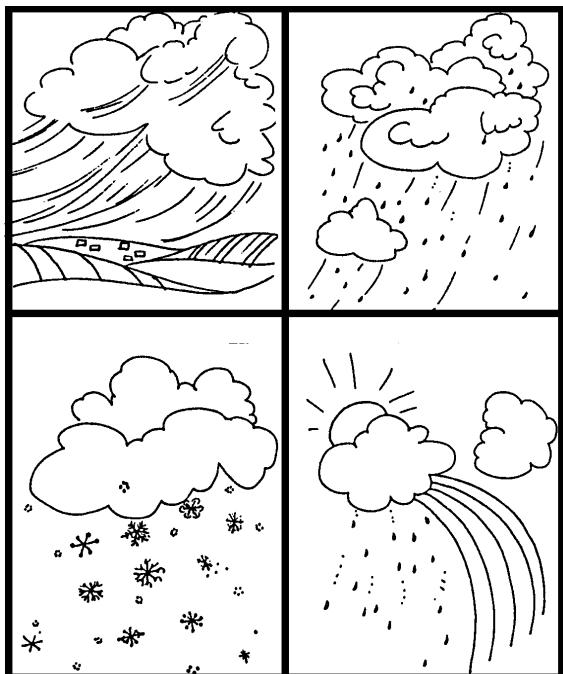


Water Cycle

The Earth's Gift



SIXTH GRADE WEATHER



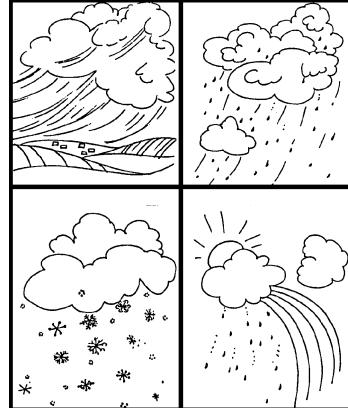
1 WEEK
LESSON PLANS AND
ACTIVITIES

WATER CYCLE OVERVIEW OF SIXTH GRADE

WATER

WEEK 1.

PRE: *Evaluating components of the water cycle.*
LAB: *Experimenting with porosity and permeability.*
POST: *Discovering the major waterways.*



OCEANS

WEEK 2.

PRE: *Exploring ocean movements.*
LAB: *Experimenting with the ocean's movements.*
POST: *Comparing the different reasons for ocean movements.*

ATMOSPHERE

WEEK 3.

PRE: *Discovering the jet stream.*
LAB: *Tracing atmospheric winds.*
POST: *Discovering different air masses in the United States.*

WEATHER

WEEK 4.

PRE: *Comparing weather map patterns.*
LAB: *Comparing satellite photos with weather maps.*
POST: *Researching books for weather information.*

WATER CYCLE - WEATHER (6)

PRE LAB

Students learn weather symbols.

OBJECTIVES:

1. Comparing weather map symbols.
2. Reading weather maps.

VOCABULARY:

temperature
atmospheric pressure
humidity
wind velocity
condensation
radiation
visibility

MATERIALS:

local newspaper (weather section)
weather map symbols
worksheet



BACKGROUND:

Meteorology is the physical and chemical science of the atmosphere. Meteorologists study and predict the weather. The interaction of the oceans and atmosphere, including solar radiation helps us understand how weather forms and sustains itself.

Describing the weather and how it changes is recorded on weather maps or synoptic chart. Information on temperature, pressure, wind, radiation, and condensation helps meteorologists to predict future weather patterns. The weather can be divided into its meteorological elements, which describe the physical condition of the atmosphere, land, and oceans.

Temperature. The air temperature is measured by a thermometer over which air is allowed to freely flow over the bulb, but protected from solar and terrestrial radiation.

Atmospheric Pressure. The pressure is the weight of the vertical column upon an area. A barometer measures atmospheric pressure.

Humidity. This term is used to express the amount of water vapor in the air. Humidity is usually measured by the change in length of hygrometric substances giving relative humidity.

Wind Velocity. This describes the speed and direction of the motion of the air. A

knot is a measure of speed used at sea by sailors. It is equal to one nautical mile per hour. A nautical mile is approximately 2 kilometers.

