

Natural Phenomena: Winds, Storms and Cyclones

Learning Objective

1. Introduction
2. Winds and air pressure
3. Wind currents and monsoon
4. Storms
5. Cyclones
6. Damages caused by cyclones
7. Safety measures for cyclones

INTRODUCTION

We have heard many times about the natural disasters. The natural disasters include storms, cyclones, earthquakes, etc. which can cause a lot of damage to human life, animals and property. In this chapter we shall study about what are winds, storms, cyclones and hurricanes? How are they formed and why are they so destructive?

WINDS AND AIR PRESSURE

Moving air is called wind. The difference in the air pressure which is caused by the unequal heating of different parts of the earth causes wind. Now let us see how wind blows?



Do you know?

It is thought that wind energy was first used to propel sailing boats.

The air in certain regions becomes hot due to the heat from the sun. The hot air is lighter and so it rises up. As a result there is a drop of air pressure in that region. The cooler air from the colder regions being heavier starts flowing towards the low pressure regions. This air moving from the high pressure regions to the low pressure regions is called wind.

Do you know?

The movements of air toward the equator are called trade winds.

Air Pressure

Earth is surrounded by an envelope of air. The force exerted by air per unit surface area is called air pressure. If a can half-filled with water is heated till all the air is expelled out, and then covered with a lid. Thereafter cold water is poured over the can then it is found that the can gets crushed. It happens because on pouring cold water, the steam convert into water, thereby, reducing the pressure inside the can. The large air pressure outside the can crushes it. Air pressure is measured by barometer.

It is important to note that air pressure is exerted in all directions.

Consequences of Air Pressure

1. Though air exerts large pressure on us but we don't feel that pressure. It is because our blood contains dissolved oxygen at a higher pressure than the air pressure. So the air pressure is counter-balanced.
2. The nose starts bleeding at higher altitudes. Actually the air pressure falls at higher altitudes. This creates a difference between the internal pressure of the body and the external air pressure. As a result the fine capillaries inside the nose burst, and hence the nose starts bleeding.
3. Sucking of lemonade with the help of straw is also based on the air pressure. As on sucking through the straw, the pressure inside it falls. The large air pressure forces the drink into the straw.
4. Weather forecasting is done on the basis of variations in the air pressure as follows:
 - (a) The increase in temperature of the air results in expansion of air and a fall in pressure. The fall in pressure without any increase in moisture results in dust-storm.
 - (b) If the fall in pressure is accompanied by rise in moisture, it indicates rain.
 - (c) If the air pressure remains normal, then it signifies fair weather.
 - (d) A gradual rise in air pressure means a dry weather is predicted.

Do you know?

The Scientists who study weather are called meteorologists.

Some applications of air expands on heating and contracts on cooling:

1. Gas thermometers are based on the fact that gases expand on heating.

2. Since hot air expands so it becomes less dense so, if a balloon contains hot air it rises up because it is less dense or lighter than the surrounding air.
3. If we place a hot air balloon over cold water, the air inside is cooled down and so it contracts.

WIND CURRENTS AND MONSOON

We know that wind flows from high pressure regions to the low pressure regions. Wind currents arise due to the following reasons.

1. Uneven heating between the equator and the poles: The equator is region of low pressure and poles are high pressure regions. As a result large wind currents are set up from the poles towards the equator.

2. Uneven heating of land and water: The uneven heating of land and water during the day causes the air above the warm land to rise up creating a low pressure. The cold and denser air above the sea is now at higher pressure. Thus a cool sea breeze flows from the oceans towards the land. And at night cool land breeze flows from land towards ocean.

Monsoon

It is the winds from the sea which carry moisture with them and bring rain. These winds are seasonal which flow from the Indian ocean towards the Indian sub-continent and they are known as monsoon winds. Monsoon brings heavy rainfall.

Do you know?

Monsoons blow from the land toward the sea in winter and from the sea toward land in the summer.

Summer monsoon: The interior of the Indian sub continent becomes very hot during summer. This results in low pressure regions. The low pressure region attracts winds from the Indian Ocean. These warm monsoon winds are known as **summer monsoon winds**.

On the other hand, during winters the high pressure is formed in the interior of the continent due to rapid cooling. Cold dry winds blow towards the ocean. These winds are called **winter monsoon winds**.

STORMS

When air moves violently i.e., with high speed it is called storm. A storm accompanied by lightning and thunder is called thunderstorm. It

occurs due to the convection of air in humid areas.

In hot areas the warm air carrying moisture rises up. On rising up the water vapours condense to form clouds and drop down as rain. This movement caused by the meeting of cool and warm air produces winds, lightning and thunder and is known as thunderstorm.



Do you know?

When air moves violently. It is called a storm and when air moves gently. It is called a breeze.

Thunderstorms, tornadoes and cyclones are three broad types of storms. How Roofs get blown off during a Storm When a high speed wind blows over a tin roof, it creates a low pressure. However the pressure below the roof is still high i.e., atmospheric. Due to the pressure difference below and above the roof the roof is lifted up and is then blown off by the storm.

CYCLONES

A cyclone is a storm that develops over the sea. It is a natural calamity which is caused by 'difference in air pressure in the atmosphere. A cyclone is basically a violently rotating windstorm over the sea.

Do you know?

Cyclone formation regions are close to the equator. The formation of cyclones depends on the temperature, humidity, the speed and the direction of the winds.

Following can be the causes of a cyclone:

1. Difference in the temperature of the two regions.
2. Difference in air pressure between two regions.

Thus cyclones are caused by warm tropical moisture bearing clouds developing in open oceans or seas. Cyclones can only form over warm water in the tropical regions of the oceans where sea temperatures are around 80°F. They occur in low pressure areas where the warm

rising air becomes full of moisture and it then condenses to thunder clouds.



The blowing of wind from the cold regions to the hot region occurs during the whole process. During this, spinning of earth on its own axis causes a spiral upward movement of air. Thus the winds start rotating faster and a cyclone is formed.

Do you know?

The centre or eye of a tropical cyclone is at the area of lowest pressure.

Hurricanes: A hurricane is a deep depression in which wind storms form upto 300 km across and 9 km high. Hurricanes develop over oceans but never close to the equator. Storms are termed as Hurricanes in US, typhoons in the China sea and cyclones in the Indian ocean. Hurricanes are set up when the winds from opposite direction meet over warm tropical regions and upward spiral of air is set up. The speed of air increases as it spirals inward. Thus it

'draws more and more energy from the water vapours rising above the sea. Thus a large amount of energy is acquired by the spiral of air which supports the hurricanes.

Damages Caused by Cyclones

1. Cyclones drown human beings, erode the beaches and destroy vegetation.
2. All the trees, dwellings, communication systems are damaged by the strong winds.
3. Heavy and prolonged rainfalls due to cyclones cause floods in rivers and low lying areas get drowned causing loss of life and property.

Do you know?

During a tornado, the best place to be is in the basement or an inner room on the ground floor.

Safety Measures for Cyclones

1. Construction of cyclone warning centers.
2. People living in the cyclone - prone areas should always listen to the weather forecast.
3. Arrangements for relocation of people during cyclones.
4. Warning people, fishermen, shipman, airplanes and various government agencies.
5. During a cyclone do not move out until and unless required.
6. Store hygienic drinking water.
7. Avoid contact with electric lines.

CONCEPT MAP

