

## Weather and climate – subject summary

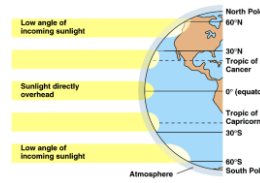
8.4.1 Describe and explain the factors which affect weather and climate.

### Key words:

- Weather** – Describes the day-to-day conditions of the atmosphere. Weather can change quickly.
- Climate** - Describes average weather conditions over longer periods and over large areas.
- Precipitation** - Any form of water, liquid or solid, falling from the sky.
- Humidity** – The amount of moisture in the air.
- Air pressure** – The force exerted onto the Earth's surface by the weight of the .

### There are 4 main factors which affect weather and climate

1. **Latitude** (how far north or south of the equator a place is): The **higher the latitude**, the **colder** it gets. As the sun is at a lower angle in the sky, meaning its heat energy is spread over more of the Earth's surface. Southern parts of the UK are warmer than northern parts because they are at a lower latitude.



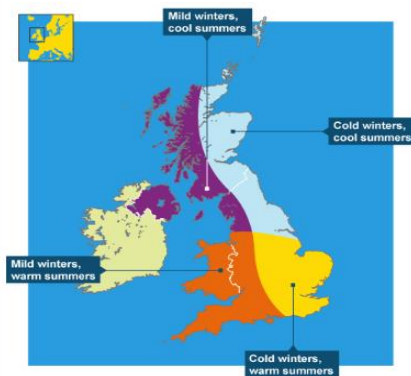
- Winds:** In the UK the wind direction mainly comes from the south west, this brings warm, moist air which makes the UK warm and wet. The UK would be much colder if the wind direction did not come from the south.
- Distance from the sea:** Areas **near the sea** are **warmer** than inland places during the **winter**, because the sea stores up heat, and any wind that blows across it will warm the land. However, areas near the sea are **cooler** in the **summer**, because the sea takes a long time to heat up; so, wind that blows across the sea in the summer cools the land at the coast.
- Altitude:** (how high the land is): The **higher up** you are the **colder** it gets because the air is thinner, so less heat energy is trapped. Also, higher areas get more rainfall as air is forced upwards and the water vapour condenses into rain clouds.

### Local factors affect the weather too:

- Urban areas** are normally **warmer** than rural areas as concrete absorbs heat in the summer and buildings give off heat in the winter. On average urban areas are 2-3 degrees warmer than rural areas.

8.4.2 To be able to describe and explain the climate patterns of a chosen country or region.

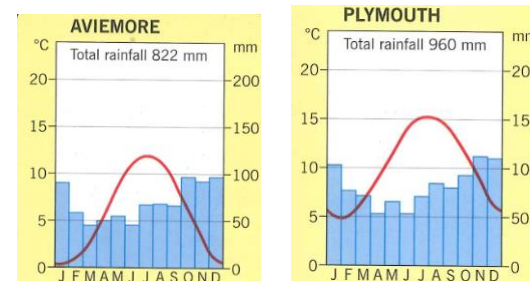
### A map showing the UK's 4 climatic zones



### The UK is affected by 4 air masses.

- Tropical maritime** (orange area) affects the **south west** bringing **wet weather** as it has travelled across the Atlantic. **Mild summers** (due to the impact of the sea) and **mild winters**.
- Tropical continental** (yellow area) affects the **south east**. The air has blown across Europe, bringing **very warm summers**, but **cold winters** (as the land cools down quickly). **Little rain** occurs.
- Polar continental** (light blue) affects the **north east**. This brings **very cold winters** and **cool summers**, as the wind blows across northern Europe. **Little rainfall** occurs.
- Polar maritime** (purple) affects the **north west**. This brings **cool summers** and **milder winters** (due to the slow cooling effect of the sea). **Rainfall** is common as the air has blown across the North Atlantic.

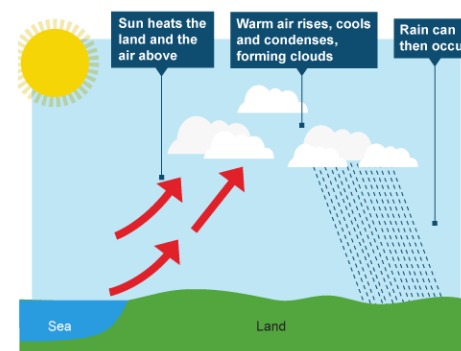
### A climate graph for the UK



- Notice that **Plymouth** has **more annual rainfall**. This is since the main air mass impacting Plymouth is **tropical maritime air**, this picks up lots of moisture from the Atlantic Ocean, bringing rain. Whereas, in **Aviemore**, **tropical continental** is the main air mass, which has **less moisture** as it has come from northern Europe.
- Plymouth** has a **higher overall temperature**, due to being in the south and the warming effect of the sea in the winter.
- Notice that **Aviemore** has very **cold winter** temperatures, this is because the land cools quickly in winter, so as the air blows across northern Europe during the winter months, it brings freezing temperatures.