Condensation. Water vapor may condense into liquid or solid particles. Liquid is precipitation (rain) and solid gives cloud cover.

Radiation. Solar radiation refers to the number of hours of bright sunshine per day. Both solar and terrestrial are measurable by total radiation receivers.

Visibility. This is defined as the maximum distance an object can be distinguished against the background sky.

Observations of current temperatures, humidity, wind, pressure, and highest and lowest temperatures are usually transmitted by commercial radio and television systems, telephones, recording systems, and NOAA (National Oceanographic and Atmospheric Agency) Weather Radios for the localities they serve.

Data such as the previous day's highest and lowest temperatures and precipitation amounts are generally carried in newspapers for both the local areas and other cities. Many papers carry foreign reports. Television and radio weather programs sometimes carry selected data, primarily for U.S. cities.

Records of past weather, which also are compiled and analyzed to describe the climate on a local, regional, or worldwide basis, are maintained by NOAA's Environmental Data and Information Service. The Weekly Series of Daily Weather is another source of past weather data. It contains daily charts of surface weather patterns, upper wind patterns, high and low temperatures, and 24-hour precipitation across the United States for each week.

PROCEDURE:

Weather is important to everyone. In many instances it controls what we can or cannot do on a particular day. It is therefore important to be able to read and interpret weather maps. This introduces students to the different weather map symbols.

1. Go over the "Symbols Used in Plotting Report," especially the sky coverage. Students will have to interpret the cloud cover of both maps from the satellite and then transfer the information onto a blank map. Make sure that students understand the symbols.

Precipitation refers to the way water is precipitating. Fog is low clouds. Snow is crystallized water. Rain is liquid water. Thunderstorms can refer to severe rain, including hail. Drizzle refers to light rain, while showers are a steady downpour of rain.

Wind speed and direction shows the direction of where the wind is coming from. The direction can be determined by comparing the line to north. So if the direction is south to north, you would refer to the wind as coming from the south. The speed of the wind is measured in knots which is a nautical term that is measured as 1.852 km per hour.

Sky coverage refers to the amount of clouds in the sky. This may be suggestive if you are looking at a satellite photo or you are on the ground looking up.

Types of clouds refers to the clouds present at different elevations and the form

they are taking.

Fronts and pressure systems refer to centers of high or low pressure system. The different fronts include a cold front, warm front, stationary front, and occluded front. A *cold front* is when the leading edge of air is colder air replacing warmer air. A *warm front* is when the leading air mass is warm air that is replacing cooler air. A *stationary front* is when the front is stalled or not moving. An *occluded front* is when a cold front catches up to a warm front.

2. Use the worksheet for students to draw the symbols and to describe what each symbol means.
3. Use a local weather map to see if students can interpret the symbols found on them. Remember that sometimes the symbols may be a little different.

WATER CYCLE - WEATHER (6)

WEATHER MAP SYMBOLS

Symbol Name	Draw Symbol	How do you interpret Symbol
Rain		
Snow		
Wind Speed		
Cloud Cover		
High Pressure		
Low Pressure		
Temperature		
Warm Front		
Cold Front		
Occluded Front		
Stationary Front		

WATER CYCLE - WEATHER (6)

SYMBOLS USED IN PLOTTING REPORT

Precipitation	Wind speed and direction	Sky coverage	Some types of high clouds
☰ Fog	○ 0 calm	○ No cover	→ Scattered cirrus
• Snow	/ 1-2 knots	○ 1/10 or less	→ Dense cirrus in patches
● Rain	↙ 3-7 knots	○ 2/10 to 3/10	→ Veil of cirrus covering entire sky
↖ Thunder-storm	↙ 8-12 knots	○ 4/10	→ Cirrus not covering entire sky
,	↙ 13-17 knots	○ ½	
,	↙ 18-22 knots	○ 6/10	
,	↙ 23-27 knots	○ 7/10	
▽ Showers	↙ 48-52 knots	○ Overcast with openings	
		● Complete overcast	
	1 knot = 1.852 km/h		

Some types of middle clouds	Some types of low clouds	Fronts and pressure systems	
↖ Thin altostratus layer	○ Cumulus of fair weather	(H) or High	Center of high or low pressure system
↖ Thick altostratus layer	— Stratocumulus	(L) or Low	
↖ Thin altostratus in patches	--- Fractocumulus of bad weather	▲▲▲	Cold front
↖ Thin altostratus in bands	— Stratus of fair weather	———	Warm front
		▲▲▲—	Occluded front
		—▲▲▲	Stationary front

WATER CYCLE - WEATHER (6)

LAB

Students interpret satellite photos.

