Factors Influencing Climate

Teachers notes

These lesson objectives are intended for the **KS3 Geography curriculum**, specifically focusing on the topic of **weather and climate**. However, the content can be tailored to suit different key stages, accommodating varying levels of prior knowledge and understanding.

The lesson on Factors Influencing Climate can be worked through at any pace, and it can be split into multiple lessons if needed. This flexibility allows you to adjust the flow based on the class's understanding and time constraints. If some sections require more in-depth exploration, feel free to extend them over additional lessons to ensure students fully grasp the concepts before moving on.

The worksheets can be filled in during the lesson, as homework, or in individual sections, depending on the pace of the lesson.

Lesson Aim:
To develop an understanding of what climate is, how it differs from weather, and the key factors that influence it.

Lesson Objectives:
- Identify and describe the key factors influencing climate, including latitude, altitude, continentality and ocean currents.

Assumed Prior knowledge:
- Students should already understand that different climates exist across the world and be able to describe some of their characteristics. They should also know that weather can change daily, while climate refers to longer-term patterns. Additionally, students should have basic map skills, including the ability to identify countries, continents, and major geographical features, as well as a general awareness of global regions like equatorial, polar, and desert areas.

Resources:
- Lesson 5 worksheet

All the blank worksheets for this lesson can be found as a separate download within the 'Lesson 5' page of the The Flood Hub KS3 Geography Weather and Climate Learning section. The answers for the worksheets can be found at the end of this document.

Factors Influencing Climate

Notes for Each Slide:
Teachers should decide what students should copy into their workbooks. While most content is provided on the worksheet, any additional information can be recorded in the workbooks.

Slide 1 - Learning Objectives
- Slide containing the aims and objectives of the lesson. Read these to the class to clarify the focus and expectations for the session.

Slide 2 - Starter Activity
- Ask students to discuss in pairs or small groups the following questions which are on the PowerPoint:
  - Why do mountain regions tend to be colder than lowland areas, even though they get the same amount of sunlight?
  - Why do places closer to the Equator usually have warmer climates than those further away?
- Use some examples from student observations to lead into the main topic of the lesson.

Slide 3 - Factors that influence climate.
- Introduce the next part of the lesson by explaining that there are many factors that influence climate. Ask students to think about what these factors might be with the help of the images on the board.
- The images show factors, such as global atmospheric circulation, latitude, altitude, ocean currents, and continentality.

Slide 4 - Latitude
- Introduce latitude as a key factor influencing climate. Explain that latitude is the measurement of a location's distance north or south of the Equator, expressed in degrees.
- At the poles, the Sun's rays hit the Earth at a shallow angle, meaning the sunlight is spread over a larger area, leading to cooler temperatures. In contrast, at the Equator, the Sun is directly overhead, so its rays are concentrated over a smaller area, resulting in hotter temperatures.
- Use the image to illustrate this – show how the Sun's rays travel a longer distance to reach the poles and are spread over a larger area. This will help students visualise how latitude affects temperature.

Slide 5 - Latitude
- Explain how seasons are influenced by latitude and the tilt of the Earth. Use the image to help students visualise how the tilt affects the length of days and nights. In polar regions, during summer, they can experience nearly 24 hours of daylight, while in winter, they go through long periods of darkness. In contrast, places near the Equator have a fairly consistent day length, with around 12 hours of daylight throughout the year.
- Discuss how this difference in the amount of sunlight each region receives contributes to the unique and varied climates of the poles compared to areas near the Equator

Slide 6 - Latitude fill the blank activity
- **TASK:** filling in the blanks
- Ask students to complete the task on their worksheets by filling in the blanks about latitude. This will help them record the key information and solidify their understanding.

Factors Influencing Climate

Slide 7 - Latitude fill the blank activity answers

- Once they've completed the task, review the answers as a class to ensure everyone has the correct notes and understanding.
- The answers are either on the slide or in the teacher's version of the worksheet at the end of the notes.

Slide 8 - Global Atmospheric Circulation

- Introduce the next factor affecting climate: Global Atmospheric Circulation. Explain that this refers to the large-scale movement of air around the Earth, which helps to distribute heat from the Equator toward the poles. This movement of air creates different climate zones and weather patterns around the world.
- Next, explain the different cell types involved in global atmospheric circulation:
  a. Hadley Cells: These are located near the Equator and move warm air upwards. As the air rises, it cools and moves towards the poles, creating a circulation pattern.
  b. Ferrel Cells: Found between 30˚ and 60˚ latitude, these cells act as a sort of "mid-latitude" circulation, where air moves from the higher latitudes towards the equator, mixing with the Hadley and Polar Cells.
  c. Polar Cells: These are located near the poles and involve cold air moving down towards the surface, where it warms and rises again, creating a cycle.

Slide 9 - Global Atmospheric Circulation Activity

- **TASK:** filling in the blanks
- Instruct students to complete the task on their worksheets by filling in the blanks about Global Atmospheric Circulation.

Slide 10 - Global Atmospheric Circulation Activity Answers

- Once completed, review the answers as a class to ensure they understand how the different atmospheric circulation cells contribute to the Earth's climate zones.
- The answers are either on the slide or in the teacher's version of the worksheet at the end of the notes.

