

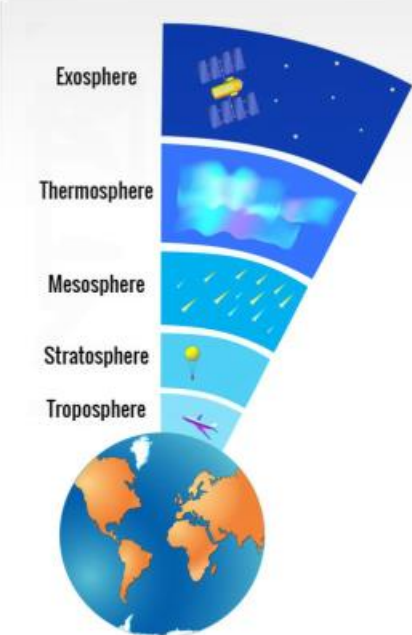
Module 11: Meteorology

Topic 1 Content: Layers of the Atmosphere Notes

Introduction

Layers of the Atmosphere

Introduction



The diagram shows a cross-section of the Earth's atmosphere, divided into five layers. From bottom to top, they are: Troposphere (containing a commercial airplane), Stratosphere (containing a hot air balloon), Mesosphere (containing a meteor), Thermosphere (containing a satellite), and Exosphere (the outermost layer). The layers are represented by different colors and textures, and a globe of the Earth is shown at the base of the diagram.

Earth's thin atmosphere is divided vertically into layers based on temperature. Each of these layers has different defining characteristics. In this interactivity, use the navigational arrows in the lower right corner to explore the atmosphere's different layers.

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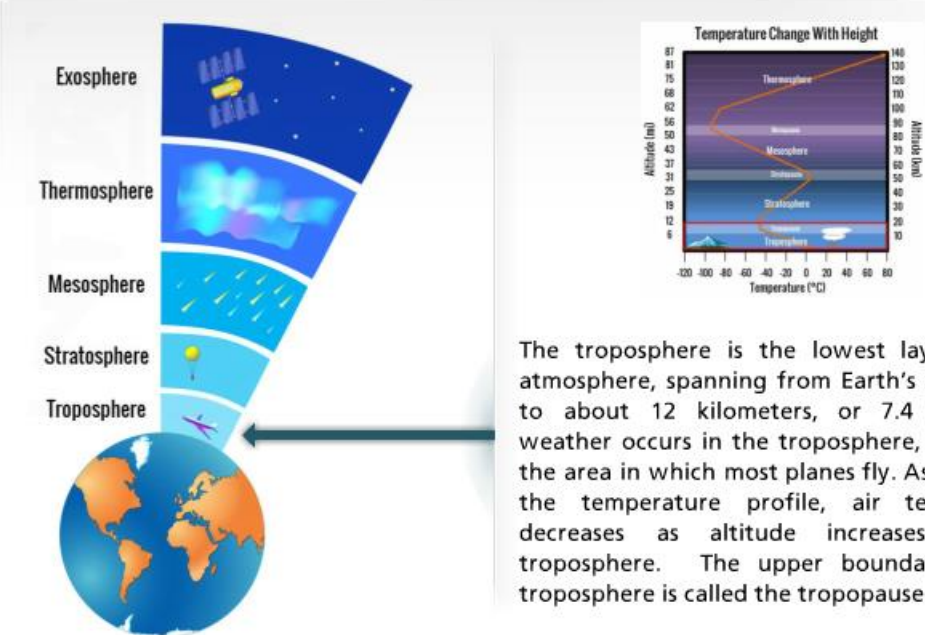
Module 11: Meteorology

Topic 1 Content: Layers of the Atmosphere Notes

Troposphere

Layers of the Atmosphere

Troposphere



The diagram on the left shows a cross-section of the atmosphere's layers: Exosphere, Thermosphere, Mesosphere, Stratosphere, and Troposphere. The Troposphere is the bottom layer, closest to Earth's surface. The temperature profile graph on the right shows temperature in degrees Celsius on the x-axis and altitude in meters on the y-axis. The graph is divided into five layers: Troposphere (0-12 km), Stratosphere (12-50 km), Mesosphere (50-85 km), Thermosphere (85-1000 km), and Exosphere (1000 km+). The temperature decreases in the Troposphere, increases in the Stratosphere, decreases in the Mesosphere, and increases in the Thermosphere and Exosphere.

