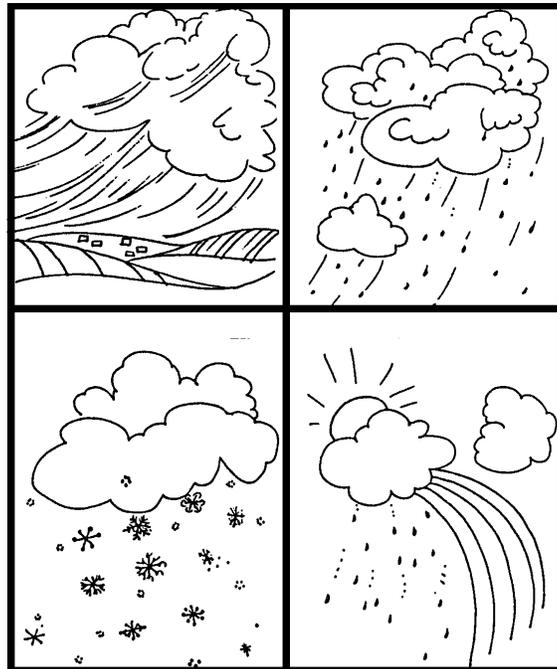


# Water Cycle

The Earth's Gift



## FOURTH GRADE WEATHER



1 WEEK  
LESSON PLANS AND  
ACTIVITIES

## WATER CYCLE OVERVIEW OF FOURTH GRADE

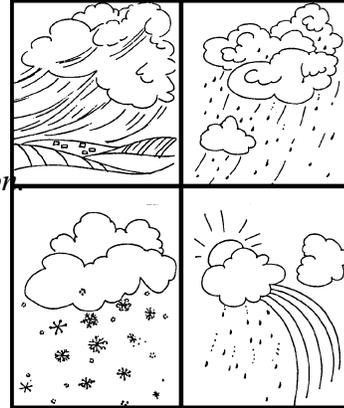
### WATER

#### WEEK 1.

PRE: *Comparing different reservoirs of water.*

LAB: *Experimenting with surface tension and capillary action.*

POST: *Discovering why icebergs float.*



### OCEANS

#### WEEK 2.

PRE: *Comparing fresh and salt water.*

LAB: *Discovering that salt water is an electrolyte.*

POST: *Distinguishing bodies of salt water.*

### ATMOSPHERE

#### WEEK 3.

PRE: *Discovering the affect of air pressure.*

LAB: *Comparing how substances heat up.*

POST: *Exploring how wind is created.*

### WEATHER

#### WEEK 4.

PRE: *Exploring different weather fronts.*

LAB: *Comparing satellite photos and weather maps.*

POST: *Discovering weather and climate patterns of California.*

## WATER CYCLE - WEATHER (4)

### PRE LAB

Students determine cloud types near weather fronts.

### OBJECTIVES:

1. Comparing cold and hot air.
2. Exploring different weather fronts.

### VOCABULARY:

fronts  
low pressure  
high pressure  
atmospheric pressure

### MATERIALS:

worksheet

### BACKGROUND:

Atmospheric pressure moves weather systems. Cold air is more dense than warm air causing what is called high pressure. Warm air which is lighter cause low pressure. In the area of higher pressure the air molecules are closer together than they are in an area of lower pressure. Air that is warmed exerts less pressure on the ground creating a low pressure region. Cold air when it is over the oceans will actually depress the sea level in that area; warm air will elevate the sea level.

Cold air is denser and heavier and pushes the warmer, lighter air upward. Depending on how the warmer air is pushed will depend upon how big the "fight" will be. Where these two air masses meet is called a "front." How these different fronts meet cause weather patterns to change. Remember there are many temperature variations of "cold" air and "warm" air, resulting in many weather types.

Fronts form when air masses collide, for air masses do not mix unless they are similar in temperature and moisture content. When warm air displaces cold air at the ground, the front is referred to as a warm front. When cold air replaces warm air at the ground the front is referred to as a cold front.

Vilhelm Bjerknes (1862-1951), a Norwegian meteorologist discovered the existence of a distinct air mass that did not mix, which he called a boundary front. His observations and recordings lead other meteorologists to begin understanding how fronts are caused and moved.



## PROCEDURE:

1. Looking at the worksheet, "Cold Front" refers to cold air pushing hard into warm air. The type of weather created would include showers and thunderstorms. This is called a cold front. "Warm Front" refers to warm air gently wedging under cold air. Widespread clouds with rain for a long duration is the prevalent weather, although it is highly erratic. This is called a warm front. Students should label the area between the two masses as the front in each diagram.