OBJECTIVES:

1. Comparing satellite photos with weather maps.
2. Reading satellite photos.

VOCABULARY:

meteorologist
satellite photos
front

MATERIALS:

U.S. Placemats
November 13 and 15, 1986 satellite photos

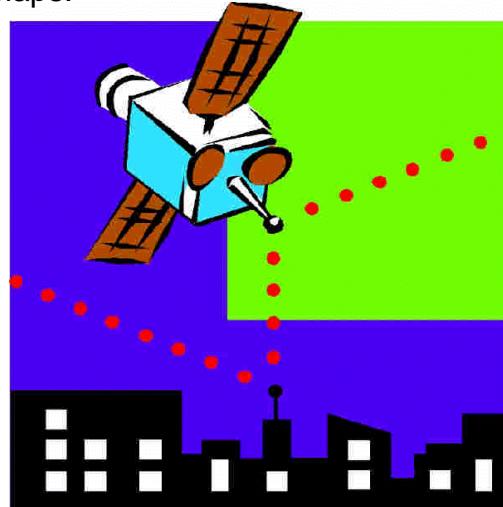
BACKGROUND:

Satellite maps take a "snapshot" of the weather. Meteorologists use them to see how air masses move. There are certain movements of the atmosphere that are very predictable and move according to where pressure ridges are traveling. When air masses move into each other, they sometimes produce severe weather conditions.

A front is a boundary or line along which a mass of air meets and moves into another mass of air, which is either colder, warmer, occluded (mixed), or stationary (not moving). If warm air displaces cold air at the ground, the front is referred to as a warm front. This passage is relatively mild and marked by the cessation of precipitation. When cold air displaces warm air at the ground, the front is referred to as a cold front. The passage of a cold front is likely to be marked by a violent convective rainstorm.

PROCEDURE:

1. These photos come from the National Weather Service, and are produced by satellites. Discuss with students what weather is and how it differs from climate.
2. This exercise will allow students to observe the differences between a newspaper weather map and a map used by a meteorologist used to create weather maps. After they answer the questions using the photos, have students look at weather symbol maps from the Pre Lab. Discuss what features you can and cannot see on their maps. Impress on them that all weather maps in the paper are interpretations of the satellite photos, symbols on a weather map are a way to describe features. If you have a local newspaper, compare



the information from the satellite photo with the weather map.

3. Use the U.S. placemats so students can visualize the states. This lab can be customized and updated easily. You can record your local weather information on a video cassette. Especially record the stations that use satellite pictures.

4. Have the students make a synoptic weather map (map with symbols) on the blank. Remember the maps that they create will be an interpretation, and difficult to have a right or wrong answer.

5. ANSWERS:

1. November 13, 1986
2. November 15, 1986
3. Pacific Ocean near Baja, California Cyclone
4. November 13, 1986, from Caribbean, north to east coast of United States
5. November 15, 1986 because the fronts are well defined, meaning more storms
6. no
7. California, Arizona, Nevada
8. They are useful in determining weather, finding areas with mineral wealth, locating vegetated areas, locating water areas, finding snow covered areas, determining soil and landforms
9. Missing information includes precipitation, wind speed, and specific type of cloud. Creating a weather map that you see in the newspaper is difficult and require a lot of information. Weather maps are more useful to determine the weather, than satellite photos. However, weather maps are many times interpretation of the weather person who is doing the map. The weather maps that the students will make are subjective, and really not have a right or wrong answer. It is the effort to try and interpret what they see on the satellite, which is difficult.

WATER CYCLE - WEATHER (6)

PROBLEM: How are satellite weather photos different from weather maps?

