

Climate and Weather

Grade-Level Expectations

The exercises in these instructional tasks address content related to the following science grade-level expectations:

ESS-M-A11 Explain and give examples of how climatic conditions on Earth are affected by the proximity of water. (GLE 25)

ESS-M-A12 Identify different air masses, jet streams, global wind patterns and other atmospheric phenomena and describe how they relate to weather events, such as El Niño and La Niña (GLE 27)

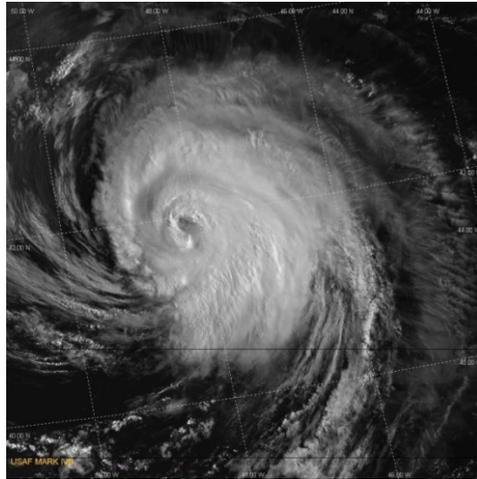
Contents

- These instructional tasks contain a set of document- or resource-based exercises about *climatic conditions and weather events*.
- Teachers may choose to use or modify the tasks as part of an instructional lesson or as a formative or summative assessment.
- The printable student-facing version excludes teacher directions.

	Objective(s)
Scaffolding Exercise 1	<ul style="list-style-type: none"> • Explain what conditions are needed to strengthen a hurricane • Describe conditions in and around the eye of a hurricane
Scaffolding Exercise 2	<ul style="list-style-type: none"> • Describe how a front develops and the most common weather change that results • Describe the weather effects of the jet stream
Culminating Exercise	<ul style="list-style-type: none"> • Analyze graphs and maps • Explain how proximity to water affects climatic conditions
Scoring Rubric	
Scoring Notes	
Printable Student Version	

Teacher Directions: Have students complete the following task.

Using the National Geographic website (<http://environment.nationalgeographic.com/environment/natural-disasters/hurricane-profile>) and other outside resources, respond to the prompts.

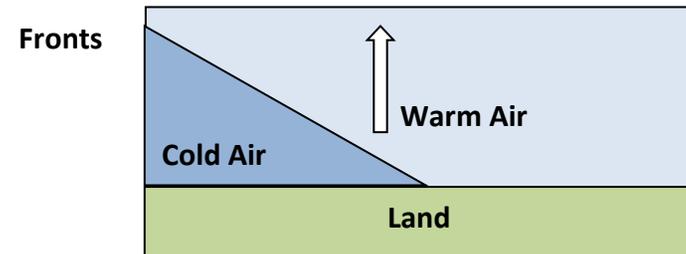
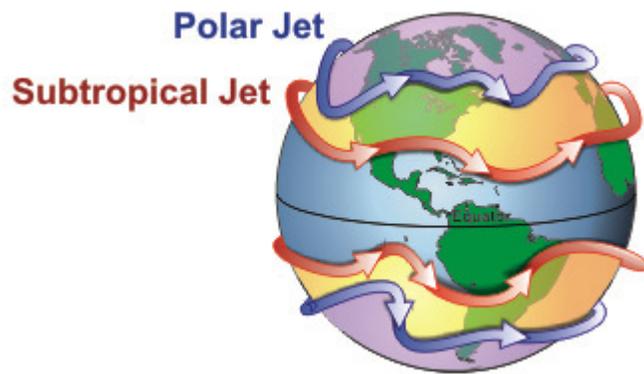


- A. What conditions are needed for a hurricane to strengthen?
- B. Describe the weather conditions closely surrounding the eye of the storm and the reasons for these conditions.
- C. Hurricanes typically develop in late summer through fall. What causes hurricanes to develop during this time of year?

Teacher Directions:

Have students respond to the prompts using information from the following paragraph, diagrams, NOAA (<http://www.crh.noaa.gov/lmk/?n=basic-fronts>) and other resources as needed.

An air mass is a large body of air that has similar temperature and moisture properties throughout. The area from which an air mass originates is called a "source region." Cold air masses move about as areas of high pressure. Tropical air masses originate over the warm waters of the tropics and Gulf of Mexico, where heat and moisture are transferred to the overlying air from the waters below. The northward movement of tropical air masses transports warm, moist air into the United States.



