

Lesson Title: Weather and Climate

Timeframe: 45-60 minutes

Target Audience: 3rd-5th grade

Next Generation Science Standards: 3-ESS2-2; 5-ESS2-2

Objective: At the end of this lesson, students will be able to explain the difference between weather and climate and describe the six basic climate zones.

Materials:

- Weather or Climate activity packet
- Weather and Climate PowerPoint

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Description: In this lesson, students will participate in a series of three activities. The first is designed to differentiate weather and climate. The second will explain the six basic climate zone classifications and test their understanding. The final activity will allow for student choice in developing an imaginary town in a climate zone of their choice.

Background Information:

Earth's system can be broken into four subsystems, containing everything on the planet. These four subsystems are: **atmosphere** (air), hydrosphere (water), lithosphere (land), and biosphere (living things). While weather, and therefore climate, occur in the atmosphere, they are affected by the other three systems, just as the atmosphere affects the others.

Further reading of Earth's System Spheres:

https://www.esrl.noaa.gov/gmd/education/info_activities/pdfs/TBI_earth_spheres.pdf

Weather is what is happening in our atmosphere on any given day. It can change in a moment. Factors that affect the weather include temperature, air pressure, humidity, wind speed, and direction among other things.

Climate describes changes in the weather over a long period of time in a specific area. When talking about climate, we may describe the weather as it moves throughout the year, changing between seasons. Averages of weather measures, such as precipitation, humidity, temperature, and others, are considered as well when discussing climate.

Weather affects what you wear on any given day where the climate will affect what kinds of clothes you have in your closet.

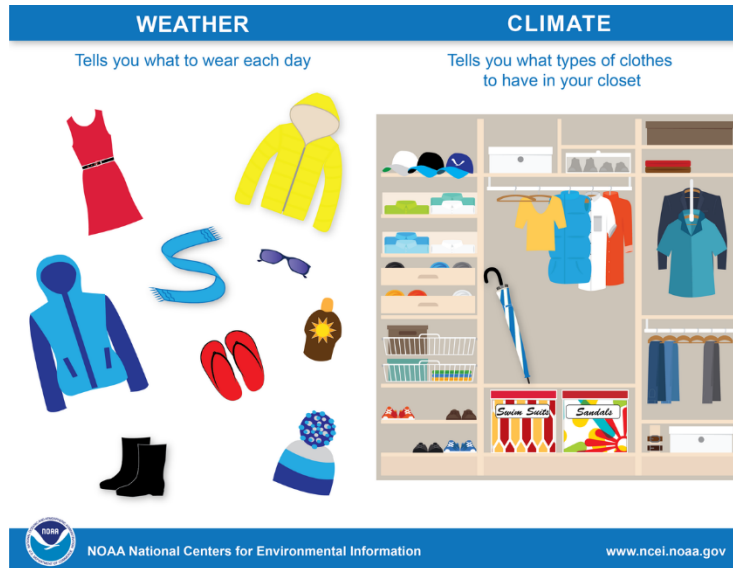


Image from: <https://www.ncei.noaa.gov/news/weather-vs-climate>

In 1900, Russian-German climate scientist Wladimir Köppen, along with others, developed the most familiar climate classification system. Rudolf Geiger continued to make updates to the classification map after Wladimir Köppen's death in 1940. The updated system is known as the **Köppen-Geiger climate classification system**. This system classifies climates around the world into six basic climate zones:

- Zone A: Tropical/Equatorial – Climates with all months have average temperatures greater than 64 degrees Fahrenheit and annual precipitation greater than 59”.
- Zone B: Arid/Dry – Often surrounded by mountains, the potential evaporation exceeds precipitation. Low humidity.
- Zone C: Warm/Mild – Generally warm and humid summers and mild winters.
- Zone D: Continental – Warm to cool summers and cold winters. Average temperature of the warmest month is greater than 50 degrees and the coldest month has lows below -22 degrees Fahrenheit.
- Zone E: Polar – Year-round cold temperatures with the warmest month's highs averaging less than 50 degrees F.
- Zone H: Highland – Unique climate based on their elevation. Highland climates occur in mountainous terrain where rapid elevation changes cause rapid climactic changes over short distances

