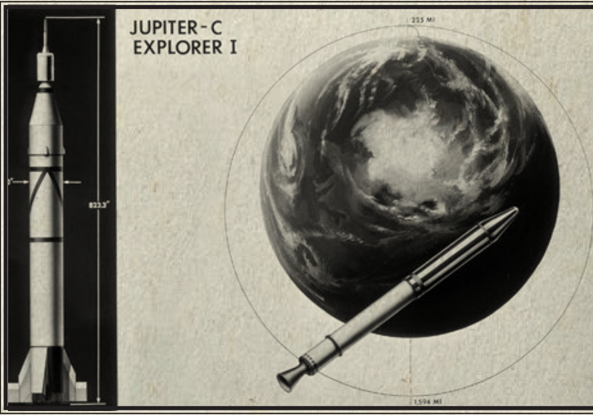
earth observatory eokids

EXPLORER 1 ANNIVERSARY SPECIAL EDITION

60 YEARS LOOKING AT EARTH FROM ABOVE

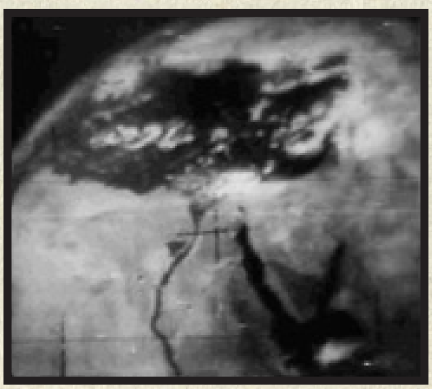


Explorer 1 Launches U.S. into the Space Age!

In 1958, before NASA was even NASA, Explorer 1 was launched into space on the Jupiter-C rocket. Explorer 1 proved America's ability to send a satellite into orbit. It also measured cosmic rays and other particles and energy around Earth. But it did not have a camera.

TIROS Photographs Earth

Luckily, we did not have to wait long for pictures of home. In 1960, TIROS-1 (Television InfraRed Observation Satellite) was launched into orbit. The satellite was the first in a series designed to study Earth's clouds and weather.



TIROS-1 could snap one picture every 30 seconds. This snap-shot shows the Nile River in Egypt. Water is black and land is light-colored. The brightest features are clouds.

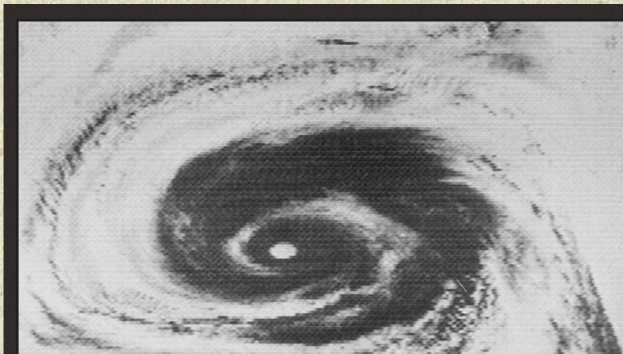
Our planet changes on every scale from seconds to seasons to centuries. That is one reason why scientists have spent the past 60 years trying to find better ways to observe Earth.

Take hurricanes, for example. They grow and travel for days to weeks, but they also can turn or intensify quickly. It is important to monitor these awesome but destructive storms.

Seeing Hurricanes in the Space Age and Beyond

For thousands of years, we could only know about storms when they hit us. Now we can see them from space, long before they arrive.

Each satellite after TIROS-1 provided even more weather information. Nimbus 1 in 1964 could measure the temperatures at the top of clouds. It also took the first images of hurricanes during the day and at night. Each pixel showed details in a 10-mile square (16 kilometer) patch of Earth. This was a great advancement for the time.



