

4. HUMIDITY

- It is the amount of water vapour in the air. The more water vapour is in the air, the higher the humidity.

❖ Water Vapour

- The gaseous phase of water.
- Also called moisture
- When water evaporates, it converts from liquid to a gas.

❖ Device/ Instrument used to measure humidity

- Hygrometer



❖ Types of Humidity

1. Absolute Humidity (AH)

- Measure the actual amount of water vapour in the air, regardless of the air's temperature. The higher the amount of water vapour, the higher the absolute humidity.
- Expressed in grams per cubic metre (g/m^3).
- What we feel outside is the actual amount of moisture (absolute humidity) in the air.
- Same with humidity ratio

2. Relative Humidity (RH)

- Measure of the actual amount of water vapour in the air compared to the total amount of water that can exist in the air at its current temperature.
- Warm air can possess more water vapour (moisture) than cold air, so with the same amount of absolute/ specific humidity, air will have a HIGHER relative humidity if the air is cooler, and a LOWER relative humidity if the air is warmer.
- Expressed in percentages (%).

3. Specific Humidity (SH)

- Refers to the weight (amount) of water vapour contained in a unit weight (amount) of air (expressed as grams of water vapour per kilogram of air).
- Absolute and specific humidity are quite similar in concept.

❖ Nature of Humidity in a named location

- The most humid areas on earth are generally located closer to the equator, near coastal regions. Cities in part of Asia and Oceania are among the most humid.

❖ Factors affecting humidity

- Air temperature
- Relative humidity
- Rainfall
- Wind speed & direction
- Sun radiation

❖ Effects of humidity in the physical environment

- Presence of the water vapour in the air, and affects how warm the air feels to us. In general, warm temperature feel even warmer as the humidity increases because as it increases, the speed at which water evaporates at any given temperature decreases.

❖ Relationship between humidity and temperature

- Relative humidity represents a percentage of water vapour in the air that changes when the air temperature changes... as air temperature increases, air can hold more water molecules and its relative humidity increases.
- When temperature drop, relative humidity increases.
- The interaction of temperature and humidity also directly affects the health and well-being of humans.

❖ How water vaporization and condensation related to humidity

- Condensation is a process by which a gas such as water vapour is changed into liquid water. When moisture cools and reaches saturation point, the tiny particles of water condenses into larger drops of water.

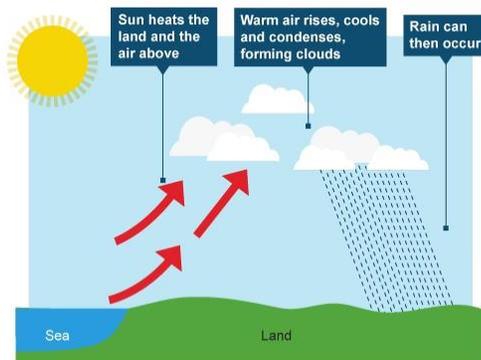
5. PRECIPITATION

- Referred to water released from clouds in the form of rain, sleet, snow or hail.

❖ 3 Types of Rainfall

1. Convective Rainfall

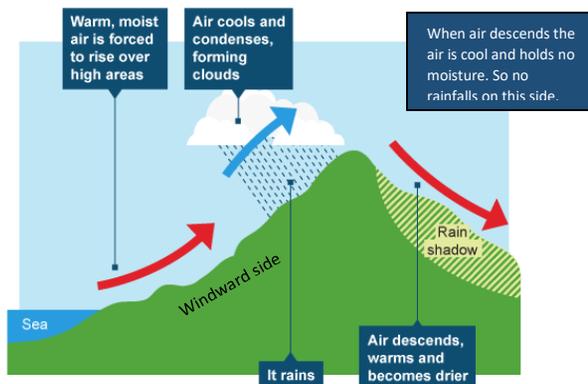
- The sun warms up the ground, which warms up the air above it, the warm air rises, it cools and condenses so rain fall.
- This type of rainfall can occur in the day or night time.
- This type of rainfall is often light and does not last for a long time.



2. Relief or Orographic Rainfall

- Occurs when warm moist air is forced to rise over the mountains, as the air rises, it cools, condenses and rain falls.

