2016

EDUCATOR EDITION

GOES-R Launch Countdown Calendar

Facts and Activities about the
NEW Generation of Weather Satellites!

GOES-R LAUNCH COUNTDOWN CALENDAR

CHECK OUT GOES-R EDUCATION PROVING GROUND AT
CIMSS.SSEC.WISC.EDU/EDUCATION/GOESR/

LET'S GET READY TO LAUNCH…GOES-R!!!

WELCOME

Thanks for joining us and other educators across the nation, as we countdown to the launch of GOES-R on Friday, November 4, 2016. GOES-R is the next generation of weather satellites, designed to yield five times faster weather coverage, better data for hurricane tracking and intensity forecasts, real time mapping of total lightning for improved severe weather forecasts, advanced warning of space weather hazards, and improved transportation safety. And, as the designers of GOES-R like to point out, all of that is from ONE satellite!!

THIS IS *YOUR* LAUNCH CALENDAR

In this calendar, you will find general facts about satellites and specific facts about GOES-R. You can use most of the activities/questions as class discussion starters on the days leading up to the launch. However, this is YOUR Launch Calendar. You can do as little or as much as your daily schedule allows. The main objective is to introduce your students to GOES-R and excite them about the launch and subsequent use of GOES-R by scientists. It's been a long time since the instruments on the GOES series have been fully upgraded. GOES-R truly represents the next generation of weather satellites.

SHARE YOUR THOUGHTS

FEEDBACK

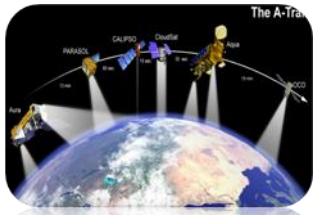
We love feedback. Please tell us what you think of our calendar and also let us know how you used it in your classroom. We would love photos and stories from the students. Just remember to have the proper releases, because students' stories and photos might be used on one or more public websites. Feedback can be sent to Margaret Mooney, CIMSS Education and Public Outreach Director, University of Wisconsin – Madison. Contact Margaret.

October 4, 2016

What is a satellite?

Expand students' knowledge of satellites. Encourage them to think of a satellite as anything that orbits something larger than itself. Highlight, there are both natural satellites and those made by man (artificial).

31 Days until Launch



October 5, 2016

Why use satellites?

This question is different from "What are satellites used for?" Introduce the concepts of Direct Methods (in situ) and Indirect Methods (remote sensing).

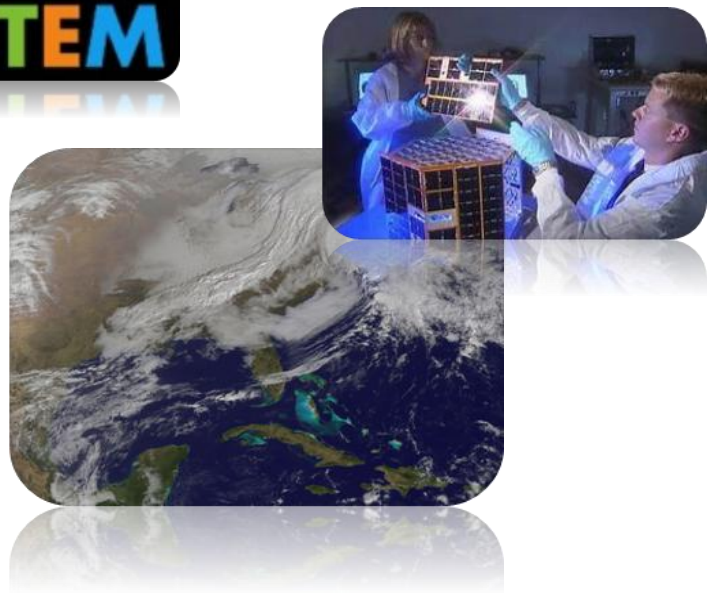
Direct methods measure the properties of the substance/medium in contact with the instrument being used.

Indirect methods obtain information without coming into physical contact with the substance/medium being measured.

