



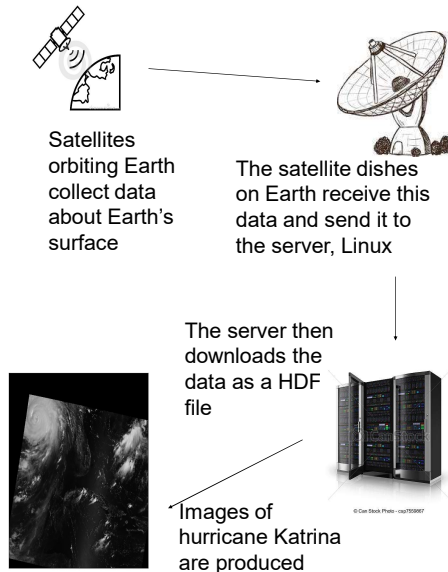
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Abstract

The earth has several satellites in its orbit that provide useful information about defense, navigation, communication, climate and weather. Satellites are essential in particular for environmental purposes such as weather prediction and forecasting. Environmental satellites are categorized into Polar Orbiting Satellites and Geostationary Satellites. Polar orbiting satellites are very close to the Earth and orbit over the poles (North and South poles) providing high resolution and detailed imagery of the Earth and its environment. Geostationary satellites orbit at the same speed as the Earth and is farther up into orbit, allowing it to obtain larger coverage but low resolution and less detail. Examples of polar orbiting satellites include Nasa-Aqua and Nasa-Terra. These satellites carry an instrument called MODIS (Moderate Resolution Imaging Spectroradiometer) that studies the Earth's surface temperature, ocean color, water vapor, snow cover, ice, and clouds. MODIS scans the Earth in 36 spectral bands that include visible, near visible, and infrared wavelengths.

In this project, data from MODIS visible bands 1 and 2 at 250 m resolution is used to map and visualize the extent and strength of hurricane Katrina from space. Using satellites, in particular the MODIS instrument on Terra and Aqua, provides critical information about severe weather events and how it effects our environment. It also helps us track and predict storms and prevent tragedies like Katrina.

Procedures



Method

System Applications

Aqua & Terra MODIS data, satellite Antenna, Server, Linux OS

Software Applications

Python, MS2GT(fornav,il2cr),bash shell,H5py,HDFView,basemap, pyresample

- The satellites, Aqua and Terra, orbit the Earth, the MODIS radiometer collects thermal measurements of the Earth's surface below in 36 spectral bands/wavelengths.
- The X-Band antenna on the ground captures the data signals from the satellite and saves it as raw L0 files
- The raw files are processed and converted to L1 files that contain calibrated radiances and geolocation information.
- The L1 data is stored in HDF format (**Hierarchical Data Format**)
- Using a customized python and shell program on the Linux server, the latitude, longitude, and radiance value for bands 1 and 2 at 250 meter resolution is retrieved.
- The retrieved data sets is reprojected to a cylindrical equidistant projection grid using MS2GT and pyresample.

MODIS Instrument on terra and Aqua Satellites

- Orbit: 705 km. descending node (Terra) or. ascending node (Aqua), sun-synchronous, near-polar, circular
- Swath Dimensions: 2330 km (cross track) by 10 km (along track at nadir)
- Spatial Resolution: 250 m (bands 1-2), 500 m (bands 3-7), 1000 m (bands 8-36)



Aqua

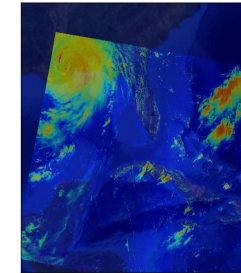


Terra

Data/Results

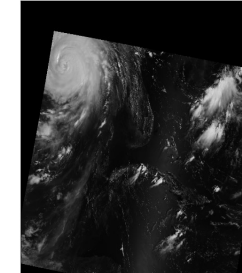
Terra + MODIS

Hurricane Katrina in the Gulf of Mexico (Hyperspectral)



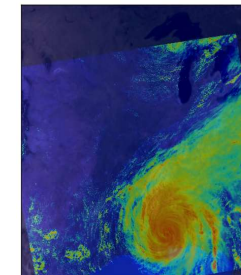
August 29 16:05 UTC

Hurricane Katrina in the Gulf of Mexico (Grayscale)



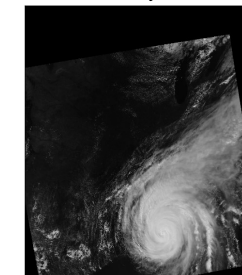
Aqua + MODIS

Hurricane Katrina in the Gulf of Mexico (Hyperspectral)



August 29 19:15 UTC

Hurricane Katrina in the Gulf of Mexico Grayscale



Conclusion

Satellites like Aqua and Terra are extremely important when it comes to severe weather predictions. Over all using environmental satellites and the instrument MODIS, is necessary because they can obtain vital information from the surface of the Earth and potentially save the lives of thousands of people.

Acknowledgment

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