The Formation of the Orographic Rainfall

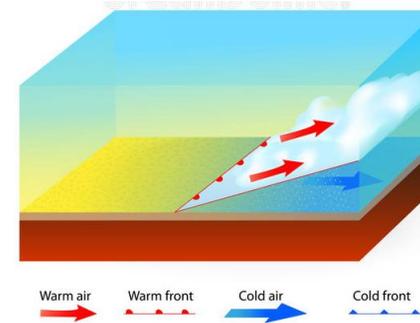


3. Frontal rainfall

This type of rainfall does not affect Tonga. It does affect countries that are much further South of the equator like New Zealand, and Australia.

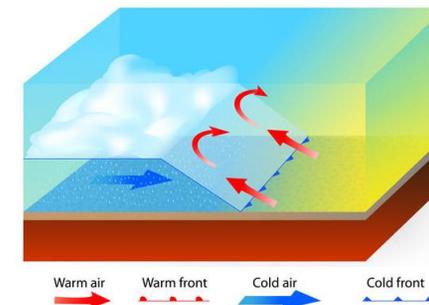
* Frontal rainfall occurs when:

1. Two air masses of different temperature meet.
E.g. a warm air mass and a cold air mass.
2. When a warm and a cold air masses meet, a **FRONT** is formed.
3. A **warm front** is formed when air moves into an area where there is cooler air: the warm air slides up and over the cooler air. When this happens:
 - There is a rise in the temperature
 - Broad layers of cloud may form
 - There is a chance of long periods of rain

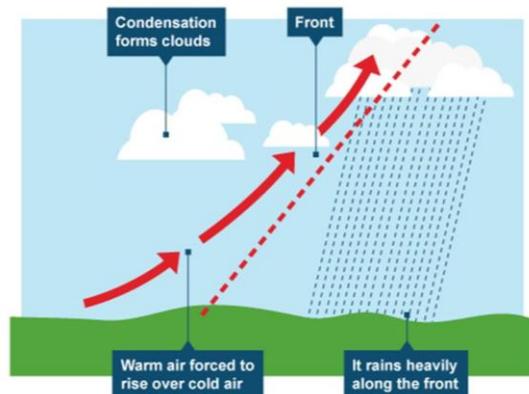


4. A **cold front** is formed when cold air moves into an areas in which there is already warmer air. The cold air pushes the warm air up and out of the way. When this happens:

- There is a fall in the temperature
- Many dark heavy clouds may form
- There is a chance of heavy rain.



The Formation of Frontal Rain



Activities

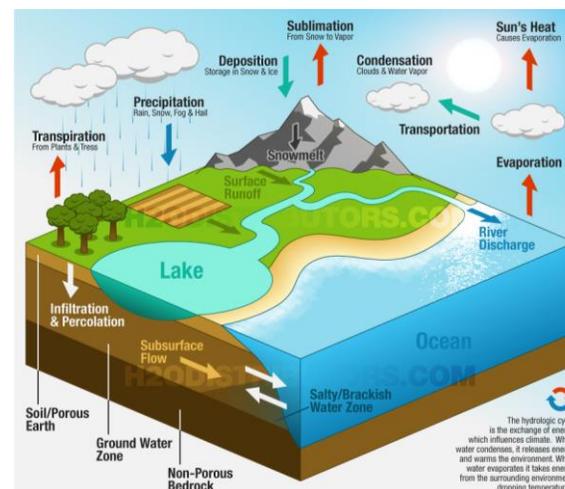
1. Which type of rainfall do you think is most common in your island?

2. Why is this type of rain common in your island?

3. Collecting and Recording oral Information

i. You are to listen to the radio and write down the weather report each day for a whole week.

Hydrological/ Water Cycle



➤ The continuous movement of water within the Earth and atmosphere. It is a complex system that includes many different processes.

Evaporation – the sun heats the ocean, lakes and other water sources transformed into water vapour. As the warm air rises it cools, condense and forming clouds.

Condensation – as air cooled, water vapour is transferred into water droplets which form clouds. The droplets increase in size until they fall as precipitation.

Transpiration – the process in which water is released from the leaves of the plants into the atmosphere.