PREDICTION: _____

MATERIALS: Satellite photos November 13th, and November 15, 1986, Weather Map Symbols Chart, Air Masses of North America, blank North America maps

PROCEDURE: Study and compare the satellite photos provided and answer the following questions:

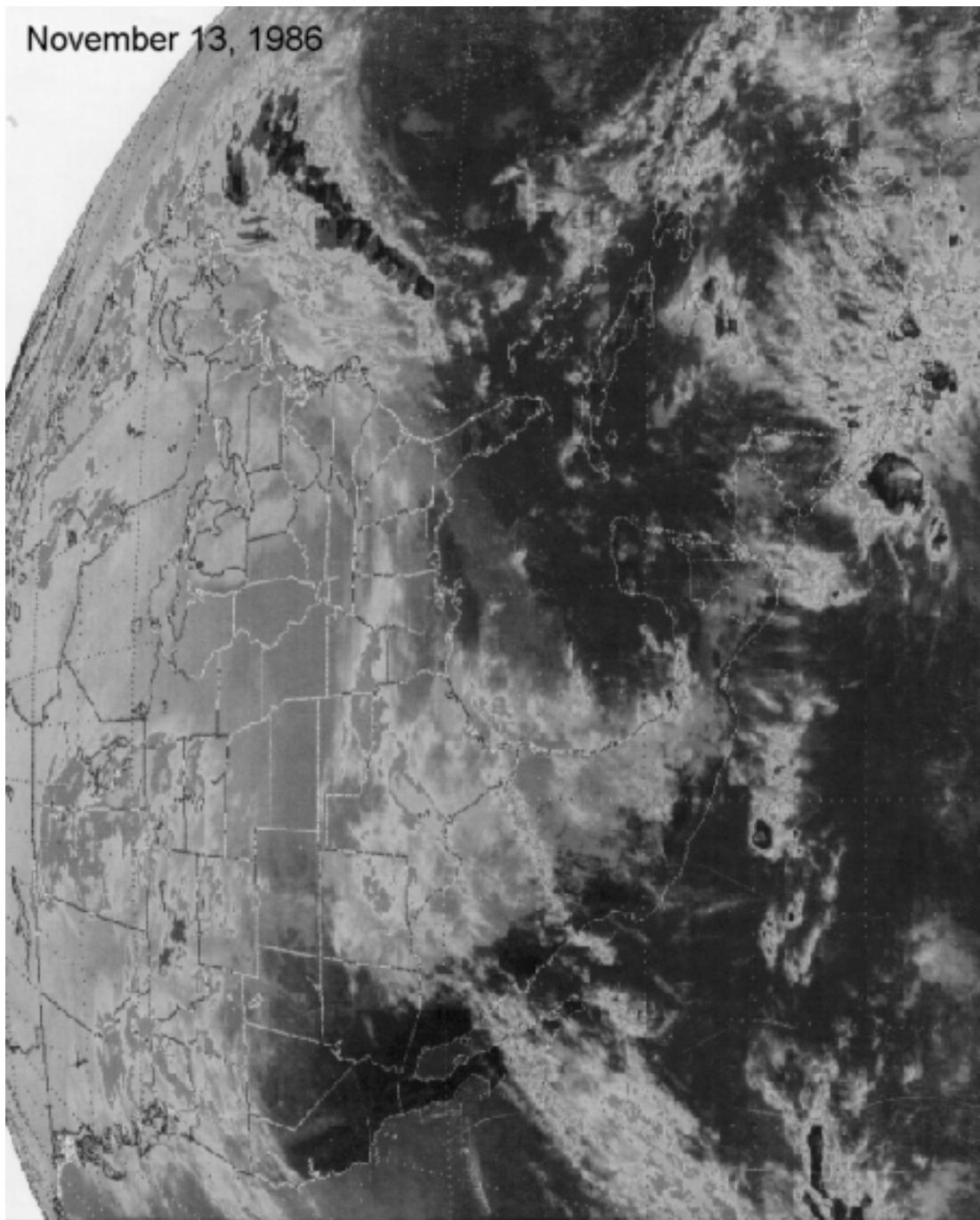
1. On which day was Central Coastal California the most cloudy? _____
2. Which map shows a large front moving across parts of Arizona, New Mexico, Texas, Baja California, and the northwest part of Mexico? _____
3. In what area was there a circular wind pattern causing the cloud cover to "swirl"? _____
4. On which date is there more activity in the Atlantic Ocean? What is the direction of movement? _____
5. Which map appears to have more severe weather? Why?