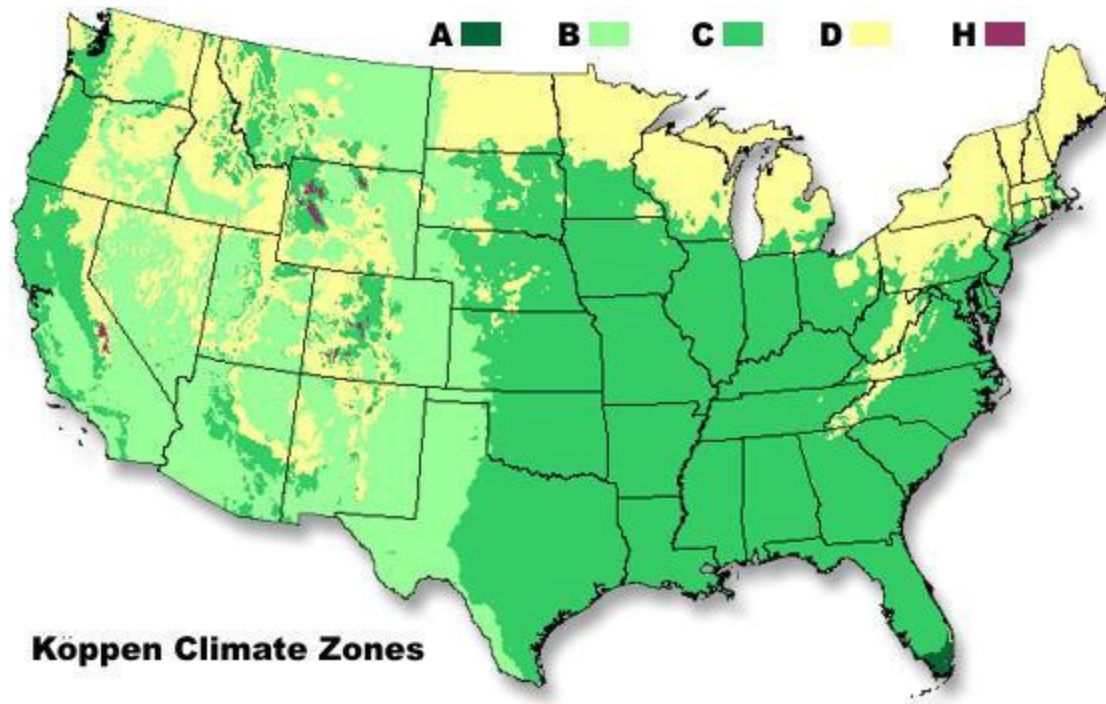


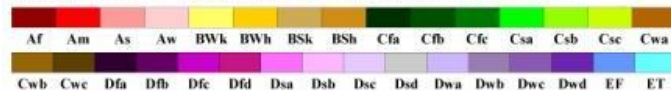
Image from: <https://www.weather.gov/jetstream/climates>

These six basic zones are further subdivided into 13 subzones, 2-3 types per basic zone, and then divided again to create 32 classifications based on temperature or dryness. This allows for more accurate climate prediction and classification. For example, Zone A is subdivided into three zones on the basis of precipitation.

- 1) Zone Af: No dry season
- 2) Zone Am: Short dry season
- 3) Zone Aw: Winter dry season

World Map of Köppen–Geiger Climate Classification

updated with CRU TS 2.1 temperature and VASCLimO v1.1 precipitation data 1951 to 2000