- Describe how a front develops and the weather that results when two fronts meet.
- What occurs in the upper atmosphere directly over the jet stream?
- Describe the most likely weather conditions north and south of the subtropical jet stream in the northern hemisphere.

A. Using the following graphs, compare the climates of Lake Charles, Louisiana, and Topeka, Kansas. Address both temperature and precipitation. Provide data to support your comparisons.

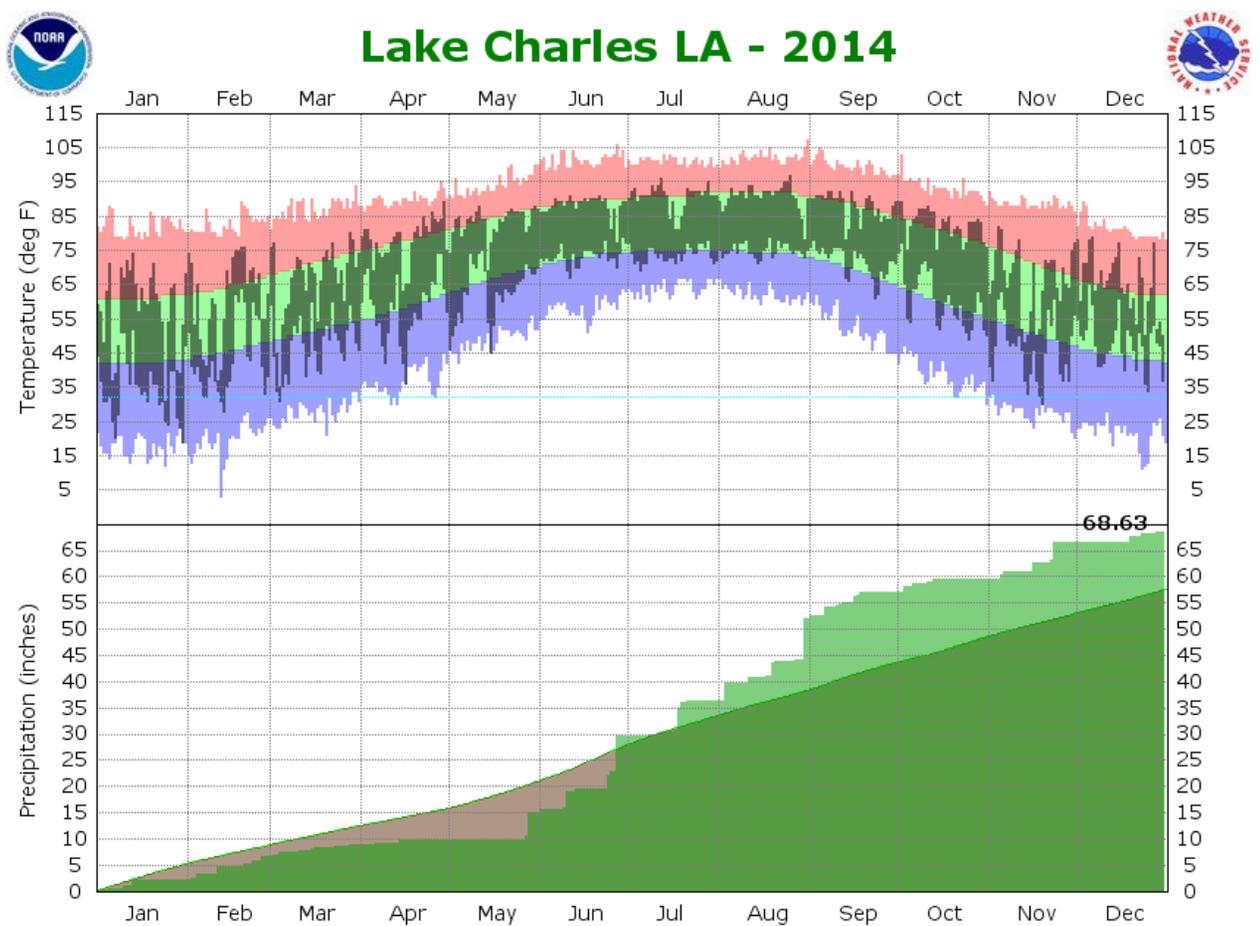
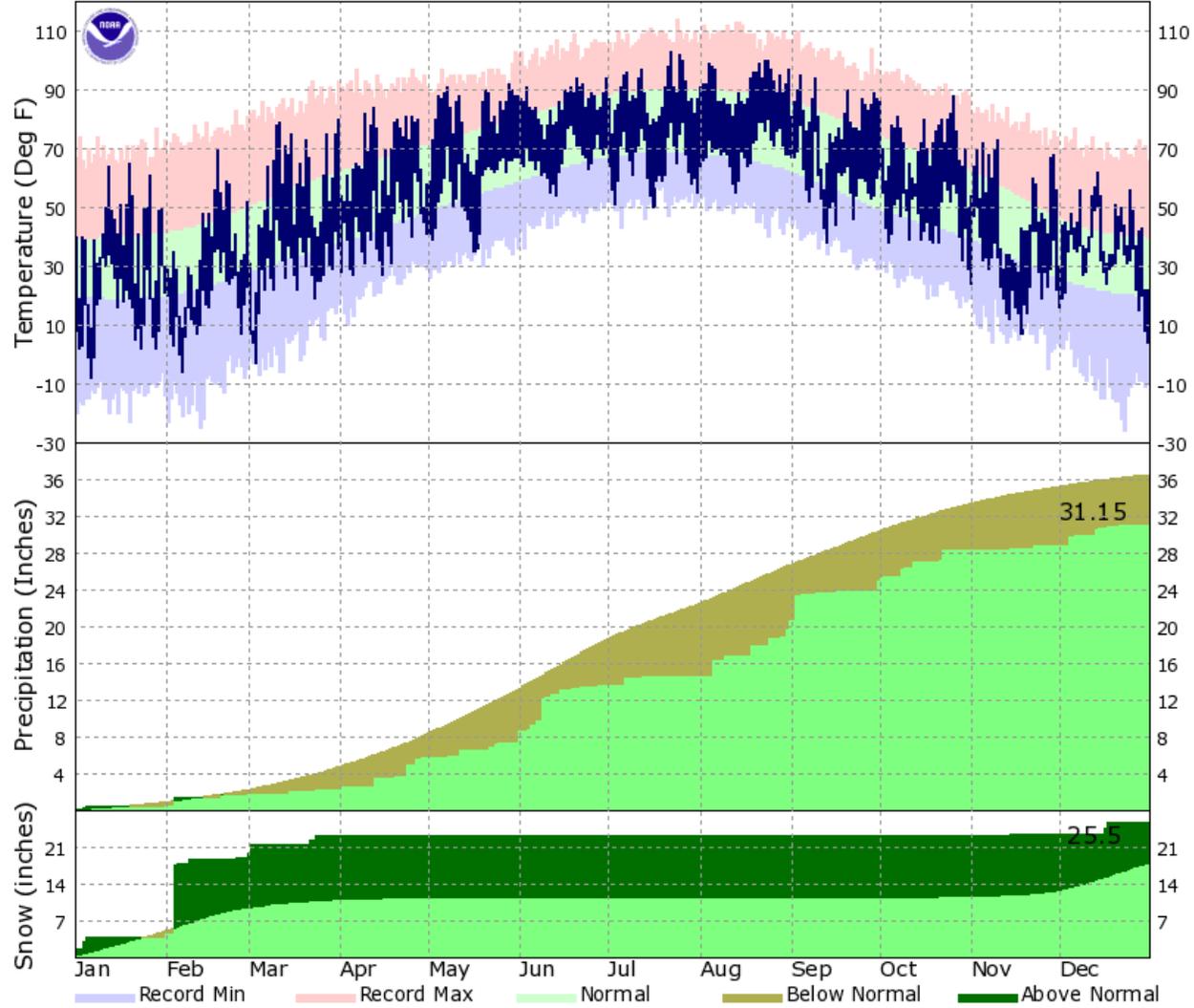


