

Adopt a Drifter Lesson Plan

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“Do Ocean Surface Currents Influence Climate?”



Objectives

- Students will construct climographs for 3 coastal cities.
- Students will describe how ocean surface currents affect climate on land.

Time Needed

Two class periods

Introduction

Climate can be defined as the long-term behavior of weather over time, including the average and extreme conditions for a region. Surface currents affect climate by moving cold and warm water around the globe. In general, currents carry warm water from the tropics toward the poles and bring cold water back toward the equator. A surface current warms or cools the air above it, influencing the climate of the land near the coast. Winds pick up moisture as they blow across warm water currents. This often brings mild rainy weather to the coastal regions. In contrast, cold water currents cool the air above them and since cold air has less of an ability to hold moisture than warm air, these currents tend to bring cool, dry weather to adjacent land areas. Fog is often found along the land-sea borders where cold ocean currents exist. An example is the west coast of South America where fog is found off the coast and the driest desert in the world, the Atacama, exists!

A climograph is a special type of graph that displays the monthly average precipitation and temperature for an area over the course of a year. By studying climographs, you can see how precipitation and temperature differ from one community to another.

Materials and Resources (per group)

- 3 Blank Climographs (provided below)
- Map of Major Ocean Currents (provided below)
- Copy of Background Information
- **Fact Sheet A** with climate data for each location (provided below)
- **Fact Sheet B** with descriptions of coastal climates (provided below)

Research Question

Do Ocean Currents Influence Climate?

Hypothesis

Have each student discuss the research question with one or two other students and then write their hypothesis(es) on paper.

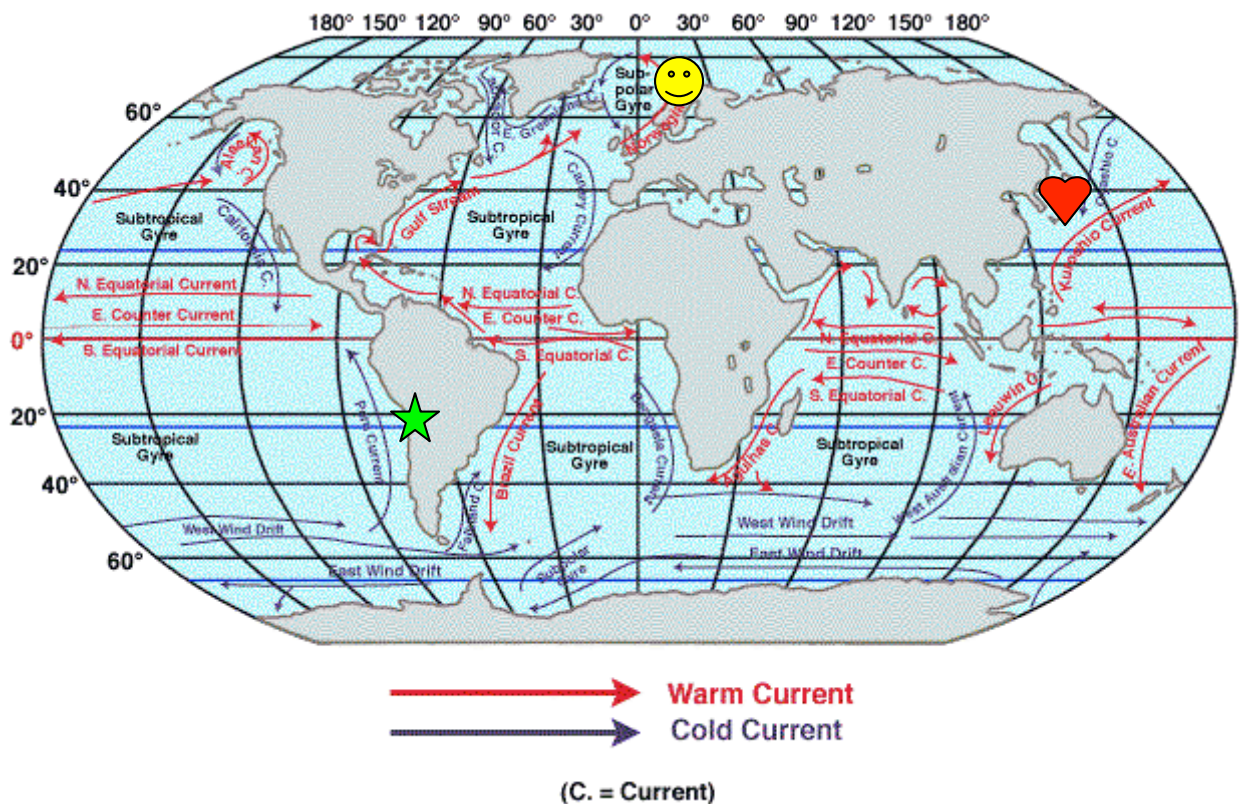
1st Procedure

Predicting the Effect of Ocean Surface Currents on Coastal Climates

Read the Introduction aloud. Then look at the map of major ocean currents and write a prediction describing the climate you would expect of each place listed below. (The symbols are to help locate the cities on the world map.)

