

Investigating Differences in Climate Instructions

1. Find the file labeled “INVESTIGATING DIFFERENCES IN CLIMATE_FRONT”
2. Read the Background information to learn about **evapotranspiration.** It will be on your test!
3. Read the procedure: You will be drawing Isolines on the imaginary continent of Ert (map found on the page titled “INVESTIGATING DIFFERENCES IN CLIMATE_BACK”) that connect areas with equal climate ratios.
4. Next, you will be shading in the climate regions using this color scheme:

Humid region is RED

Subhumid region is GREEN

Semiarid region is BLUE

Arid region is BLANK or WHITE

5. Finally, answer the conclusion questions #1-3 on the sheet itself (You will have to print these files out)

Factors Influencing Climate Instructions

1. Find the document labeled “FACTORS THAT INFLUENCE CLIMATE_FRONT.”
2. Use the information from the chart in section A to answer the conclusion questions #1-5 on the page labeled 462 (at the bottom)
3. On the back of the sheet, Use the Factors That Influence Climates chart in section B AND THE LARGE MAP titled “Factors Influencing Climate_page2_Continent of Ert” to answer the conclusion questions #1-6
4. You DO NOT need to plot or color anything on this map

Front

Name _____ Date _____

Investigating Differences in Climate

Background Information

You have learned that there are many different types of climates. You have also learned that many factors are responsible for such climatic differences. However, each of these factors can eventually be reduced to two major categories: those that affect the average yearly temperature of an area and those that affect the average yearly precipitation.

In this investigation, you will study the effect of the relationship between available energy and moisture on the climate of various regions. The amount of available energy helps to determine the temperature of a region. For this investigation, you will use the ratio of average yearly precipitation (P) to average yearly potential evapotranspiration (E_p). These climate ratios, written as P/E_p , represent the average yearly moisture supply divided by the moisture demand, or need, at a certain location. The word "evapotranspiration" refers to the total water loss from the soil, including direct evaporation, and transpiration, which is the giving off of moisture through the surface of leaves and other plant parts.

Four different climatic types based on P/E_p values are generally recognized: arid, semiarid, subhumid, and humid. Each different type and their climate ratios are given in Figure 1.

Figure 1

P/E_p	Climate Type
Less than 0.4	Arid
0.4-0.8	Semiarid
0.8-1.2	Subhumid
Greater than 1.2	Humid

Purpose

What climate patterns of an imaginary continent can be drawn when you draw lines to connect similar climate ratios? What is the location of different climate types of an imaginary continent when you are given precipitation (P) and potential evapotranspiration (E_p) data?