Image created: Thu, 1 Jan 2015 08:00 GMT+00:00

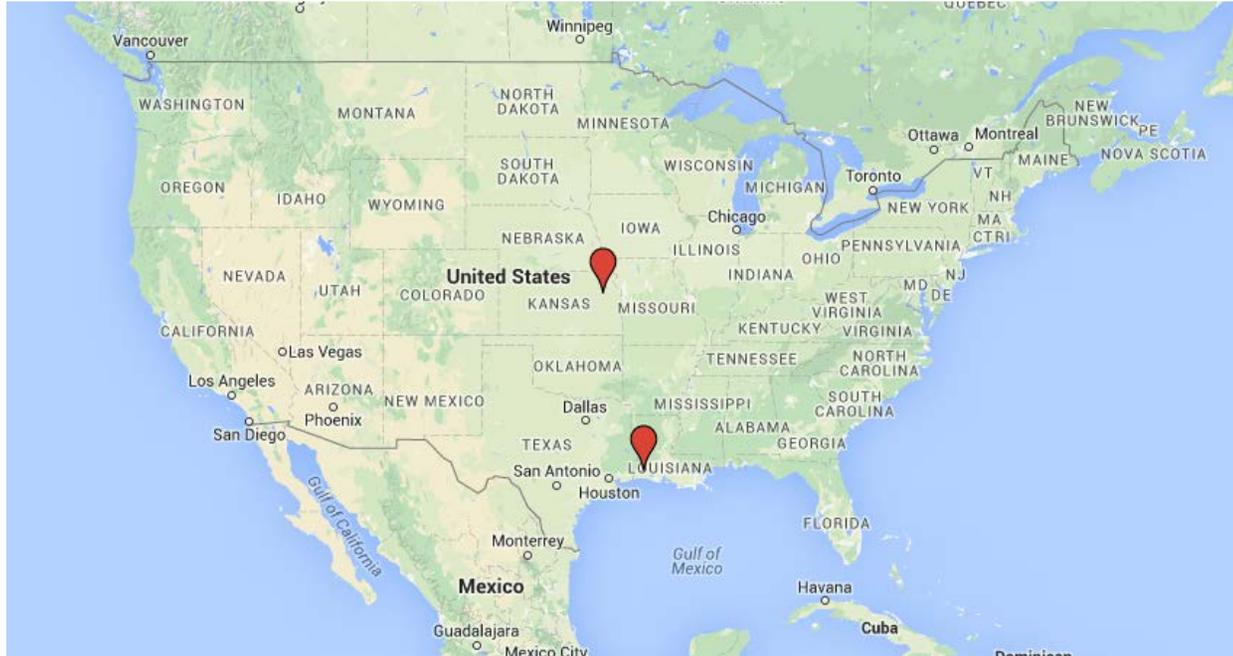
<http://www.weather.gov/disclaimer>

Topeka, KS - 2014



<http://www.weather.gov/disclaimer>

B. Using the map, identify **two** factors that contribute to these climatic differences. Explain how each factor impacts the climate.



Additional Resources for Teachers:

- <http://www.windows2universe.org/earth/Atmosphere/front.html>
- <http://www.waterencyclopedia.com/Ce-Cr/Climate-Moderator-Water-as-a.html>
- <http://environment.nationalgeographic.com/environment/natural-disasters/hurricane-profile>
- <http://news.nationalgeographic.com/news/2013/09/130923-typhoon-hurricane-cyclone-primer-natural-disaster>
- <http://www.theclimatechangeclearinghouse.org/ClimateChangeImpacts/ChangesStormIntensityFrequency/Pages/default.aspx>
- http://opensky.library.ucar.edu/collections/?ky=soars&os_sort_sortby=date_desc&skip=60&show=20&itemId=SOARS-000-000-000-042&metrics=visible
- <http://www.healthygulf.org/our-work/global-warming/hurricane-intensity>

Rubric

Key Elements:

- A.** Response correctly compares the climate between Lake Charles, Louisiana, and Topeka, Kansas.
- B.** Response provides data to support the climate comparison between Lake Charles, Louisiana, and Topeka, Kansas.
- C.** Response correctly identifies one factor that affects the climate and describes how it impacts the climate.
- D.** Response correctly identifies a second factor that affects the climate and describes how it impacts the climate.

4 Points

Response includes all four key elements.
Response contains no scientific errors.

3 Points

Response includes three of the four key elements.
Response may include scientific errors.

2 Points

Response includes two of the four key elements.
Response may include scientific errors.

1 Point

Response includes one of the four key elements.
Response may include scientific errors.