- Arica, Chile (along the Peru Current) ★
- Trondheim, Norway (along the Norwegian Current) ☺
- Tokyo, Japan along the (Kuroshio Current) ♥

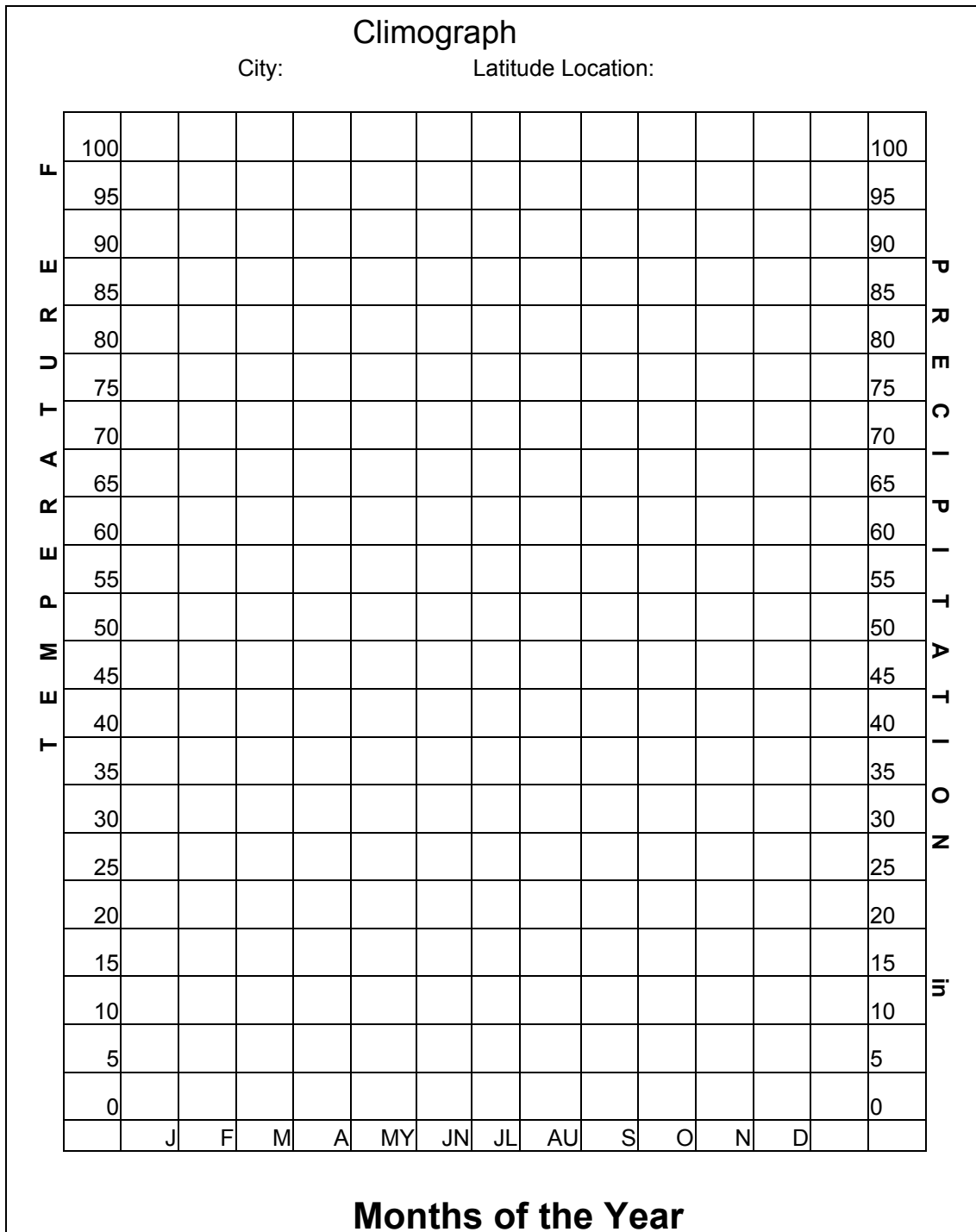
Map of Major Ocean Currents



2nd Procedure

Recording Data: Making a Climograph (teacher should make 3 copies of blank climographs per student or group).