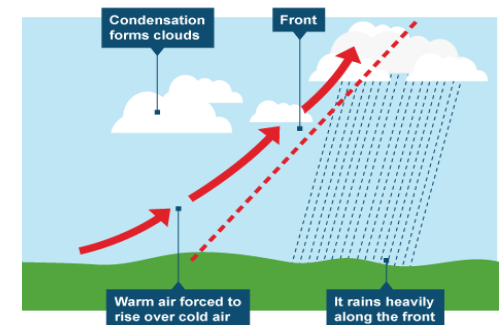
- The graphs show that **places** in the **UK do not have the same climate**.
- Aviemore is in the north east of Scotland (light blue area of map) and Plymouth is in the south west of the UK (orange area of map).

### Convective rainfall



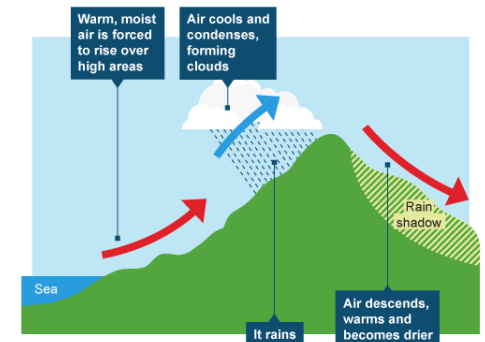
- The **sun heats** the land and the air above.
- The **warm air rises**.
- It **cools** and **condenses** forming clouds.
- When the clouds become **cold** enough, it begins to **rain**.
- This kind of rainfall is common in the **rainforest** where the sun is always overhead. In the summer in the UK this process is often associated with thunderstorms.

### Frontal rainfall



- This happens when a **cold front** (cold air) meets a **warm front** (warm air).
- The **cold air** is **denser** than the warm air.
- This means that the **warmer air** is forced to **rise** above the colder air.
- As it rises it **cools** and **condenses** forming clouds along the frontal system.
- Eventually this produces rainfall. In winter this is the cause of heavy snow in the UK.

### Relief Rainfall

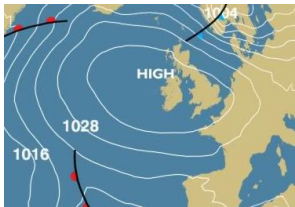
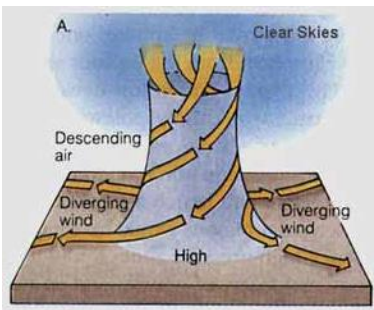


- As in the diagram, **air** has blown **across the sea**.
- As it meets the coast it is **forced to rise** due to the mountains/ relief of the land.
- As it rises, it **cools** and **condenses** forming clouds.
- This causes **rainfall** on the **windward side** of the hill (the side where the air was blown).
- As the air reaches the other side it sinks, it has no moisture left, so no rain falls.
- This creates a **rain shadow** on the **leeward side**, this can result in desert areas, such as Death Valley in the USA.

## Weather and climate – subject summary

8.4.3 To be able to identify and explain the differences between high and low pressure systems.

### High pressure events



### The causes of high pressure events:

1. These are also known as **anticyclones**.
2. These form as **air sinks**.
3. Falling air gets **warmer** so **no clouds** form.
4. This creates **high pressure**.
5. Light winds blow outwards from the area of sinking air.

### Conditions associated with high pressure systems:

1. High pressure conditions can be seen on a weather map, like the one above. The **isobars** (which are the white lines) are quite **far apart**. This indicates a high pressure system. With the isobars far apart the **air pressure does not change quickly**.
2. As the picture shows, high pressure brings **calm weather** to places. In both winter and summer, it results in a **cloudless sky** (or very few clouds) and very little wind.
3. In the **summer** high pressure systems bring **hot weather**, over a prolonged period.
4. In the **winter** they bring **sunny days**, which are **very cold**. Normally a morning frost will be present as temperatures dip at night due to the lack of cloud cover.