A well-developed response should demonstrate a correct and thorough understanding of climate and weather. The response should be clear, include specific details, show a higher level of reasoning skills where appropriate, and address the key elements of the task.

Scoring Notes

Student responses will not be an exact imitation of the responses below. These are given only as examples.

Temperatures are fairly consistent throughout the year for both Lake Charles and Topeka. According to the graph, Topeka experiences a more extreme temperature difference. Temperatures range from -10° to 95° F for Topeka while Lake Charles has a temperature range of 20° to 95° F. The average temperature during winter months (January-March) for Topeka was 40° - 56° F while Lake Charles has temperatures ranging from 61° - 71° F for the same time period. During the summer months (June-August), Lake Charles had average temperatures from 89° - 92° F while Topeka's average temperatures for the same time period was 85° - 92° F.

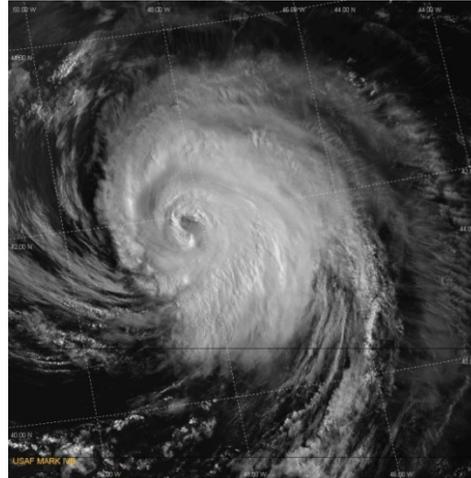
Lake Charles had a greater precipitation than Topeka for the year. Lake Charles received 68.62 inches compared to Topeka's annual precipitation of 56.65 inches (which includes 25.50 inches of snow).

One factor that affects the climate is latitude. Cities that are located in higher latitude have a colder climate. Topeka is further north and will experience colder weather than Lake Charles as evidenced by the amount of snow that Topeka experiences during the winter months.

Another factor that affects climate is the proximity to water. Bodies of water help maintain moderate air temperatures in the areas that surround the water. It is typical for areas near water to receive more precipitation than inland areas. Lake Charles is close to the Gulf of Mexico and will generally receive more precipitation as evidenced by the amount of precipitation it receives when compared to Topeka.

Printable
Student Version

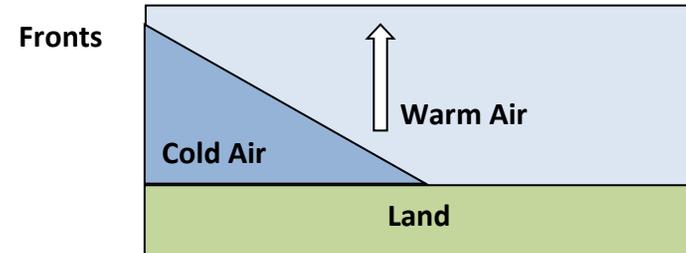
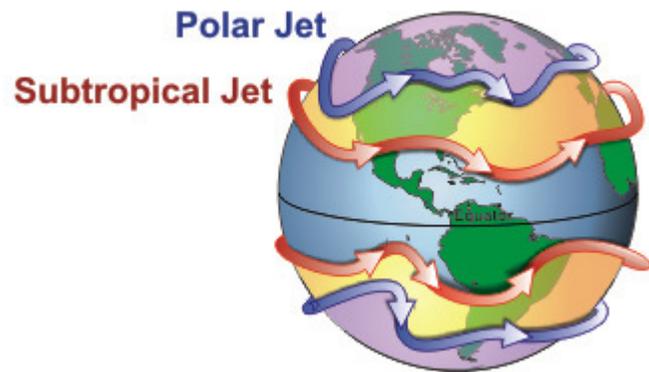
Using the National Geographic website (<http://environment.nationalgeographic.com/environment/natural-disasters/hurricane-profile>) and other outside resources, respond to the prompts.



- A. What conditions are needed for a hurricane to strengthen?
- B. Describe the weather conditions closely surrounding the eye of the storm and the reasons for these conditions.
- C. Hurricanes typically develop in late summer through fall. What causes hurricanes to develop during this time of year?

Respond to the prompts using information from the following paragraph, diagrams, NOAA (<http://www.crh.noaa.gov/lmk/?n=basic-fronts>) and other resources as needed.

