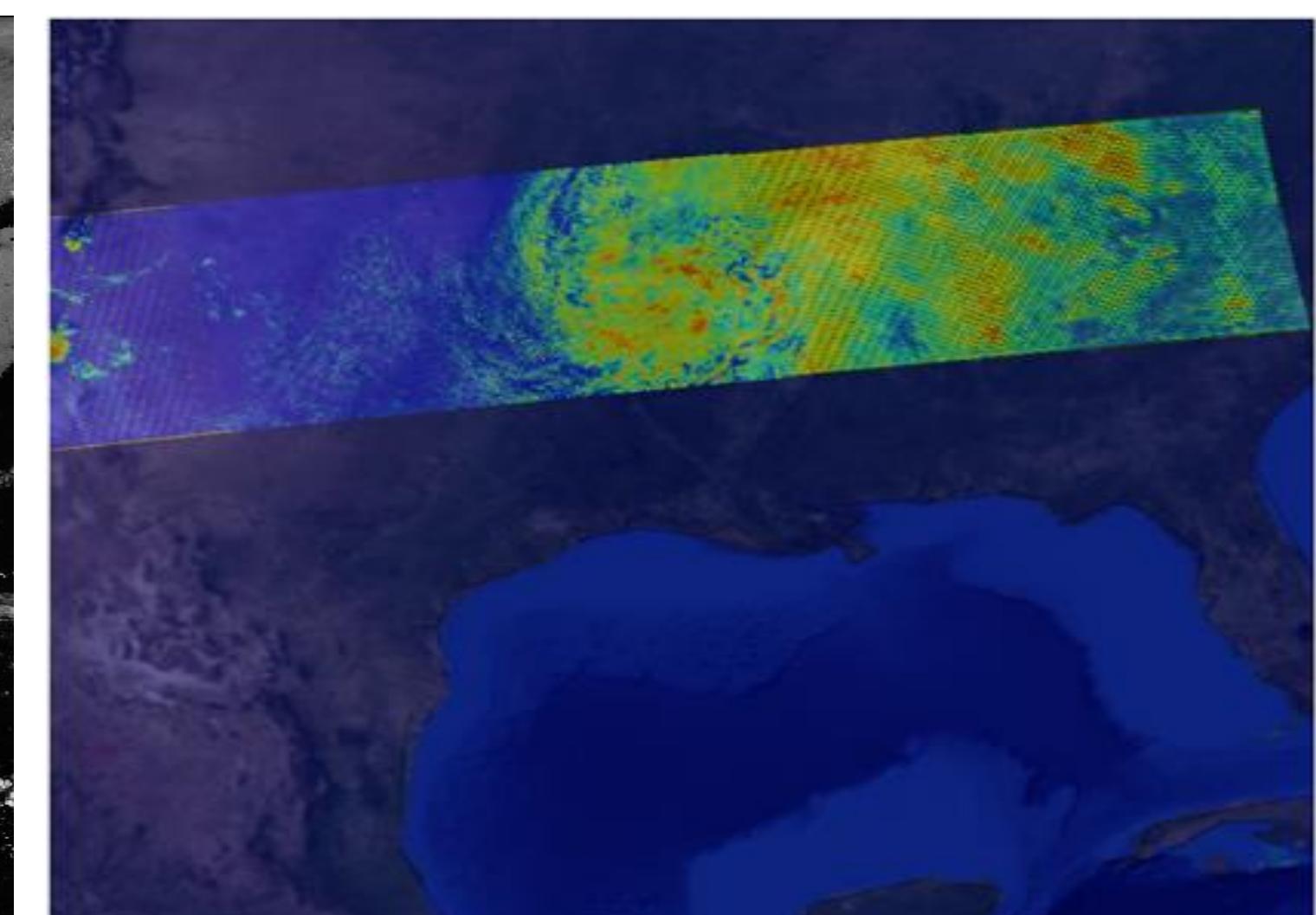
Corresponding VIIRS satellite image for the 13<sup>th</sup> of July.



