

NOAA Satellite JPSS

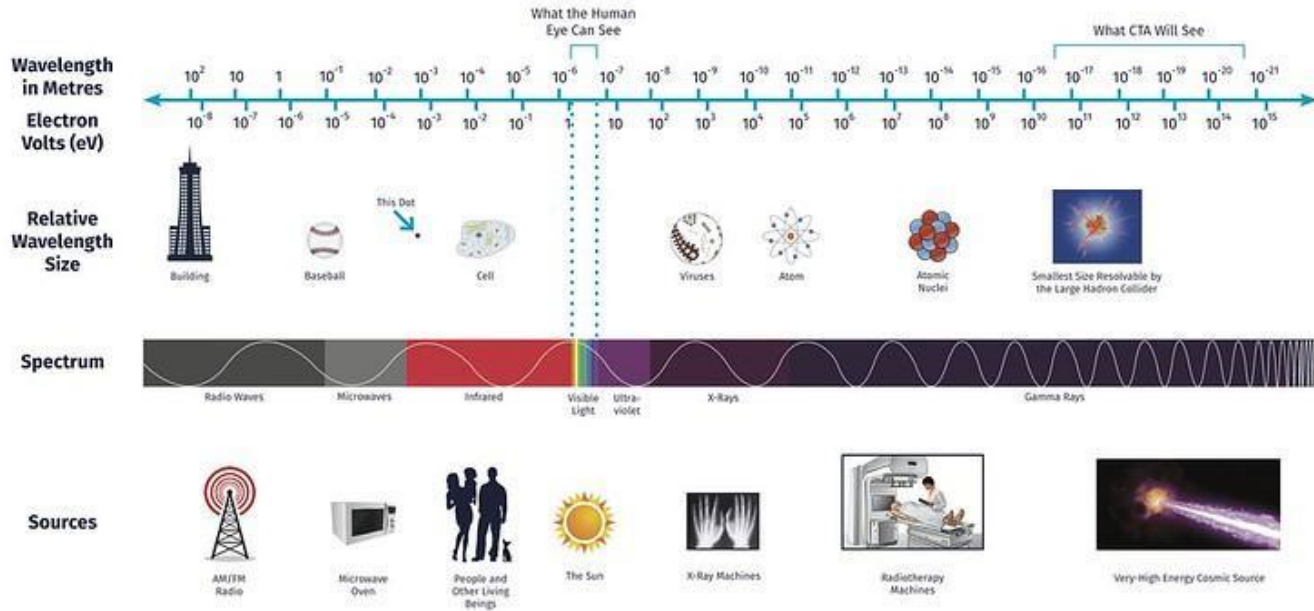
What is the Joint Polar Satellite System (JPSS)?

As much as 85% of local weather data comes from polar-orbiting satellites like some that make up the Joint Polar Satellite System (JPSS). Satellite systems use different portions of the electromagnetic spectrum to collect weather data.

What is the electromagnetic spectrum (EM)?

The electromagnetic spectrum is electromagnetic energy that travels in waves and spans from very long radio waves to very short gamma rays. Basically the EM spectrum is made of different types of energy.

The Electromagnetic Spectrum



"[The Electromagnetic Spectrum](#). CTA Observatory. Creative Commons

Image credits: Vector

NASA Tour of the EMS 01 - Introduction

- ★ Video introduction to the EM spectrum
- ★ <http://www.youtube.com/watch?v=lwfJPc-rSXw>



“Tour of the EMS 01 - Introduction”. NASA Science Share The Science. 7/27/2022.
https://science.nasa.gov/ems/01_intro. Accessed 27 July 2022.

How does the JPSS measure Earth's temperature?

First.....

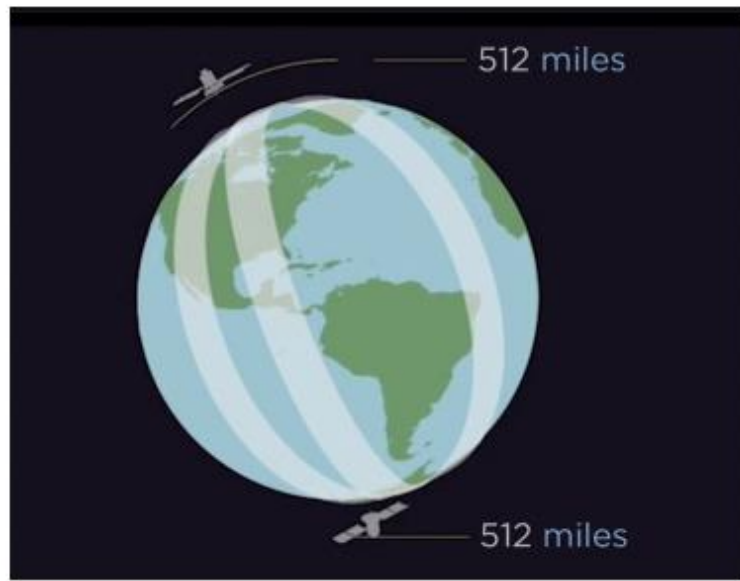
The JPSS uses a polar orbit. In a polar orbit, a satellite circles the Earth by passing above the North and South Poles. While JPSS orbits the Poles, Earth spins underneath, allowing JPSS to observe the entire Earth twice in one day.