2. Read the following information about warm and cold fronts to students. They should then try to draw this information on the worksheet. If your students do not remember the different types of clouds, you may want to review cloud types with them.

Cirrus are high clouds which are wispy, icy clouds. Cumulus or puffy clouds are mid level clouds that are packed close together. Stratus clouds are a long uniform layer of clouds resembling fog but not resting on the ground. Nimbus when used with a cloud name refers to a dark cloud usually meaning rain.



Altostratus, Nimbostratus



Cirrus

### WARM FRONT:

Warm, moist air from the tropics slides over a wedge of cold polar air. As the warm air moves over the cold air, wispy cirrus clouds form and a milky veil of cirrostratus clouds can be seen. Above the base of the front, clouds thicken first with altostratus above great, gray nimbostratus clouds. A rain storm falls in the cold sector beneath the front.

## COLD FRONT:

Thickening cumulus clouds warn of the coming cold front, where cold polar air cuts in sharply beneath the warm, moist tropical air. The cold front slopes much more steeply than the warm front, and strong updrafts can stir up violent storms. Huge cumulonimbus many build up all along the front, bring heavy rain and sometimes thunderstorms as it passes over.

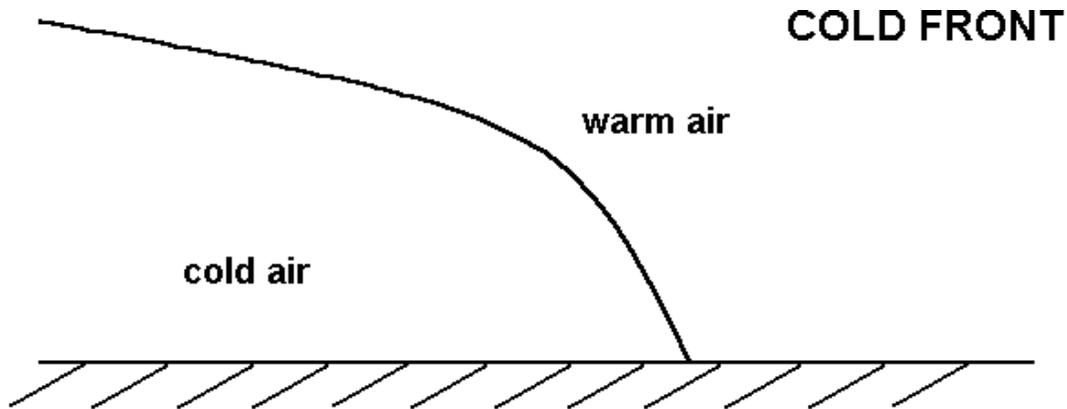


Cumulus

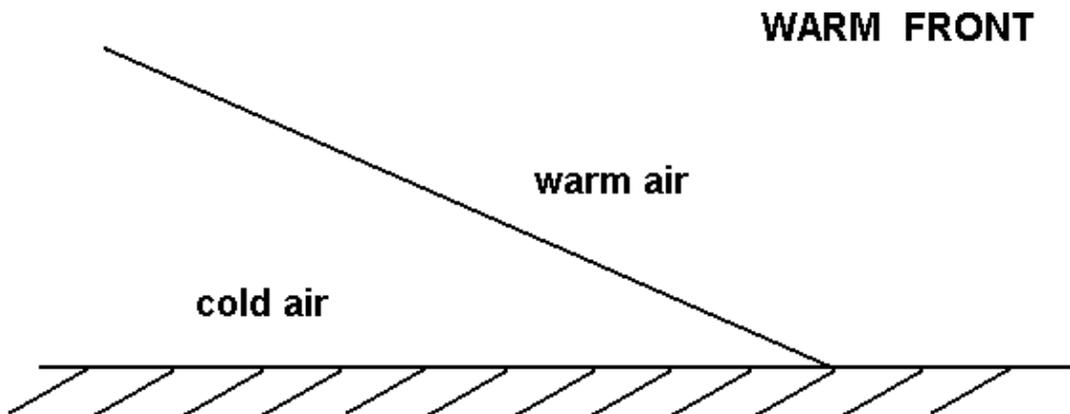


Cumulonimbus

## WATER CYCLE - WEATHER (4)



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Warm, moist air from the tropics slides over a wedge of cold polar air. As the warm air moves over the cold air. Wispy cirrus clouds form and a milky veil of cirrostratus clouds can be seen. Above the base of the front, clouds thicken first with altostratus above great, gray nimbostratus clouds. A rain storm falls in the cold sector beneath the front.