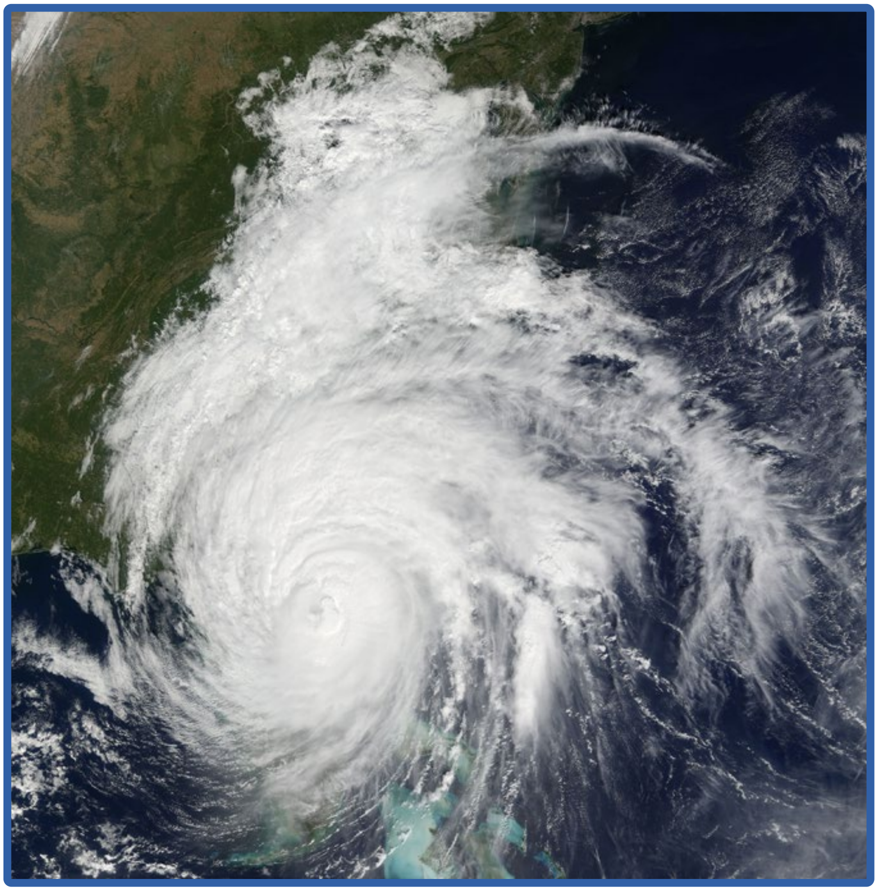
Nimbus 1 took this infrared picture of a hurricane in 1964. Cloud tops are dark (colder) and ocean surfaces are brighter (warmer).

Nimbus is the Latin word for rain cloud.

"Nimbus is the granddaddy of the current Earth-observing fleet. When you look at all the incredible science we are doing from Earth orbit right now, you can trace it back to Nimbus. By any measure — scientific, engineering, operational, economic, human — the program was a smashing success and a huge return on investment."

— Piers Sellers, NASA astronaut and Earth scientist

HURRICANE MATTHEW



The Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Terra satellite captured this natural-color image of Hurricane Matthew on October 7, 2016.

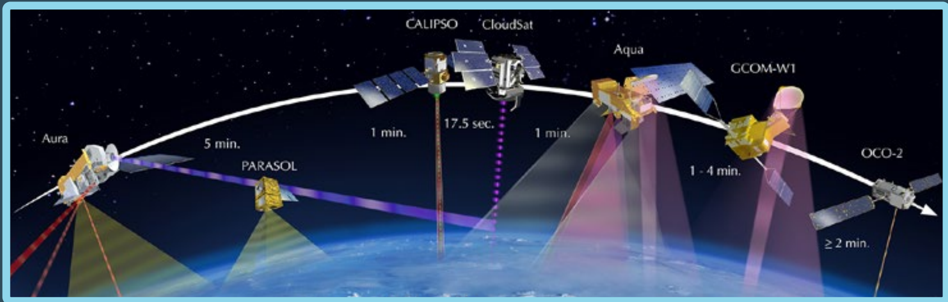
Explorer 1 was the first successful U.S. satellite. It was also the first satellite to take scientific measurements.

NASA's Fleet of Earth Observatories

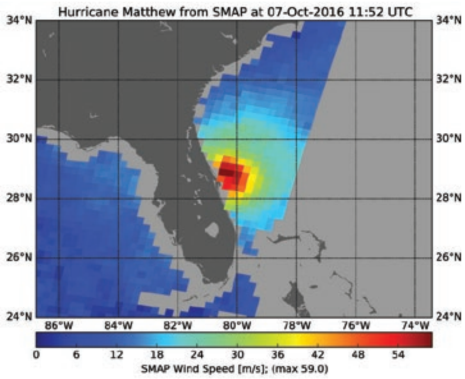
With these satellites we can obtain images that are hundreds of times more detailed than TIROS. We can also see and sense the fine details of storms in a variety of ways — everything from wind speed and direction to cloud temperatures and types to the amount and rate of rain falling. We can view the same storm from more than one perspective.

