



GRACE Education Curriculum Satellites	
Teachers	Grades K-5
Science	

Follow the Paths

Background Information: GRACE is a pair of satellites that will orbit the Earth, collecting information and taking images from space. When satellites enter space they must take a path or orbit around planet Earth. The orbit a satellite takes depends on the satellite's job. Some satellites travel so close to Earth that they can be seen with the naked eye. Weather conditions and time of day must be perfect so they can be seen. They look like shooting stars.

Three orbits for satellites are the polar orbit, elliptical orbit and the geosynchronous orbit.

- The polar orbit is when a satellite travels from pole to pole (north to south) in a 24-hour period.
- An elliptical orbit is when a satellite forms an ellipse (not circular). The satellite travels far from Earth at one end of its orbit and very close to Earth at the other end of its orbit.
- A geosynchronous orbit is when a satellite moves at the same speed the Earth is moving. Even though the satellite is moving it always stays in the same spot because it is moving with the Earth.

Satellites that are moving too slow get pulled away from earth. As they are pulled away, air slows them down more. This is called drag. Drag and gravity can cause a satellite to be pulled out of orbit.

Objectives: At the end of the lesson, the students will:

- Define satellite.
- Define the three different types of satellite orbits or paths.
- Describe how satellites orbit the Earth.
- Understand how drag affects satellites.

Standards: Science: unifying concepts and processes; earth and space science.

Vocabulary: Satellite Elliptic Polar orbit al Orbit
Geosynchronous orbit orbit Drag

Materials: Satellite model or something to represent a satellite
Globe
Bulletin board paper with Earth outline
Construction paper
Paint
Markers

Directions to the Teacher:

1. Review the background information about satellite orbits. Use a satellite model or something to represent a satellite and show the student how each orbit looks by moving around a globe.
2. Have students paint the picture of Earth on a large round bulletin board sheet. Place the Earth painting on the classroom floor.
3. Divide the class into three groups. Each group will represent an orbit: polar, elliptical and geosynchronous. Demonstrate how each orbit will look around the Earth painting.
4. Play music and have students "orbit the Earth" correctly. After each group has practiced, remind students of drag. Drag slows the satellite down and can cause it to be pulled out of orbit.
5. Place chairs around the Earth. Play musical chairs. First have one less chair than child, then after each stop take away another chair. After the music is played and stopped, the child left standing without a chair is "out of orbit."
6. After games have been played, have students draw a picture of a satellite orbiting the Earth and display.

Extensions:

- Sing "This is the Way We Orbit the Earth" as we move around Earth.
[See satellite songs from Satellite Song lesson.]
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References / Resources:

Walker, Niki. Satellites and Space Probes. Crabtree: NY, 1998.

Space music: AstroCapella CD found in www.pagecreations.com/astrocapella

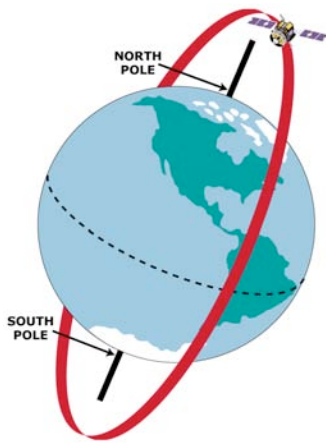
Websites:

- <http://starchild.gsfc.nasa.gov>
- www.csr.utexas.edu/grace/
- <http://www.heavens-above.com/> [to view satellites]

Satellite Paths

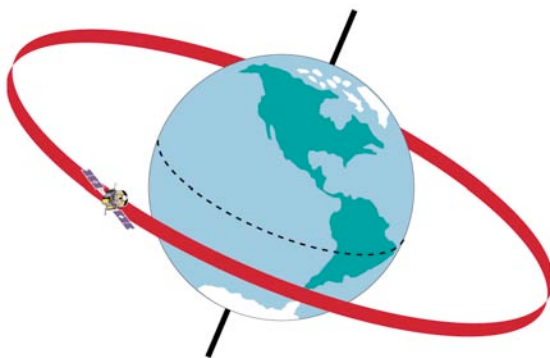
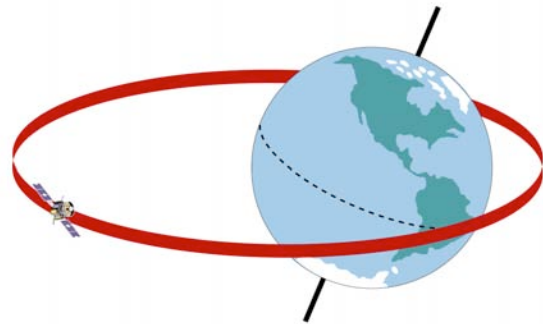
The satellites orbiting Earth travel in one of several orbits, or paths around the planet. A satellite's orbit depends on the job the satellite has to do. The six major jobs for satellites are communication, resource, navigation, military, scientific, and weather. The illustrations here show the different paths satellites can take. Most satellites are found in a band that is between 300 and 23,000 miles [485 km and 37,000 km] above Earth's surface.

Some satellites travel so close to Earth that they can be seen without using a telescope. The best time to spot a satellite is just after sunset or just before sunrise. Watch the sky near the horizon for a "star" moving in a slow, steady line across the sky. The star is actually a satellite! The satellite's metal body and big solar panels reflect sunlight, making it appear as bright as a star.



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A **geosynchronous orbit** is when a satellite moves at the same speed as Earth is moving. Even though the satellite is moving it always stays in the same spot because it is moving with the Earth.