The troposphere is the lowest layer of the atmosphere, spanning from Earth's surface up to about 12 kilometers, or 7.4 miles. All weather occurs in the troposphere, and this is the area in which most planes fly. As shown by the temperature profile, air temperature decreases as altitude increases in the troposphere. The upper boundary of the troposphere is called the tropopause.

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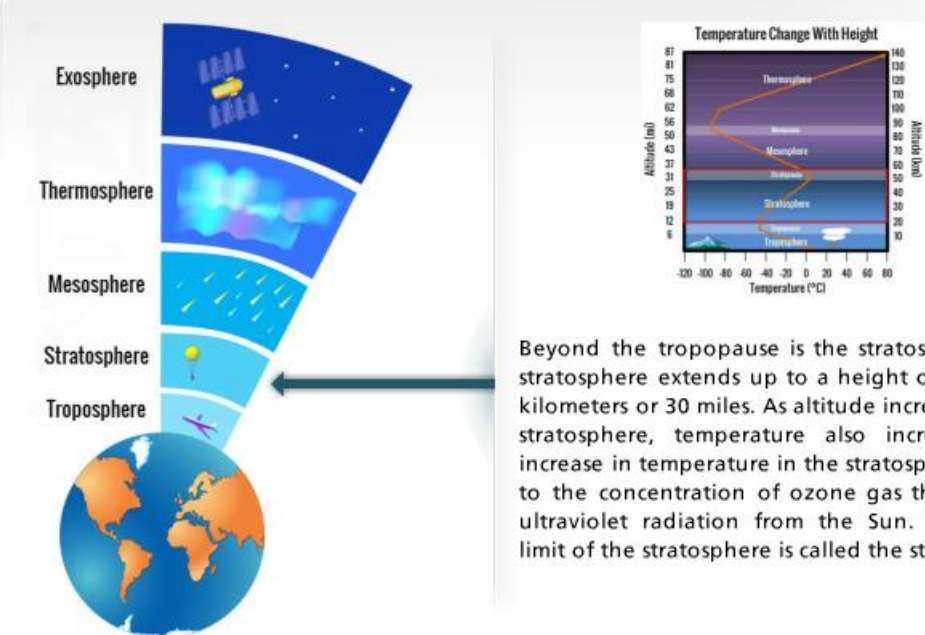
Module 11: Meteorology

Topic 1 Content: Layers of the Atmosphere Notes

Stratosphere

Layers of the Atmosphere

Stratosphere



The diagram on the left shows a cross-section of the Earth's atmosphere with five layers: Troposphere, Stratosphere, Mesosphere, Thermosphere, and Exosphere. The Troposphere is the lowest layer, containing a commercial airplane. The Stratosphere is the layer above it, containing a hot air balloon. The Mesosphere is above that, containing a meteor. The Thermosphere is above that, containing a satellite. The Exosphere is the outermost layer. A globe is shown at the bottom left, with an arrow pointing from the Troposphere to the Stratosphere. To the right is a graph titled 'Temperature Change With Height' showing temperature in degrees Celsius on the x-axis (from -120 to 60) and altitude in meters on the y-axis (from 0 to 140). The graph shows a sawtooth pattern: temperature decreases in the Troposphere, increases in the Stratosphere, decreases in the Mesosphere, and increases in the Thermosphere. The boundary between the Troposphere and Stratosphere is the tropopause, and the boundary between the Stratosphere and Thermosphere is the stratopause.

Beyond the tropopause is the stratosphere. The stratosphere extends up to a height of about 50 kilometers or 30 miles. As altitude increases in the stratosphere, temperature also increases. The increase in temperature in the stratosphere is due to the concentration of ozone gas that absorbs ultraviolet radiation from the Sun. The upper limit of the stratosphere is called the stratopause.