Name _____ Date _____

Materials

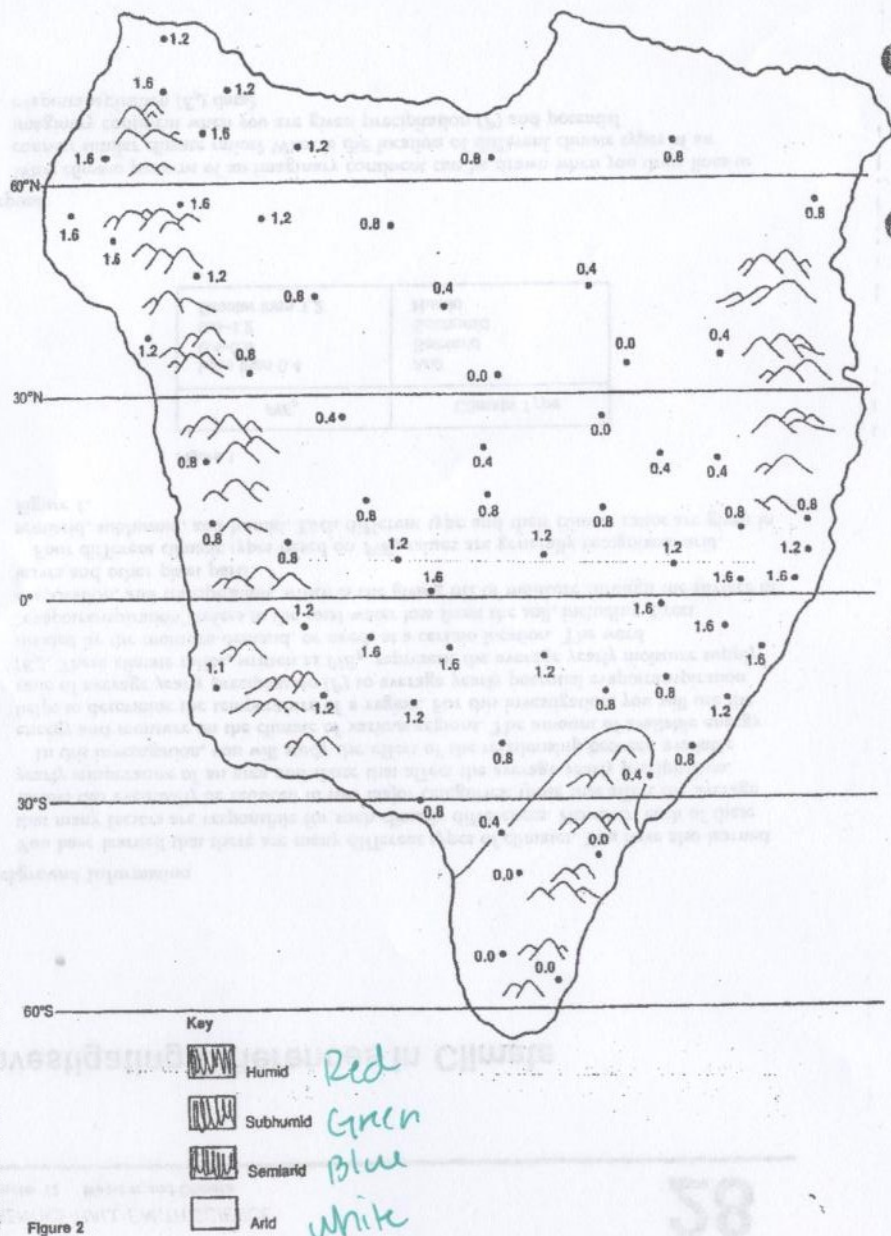
Each group of students will need:

- Map of the imaginary continent of Ert
- Soft graphite pencils
- Colored pens, pencils, or crayons

Procedure

- Carefully examine Figure 2, a map of an imaginary continent. The numbers at various locations are the climate ratios for those areas. Notice that the continent of Ert is a very large continent, extending poleward beyond latitudes 60° north and south. Notice also that there is a very extensive mountain range along the west coast, as well as two separate mountain ranges along the east coast.
- The following information is important to remember when working on your map:
 - Climate ratios greater than 1.2 are usually found in regions at or near the equator. These regions are generally humid.
 - Regions at or near latitudes 30° north and south are generally arid, unless influenced by mountain ranges or other factors. Climate ratios of 0.4 or less are usually found in these regions.
 - Areas at or near latitudes 60° north and south are generally moist but have climate ratios that often show wide variations because of the influence of global wind systems, large bodies of water, and mountain ranges.
 - When drawing climate ratio lines, remember that the lines of any climate type cannot cross. They tend to run parallel to each other and do not form sharp edges or acute angles. Also, these lines must be continuous; that is, they must form closed loops or run off the edges of the continent.
- Try to locate the regions on the imaginary continent that are most arid and humid. Find the locations of mountain ranges and specific lines of latitude.
- Using a soft graphite pencil, lightly connect each location with a 0.4 climate ratio. Notice that there are two separate regions having such a climate ratio, one in each hemisphere. The 0.4 line located in the Southern Hemisphere has been sketched in for you as an example of a correctly drawn climate ratio.
- Lightly draw in lines having an 0.8 climate ratio.
- Draw in lines connecting regions having 0.0, 1.2, and 1.6 climate ratios.
- Upon completion of your map, darken the lines and identify the areas between the lines as arid, semiarid, humid or subhumid. For example, regions located between climate lines 0.4 and 0.8 should be labeled semiarid. Regions between 0.8 and 1.2 should be labeled subhumid. Color the different regions on your map. Be sure to include a color key identifying these regions.