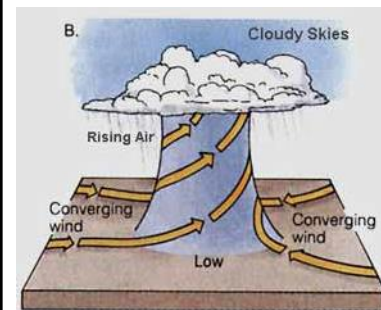
### The positive impacts of high pressure weather systems:

1. Sunny weather means **more day trips**, this is a **boost to the economy** as people spend more, for example shops at the seaside.
2. High pressure is **good** for those growing plants and for **farmers**.
3. Increase in summer **clothing sales**, means shops make more money.
4. Outside **construction** will be able to work for **longer, more consistent hours**, even in the winter.

### Negative impact of high pressure systems:

1. Could lead to **drought**, which leads to **hose pipe bans** and crop failure.
2. **Heat stroke**, especially in the elderly.
3. In some places it could lead to **forest fires** e.g. Spain and Portugal.
4. **Icy roads** in the **winter**, can lead to accidents.
5. Fog is common during the winter, which can lead to accidents.
6. In the **winter** the **elderly** can be at risk of **hyperthermia**, due to the large drop in temperature.

### Low pressure events



### The cause of low-pressure events:

1. They happen where a **cold and warm front** meet (see frontal rainfall).
2. As the warm air rises above the cold air, **low pressure** forms **below** the air.
3. **Air rushes** into the **low-pressure zone** causing high winds.

### Conditions associated with low pressure systems:

1. Low pressure conditions can be seen on a weather map, like the one above. This time the **isobars** (which are the white lines) are **close together**. This is a sign of a low pressure system. With the isobars close together the **air pressure is changing quickly** over a small area, this leads to strong winds as the air moves between the different air pressure zones.
2. As the photograph shows, the **weather** will be **unsettled** in the summer and the winter, bringing clouds and rainfall.
3. In the **summer** the cloud cover causes the **temperature to drop** as the sun cannot get in.
4. In the **winter** this cloud cover can lead to slightly **warmer temperatures** as the **heat is trapped** by the blanket of clouds.

### The positive impacts of low pressure weather systems:

1. The heavy rainfall can **replenish the reservoirs** and is a key factor as to why droughts are rare in the UK.
2. Can be beneficial for some activities such as **fishing, surfing** etc.

### Negative impact of low pressure systems:

1. All the UK's big **storms** are caused by these systems, such as storm Doris, Caroline and Desmond.
2. **Damage to property** due to high winds.
3. **Fallen trees** block roads.
4. **Flooding**.
5. High bridges closed, **disrupts travel**.
6. Can lead to a **decline in business** during the **summer** months, due to less people taking days out.
7. Can **stop construction** e.g. on building sites.

8.4.4 To explain the impacts of a high or low pressure event on a chosen location and to assess the strategies used to reduce this.

### Hurricane Katrina

Hurricane Katrina hit New Orleans in **Louisiana** on the **29<sup>th</sup> August 2005**. New Orleans is **2m below sea level** and is protected by a **levee system**.

### Cause

1. The **ocean** gets to **26.5 degrees**.
2. Where the ocean is **60m deep** or more, **rapid evaporation** begins.
3. This air rises, **cools** and **condenses** and forms a **tropical depression**.
4. Below the tropical depression **low pressure** forms.
5. The **Coriolis effect** causes the tropical depression to spin.
6. **Air rushes** in to fill the area of **low pressure**.
7. This causes the cloud mass to **spin** and leads to high winds.
8. Once the wind speeds get to **75mp/h** or more, a tropical storm is born.
9. The low pressure and wind **draw the ocean up** causing a **storm surge**.
10. Hurricane Katrina started over the **Atlantic Ocean** in early August 2005. However, it became a **category 5** storm over the very warm waters of the **Gulf of Mexico**.



### Effect

1. **1836 dead**, many died due to drowning in the storm surge.
2. The **levees broke** in 53 different places causing the city to flood, in some places up to 3m deep.
3. **10,000 homeless** as homes were destroyed by the 200km/h winds, destroying many homes in the Lower Ninth Ward.
4. **Looting** took place in the **French Quarter** as there was a lack of police to control the city.



### Response

1. In the run up to the event, **evacuation** took place, however there was not enough fuel for everyone to leave.
2. **10,000 people** made their way to the **Superdome** to stay in a safe and sturdy building.
3. After the event, aid e.g. water, was slow to get to those left behind but it did make it eventually.
4. **\$105 billion spent** on repairing damaged buildings to get businesses and homes back to normal.

### KPI's:

- 8.4.1 Describe and explain the factors which affect weather and climate.
- 8.4.2 To be able to describe and explain the climate patterns of a chosen country or region.
- 8.4.3 To be able to identify and explain the differences between high and low pressure systems.
- 8.4.4 To explain the impacts of a high or low pressure event on a chosen location and to assess the strategies used to reduce this.