## WATER CYCLE - WEATHER (4)

### LAB

Students compare cloud cover on satellite images.

### OBJECTIVES:

1. Analyzing weather satellite photos.
2. Creating a cloud cover map.

### VOCABULARY:

meteorologist  
satellite photo  
weather map

### MATERIALS:

Internet  
Symbols Used in Plotting Report  
Satellite Map-Southeastern Coast of U.S.  
United States Placemats  
newspaper weather map



### BACKGROUND:

Although students have heard TV weather personalities talk about weather satellite photos, many students do not know really what they mean. Weather is constantly changing, satellite photos record this dynamic changing system. A satellite photo is what an area actually looks like from space. There are many types of data that satellites can obtain. They can chart the movement of cloud cover, heat, precipitation, and many other parameters. Satellite photos have provided an invaluable tool to understand how weather moves. Sometimes the data may reflect only what the satellite can detect. For instance on cloud photos, they may only record the highest type of cloud.

A weather map is a graphical representation of how the meteorologist may interpret the information they receive. The weather map is a way to chart all the data points to easily see if there are patterns emerging from the weather patterns.

### PROCEDURE:

1. Refer back to last week's lab on how air moves. Discuss pressure systems. High pressures refers to air that dense which usually refers to cold air. Low pressures refers to air whose molecules are farther apart, which usually refers to warm air. Pressure moves from high to low pressure.

2. Use a newspaper to show students a weather map and compare it with the satellite photo they will be using in lab.

3. If you have internet access you may want students to visit the following sites, so students can see how much data can be obtained from satellite images.

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.

4. The lab sheet mainly guides students to find answers to questions about the specific maps. **Sky coverage** refers to the amount of clouds in the sky. This is an observational recording, especially if you are looking at a satellite photo or you are on the ground looking.

a. Students may have problems trying to make a sky coverage map, so help guide their learning. You may want to make sure student understand what the fractions represent on the pie chart.

b. Make sure that all students understand that the lines of the states are not seen from space. They are superimposed by computer graphics.

c. You may want students work in groups to determine the cloud cover. Debate is good, because many of these calls are subject to interpretation.

**WATER CYCLE - WEATHER (4)**

**PROBLEM:** What do satellite pictures tell us about the weather?

**PREDICTION:** \_\_\_\_\_

**PROCEDURE:** Study and compare the satellite photo maps and answer the questions below. Use maps of the United States reference to help you find specific locations.

1. Which part of the United States is shown in the photo maps?  
(North, East, South, West)

\_\_\_\_\_

2. How many states are shown on 12/7-8/97 satellite photo map? List them.

\_\_\_\_\_

\_\_\_\_\_

3. On which satellite map is North Carolina the most cloudy?

\_\_\_\_\_

4. On which photo map can you best see New Orleans in Louisiana?

\_\_\_\_\_

5. On which photo map is Georgia the least cloudy? \_\_\_\_\_

6. What kind of clouds are over the Atlantic Ocean on 12/8/97?

\_\_\_\_\_

7. Are the white patches over the Appalachia in South Carolina (12/8/97) clouds or snow?  
How do you know? \_\_\_\_\_

\_\_\_\_\_

8. On which satellite photo does the cloud cover seem to be coming from the west?  
Explain why.

\_\_\_\_\_

\_\_\_\_\_

9. Look at the blank maps of the southeast. Create your own sky coverage map from the information given on the satellite photos. Label states, Gulf of Mexico, and Atlantic Ocean.

**CONCLUSIONS:** Can you predict the cloud cover for 12/9/97 with the information given on the photos labeled, "Cloud Cover Southeastern United States"?