Same Storm, Many Views

Hurricane Matthew battered parts of the Caribbean, the Bahamas, and the southeastern United States in September and October 2016. This category 5 storm was closely watched by several NASA satellites.

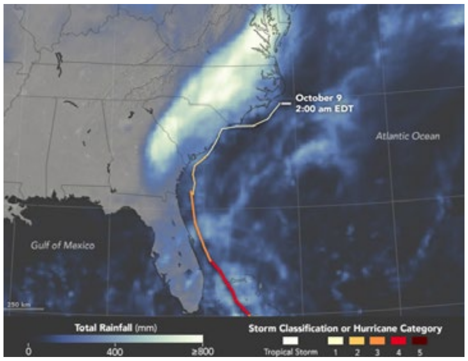


Several satellites monitor storms in many ways and provide much more data than NASA's early satellites.

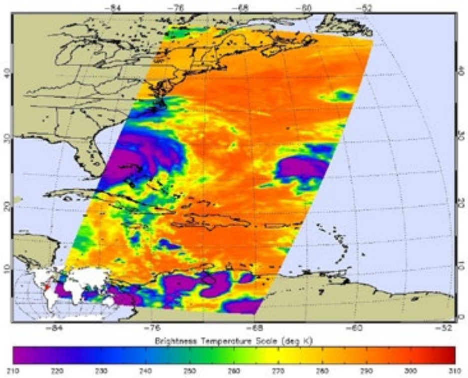


NASA's Soil Moisture Active Passive (SMAP) satellite measured the hurricane's wind speeds at 132 miles per hour (59 meters per second).

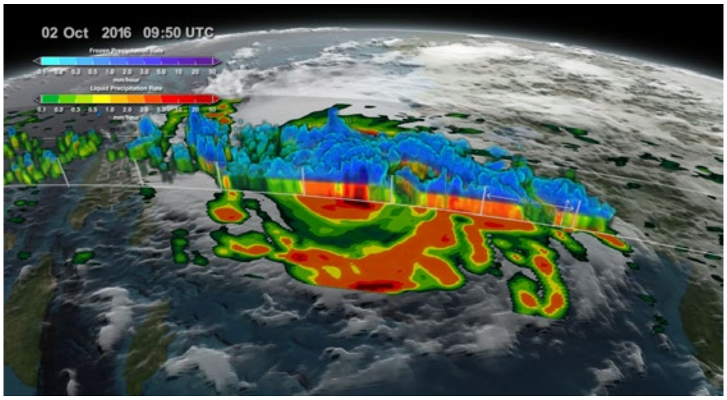
This map shows rainfall measured by satellites from September 28 to October 10, 2016.



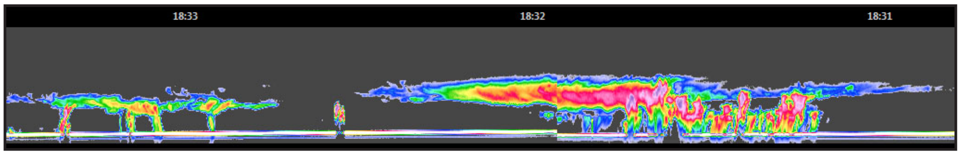
NASA's Aqua satellite measures cloud-top temperatures. The colder the cloud, the more likely it will produce rain or snow.



The Global Precipitation Measurement mission (GPM) satellite mapped the intensity of rainfall. The brightest reds show where the rain is heaviest.



Reds and pinks show where CloudSat saw large water droplets and ice crystals in rainclouds. This helps scientists identify areas with the heaviest rainfall.



Getting Better All the Time

Data from all these satellites help hurricane scientists to better forecast and track a storm's intensity, path, and impact. What we learn helps us all be better prepared for natural disasters.

It takes time and creative scientific thinking to understand our world. The first satellites were simple compared to modern satellites, but they paved the way to better weather monitoring. As we continue to develop new satellites, who knows what we will discover. Only time will tell.

Image credits clockwise from top left: NASA/JPL-Caltech; NASA/IMERG; NASA; NASA/JPL/CIRA, & Colorado State University.

All other images in this issue are from NASA or NASA Earth Observatory.

