

## Introduction

The study of weather and climate is increasingly becoming important in national economic planning, social and political development. Climate studies have played an integral role in policy formulation and development in the West and have also become vital in Africa as has been seen from the establishment of departments of environment studies at African universities and the appointment of Ministers of Environment in recent years. In this chapter, we study the atmosphere and the processes which occur mainly in the troposphere which is about 12 to 13 km thick above the earth's surface. We also seek to understand climatology which describes the study of meteorological variables such as pressure, temperature, wind, humidity, precipitation and cloud cover and how these vary from time to time and from place to place. The increasing human interference on the natural environment, with serious consequences in both developed and developing countries, will also form a special object of analysis in this chapter.

## The atmosphere

The atmosphere has four significant layers or spheres namely the troposphere, the stratosphere, the mesosphere and the thermosphere. These four spheres are distinguishable largely in terms of their variations in temperature, altitude (height above sea level) and pressure. The top of each layer is characterised by an isothermal zone identified as the tropopause, stratopause and the mesopause for the first three spheres respectively. Fig 1.0 illustrates the stratification and temperature of the atmosphere.

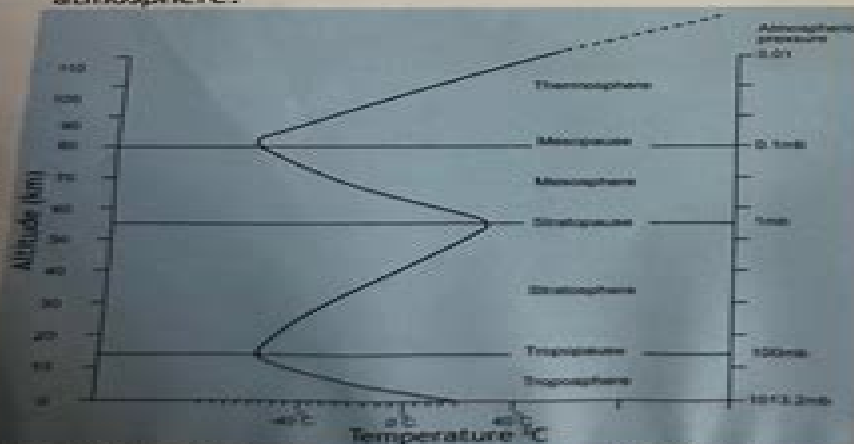


Fig 1.0 The atmosphere: temperature - height diagram

## Troposphere

This is the atmospheric layer extending from the earth surface up to about 13 000m in height. It is the thinnest of all the spheres but it contains over 75% of the total gaseous mass of the atmosphere. Atmospheric gases include nitrogen which composes 78.8%, oxygen (20.9%), argon (0.95%) and carbon dioxide (0.033%) which are the major components, adding up to 99.9%. Other trace constituents include neon, helium, xenon, hydrogen and methane which constitute 0.003% altogether. According to Colin Buckle (1996), the term "troposphere" is derived from a Greek word "tropos", which means a situation where air is constantly in motion, arranging and rearranging itself in an attempt to achieve equilibrium.

We need to understand the various processes taking place in this layer since it is the weather-making sphere with a direct importance to humankind. Meteorologists have divided it into two layers of distinct aerodynamic characteristics. These are the upper air and the boundary layer which is synonymously known as the friction layer. Because the latter is in direct contact with the earth surface, it is constantly affected by the earth-atmospheric processes. As a result, it forms the major study area for meteorological analysis.

## The Boundary Layers

The friction layer is about 1 000m in height and it can further be divided into two distinct layers. The lowest layer stretching from the earth surface up to about 100m is described as the surface boundary layer. It is a zone of highest pressure, moisture and temperature. Sometimes the phrase 'earth-atmosphere intersurface' is used to identify this layer. The second layer is the planetary boundary layer which stretches from about 100m to 600m in the atmosphere. Meteorological variables in this layer are not directly influenced by the earth surface. Fig 1.1 illustrates the two layers in the lower atmosphere.

The depth of the troposphere is a function of vertical temperature and pressure variations which cause convective air currents. The high radiation intensity at the equatorial belt which influences vertical pressure variation causes the troposphere to be deepest at the equator, decreasing accordingly with increase in latitude. Similarly, the boundary layer also varies in depth with radiation intensity. In

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# Energy Mutodi A Level Geography

**Marcel A. Müller**



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