Students can brainstorm the pros and cons of each method. Ideas should include safety, cost, accessibility (distance and time), point of view, amounts of data, etc.

30 days until Launch

Create a class countdown calendar, or have students make their own. Encourage them to share newfound knowledge with family and friends! GET EXCITED!



Week One Notes

Satellites are a great way to introduce STEM concepts to your classroom. Satellite design, creation, and mission accomplishment use the four STEM disciplines better than most other topics. Take the time and effort to get your students "hooked" on satellites. Then, incorporate satellites, remote sensing and image analyses into your lessons on a regular basis.

This week, your students will be learning background information on satellites, but we want GOES-R to enter the picture, too! Plan to introduce GOES-R by watching the following two-minute video.

"Meet GOES-R"

October 6, 2016

What are NASA and NOAA?

NASA stands for National Aeronautics and Space Administration. NOAA stands for National Oceanic and Atmospheric Administration. Your students may have heard about NASA and NOAA, but do they understand the missions of both entities? Most think NASA only looks at space, when, in fact, a large portion of NASA's mission is looking at Earth from space. NOAA's focus is on both the atmosphere and oceans and includes missions about climate and weather. It's very logical GOES-R would be a joint NASA/NOAA mission.

29 days until Launch

October 7, 2016

Mission: There is a hurricane forming in the Atlantic Ocean. You are your state's meteorologist, and the Governor of your state wants to know the present size of the hurricane. From what sources do you get your information?

At this point, though your students might give you several different answers, one of the answers should be "from a satellite." Introduce the concepts of perspective and "point of view." If we are on Earth looking up and around, we can see only a few kilometers in any direction. But, Earth is huge and global phenomena can be hundreds or even thousands of kilometers across. Orbiting satellites give us the views we need to study weather events such as hurricanes.

28 days till Launch

Week One Notes

NASA and NOAA provide educators with a wealth of resources. Here are a few websites. For more sites, look at the last page in this countdown calendar!

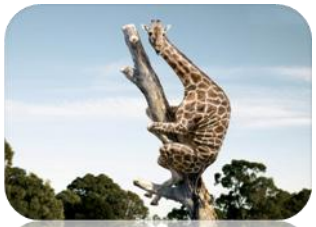
http://scijinks.jpl.nasa.gov/

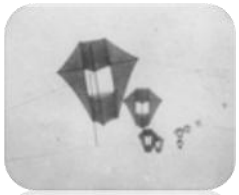
http://scool.larc.nasa.gov/geoobs.html

http:www.earthobservatory.nasa.gov

Here is the link to the GOES-R mission page.

http://www.goes-r.gov/





October 10, 2016

What came before satellites?

Have some fun today with your students. Ask them to answer the following questions.

- How could early earth inhabitants get a view of the Earth from above?
- What invention (in 1792) allowed man a better view "from above?"
- In the mid-1800's, another invention helped in seeing the Earth from above. What was it?

Use the images to the left (or similar ones) when discussing the answers to the above questions.

25 days until Launch

October 11, 2016

From kites to satellites!

In 1906, the construction of an array of 17 kites moored to a boat in the San Francisco Bay enabled photographs of the aftermath of the historic earthquake and resulting fire to be taken from a bird's eye view. Residents there could have benefitted from satellite images!

When was the first satellite launched and who launched it? What was it called?

ANS: 1957, Soviet Union, Sputnik 1

24 days until Launch

Week Two Notes

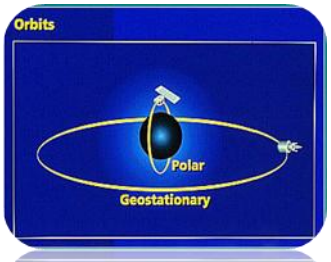
Your students were born long after the Space Race of the 1960's. Maybe, you were, too! It's important to understand how relatively recently satellites came on the scene, and how much they have evolved in the last 50+ years. NASA launched Explorer 1 in 1958. The first satellite picture of Earth came from Explorer 6 in 1959. The first TV picture from space was from TIROS 1 on April 1, 1960. You can imagine how many people might have thought this was an April Fools' Day joke. Imagine, seeing what the Earth looked like from that perspective. It *IS* round! The early images were in black and white. Now, we have the NASA Blue Marble image we know and love. And how far have we really come? Students are launching high altitude balloons with cameras that get a better quality picture than that first one sent by TIROS 1.