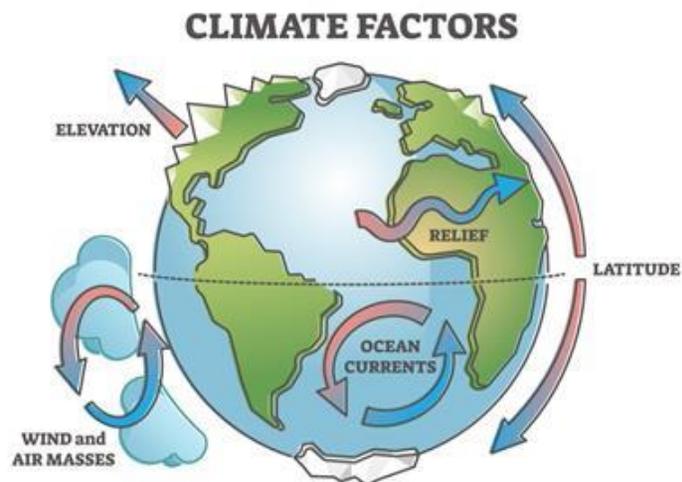
❖ Factors which causes rainfall

- Atmospheric temperature
- Wind speed and direction
- The presence of mountains

❖ Relationship between temperature and rainfall

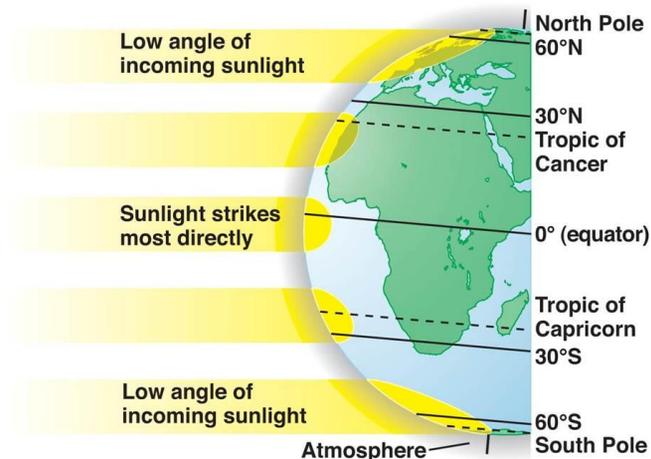
- As average temperatures at the Earth's surface rise, more evaporation occurs, which in turn, increases overall precipitation. Therefore a warming climate is expected to increase precipitation in many areas.

6. Factors affecting Climate Worldwide



a) Latitude (location)

- The distance from the equator affects the climate of a place. At the poles energy from the sun reaches the Earth's surface at lower angles and passes through a thicker layer of atmosphere than at the equator. This means the climate is cooler further from the equator. The poles also experience the greatest difference between summer and winter day lengths: in the summer there is a period when the sun does not set at the poles;



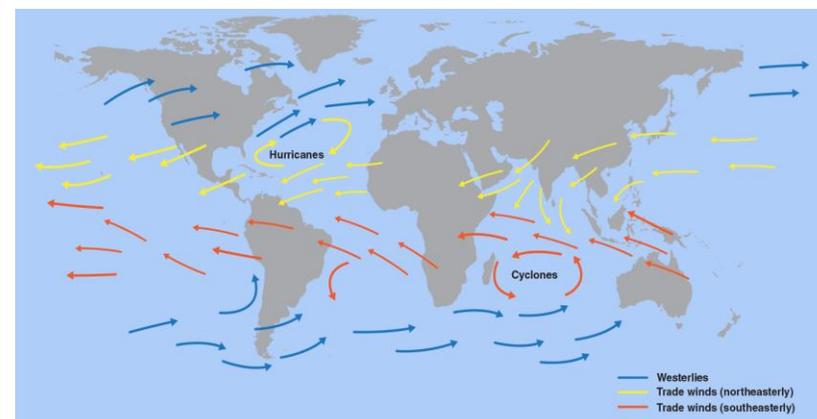
b) Relief (topography)

- Climate can be affected by mountains. Mountains receive more rainfall than low lying areas because as air is forced over the higher grounds it cools, causing moist air to condense and fall out as rainfall.
- The higher the place is above the sea level the colder it will be. This happens because of altitude increases, air becomes thinner and is less able to absorb and retain heat. That is why you may see snow on the top of mountains all year round.