MakerCorner

Fizzy Rocket Science

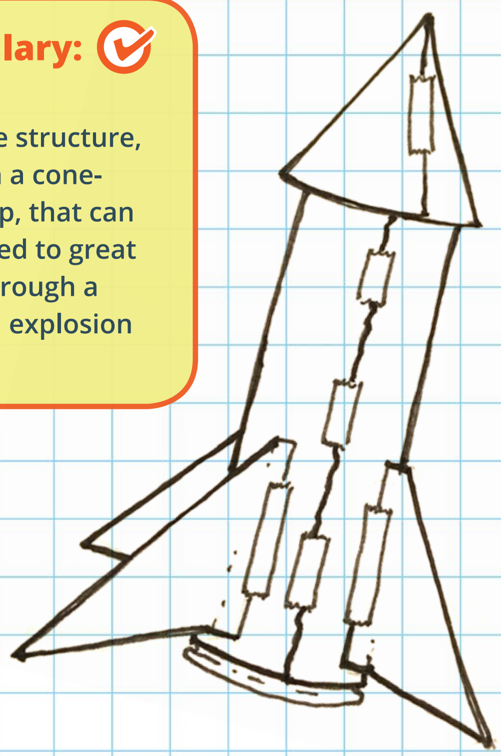
The only way we can overcome gravity and get into space is with **rockets**. Wernher von Braun, one of the pioneers of liquid-fueled rocketry, led the team that engineered the Jupiter-C rocket that took the first U.S. satellite into space. In this activity, you will build your own "liquid-fueled" rocket.

Materials:

- clear plastic film canister (available online)
- flat surface (wood, concrete, black top, etc.)
- 2 sheets of construction paper
- antacid tablets
- small bowl
- pencil or pen
- paper cup
- tape
- glue
- water
- scissors

Vocabulary:

Rocket:
A tube-like structure, often with a cone-shaped top, that can be launched to great heights through a controlled explosion of fuel.



Build Your Rocket

1

Glue a quarter of an antacid tablet to the inside of the film canister's lid. Set aside.

2

Wrap the film canister with paper to make a cylinder. Tape together. Leave space to attach the lid.

3

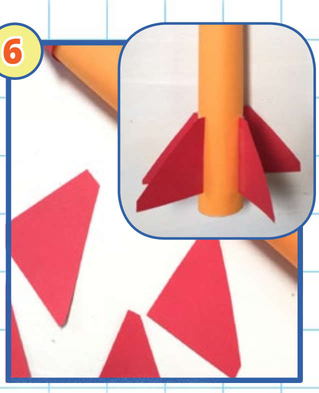
Trace a circle around the bowl. Cut the circle out.

4

Cut a triangle slice out of the circle. Overlap the corners of the triangle to form a cone and tape.

5

Glue the cone to the end of the cylinder opposite the film canister.

6

Cut out 4 triangle shapes. Tape them to the base of your rocket for fins.

Blast Off!

Launch your rocket outside.

1

Fill the rocket/film canister half way with water.

2

Attach the lid with the antacid tablet to the film canister.

3

Flip and quickly set the rocket upright on a wood board or flat surface.

4

Move away and get ready for liftoff!

Action & Reaction:

But how do rockets work? Rocket launches make use of Newton's Third Law, which states: "For every action, there is an equal and opposite reaction."

Rocket fuel, when ignited, produces hot gases. These gases are then ejected through a nozzle at the base of the rocket. This action of gas pushing **DOWN** must be accompanied by an opposite and equal reaction force — the force that pushes the rocket **UP** and into space.

What's Happening?

The antacid tablet will dissolve and create gas pressure inside the film canister. Once enough pressure builds inside, the lid will pop off and the rocket will launch into the air.

It Takes a Team!

Every satellite mission is the result of many people working together. William Pickering, James Van Allen, and Wernher von Braun led the team that launched the Explorer 1 satellite.

Go Further...

The size, shape, and weight of your rocket will affect its ability to fly far and straight, so will different amounts of water and antacid (your fuel). Experiment with different designs, taking notes as you go, and figure out which combination works best. What happens when you add more or less water? What happens when you change the size of the tablet to a whole or a half?

You could also create a team complete with a project lead, designer, hardware engineer, and analyst, and do this experiment together. Or host a rocket design competition with your friends to try out all of the options.