

NAME _____ DATE _____

Activity 3A: WEATHER SATELLITE IMAGERY

NOTICE: This activity consists of two parts:

1. This packet (complete first)
2. Internet files obtained from Mr. Nap's meteorology course page
(staple internet files to this packet)

<http://www.napscience.com/weather>

Educational Outcomes:

Orbiting satellites are platforms carrying sensors that make it possible for us to "look" down on the atmosphere and underlying Earth surfaces. From their vantage points, it is evident that fair and stormy weather are somehow related. Clear areas and giant swirls of clouds fit together as part of the continuous ocean of air that encircles the planet. Over time, weather systems can be observed as they develop and migrate across the Earth's surface. Areas showing signs of potential or actual hazardous weather conditions can be carefully monitored.

Satellite images are produced by sunlight that is reflected (and scattered) by the Earth-atmosphere system and by infrared radiation that is emitted by that same system.

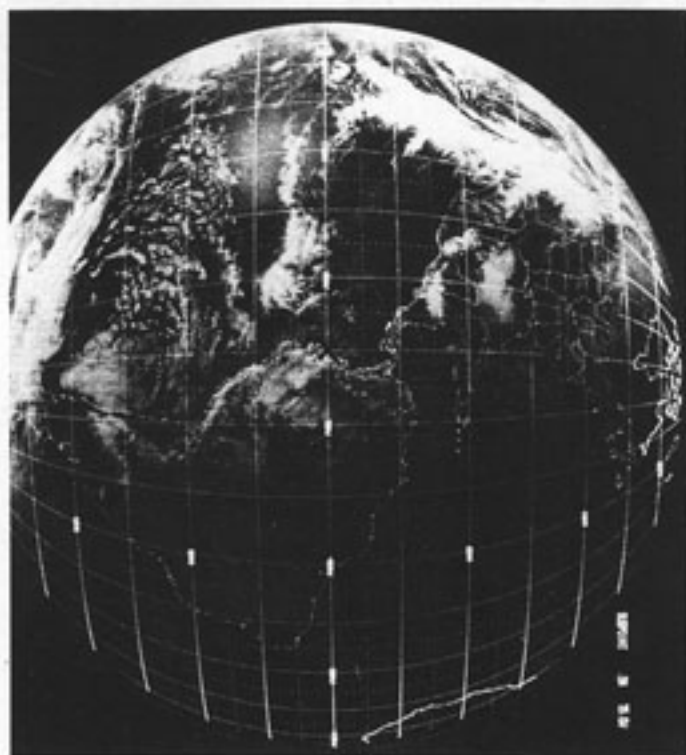
After completing this activity, you should be able to:

- ◆ Distinguish among the different types of weather-satellite imagery and describe the information they can provide.
- ◆ Interpret probable atmospheric conditions from weather-satellite imagery.

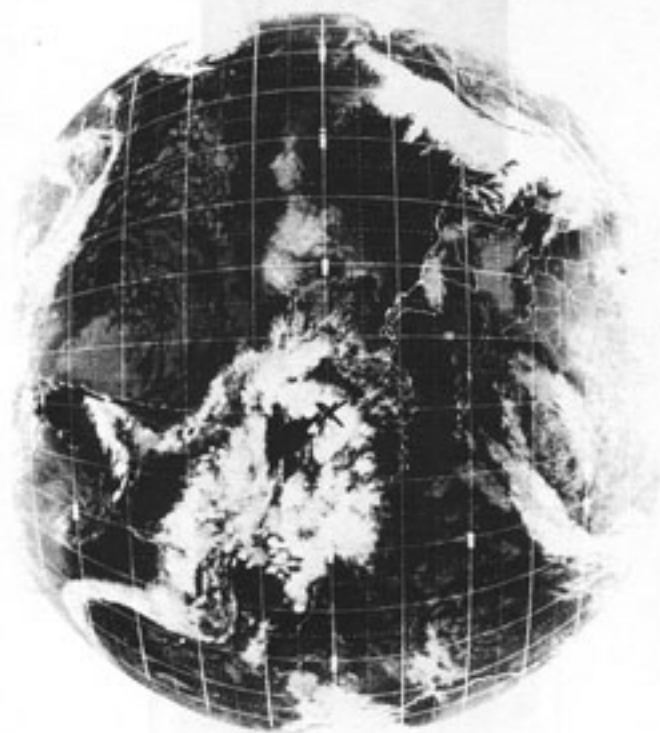
Materials: Hard copies of the Activity File plus designated Image(s).

Investigations:

1. The accompanying images were acquired simultaneously from sensors aboard an Earth geostationary satellite in orbit about 36,000 km (22,300 mi) above a spot on the equator at 75 degrees West Longitude. Recall that a geostationary (or geosynchronous) satellite orbits toward the east at the same rate as the Earth rotates eastward so that the satellite always appears above the same spot on the Earth's surface. Coastlines and longitude and latitude lines have been added to the images. **Place a small "x" in the center of each image where the equator intersects the only longitude line which appears as a straight line.** This marks the location of the sub-satellite point, that is, the spot on the Earth's surface directly under the satellite. The subsatellite point is located in **(South) (North)** America.
2. One satellite image was produced by reflected sunlight and the other by infrared radiation. Keeping in mind that the Earth radiates infrared radiation continually (day and night), **label the appropriate images as "visible" or "infrared"**.
3. On the visible satellite image, the Sun's rays are from the general direction of **(east) (west)**.
4. Because the Earth rotates eastward, local time at the sub-satellite point is near **(sunrise) (sunset)**.
5. Using reflected visible light the satellite "sees" clouds and surface features as we do. In the visible image, the general appearance of all the clouds in the illuminate portion of the image is **(white) (dark)**. The cloud band along the west coast of the U.S. and the clouds in the Gulf of Mexico illustrate this point. Compared to the land and ocean, clouds have a **(lower) (higher)** albedo.
6. The broad-scale organization of clouds provides clues as to the types and locations of various weather systems. On the visible satellite image, a massive storm system characterized by a huge band of clouds is evident over **(Western North America) (the Caribbean Sea)**.
7. A major advantage of infrared imagery is that it can be used to observe the planet both day and night. The image produced by infrared radiation emitted by the Earth-atmosphere system demonstrates that there are clouds in **(only the daylight portion) (both the daylight and night portions)** of the Earth view shown.



Image



Image

8. In the infrared image, relatively warm land and sea surfaces appear dark, cooler low cloud tops are gray, and cold high cloud tops are shown as bright white. Therefore, we can infer that the clouds covering much of Brazil in South America have **(high) (low)** tops.
9. On the infrared image, the contrast in the appearance of clouds over the Gulf of Mexico versus those off the west coast of the U.S. indicates the Gulf clouds are **(low) (high)** level.

STAPLE ACTIVITY 3A (FROM THE INTERNET) TO THE BACK OF THIS PACKET.