6. Is there a day of clear weather in all of Central America? _____
7. Which states had the clearest weather on these two days? _____
8. Why are these satellite photos useful?

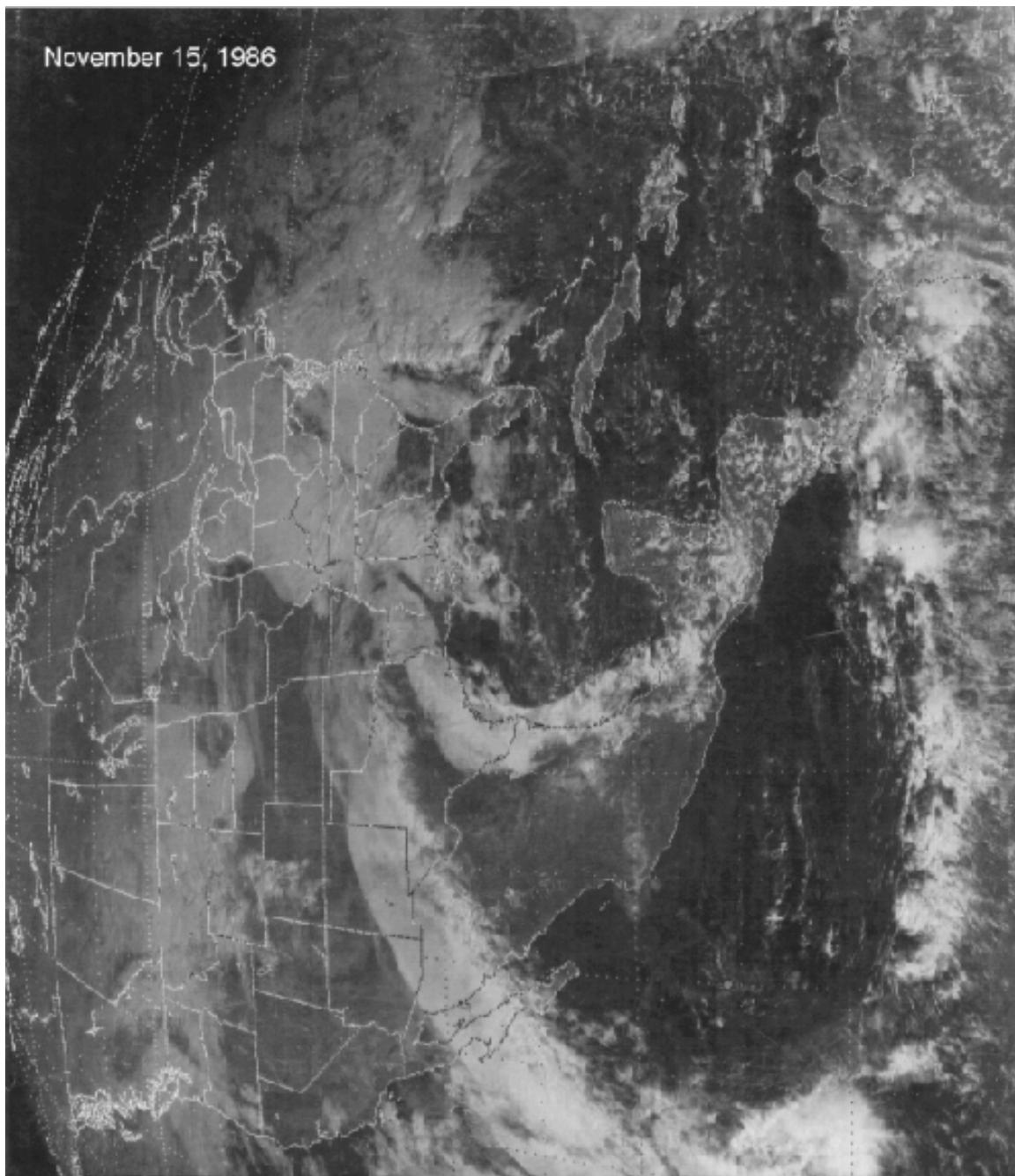
Using the outline maps of North America and the "Symbols Used in Plotting Report" try and create your own weather map for both November 13 and 15. Use the Air Mass map of North America to try and determine what the air masses may be. This might help you determine the correct type of front. **Remember you are missing information. What are you missing?** _____

CONCLUSIONS: How do the satellite and weather maps differ?