October 12, 2016

Who uses satellites?

This is a good question to get your students thinking about some of the different uses of satellites. Uses include: Weather, Space Exploration, Defense, Communication, Navigation, Search and Rescue, Reconnaissance (Spy). After today, you will focus mainly on Weather Satellites.

23 days until Launch



October 13 and 14, 2016

The two main types of Weather Satellites are defined by their orbital characteristics. Depending on the level of your class, you can skim this topic or delve in with mathematical applications.

Polar Operational Environmental Satellites (POES) travel in a more or less circular orbit moving from pole to pole. The satellites collect data in a swath beneath them as the earth rotates on its axis. Flying close to Earth (200-500 miles in altitude), these satellites can complete one orbit in about 90-100 minutes.

Geostationary Operational Environmental Satellites (GOES) are located over the Equator and high above the Earth (22,300 miles in altitude). They make one revolution in the same direction and time it takes for the Earth to make one rotation. Therefore, they stay above the same spot on the Equator. This makes them appear stationary.

See page 10 for a quick and easy student activity on this topic.

22 days until Launch

21 days until Launch

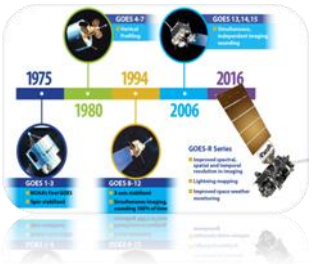
Week Two Notes

As students are becoming more familiar with satellites, in general, you can begin to introduce more facts about GOES-R. It's time for your students to watch the following video.

GOES-R gets launched!

Here is a great site for you and your students to use for more detailed information about GOES-R. Be sure to check out the complete listing of GOES-R fact sheets.

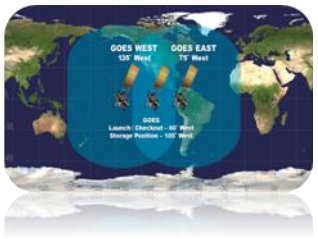
http://www.goes-r.gov/products/factsheets.html



October 17, 2016

Ask your students, "How long has GOES been looking at Earth?" They might be surprised to know it has been over 40 years…since the mid 1970's.

18 days until Launch



October 18, 2016

There are two GOES currently orbiting and viewing the continental US. One is called GOES-East; the other is called GOES-West. In addition, there is an on-orbit spare, which can be used in the event of an emergency or malfunction of the East and West satellites.

17 days until Launch

October 19, 2016

After GOES-R is launched in November, scientists will decide if it will replace GOES-East or GOES-West. Have students present reasons for East or West substitution. Send your best arguments to the GOES-R scientists. Get your whole school involved. Those for East can wear a certain color on Fridays. Those for West can wear a different color.

16 days until Launch

October 20 and 21, 2016

Take the time to view two GOES-R videos. Each is under four minutes. One can be viewed on the 20th and the other, on the 21st. leave a bit of time for student discussion.

What is GOES-R?

Living with Space Weather?