Back



Observations and Conclusions

1. You have learned that the climate ratio (P/E_p) is actually a comparison of a region's precipitation (P) to its potential evapotranspiration (E_p). You have also learned that the potential evapotranspiration value is directly related to a region's temperature: the higher the temperature, the higher the E_p value.

a. How is it possible for two regions with the same total yearly precipitation to have different climate ratios? _____

b. How is it possible for two regions with the same average yearly temperature to have different climate ratios? _____

2. What relationship exists between latitude and temperature patterns? _____

3. a. According to your map, describe in general terms, the locations of the regions that are most humid. _____

b. Describe the locations of the regions that are most arid. _____

Going Further

Suppose the imaginary continent of Ert is located on the earth. What reasons can you give to explain the locations of the most humid and most arid regions of Ert? Draw on your map the directions of the global winds from above 60°N to 60°S. See Figure 12-12 in your textbook. Also label each latitude line shown on your map as an area of generally (1) high or low air pressure and (2) wet or dry weather conditions. Remember from Chapter 12 in your textbook that winds flow from high-pressure areas to low-pressure areas.

Since winds flow from high-pressure areas to low-pressure areas, humid climates are associated with (1) being close to large bodies of water that supply moisture brought inland by global winds, (2) low-pressure systems as winds tend to flow toward these regions, and (3) wet weather conditions. Arid climates are associated with (1) being far from large bodies of water, (2) high-pressure systems as winds tend to flow away from these regions, (3) moisture loss as air moves over barriers such as mountain ranges, and (4) dry weather conditions.

Climate

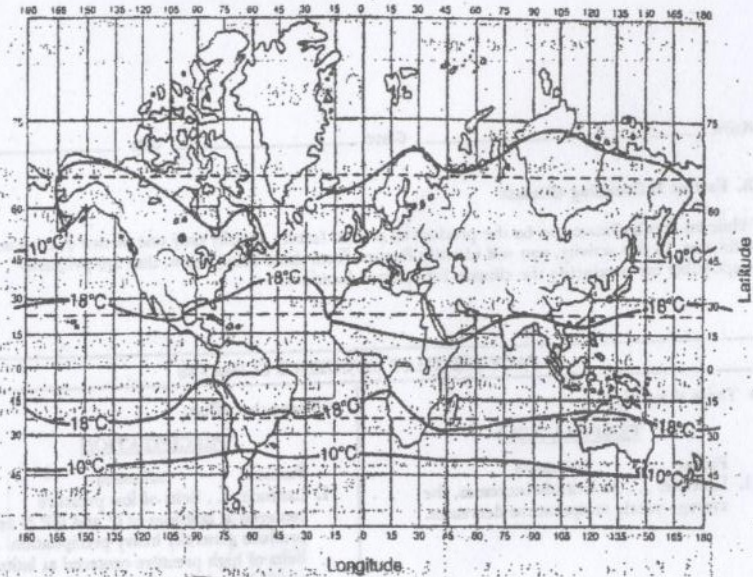
A. Locating Climate Zones

Climate and weather are closely related terms that describe the conditions of the atmosphere. They differ primarily in the length of time the atmospheric properties are observed. Weather represents the hour-to-hour and day-to-day conditions of the atmosphere for a particular location. Climate is the average of all the weather changes over an area for a period of many years. Since an area's weather is composed of several elements, classification of climates can become complex and involved. For the purpose of this activity, however, we will limit the classification of climates to the two weather elements, temperature and precipitation.

The following table lists the three major climate zones on earth and contains a short description of the climate. You will see that the boundaries of each climate are listed by isotherms. An isotherm is an imaginary line that connects areas with similar average low temperatures during their coldest month of the year. The 18°C isotherm, for example, connects all locations that average no colder than 18°C for the coldest month of the year.