\_\_\_\_\_

\_\_\_\_\_

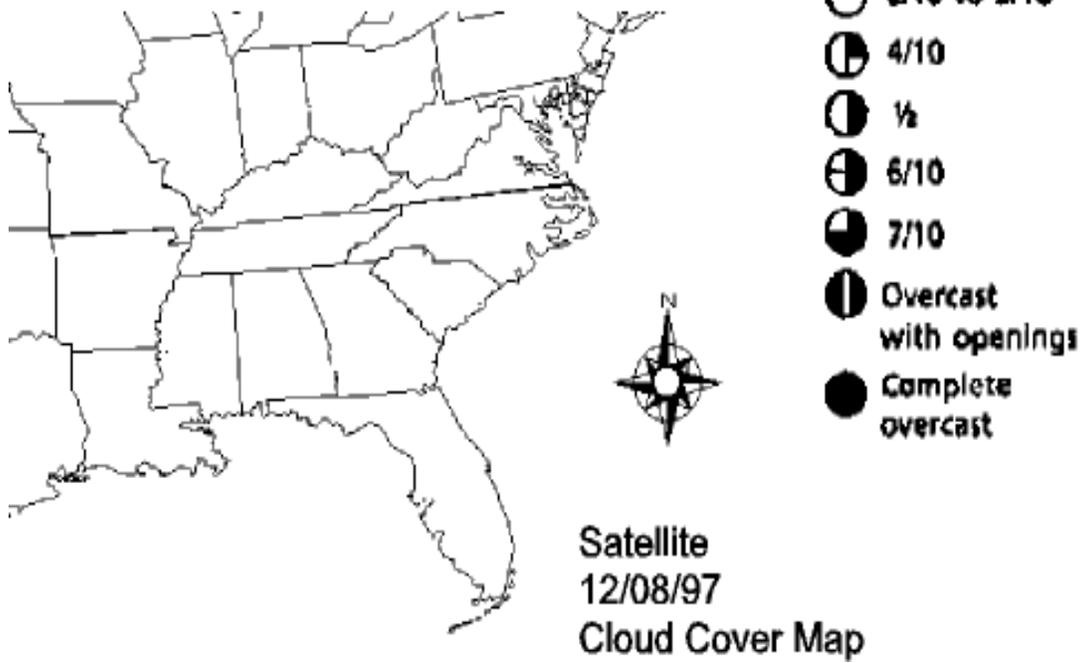
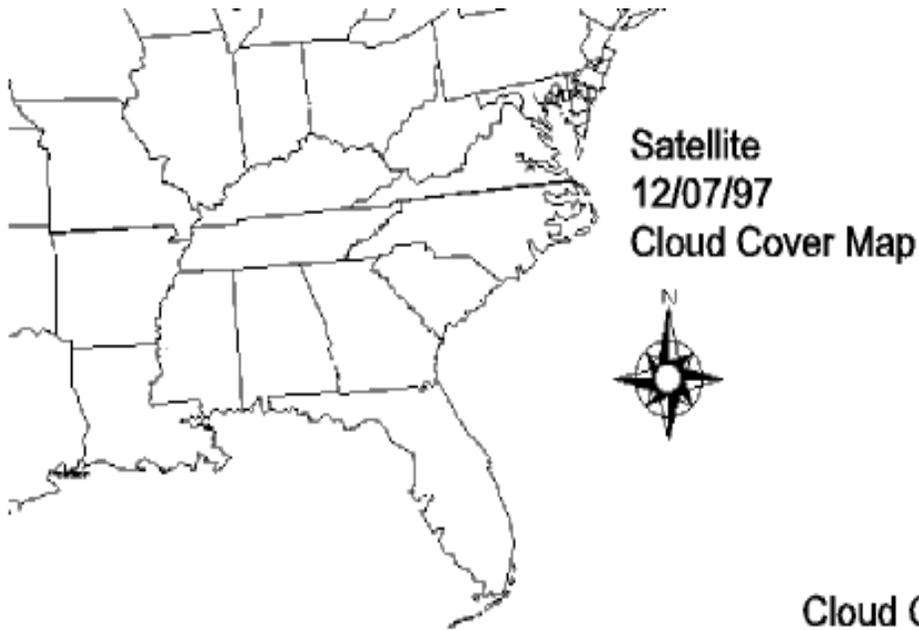
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## WATER CYCLE - WEATHER (4) LAB

### CLOUD COVER SOUTHEASTERN UNITED STATES



**WATER CYCLE - WEATHER (4)**



## WATER CYCLE - WEATHER (4)

### POST LAB

Students look for weather patterns to determine climate.

### OBJECTIVES:

1. Analyzing the average weather over a period of time.
2. Discovering weather and climate patterns using the Internet.

### VOCABULARY:

snow  
rain  
mild climate  
cold climate  
warm climate



### MATERIALS:

U.S. Placemat  
Internet  
other reference materials

### BACKGROUND:

Climate can be considered the average weather conditions over a long period of time. The climate is influenced by latitude, land and water distribution, altitude, land barrier, air movement, ocean currents, permanent storm areas, temperature, humidity, precipitation, cloud cover, high and low pressure centers, and other weather phenomena.