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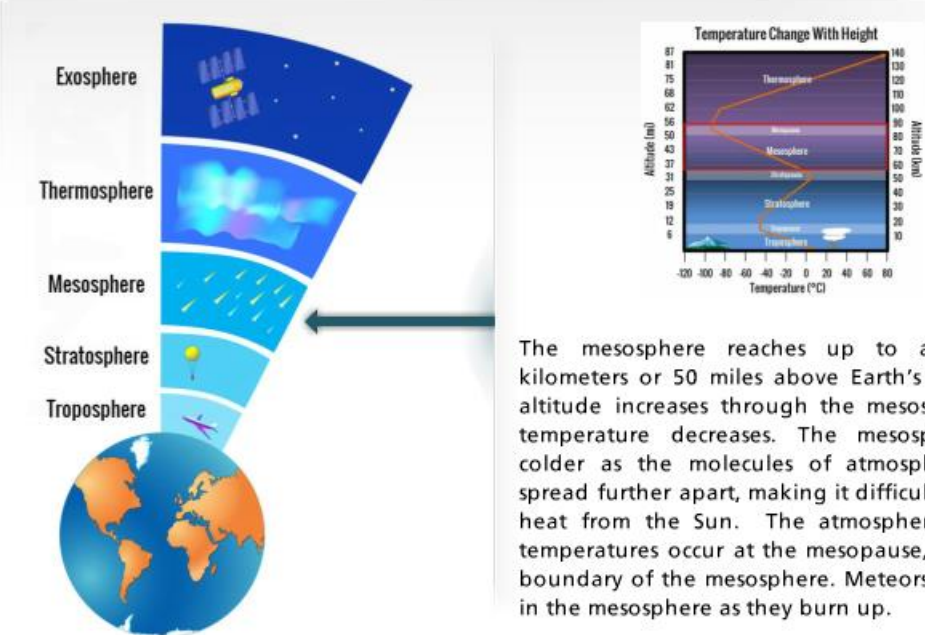
Module 11: Meteorology

Topic 1 Content: Layers of the Atmosphere Notes

Mesosphere

Layers of the Atmosphere

Mesosphere



The diagram on the left shows the five layers of the atmosphere: Exosphere, Thermosphere, Mesosphere, Stratosphere, and Troposphere. The Mesosphere is highlighted with a blue background and contains an illustration of a meteor streaking across the sky. The graph on the right, titled 'Temperature Change With Height', shows temperature in degrees Celsius on the x-axis (ranging from -120 to 60) and altitude in meters on the y-axis (ranging from 0 to 87). The graph shows a decrease in temperature in the troposphere, a slight increase in the stratosphere, a sharp decrease in the mesosphere, and a sharp increase in the thermosphere. The mesosphere is labeled as the layer where meteors burn up.

The mesosphere reaches up to around 80 kilometers or 50 miles above Earth's surface. As altitude increases through the mesosphere, the temperature decreases. The mesosphere gets colder as the molecules of atmospheric gases spread further apart, making it difficult to absorb heat from the Sun. The atmosphere's coldest temperatures occur at the mesopause, the upper boundary of the mesosphere. Meteors are visible in the mesosphere as they burn up.