Climate Type	Boundaries	Comments
1. TROPICAL CLIMATES	bounded on the north and south by the 18°C isotherm	temperatures are uniformly warm during the whole year and there is no true winter season
2. TEMPERATE CLIMATES	bounded on the poleward side by the 10°C isotherm and on the equatorward side by the 18°C isotherm	the temperatures are high during the summer and low during the winter
3. POLAR CLIMATES	bounded on the equatorward side by the 10°C isotherm	temperatures are low during the whole year and there is no true summer season, although summers are warmer than winters

Using the information from the climate table, label the three major climate groups on the map.
 Hint: Find the 10°C and 18°C isotherms on the map before you begin.



Questions

- Which climate type experiences no time during the year when the average monthly temperature is cooler than 18°C?
- Which climate type experiences at least one month during the year when the average monthly temperature is warmer than 10°C but never experiences a month with an average temperature above 18°C?
- Which climate type experiences no time during the year when the average monthly temperature is higher than 10°C?
- The major worldwide climate types are classified according to which atmospheric property?
- Which major worldwide climate area do you live in?

Name _____ Class _____ Date _____

B. Factors Influencing Climate

While an area's climate can be the product of several factors, usually only one or two exert a major influence. In this activity, you will identify factors, from those listed below, that are primarily responsible for producing the climate for selected locations.

FACTORS THAT INFLUENCE CLIMATES

• Those that affect:

TEMPERATURE

- | Factor | Influence |
|--|---|
| 1. Latitude. . . . | As latitude increases, the average yearly temperature decreases. |
| 2. Nearness to centers of large land masses. . . . | Locations near the center of a large land mass tend to have wide ranges in temperatures, both between day and night and seasonally. |
| 3. Nearness to large bodies of water. . . . | Large bodies of water have a milder effect on the temperatures of coastal areas producing low ranges in temperature, both between day and night and seasonally. |
| 4. Location relative to large mountain ranges. . . . | Windward sides of mountain ranges are cooled while leeward sides are warmed. |
| 5. Altitude (height above sea level). . . . | As altitude increases, the average yearly temperature decreases. |
| 6. Ocean currents. . . . | Ocean currents tend to warm temperatures of eastern coastal areas and cool temperatures of western coastal areas. |

• Those that affect:

PRECIPITATION

- | Factor | Influence |
|--|--|
| 1. Latitude. . . . | Belts of low pressure centered at latitudes of 0° and 60° N and S produce generally heavy precipitation. . . . Belts of high pressure centered at latitudes of 30° N and S produce dry climates; sometimes even deserts. |
| 2. Nearness to centers of large land masses. . . . | Locations near the center of a large land mass tend to have dry climates. |
| 3. Nearness to large bodies of water. . . . | Areas near large bodies of water tend to have higher than average precipitation, especially areas on the leeward side of the water. |
| 4. Location relative to large mountain ranges. . . . | Windward sides of mountains tend to receive higher than average precipitation while leeward sides receive lower than average precipitation. |
| 5. Prevailing wind direction. . . . | Wind direction determines the windward and leeward sides of both mountain ranges and large bodies of water. |

Questions

Using the table of factors that influence climate, answer the following questions, which refer to the diagram on the next page. The diagram represents an imaginary continent on the earth that is surrounded by water. The arrows indicate the direction of the prevailing winds. Two large mountain ranges are also indicated. Points A, B, and E are located at sea level; C and D are in the foothills of the mountains; F is high in the mountains.

1. What factor would cause location F to have a colder yearly climate than any other location?

2. What three factors would cause location E to have the greatest annual rainfall?

3. Which location, C or D, would you expect to have the greater annual rainfall?

Explain your answer. _____

4. Which location, A or B, would you expect to have the greater range in temperature during the year? Explain your answer.

5. Location A is in the center of a large desert. What factor could account for its low annual precipitation?

6. What three factors would cause the climate at location D to be cooler than at location B?

Continent of Earth

for Factors Influencing Climate

Name _____

Class _____

Date _____