Slide 11 - Altitude

- Introduce the next factor affecting climate: Altitude. Explain that as you ascend, the air becomes less dense, meaning there are fewer molecules to absorb and retain heat, so temperatures drop. Additionally, cooler air holds less moisture, which causes water vapor to condense into clouds. When enough water collects, it falls as precipitation, resulting in relief rainfall. This process means that mountainous areas often receive more rain than low-lying regions, creating distinct climates based on height.
- Ask students if they've ever been up a mountain and noticed that it was colder at the top than at the bottom. This will help them connect the concept of altitude to real-life experiences. Explain that, on average, the temperature decreases by 1˚C for every 150 meters climbed.

Slide 12- Altitude Activity

- TASK: filling in the blanks
- Instruct students to complete the task on their worksheets by filling in the blanks about Altitude.

Factors Influencing Climate

Slide 13 - Altitude Activity Answers

- Once they've finished, review the answers as a class to ensure everyone has a clear understanding of the relationship between altitude and climate.

Slide 14 - Ocean Currents

- Introduce the next factor influencing climate: Ocean Currents. Explain that ocean currents play a vital role in shaping climate by redistributing heat across the planet. Warm currents, such as the Gulf Stream, carry warm water from the equator toward higher latitudes, raising temperatures in coastal regions like the UK. Cold currents, such as the California Current, bring cooler water from polar regions, resulting in lower temperatures along coastlines.
- Highlight how ocean currents also affect weather patterns. When warm currents heat the air above them, it can lead to more rainfall in those regions. On the other hand, cold currents can create drier conditions.

Slide 15 - Ocean Currents

- Guide students through the diagram. Point out the key warm and cold currents, such as the Gulf Stream and California Current, and discuss how these currents move heat around the globe. Emphasise how they influence the climate of coastal regions by either warming or cooling the air

Slide 16- Ocean Currents Activity

- **TASK:** filling in the blanks
- Instruct students to fill in their worksheets by filling in the blanks about ocean currents.

Slide 17- Ocean Currents Activity Answers

- Once they've finished, review the answers as a class to ensure everyone has a clear understanding of the relationship between ocean currents and climate.

Slide 18 - Continentality

- Introduce the next factor affecting climate: Continentality. Explain that continentality refers to how a location's distance from the sea influences its climate. Places far from the ocean tend to experience more extreme temperatures compared to coastal areas. Inland areas heat up quickly in the summer and cool down rapidly in the winter, leading to hotter summers and colder winters.
- Discuss how this effect is stronger in larger continents, where areas far inland experience more extreme temperatures because they are farther from the moderating influence of the sea. Coastal areas, on the other hand, are moderated by the ocean, which absorbs and releases heat more slowly, resulting in milder temperatures throughout the year.

Slide 19 - Continentality Activity

- **TASK:** filling in the blanks
- Instruct students to complete the task on their worksheets by filling in the blanks about Continentality.

Slide 20 - Continentality Activity

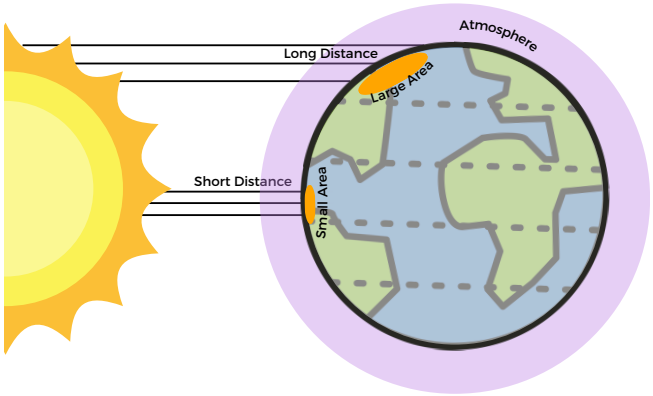
- Once they've finished, review the answers as a class to ensure everyone has a clear understanding of the relationship between continentality and climate.

Introduction to Climate

Factors Influencing Climate:

Use the words in boxes to fill the gaps on your worksheet

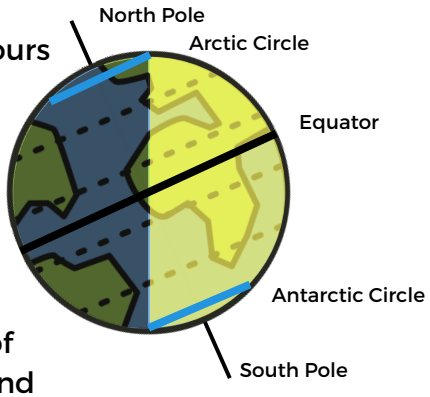
lower, equator, daylight, overhead, summer, poles, equator, latitude, polar, smaller, consistent, larger, direct, hotter, cooler, darkness, winter.



latitude is the measurement of a location's distance north or south of the Equator, expressed in degrees.