GOES satellite images for the 15<sup>th</sup> of July, 17:19 UTC. Shows Barry weakening in the Northeast. (Left – RGB TrueColor, Right – Gray scale)



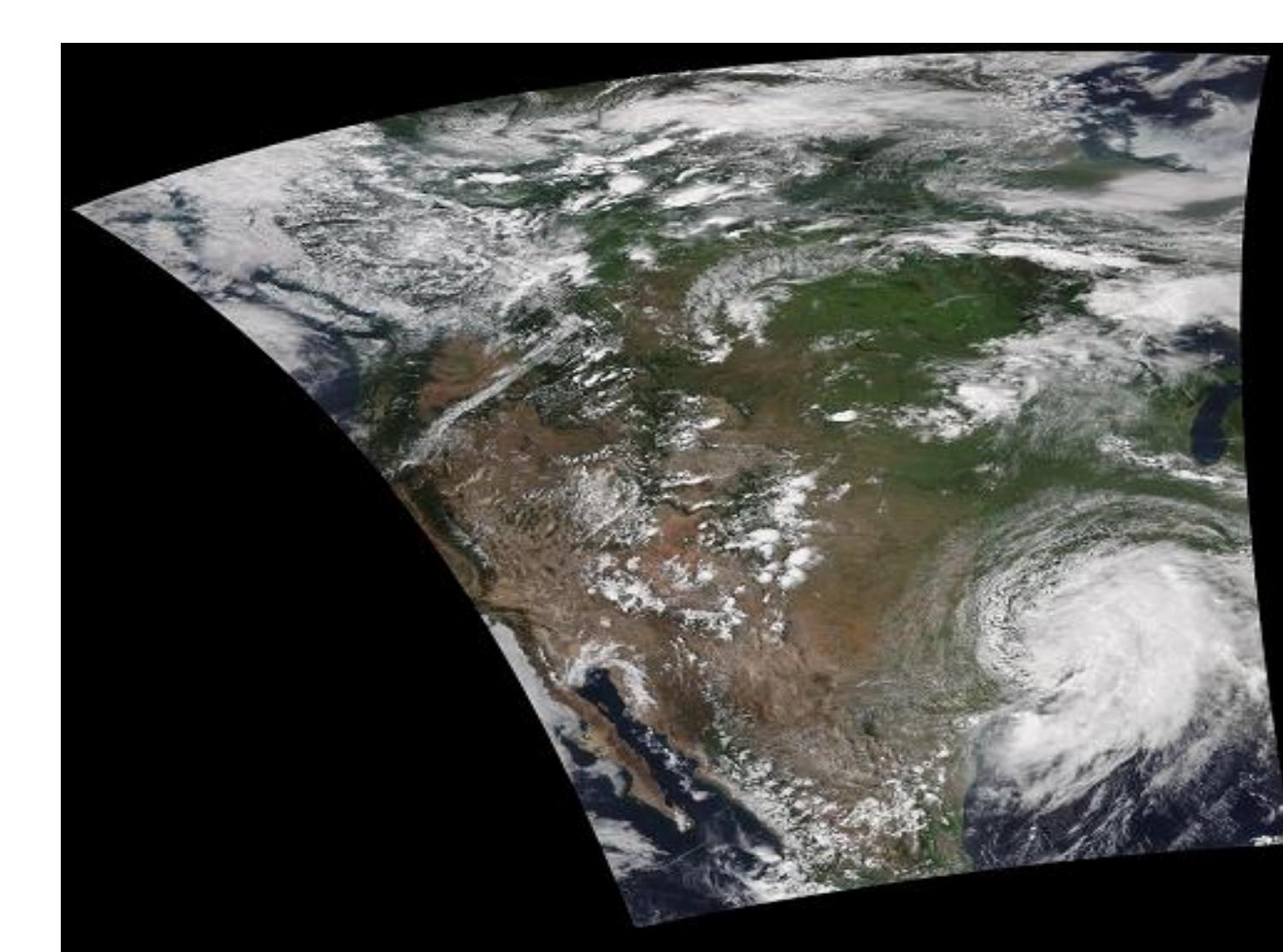
Corresponding NOAA-20 pass - VIIRS satellite image for the 15<sup>th</sup> of July.



(Left) VIIRS true color image. Shows Hurricane Barry on land leaving the Gulf of Mexico on July 14<sup>th</sup>.

## Conclusion

Hurricane Barry was a category 1 storm with winds reaching 75 mph. It brought about 6 to 9 inches of rainfall and caused a lot of structural damages and loss of power. NOAA, Meteorologist, researchers and even emergency services like (FEMA) use images such as those depicted in this poster to view extreme weather events such as Hurricane Barry and monitor their patterns, paths and characteristics. Satellite images allow us to look at intense developing weather systems in advance and notify any endangered people of their situation. These efforts help prepare and protect lives and property of citizens in the path of the storm. This is an example of tools used in real life to save the lives of people all around the world.



## Acknowledgement

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