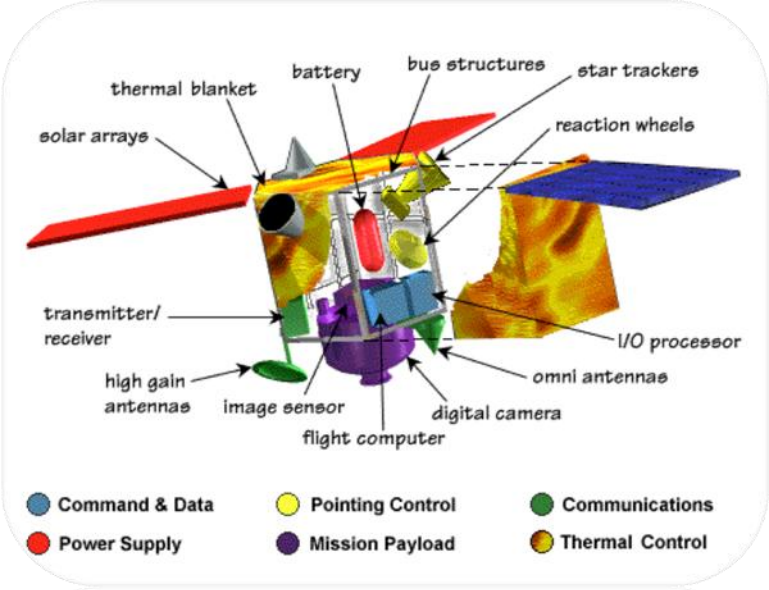
15 days until Launch

14 days until Launch

Week Three Notes

As the GOES-R launch approaches, your students should take a more vested approach to learning about the satellite. Make them feel as if they are part of the NASA/NOAA team. Explain that NASA is responsible for the building and launch of the satellite, while NOAA will be responsible for its operation and use. Impress upon the students that scientists collaborate and constantly reflect upon their work. Link this to how the students should approach scientific challenges in the classroom. As they try to answer big questions and take on big challenges, remind them that cooperation and teamwork are key.

Week Four



October 24, 2016

What do satellites have in common with the big yellow vehicle some of you ride to school?

You never know what answers you will get when you ask this question! It's a fun way to teach students about the two main "parts" of a satellite. The "Bus" carries the payload and all its equipment into space. It holds all of the satellite's parts together. In addition, it provides electrical power, computer systems, propulsion, and the equipment necessary to communicate with earth. The "Payload" is all the equipment a satellite needs to do its job. It is different for every satellite.

This week, your students will learn about some of the instruments that make up the GOES-R payload.

11 days until Launch

October 25, 2016

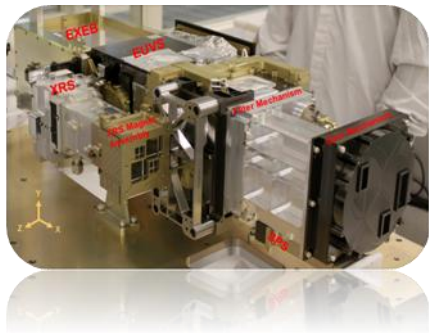
The Advanced Baseline Imager (ABI) is the primary instrument on GOES-R for imaging Earth's weather, climate, oceans, and the environment.

10 days until Launch

October 26, 2016

The Geostationary Lightning Mapper (GLM) maps total lightning activity 24/7. Scientists believe GLM will improve warning response times for tornadoes.

9 days until Launch



October 27, 2016

The Extreme Ultraviolet and X-ray Irradiance Sensors (EXIS) measure solar flares and solar variations that can disrupt communications and degrade navigational accuracy, including that of commercial airline flights!

8 days until Launch

October 28, 2016

The Solar Ultraviolet Imager (SUVI) data enables better prediction of space weather and improved early warning possible impacts to Earth and Earth's environment.

7 days until Launch

Launch Week

October 31, 2016

The Advanced Baseline Imager on GOES-R will improve both spatial and temporal resolution. In fact, it will provide "three times more spectral information, four times the spatial resolution, and more than five times faster temporal coverage than the current system."

It would be time well spent in the classroom to include 2 or 3 lessons on resolution and how the increased capabilities of GOES-R will make this satellite invaluable as a weather observing and predicting resource. Click here to view the lessons on the GOES-R Education Proving Ground pages.

4 days until Launch

November 1, 2, 3, 2016

It's time to get the word out on social media! The official GOES-R Facebook page is http://www.facebook.com/GOESRsatellite
On Twitter, please check @UWCIMSS, @NOAASatellites and @NASAKennedy. Use #GOESR_ED when tweeting about your GOES-R activities. Help get the word out!