Second.....

JPSS uses scientific instruments to observe Earth's thermal energy. Two of these scientific instruments detect **infrared** wavelengths to monitor Earth's changing temperatures.

The two instruments are the Visible Infrared Imaging and Radiometer Suite (VIIRS) and the Cross-track Infrared Sounder (CrIS).

- VIIRS uses **visible** & **infrared** wavelengths from 412 nm - 12 μ m.
- CrIS uses **infrared** wavelengths from 3.92 - 15.38 μ m .



The picture above shows Suomi NPP and NOAA-20, the two satellites in the Joint Polar Satellite System in their polar orbit. Each satellite is approximately 512 miles above Earth's surface, traveling at approximately 17,000 miles per hour. At this speed, JPSS completes 14 polar orbits in one day, covering the entire Earth twice a day.

Image: www.nesdis.noaa.gov/content/jpss-joint-polar-satellite-system-overview

JPSS's Primary Mission

Understanding past, present, and future weather patterns is one of the primary missions of JPSS. In order to forecast the weather, scientists must understand the movement of the water throughout Earth's surface, oceans, and atmosphere. Scientists call this global process..... **the water cycle.**

Depending on its temperature, water can be a solid, liquid, or gas. The infrared instruments aboard JPSS detect water in its different phases by measuring its temperature.

VIIRS and CrIS work together to monitor the thermal energy of water radiating as infrared energy, specifically in the oceans and atmosphere.

VIIRS & CrIS Use Infrared to Monitor Hurricane Formation ...by measuring:

Visible Infrared Imaging and Radiometer Suite (VIIRS)
Cross-track Infrared Sounder (CrIS)
aboard JPSS-2