Overall the major control is governed by solar radiation. This was first recognized by Eratosthenes (276-192BC) who observed that the angle of the Sun's rays had something to do with solar radiation. This in effect is due to the tilt of the Earth on its axis, which throughout the year causes the change of the seasons. However, do not confuse seasons with climate. climate has many other factors that have to be considered. For instance the climate in St. Louis, Missouri, Washington, D.C. and San Francisco, California are very different, but yet they receive the same solar radiation. Mountains, closeness to coastal area, and other parameters can cause very different climate.

Climates can be defined by temperature, rain, and humidity. We recognize the following: Tropical climates (rainforest, savanna and monsoon); dry climates (desert and grasslands); mid-latitude climate (humid subtropical, marine west coast, Mediterranean, and mid latitude monsoon); and polar including tundra areas which are frozen all year round.

### PROCEDURE:

1. The internet has a wealth of information for students to use to develop their own

idea of climate. In this exercise the web sites provide long term information on temperature and precipitation. On the web site we highly suggest you access data from any year. There is many ways to have the students interpret this data.

<http://www.cdc.noaa.gov/USclimate/USclimdivs.html>

a. Students could compare the temperature and/or precipitation the year they were born and last year.

b. Students could look at every 10 years of temperature and see if the United States is actually “cooling” or “warming.” Debate is sure to occur.

c. Students can look at five years in a row, and see if they could predict the 6<sup>th</sup> year with that information.

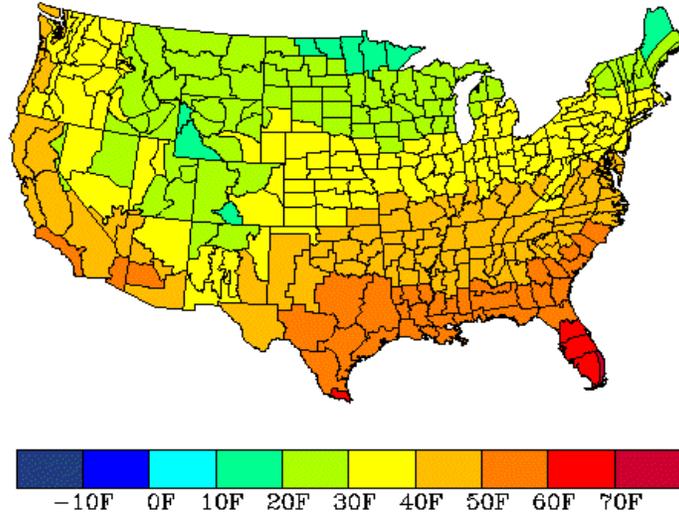
2. If you do not have internet access we suggest that you use the figures included in this lesson and have the students look at all the states to determine whether it has gotten cooler or warmer. Use a map of the United States to make sure that students know their states. You may want them record the information on a blank map or just to just to gather the data in a data chart.

3. The worksheet has the students look at temperature in the United States in January, 1990 and January, 1996. You cannot make a “scientific conclusion” from only two data points. To interpret data you must have sufficient data to make a valid interpretation that is accurate. New data can sometimes change the interpretation.

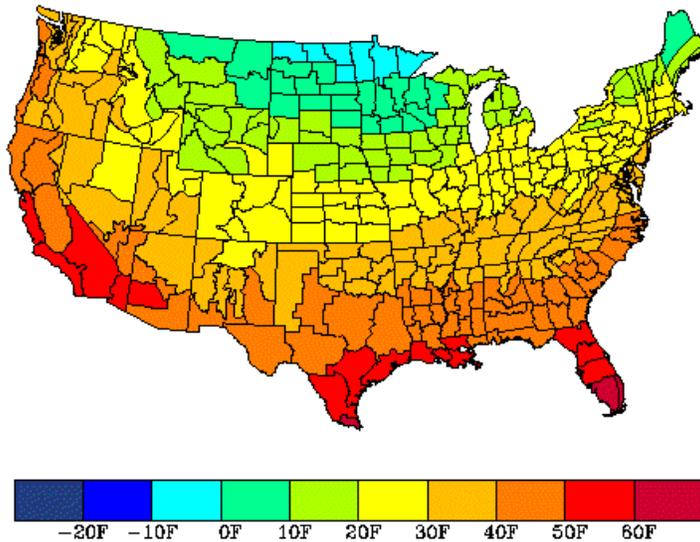
# WATER CYCLE - WEATHER (4) POST

<http://www.cdc.noaa.gov/USclimate/USclimdivs.html>

Temperatures Jan 1990



Temperatures Jan 1996



Can you interpret if the temperatures are getting hotter from January, 1990 to January, 1996? What states were warmer? Which states were colder? Which states remained the same temperature? Do you have enough information to make a generalized statement.