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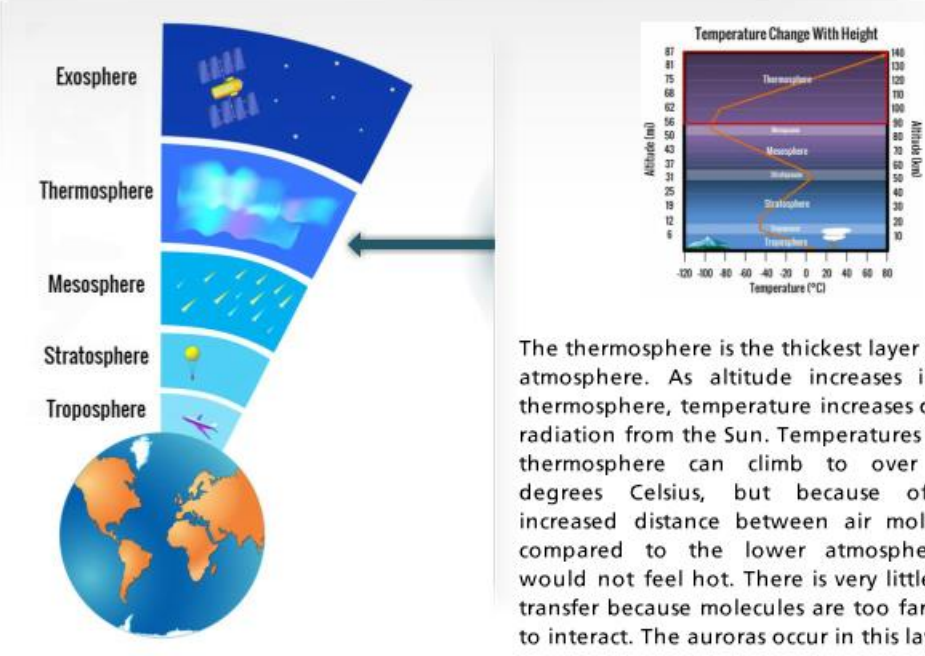
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Topic 1 Content: Layers of the Atmosphere Notes

Thermosphere

Layers of the Atmosphere

Thermosphere



The diagram on the left shows the five layers of the atmosphere: Exosphere, Thermosphere, Mesosphere, Stratosphere, and Troposphere. The Thermosphere is highlighted in blue and contains an illustration of the aurora borealis. To the right, a graph titled 'Temperature Change With Height' plots altitude in meters (0 to 146) against temperature in degrees Celsius (-120 to 60). The graph shows temperature increasing in the troposphere, decreasing in the stratosphere, increasing in the mesosphere, and increasing sharply in the thermosphere.

The thermosphere is the thickest layer of the atmosphere. As altitude increases in the thermosphere, temperature increases due to radiation from the Sun. Temperatures in the thermosphere can climb to over 1000 degrees Celsius, but because of the increased distance between air molecules compared to the lower atmosphere, it would not feel hot. There is very little heat transfer because molecules are too far apart to interact. The auroras occur in this layer, as solar radiations strikes freely floating ions.

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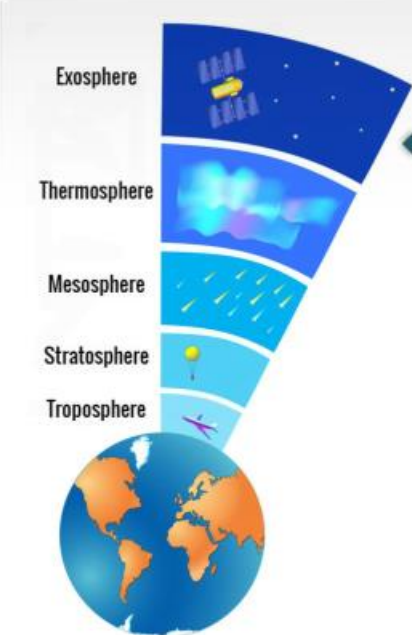
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Topic 1 Content: Layers of the Atmosphere Notes

Exosphere

Layers of the Atmosphere

Exosphere



The diagram shows a cross-section of the Earth's atmosphere. At the bottom is a globe of the Earth. Above it are five layers of the atmosphere, each with a different color and icon: Troposphere (light blue, airplane), Stratosphere (medium blue, hot air balloon), Mesosphere (darker blue, meteor), Thermosphere (very dark blue, aurora), and Exosphere (darkest blue, satellite). An arrow points from the text box to the Exosphere layer.

The uppermost region of the Earth's atmosphere is called the exosphere. This layer of the atmosphere is not shown on the temperature profile as it is located at 600 km above the surface of Earth. The temperature of this layer is constant and it is almost the same as the void of outer space.

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