WATER CYCLE - WEATHER (6)
UNITED STATES



WATER CYCLE - WEATHER (6)
UNITED STATES



November 13, 1986



November 15, 1986



WATER CYCLE - WEATHER (6)

POST LAB

Students research the internet or reference material to find out more about the weather.

OBJECTIVES:

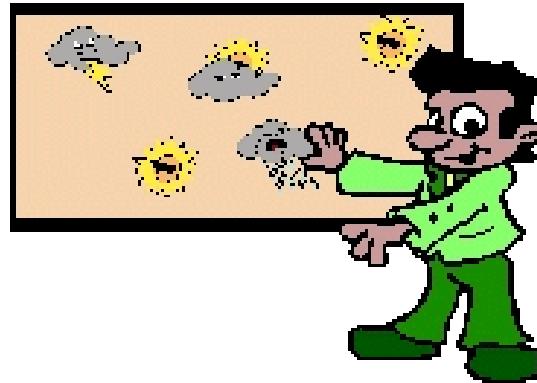
1. Researching reference material for information on weather.
2. Retrieving information from reference material.

VOCABULARY:

atmosphere
weather
meteorologist

MATERIALS:

Internet
reference material
worksheet



BACKGROUND:

Weather is of interest to everyone. Although we see and hear about the weather every day, there are many weather phenomena that we don't fully understand. We cannot teach our students everything on the weather, but we can emphasize how to research information so they can find answers on their own.

It is important to go over how they derived their answer. Students need to develop a logical approach to problem solving. They can learn from other students or adults to learn how they solved a problem.

As students learn more about the meteorology, they realize that there is more to the science than the temperature. The field is a specialized career under atmospheric sciences, which is a subfield of earth sciences. Meteorologists need to understand not only the atmosphere but the interaction of the ocean with air masses. The career may be very mathematical because of the modeling that is required for the field or it can be observational that interacts with the public. Career paths can specialize in marine or continental weather.

PROCEDURE:

1. This exercise can be done as independent learning or in groups. Ask students to ask a question about the weather that they don't know, and then search for the answer. Several topics are listed below to help them think about questions. The object is to learn more about weather, but also to teach students to use reference material.

Possible Research Topics

1. How do tornadoes form? Why are some tornadoes more devastating than others?
How do you survive a tornado?
2. How do hurricanes form? Are there certain areas that have more hurricanes than others? Why?
3. What are monsoons? Are there certain oceans where monsoons occur? Why?
4. What causes lightning? Can you have thunder without lightning? Is lightning dangerous?
5. What kind of work does a meteorologist do? Is a TV weather person really a meteorologist?

2. The world wide web can help find answers to question. If you have Internet access have students search out where they find the information. If you don't have Internet access use your library or give this as a homework assignment. The worksheet can help guide your student's thoughts.

- a. <http://www.weatherimages.org/>

This site links to many other sites that have live image feeds. You can find your local area so students can learn how to access information. You never know when students want to know the weather for a sporting event!

- b. <http://www.noaa.gov/>

This site is the government agency responsible for weather services. The National Oceanographic and Atmospheric Agency provides information from satellite feeds and other types of monitoring system throughout the world. The National Weather Service is responsible for the weather.

- c. <http://www.nwlink.com/~wdxude/>

Weather Dude web site has a TV personality help explain weather through some fun methods. A glossary can help students find information.

3. Discuss other possible references you might use for weather like encyclopedias, Farmer's Almanacs, newspapers, or textbooks. Calling the local National Weather Service can also get you specific answers. You may want to mention that calling a TV weather person is probably not a good idea, because most of them are not meteorologists.

WATER CYCLE - WEATHER (6)

FINDING ANSWERS

1. What is the problem you are searching?

2. What are key words or phrases that might help you search?

3. Where are you going to start your research?

4. Describe how you found the answer?

5. Write your answer to the problem you were researching?
