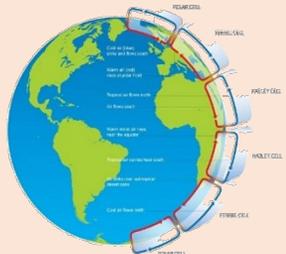


Global pattern of air circulation

Atmospheric circulation is the large-scale movement of air by which heat is distributed on the surface of the Earth.

Hadley cell	Largest cell which extends from the Equator to between 30° to 40° north & south .
Ferrel cell	Middle cell where air flows poleward between 60° & 70° latitude .
Polar cell	Smallest & weakness cell that occurs from the poles to the Ferrel cell.



Distribution of Tropical Storms.

High and Low Pressure

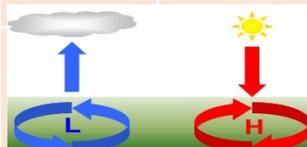
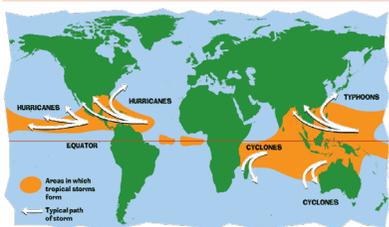
They are known by many names, including **hurricanes** (North America), **cyclones** (India) and **typhoons** (Japan and East Asia). They all occur in a band that lies roughly **5-15°** either side of the **Equator**.

Low Pressure

Caused by **hot air rising**. Causes **stormy, cloudy weather**.

High Pressure

Caused by **cold air sinking**. Causes **clear and calm weather**.



Formation of Tropical Storms

- The sun's rays heats large areas of ocean in the summer and autumn. This causes **warm, moist air** to rise over the particular spots
- Once the **temperature is 27°**, the rising warm moist air leads to a **low pressure**. This eventually turns into a thunderstorm. This causes air to be sucked in from the **trade winds**.
- With trade winds blowing in the opposite direction and the rotation of earth involved (Coriolis effect), the thunderstorm will eventually start to **spin**.
- When the storm begins to **spin faster than 74mph**, a tropical storm (such as a hurricane) is officially born.
- With the tropical storm growing in power, **more cool air sinks** in the centre of the storm, creating calm, clear condition called the **eye of the storm**.
- When the tropical storm hits land, it **loses its energy source** (the warm ocean) and it begins to lose strength. Eventually it will 'blow itself out'.

Changing pattern of Tropical Storms

Scientists believe that **global warming is having an impact on the frequency and strength of tropical storms**. This may be due to an **increase in ocean temperatures**.

Management of Tropical Storms



Protection
Preparing for a tropical storm may involve construction projects that will improve protection.

Aid
Aid involves assisting after the storm, commonly in LIDS.

Development
The scale of the impacts depends on the whether the country has the resources cope with the storm.

Planning
Involves getting people and the emergency services ready to deal with the impacts.

Prediction
Constant monitoring can help to give advanced warning of a tropical storm

Education
Teaching people about what to do in a tropical storm.

Primary Effects of Tropical Storms

- The intense winds of tropical storms can destroy whole **communities, buildings and communication networks**.
- As well as their own destructive energy, the winds can generate abnormally high waves called **storm surges**.
- Sometimes the most destructive elements of a storm are these subsequent **high seas and flooding** they cause to coastal areas.

Secondary Effects of Tropical Storms

- People are **left homeless**, which can cause distress, poverty and ill health due to lack of shelter.
- Shortage of clean water and lack of proper sanitation** makes it easier for diseases to spread.
- Businesses are damaged** or destroyed causing employment.
- Shortage of food as **crops are damaged**.

Case Study: Typhoon Haiyan 2013



Causes

Started as a tropical depression on **2nd November 2013** and gained strength. Became a Category 5 "**super typhoon**" and made landfall on the Pacific islands of the Philippines.

Effects

- Almost **6,500 deaths**.
- 130,000 homes destroyed**.
- Water and sewage systems destroyed had caused **diseases**.
- Emotional grief** for dead.

Management

- The UN raised **£190m in aid**.
- USA & UK sent **helicopter carrier ships** deliver aid remote areas.
- Education** on typhoon preparedness.

Case Study: Beast from the East



Beginning on 24 February 2018. Change to the northern polar jet stream – it brought in from the East. The air picked up moisture from the North Sea, creating snow. Storm Emma happened at the same time and hit Cornwall and Devon.

Effect

50cm of snow was dropped on Dartmoor (environmental).
17 people died in the UK (social).
Snow ploughs and gritters sent out to clear roads (economic).
People trapped in their cars on the road for hours (social).
The AA estimated that there were 8,260 collisions on the road (social).

Management

Stranded drivers given foil blankets to keep warm.
Army and mountain rescue helped nurses and doctors get to work to help.
Met Office released Red weather warnings
Hundreds of flights cancelled from Heathrow, Gatwick etc.

What is Climate Change?



Climate change is a large-scale, long-term shift in the planet's weather patterns or average temperatures. Earth has had tropical climates and ice ages many times in its 4.5 billion years.

Recent Evidence for climate change.

Global temperature

Average global temperatures have increased by more than **0.6°C since 1950**.

Ice sheets & glaciers

Many of the world's glaciers and ice sheets are melting. E.g. the Arctic sea ice has declined by **10% in 30 years**.

Sea Level Change

Average global **sea level has risen by 10-20cms** in the past 100 years. This is due to the additional water from ice and thermal expansion.

Enhanced Greenhouse Effect



Recently there has been an increase in **humans burning fossil fuels** for energy. These fuels (gas, coal and oil) emit **greenhouse gases**. This is making the Earth's atmosphere thicker, therefore trapping more solar radiation and causing **less to be reflected**. As a result, the Earth is becoming warmer.

Evidence of natural change

Orbital Changes

Some argue that climate change is linked to how the Earth orbits the Sun, and the way it wobbles and tilts as it does it.

Sun Spots

Dark spots on the Sun are called Sun spots. They increase the **amount of energy Earth receives** from the Sun.

Volcanic Eruptions

Volcanoes release large amounts of **dust containing gases**. These can **block sunlight** and results in cooler temperatures.

Managing Climate Change

Carbon Capture

This involves new technology designed to reduce climate change.

Planting Trees

Planting trees increase the amount of carbon is absorbed from atmosphere.

International Agreements

Countries aim to cut emissions by signing international deals and by setting targets.

Renewable Energy

Replacing fossil fuels based energy with clean/natural sources of energy.