Using the climate data from Fact Sheet A, create a climograph for each city listed. Use a line graph for temperature and a bar graph for precipitation on the same graph.



Fact Sheet A (Climate Data)

Average Precipitation for Trondheim, Norway (inches)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2.1	1.6	2.8	2.0	1.8	2.7	3.0	3.5	3.5	2.5	3.0	5.5

Average Temperature for Trondheim, Norway (°F)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
25	27	32	39	46	54	57	57	50	43	34	30

Average Precipitation for Arica, Chile (inches)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	0	0	0	0	0	0	0	0	0

Average Temperature for Arica, Chile (°F)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
74	74	73	69	66	63	62	62	63	65	68	71

Average Precipitation for Tokyo, Japan (inches)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2.0	2.8	4.2	5.1	5.7	6.9	5.3	5.8	8.5	7.6	3.8	2.1

Average Temperature for Tokyo, Japan (°F)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
42	43	48	57	65	71	77	81	74	64	55	47

Fact Sheet B



Arica, Chile (photo credit: Mary Cook)

Arica, Chile lies within one of the driest regions on Earth called the Atacama Desert. Ocean currents keep clouds and fog just off the coast, so most rain falls into the nearby ocean.



Trondheim, Norway (photo credit: www.cbnpa.drake.edu)

Trondheim, Norway has a temperate climate. Summers and winters are remarkably mild for their latitude. Rainfall is very heavy. The local harbors are free of ice most of the winter.



Tokyo, Bay

Tokyo, Japan has a rainy climate and the temperature is milder than one expects at that latitude.

Conclusion and Analysis

1. Examine your climographs. What is the difference between the highest and lowest temperatures in the climograph for each city?
2. Which city is in a desert? How can you tell?
3. Take a closer look at the Arica, Chile climograph. What can you tell about the seasons and the months? How is this related to the hemisphere where Arica is located?
4. Is there a relationship between the temperature of the ocean current and the coastal climate?
5. Is there a relationship between the direction of the ocean current and the coastal climate?
6. In general, on which side of the ocean basins are the cold currents? Warm currents?
7. What can you infer about the climate of each region by reviewing these climographs?

(answers)

1. Trondheim: 32; Arica: 12; Tokyo: 39
2. Arica, Chile. Because it has no precipitation for the year.
3. It is warmer in January and February. The seasons in the southern hemisphere are opposite of those in the northern hemisphere. It is summer in Arica during January and February.
4. Yes. Warm currents bring warm, moist air and cold currents bring cool, dry air to the region.
5. Yes. When the current is flowing away from the coast it will cause the air to be drier on land.
6. In general, the cold currents are on the eastern side of the ocean basins and warm currents are on the western side of the ocean basins.
7. Answers will vary. It is obvious to see that Arica is a desert. Trondheim is warm for its latitudinal location. Tokyo is quite rainy and experiences mild temperatures because of the moderating effect of the ocean water.

Extension

1. Conduct research and write a report about a city in one of the regions mentioned in this lesson. Include a discussion of the temperature, precipitation, and vegetation patterns found in each region. Describe the culture of the region and how the culture may or may not reflect the physical geography of the area.
2. Compare more cities such as Seattle, Washington and Luderitz, Namibia (data supplied below)

Average Precipitation for Seattle, Washington (inches)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5.7	4.2	3.7	2.5	1.7	1.4	.78	1.1	1.8	3.5	6.0	5.8

Average Temperature for Seattle, Washington (°F)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
39	43	45	49	55	60	65	65	60	52	45	41

Average Precipitation for Luderitz, Namibia (inches)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0

Average Temperature for Luderitz, Namibia (°F)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
64	64	63	61	60	59	58	58	57	58	60	63



Seattle, Washington (photo credit: Jeff Beckstrom)

Seattle, Washington has a mild climate with temperatures moderated by the sea and protected from winds and storms by the mountains. This area is often cloudy with light rain.



Luderitz, Namibia (photo credit: imigrantevoyage.com)

Luderitz, Namibia in Southwestern Africa has a cool, dry climate and includes the Namib Desert. It receives almost no annual rainfall.

National Science Content Standards:

1. Content Standard A: As a result of activities in grades 5-8, all students should develop
 - Abilities necessary to do scientific inquiry
 - Understandings about scientific inquiry
2. Content Standard D: As a result of their activities in grades 5-8, all students should develop an understanding of
 - Structure of the earth system
3. Content Standard E: As a result of activities in grades 5-8, all students should develop
 - Understandings about science and technology
4. Content Standard F: As a result of activities in grades 5-8, all students should develop understanding of
 - Science and technology in society