temperature

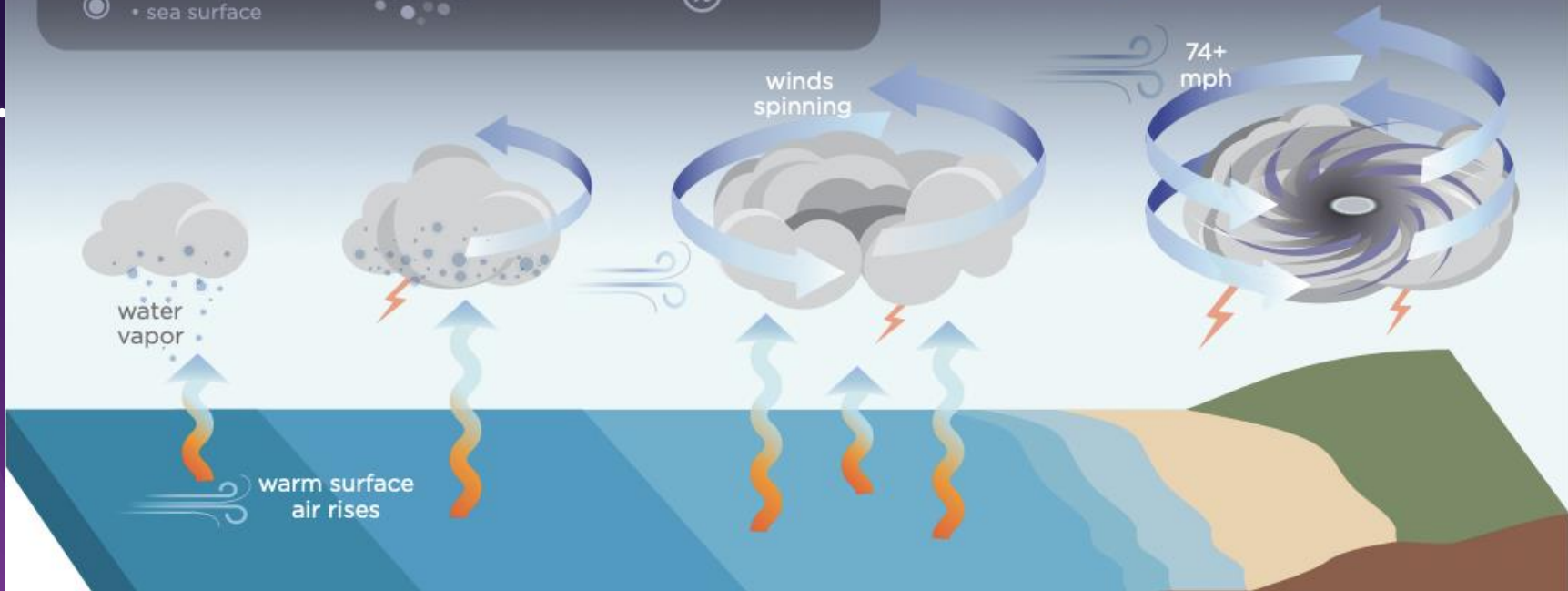


- cloud
- atmosphere
- sea surface

water vapor



atmospheric moisture





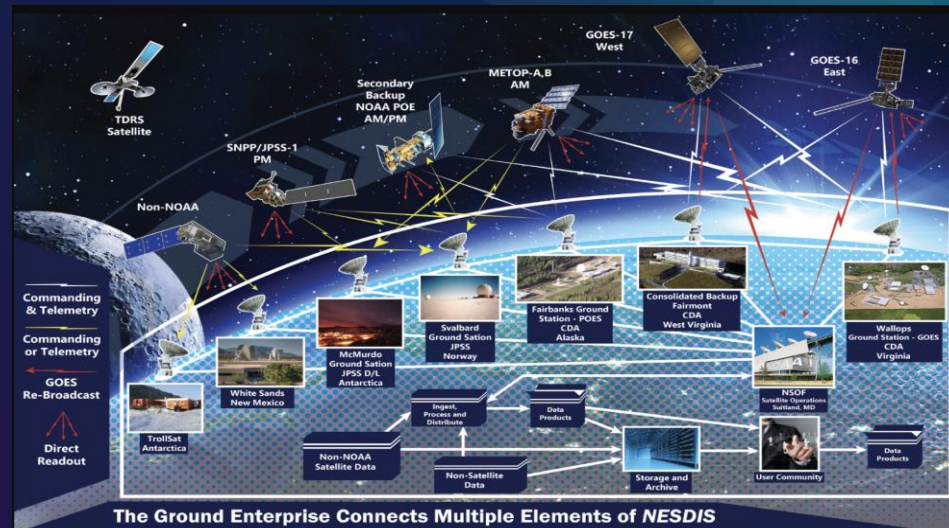
How do we visualize invisible light from JPSS?

The human eye cannot perceive the infrared light detected by VIIRS and CrIS.

In order to visualize data in wavelengths beyond the visible light spectrum, scientists use false color images. A false color image can reveal data or patterns in Earth's weather systems that would normally be invisible, such as temperature, cloud intensity, air pressure, and wind speeds.

What wavelengths does JPSS use other than infrared?

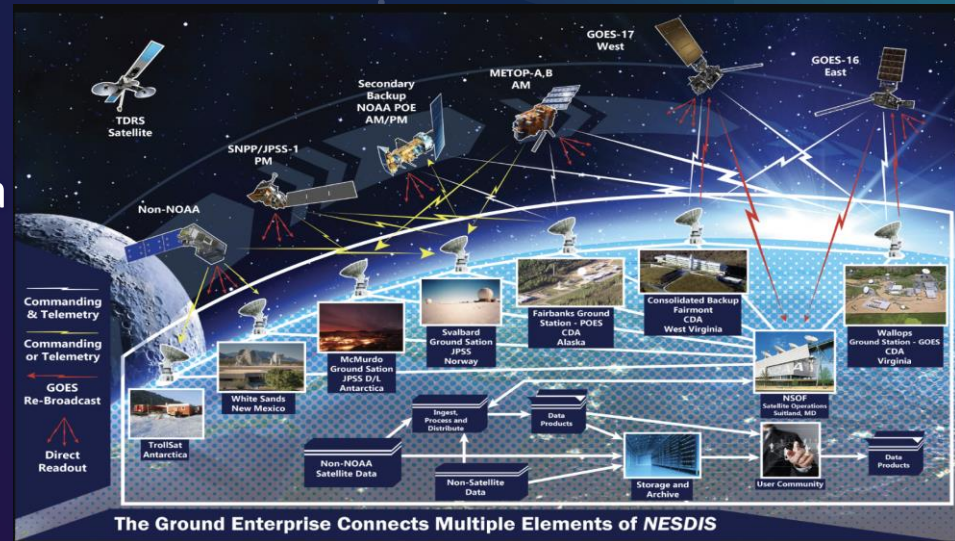
- ★ JPSS uses **microwaves**, **radio waves**, and **ultraviolet waves**.
- ★ **Radio waves** are used by the JPSS to transmit the data back to ground stations.



Office of Satellite Ground Services NOAA/NESDIS. <https://www.nesdis.noaa.gov/about/our-offices/office-of-satellite-ground-services>

Satellite Ground Stations

- ★ The ground stations send commands via radio waves to the satellites which determine the data collected
- ★ The satellites return the collected data to the ground stations via radio waves





Citations:

[The Electromagnetic Spectrum.](#) CTA Observatory. Creative Commons. Accessed 30 August, 2022

Joint Polar Satellite System Understanding Infrared Light Teacher/Parent Activity Manual. NOAA/NASA. https://www.nesdis.noaa.gov/s3/2022-02/JPSS%20Understanding%20Infrared%20Light_Teacher-Parent%20Activity%20Manual_Final.pdf. June 2020.



It's All About the Weather. NOAA SciLinks. July 14, 2022 www.sciinks.gov/hurricane/. Accessed 27 July 2022.