Main climates

A: equatorial
B: arid
C: warm temperate
D: snow
E: polar

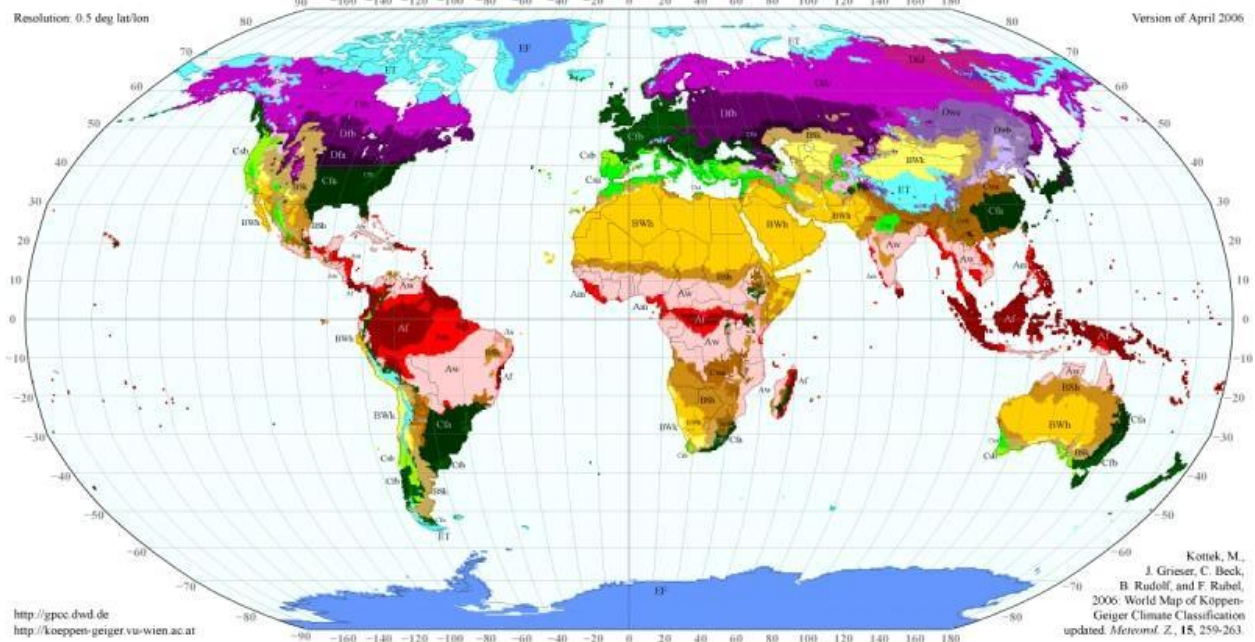
Precipitation

W: desert
S: steppe
f: fully humid
s: summer dry
w: winter dry
m: monsoonal

Temperature

h: hot arid
k: cold arid
a: hot summer
b: warm summer
c: cool summer
d: extremely continental
F: polar frost
T: polar tundra

Resolution: 0.5 deg lat/lon



<http://gpcp.dwd.de>
<http://koeppen-geiger.vu-wien.ac.at>

Kottek, M.,
J. Grieser, C. Beck,
B. Rudolf, and F. Rubel,
2006: World Map of Köppen-
Geiger Climate Classification
updated. *Meteorol. Z.*, 15, 259-263.

Image from: <http://koeppen-geiger.vu-wien.ac.at/present.htm>

This lesson will focus on the six basic climate zones only.

Further reading on the Köppen-Geiger Classification System:

<https://www.britannica.com/science/Koppen-climate-classification>

<https://www.nationalgeographic.org/encyclopedia/koppen-climate-classification-system/>

<https://www.nationalgeographic.org/article/all-about-climate/>

Activities

Activity 1: Weather or Climate?

- 1) Using the PowerPoint provided as a guide, explain the difference in weather and climate:
 - a. Key takeaway: Weather is what is happening in the atmosphere at one point in time. Climate is a summary or average, looking at patterns over a period of time.
- 2) Students will cut along dotted lines of Activity 1 worksheet. Individually or in teams, sort into two columns, weather and climate.

- 3) Review the key difference between weather and climate: Weather is a short-term snapshot of what is happening outside. It is something you can look at and feel. Climate is a big-picture look at weather over the course of many years.

Activity 2: Climate Zones

- 1) Using the PowerPoint provided as a guide, explain the six basic climate zones of the world.
- 2) Individually or in teams, match the locations to their appropriate climates.
- 3) On the blank location, students will fill in information about the city/town the student lives in.
- 4) Students will file it into the climate zone they feel it belongs and explain why they think that is correct option.
- 5) *Extension opportunity*: Interview a family member or friend who has been in the community for a long period of time. Has the climate changed any in their lifetime? For example: Does it snow as much? Are summers hotter? Etc.
- 6) *Extension opportunity*: We know climate affects the clothes in your closet. Other than your wardrobe, what is affected by the climate someone lives in? (Vehicles, houses, food, etc.)

Activity 3: Imaginary Towns

- 1) Using the PowerPoint provided, review the six basic Climate Zones.
- 2) Individually or in teams, assign or allow students to select one of the six climate zones.
- 3) Students will
- 4) *Alternatives: Roll a die to determine which of the six zones your imaginary town must be in! Have extra time? Develop an imaginary town in each of the six zones*
- 5) *Extension opportunity*: What cars, wardrobes, food would your town have?
- 6) *Extension opportunity*: How does your town mitigate negative impacts of your climate such as drought, heavy snow, flooding, etc.?