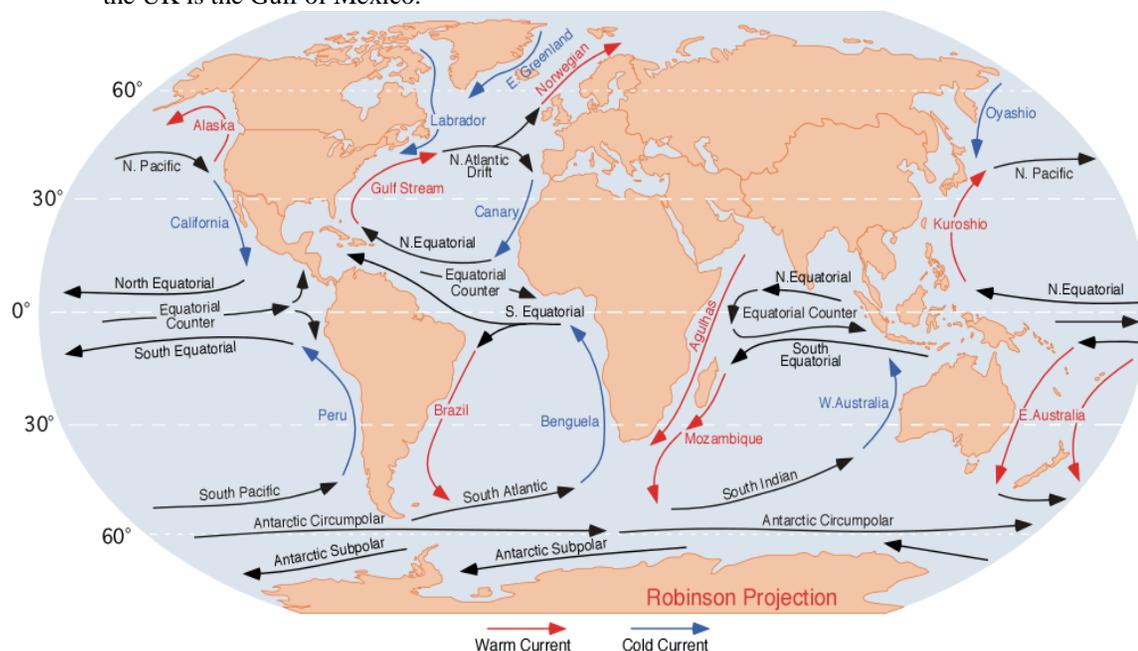
c) Prevailing winds

- Winds that blow from the sea often bring rain to the coast and dry weather to inland areas. Winds that blow to Britain from warm inland areas such as Africa will be warm and dry. Wind that blow to Britain from inland areas such as central Europe will be cold and dry in winter. Britain's prevailing (i.e. most frequently experienced) winds come from a south westerly direction over the Atlantic. These winds are cool in the summer, mild in the winter and tend to bring wet weather.



d) Ocean Currents

- Ocean currents can increase or reduce temperatures. The diagram below shows the ocean currents of the world. The main ocean currents that affects the UK is the Gulf of Mexico.



The Gulf Stream

- The Gulf Stream is a warm ocean current in the North Atlantic flowing from the Gulf of Mexico, northeast along the U.S coast, and from there to the British Isles.
- The Gulf of Mexico has higher air temperatures than Britain as it is closer to the equator. This means that the air coming from the Gulf of Mexico to Britain is also warm. However, the air is also quite moist as it travels over the Atlantic Ocean. This is one reason why Britain often receives wet weather.

The Gulf Stream keeps the West coast of Europe free from ice in the winter and, in the summer warmer than other places of a similar latitude.

CASE STUDY**1. Tongatapu (Coral Island)**

- ❖ *Features of its climate*
 - Heavy rain
 - Convective rainfall is common
 - Orographical rainfall also occurs at some extent in the Southern part.
 - Island is susceptible to tropical cyclone
 - Lies in the belt of the South-East winds
 - Has high humidity
 - Generally warm
- ❖ *Factors influencing its climate*
 - Location (within the tropics)
 - Relief (flat – convective is common / Southern part is higher – much more rain on the windward side)
 - Prevailing wind brings more rain
 - Ocean currents

**2. Niuafóú (Volcanic Island)**

- ❖ *Features of its climate*
 - Heavy rain
 - Orographical rainfall is common.
 - Experience tropical cyclone
 - Lies in the belt of South-East trades
 - Warmer than Tongatapu
- ❖ *Factors influencing its climate*
 - Location (Niuafóú is closer to the equator than Tongatapu, hence has higher temperature)
 - Relief (orographical is common due to high relief)
 - Ocean currents bring more rain
 - Prevailing wind

