

## 16. Weather Satellites

**OBJECTIVES:** After completing this lesson, a student should be able to:

- \* **Define WEATHER SATELLITE**
- \* **Explain the importance of weather satellites to forecasting**
- \* **Recognize two types of satellites (Grades 4-8)**

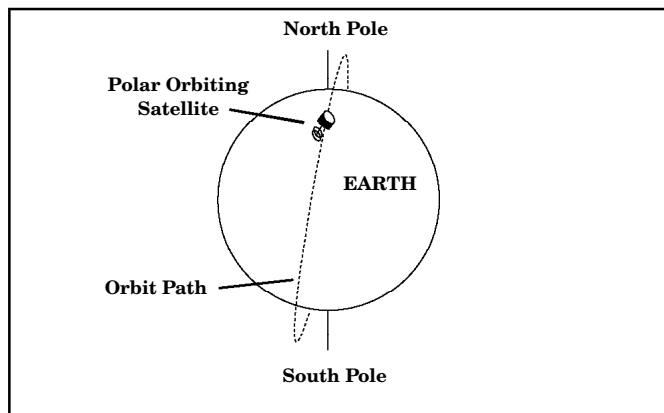
**TEACHER BACKGROUND:** (Grades 1-8)

How many students can name the earth's natural satellite? This satellite can be seen most nights and some days without telescopes. This satellite orbits the earth, and it is called the moon!

Today, we build our own satellites which orbit the earth, collecting important information about weather, crops, the size of the polar ice caps, the eruption of volcanoes, the amount of water vapor in the air and the temperature of the oceans. They even help with search and rescue operations by locating distress signals from downed aircraft. **WEATHER SATELLITES are spacecraft which collect and relay weather information to Earth.** Before the first weather satellite was launched in 1960, forecasters could not reliably track weather across the oceans that cover most of the earth. Now, if a hurricane approaches land, a "bird's eye" view of the storm assists the National Weather Service in issuing warnings to areas that may be affected.

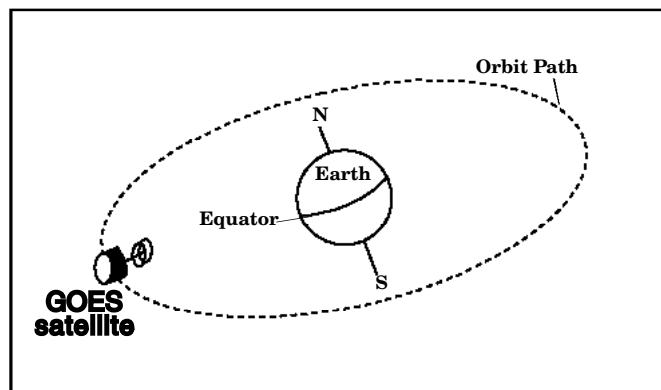
**Additional notes for grades 4-8:**

There are two types of weather satellites. **POLAR ORBITING SATELLITES circle the earth from pole to pole, completing one orbit every 100 minutes.** (See figure below.)



These satellites orbit at an altitude of about five-hundred miles above the earth's surface and provide coverage of the entire earth four times per day.

The second type of weather satellite is *geostationary*. **GEOSTATIONARY satellites orbit the earth at the same rate that the earth rotates, so the satellite is always seeing the same part of Earth.** Geostationary satellites provide continuous viewing of the United States and adjacent coastal waters from their vantage points over the equator. (See figure below.)



Since geostationary satellites rotate at the same rate as Earth, they complete one orbit every twenty-four hours. Geostationary satellites are located at a much higher altitude than polar orbiting satellites, positioned at 22,300 miles above the earth's surface. Geostationary satellites are abbreviated GOES (Geostationary Operational Environmental Satellite). Under normal operating conditions, two GOES satellites observe the Eastern and Western United States, adjacent oceans and a large part of the Southern Hemisphere. Image data collected by all satellites are transmitted down to Earth where computers transform the data into the images that we see on the television weather broadcast.

# Satellite Activity

## GRADES 1-3

### INTRODUCTORY: **CARTON SATELLITE**

Rinse small, empty milk cartons to begin designing individual satellites. Gather as many items as possible to glue to the cartons as special instruments and antennae (buttons, wires, coins, etc.). Add color with markers or crayons and have each child hang the satellite over an area (or person) they want their satellite to "watch!"

### INTRODUCTORY: **HAND SATELLITE**

Using a classroom globe, pretend that your hand is a satellite and rotate it around the earth, North Pole to South Pole (top to bottom). In orbit, pretend that your satellite hand has a special camera which can take pictures of Earth. What is it seeing, land or ocean? Does it see all of the earth at once? (no) Do satellites

travel faster than jets? (yes)

## GRADES 4-8

### INTRODUCTORY: **SATELLITE USES**

Have a group of students research ways satellites are used by the world (viewing Mt. St. Helens and Chernobyl disasters, spying, communications, vegetation monitoring, etc.). A second group can design and construct a wall chart of the earth and the various uses of satellites. Refer to the background section on the previous page.

### ADVANCED: **PHOTO RESOLUTION**

Satellites can only detect objects that are a certain size. This is their *resolution*. (Spy satellites can see six-inch objects!) Have each student take a photo of the ground (or globe) at a specific distance just as though they were a satellite. What is the photo resolution? (How large did an object have to be in the photo before it

## MAKE A SATELLITE IMAGE - PART I (Time: 10-15 minutes) GRADES 4-8

- Materials:** Completed weather map worksheet #2, a pencil or crayon
- Preparation:** Distribute worksheets and tell students they are satellites scanning the U.S. (map). This part of the exercise is a student's estimate of cloud cover.
- Procedure:** Using a pencil or crayon and scanning the sky symbol data previously plotted on the map, each student should draw an outline where they *think* clouds would be seen by a weather satellite. Hint: Clouds can cover several states at the same time.
- Evaluation:** Are all of the cloudy stations within the cloud outline? (Intermediate students may want to lightly shade in their outline.) Is there a large area of clouds? (Yes, in the central U.S.)
- Excursions:** On a black and white satellite image, what color(s) do you think your clouds would be? (white) Students will see how accurate their estimate was in the next lesson (Part II).
- Computer:** View computer satellite images. Identify geographical areas.

### COLLECT WORKSHEET #2

#### **WEATHERSCHOOL QUESTION:**

**Obtain the question and correct answer from your local Weatherschool TV channel!**