An air mass is a large body of air that has similar temperature and moisture properties throughout. The area from which an air mass originates is called a "source region." Cold air masses move about as areas of high pressure. Tropical air masses originate over the warm waters of the tropics and Gulf of Mexico, where heat and moisture are transferred to the overlying air from the waters below. The northward movement of tropical air masses transports warm, moist air into the United States.



- Describe how a front develops and the weather that results when two fronts meet.
- What occurs in the upper atmosphere directly over the jet stream?
- Describe the most likely weather conditions north and south of the subtropical jet stream in the northern hemisphere.

A. Using the following graphs, compare the climates of Lake Charles, Louisiana, and Topeka, Kansas. Address both temperature and precipitation. Provide data to support your comparisons.

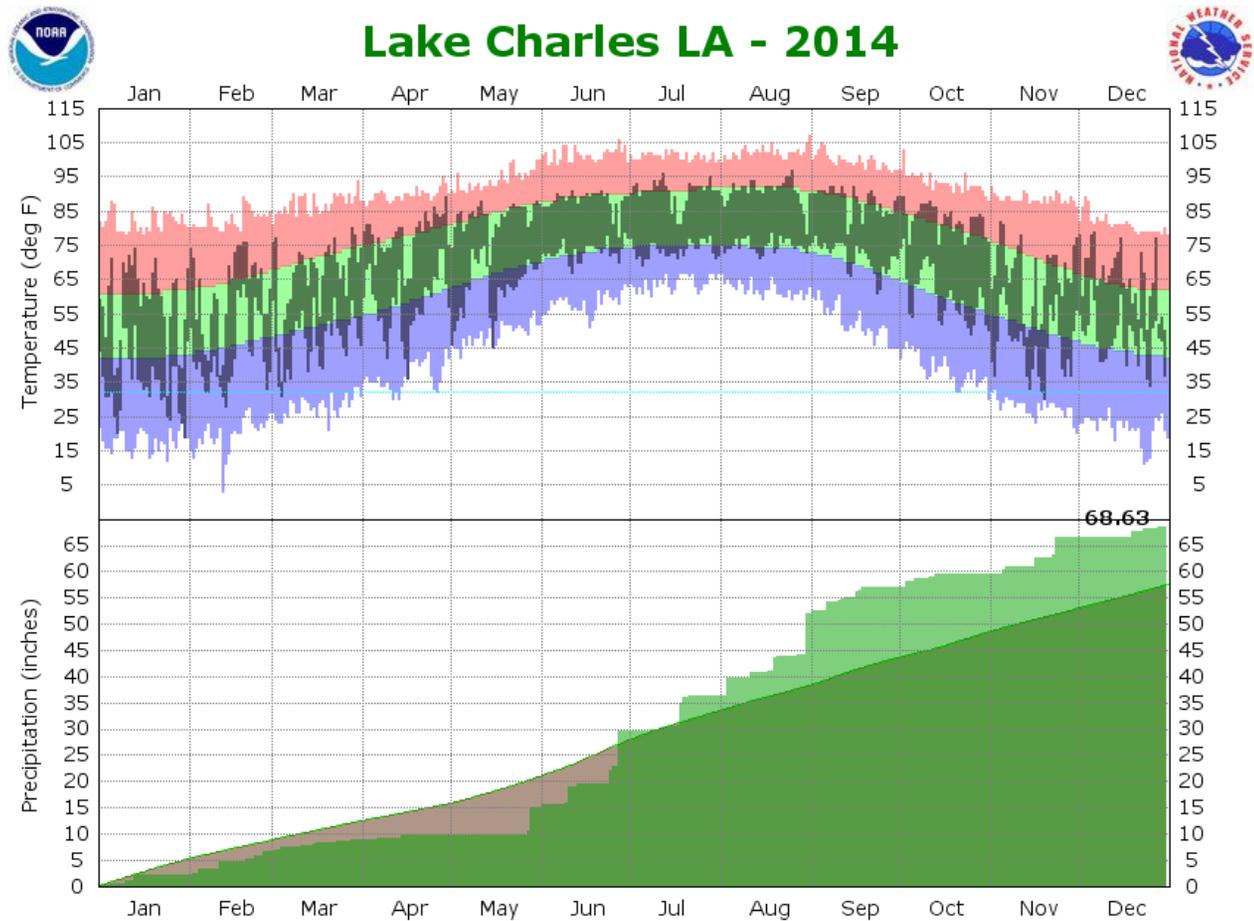
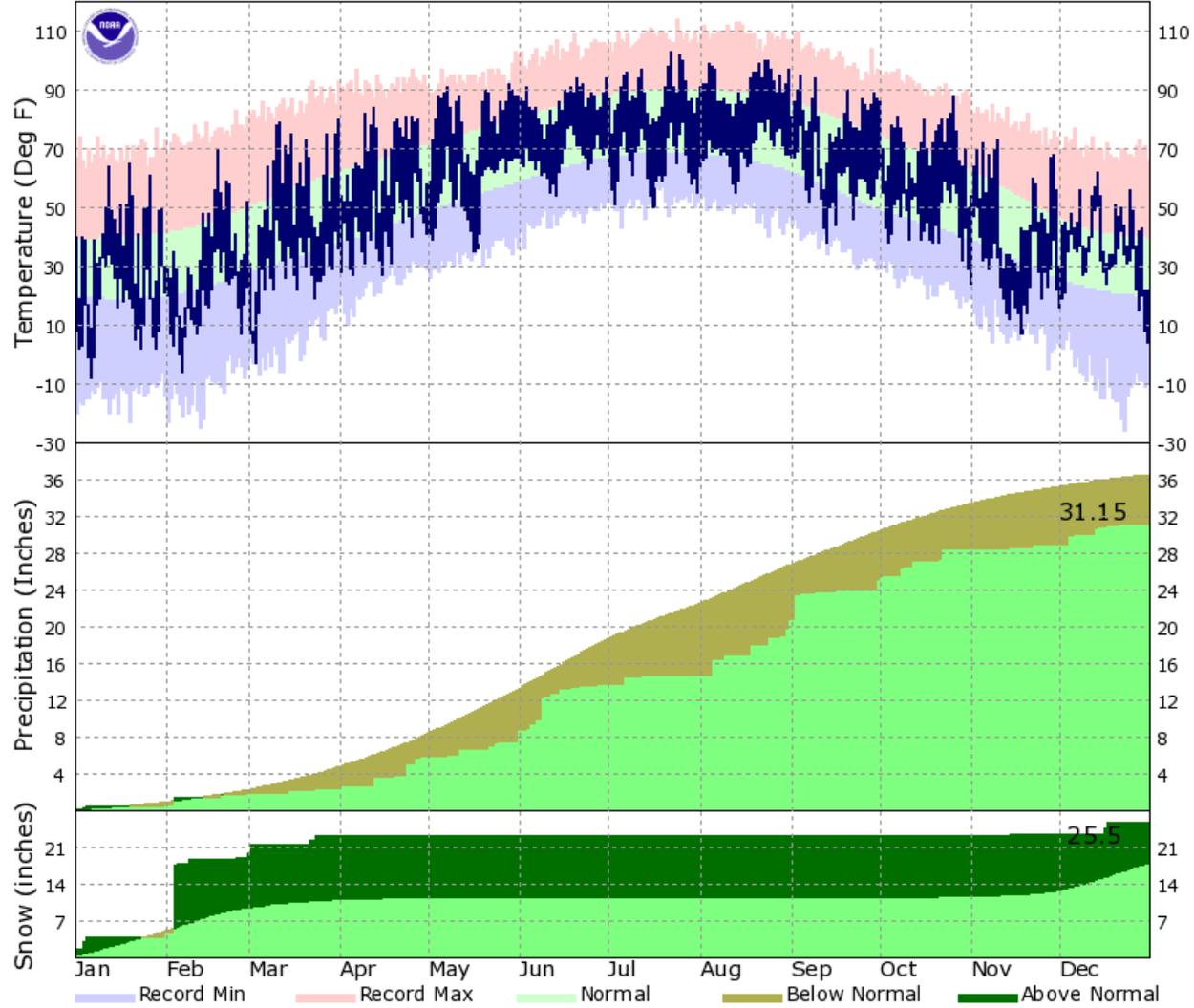


Image created: Thu, 1 Jan 2015 08:00 GMT+00:00

<http://www.weather.gov/disclaimer>

Topeka, KS - 2014



<http://www.weather.gov/disclaimer>

B. Using the map, identify **two** factors that contribute to these climatic differences. Explain how each factor impacts the climate.