3 days until Launch

2 days until Launch

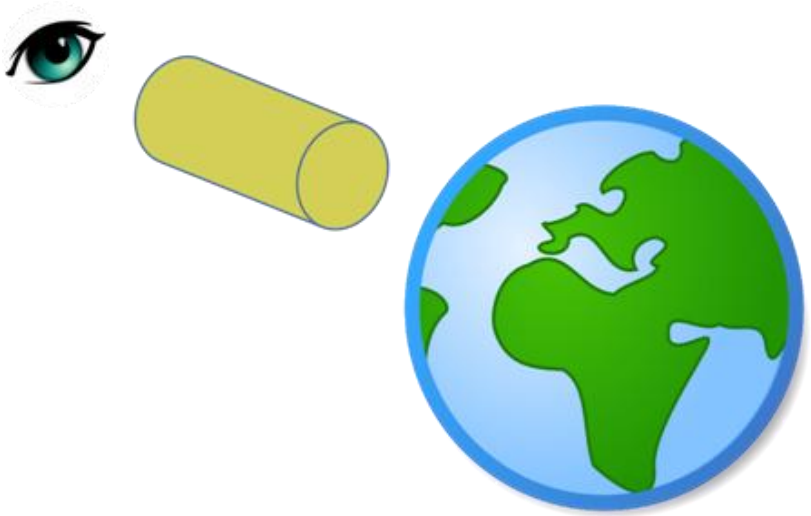
1 day until Launch

November 4, 2016

It's here! Your students should be excited. Are they dressing for the day? Are there posters around the school? Have you contacted your local paper? If you can, get your whole district involved! Pizza parties? GOES-R launch ice cream sundaes? A GOES-R parade with floats!? Celebrate this day anyway you can!!

The launch is scheduled for 21:40 GMT (5:40 EDT) at Cape Canaveral Air Force Station, Florida. You can get the latest information about the launch at https://spaceflightnow.com/. Watch NASA TV during the launch. Additional information about the launch and launch preparation can be found on the GOES-R website; click on the link below the countdown timer.

If you are new to the GOES-R community and would like to continue to get information about post-launch activities, please e-mail our GOES-R Team.



Understanding Orbits

This brief activity will help students to visualize the two main types of satellite orbits, polar orbiting and geostationary. You can do this activity prior to explaining the difference between the two. In this way, students can experiment and come up with their own definitions and explanations. Either way, the price is right and the investigation, educational!!!

- Gather up some inserts from either toilet paper rolls or paper towels.
- Have the student look through the insert at a medium or large size globe. The insert is the satellite and the eye of the student is the instrument on the satellite.
- Direct the student to place the insert fairly close to the globe.
- Ask the student what he/she sees.
- Then explain you want your satellite instrument to see more of the globe.
- What must the student do to accomplish this? (student must get further away from globe)
- Now, tell the student the satellite instrument must look at the same location on the globe. (simulating a geostationary satellite)
- Start to rotate the globe and ask the student to follow the image.
- Ensure the area is clear of anything the student might encounter while following the rotation of the globe.
- Encourage the student to position the insert opposite the Equator. Ask the student to describe the speed and direction the satellite is moving.
- Now ask the student to position the insert over a higher latitude.
- What happens to the speed of the student as he/she follows this new spot?
- Now, simulate a polar orbiting satellite, this time without the “eye” of the student.
- Use a flashlight with the insert as an extension of the lens, and have the student position both closer to the globe to represent a lower earth orbit than that of the geostationary satellite.
- Let the student see the swath (beam of light) prescribed by the satellite moving over the poles.
- Rotate the globe while the student keeps the satellite in the same polar orbit.
- Are the swaths connected, or is there a space between them? What kind of image is produced by this type of orbit? How long would it take to cover the same region GOES looks at all of the time?

Additional Websites and Resources

NASA Eyes on Earth

NOAA View

The GLOBE program

The GLOBE program (satellite campaigns)

The GLOBE program (GOES-R Weather Watchers)

NOAA

NOAA (Education)

NOAA (Satellites)

The National Environmental Satellite, Data, and Information Service (NESDIS)

National Weather Service – Satellite Images

GOES-R Activities at CIMSS/SSEC

Kennedy Space Center

NASA EarthData

NASA Weather Satellite Images

Satellite Educators Association