- At the poles, the Sun is lower in the sky, meaning its rays hit the Earth at a shallow angle. This angle spreads the sunlight over a larger area, leading to less direct sunlight and cooler temperatures.
- At the equator, the Sun is directly overhead, resulting in hotter temperatures because its rays are concentrated over a smaller area.

- In summer, polar regions can have almost 24 hours of daylight, while in winter, they experience long periods of darkness.
- Locations on the equator have a fairly consistent day length throughout the year, with around 12 hours of daylight.

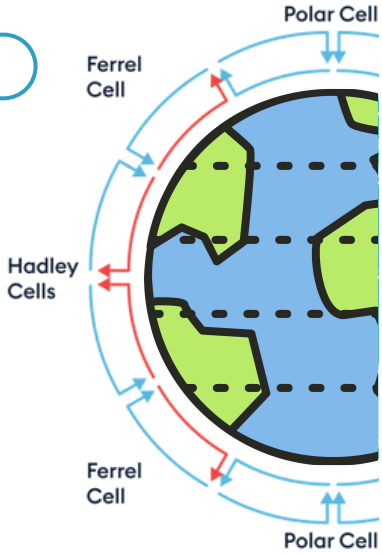


This difference in how long the Sun shines on different parts of the Earth helps explain why polar regions have such unique and varied climates compared to places near the Equator.

Global atmospheric circulation

wet, Hadley, global atmospheric circulation, rises, air, windy, heat, Ferrel, equator, sinks, poles,

Global atmospheric circulation is the large-scale movement of air around the Earth, which helps distribute heat from the equator toward the poles. This movement of air creates different climate zones and weather patterns across the planet.

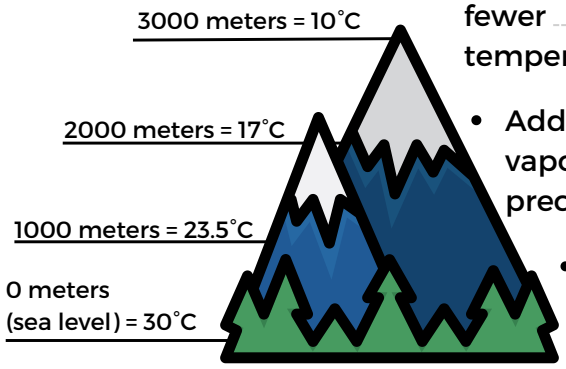


- In the Hadley cell, warm air rises at the Equator, then cools and sinks around 30° north and south, creating deserts like the Sahara. The air then flows back toward the Equator, completing the loop.
- The Ferrel cell, between 30° and 60°, moves in the opposite direction. Air rises at around 60° and sinks at 30°, bringing wet and windy weather to places like the UK.

Introduction to Climate

Altitude (Height above sea level)

condensing, mountainous, ascend, cooler, molecules, dense, drop, less, climates, retain,

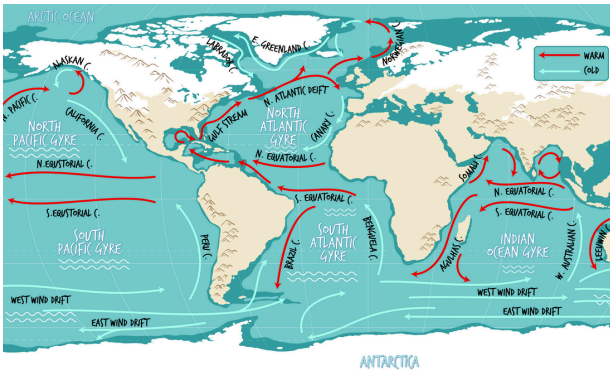


- As you ascend, the air becomes less dense, which means there are fewer molecules to absorb and retain heat, causing temperatures to drop.
- Additionally, cooler air holds less moisture, leading to water vapor condensing into clouds. When enough water collects, it falls as precipitation, resulting in relief rainfall.
- This process means that mountainous areas often receive more rain than low-lying regions, creating distinct climates based on height.

Ocean Currents

polar, warm, raising, ocean currents, latitudes, cold, redistributing, equator,

Ocean currents play a vital role in shaping climate by redistributing heat across the planet.



- Cold currents, such as the California Current, bring cooler water from polar regions, resulting in lower temperatures along coastlines.
- Warm currents, like the Gulf Stream, carry warm water from the equator toward higher latitudes, raising temperatures in coastal regions in the UK.

These currents also affect weather patterns. When warm currents heat the air above them, it can lead to more rainfall in those regions. In contrast, cold currents can create drier conditions.

Continentality

distance, balanced, hotter, coastal, extreme, moderated, sea, inland, continentality, colder,

Continentality refers to how a location's distance from the sea affects its climate. Places that are far from the ocean tend to experience more extreme temperatures compared to coastal areas.

- Inland areas heat up quickly in the summer and cool down rapidly in the winter, leading to hotter summers and cooler winters.
- Coastal areas are moderated by the ocean, which absorbs and releases heat more slowly, leading to milder temperatures throughout the year.

This effect is stronger in big continents, where places far inland have more extreme temperatures because they are further away from the sea, which helps keep temperatures more balanced.