**Troposphere Facts**

The troposphere is one of five layers of the atmosphere surrounding the earth. The other four layers include the stratosphere, mesosphere, thermosphere, and exosphere. The troposphere is the lowest layer of the atmosphere, closest to the earth's surface. Its depth is different at different regions of the earth, being deeper in the warmer regions and shallower in the colder regions. The word 'troposphere' is derived from the Greek word 'Tropos' which means 'change'. This name represents the extensive turbulence and constant change in the weather within the troposphere itself. The weather we experience on a daily basis on earth occurs mostly in the troposphere.

Interesting Troposphere Facts:

The troposphere is located closest to the earth, followed by the stratosphere, mesosphere, thermosphere, and the exosphere.

The transitional area between the troposphere and stratosphere is called the tropopause. The jet stream or 'river of air' as it is also referred to, is located just below the tropopause and moves at approximately 250 miles per hour.

The troposphere extends from the earth's surface to approximately 33,000 feet (6.2 miles) high. However in warm regions like the equator it can rise as high as 65,000 feet (12 miles). In colder regions like the north and south poles, it may rise only as high as 23,000 feet (4 miles).

The depth of the troposphere varies among regions, and is affected by the season, time of day, and latitude.

The air in the troposphere is warmest closest to the earth and colder at higher elevations.

As an airplane flies higher in the sky the air density and air pressure decreases. Airplanes and jets that fly at high altitudes must be pressurized to account for these changes.

Most of the dust particles in the earth's atmosphere are found in the troposphere.

Most of the water vapor in the earth's atmosphere is found in the troposphere, which is the reason why most of the clouds in earth's atmosphere are also found in the troposphere.

The troposphere is not heated directly from the sun. Instead, the sun heats the ground and the ocean and this heat is then radiated into the troposphere.

The weather we experience on earth, including rain, thunderstorms, lightning, wind, tornadoes, hurricanes, typhoons and even gentle breezes, occur within the troposphere.

The troposphere is made up of approximately 78% nitrogen, 21% oxygen, and 1% other gases, which include carbon dioxide, methane, neon, krypton, argon, helium, and hydrogen.

The troposphere contains approximately 99% of the water vapor in the earth's entire atmosphere.

Despite the fact that only a small percentage of the troposphere's gas is carbon dioxide, this is the determining factor in whether the earth is warm or whether it experiences an ice age. More carbon dioxide equals warmer temperatures while too little will result in another ice age.

At sea level the air pressure is at its maximum. As one goes higher up, away from sea level, the pressure decreases. So does the amount of oxygen. This is why mountain climbers and others who venture to higher altitudes require oxygen to breathe and to stay alive.

**Stratosphere Facts**

The stratosphere is one of five layers of the earth's atmosphere. The other four layers include the troposphere, mesosphere, thermosphere, and exosphere. The stratosphere the atmosphere's second layer, and is located right above the troposphere and right below the mesosphere. Just like the troposphere, its depth varies with latitude. The stratosphere can be as deep 20 miles or as shallow as 5.5 miles. Unlike the troposphere however it is colder closer to the earth and warmer as it gets closer to the mesosphere. The stratosphere is abundant in ozone, a type of oxygen molecule that absorbs the sun's ultraviolet radiation and uses it to heat this layer in the atmosphere.

Interesting Stratosphere Facts:

The stratosphere is one of five layers of the atmosphere. The atmosphere is one of four spheres of the earth, which include the atmosphere, the hydrosphere, the biosphere, and the lithosphere.

The word 'stratosphere' is derived from the word 'strato' meaning layer, and 'sphere' which is earth's shape.

The stratosphere accounts for approximately 24% of the earth's total atmosphere.

The stratosphere contains approximately 19% of the earth's total atmospheric gases.

90% of the ozone layer is found in the stratosphere's upper crust. This ozone layer is important for man's survival, and for the survival of life on earth, as it absorbs the UV radiation from the sun that would otherwise be deadly.

Scientists have been warning people for many years about the damage we are doing to the ozone layer. Planting trees is one of the efforts that people have done to try to minimize damage and to help rebuild the damaged ozone layer.

Damage to the ozone layer of the stratosphere occurs naturally when volcanic gases and dust reach the stratosphere, but people have been contributing to this as well with the use of aerosol's containing CFCs.

The holes in the ozone layer have been recorded above the Antarctica seasonally, as well as in other parts of the world.

Ozone is important for ensuring that just the right amount of ultraviolet radiation reaches the earth. This UV radiation is important for the production of vitamin D in humans, but too much can destroy tissue.

The amount of water vapour in the stratosphere is very low, and because of this there are no clouds in the stratosphere.

Airplanes fly in the stratosphere to avoid turbulence. Planes that are low on fuel also fly at this altitude because they can cover more distance than in the troposphere while using less fuel and encountering less turbulence.

There are forms of biological bacteria living in the stratosphere.

There are some species of birds capable of flying in the stratosphere.

It is possible to send research balloons into the stratosphere. Some researchers and even students have sent helium balloons with cameras to record the stratosphere.

Although on average the stratosphere begins at about 7 miles up from the earth's surface, it can range from 5 miles at the earth's poles, to 6-8 miles at moderate latitudes, to 11 miles at the equator. Its depth also varies from 5.5 to 20 miles depending on latitude as well.

**Mesosphere Facts**

The mesosphere is one of five layers of the atmosphere surrounding the planet earth. The other four layers include the troposphere, stratosphere, thermosphere, and exosphere. The mesosphere is located approximately 50km from the earth's surface and extends as far as 85km from the earth's surface. The mesosphere is located above the stratosphere and below the thermosphere. And it is third layer, located above the troposphere and stratosphere. The word 'mesosphere' is derived from the Greek words 'mesos sphaira' that literally translate to 'middle sphere'. The mesosphere is too high for weather balloons or airplanes and too low for satellites, making it difficult to study, however scientists are able to use research rockets capable of short trips for specific experiments.

Interesting Mesosphere Facts:

Due to high atmospheric drag in the mesosphere it is not possible for research equipment such as satellites to stay in orbit.

The mesosphere is very important for earth's protection. The mesosphere burns up most meteors and asteroids before they are able to reach the earth's surface.

It is estimated that approximately 40 tons of meteors fall towards earth each day, and the mesosphere is responsible for burning them up before they reach the earth and cause damage to its surface.

As meteors burn up they can sometimes be seen in the night's sky. Most people call them shooting stars.

The mesosphere's atmosphere is low density and made up of oxygen, carbon dioxide, and nitrogen.

Although most of the meteors that reach the mesosphere are burned up, some of their material hangs around afterwards, including iron and other metallic atoms.

The temperature of the mesosphere becomes colder as the distance from the earth increases. The temperature can drop to -140 degrees Celsius however at its warmest level, depending on season, the temperature can reach -5 degrees Celsius.

The mesosphere is the coldest atmospheric layer surrounding the earth. It becomes cold enough to freeze water vapour in its atmosphere into ice clouds. These ice clouds are blue-white and are called noctilucent clouds or polar mesospheric clouds. These clouds are more visible at sunset from the earth's poles.

The mesosphere experiences atmospheric gravity waves, atmospheric tides, planetary waves, and strong winds that flow from north to south and east to west called zonal winds.

The research rockets used to study the mesosphere are also called sounding rockets. These rockets are often made with surplus military rocket motors.

A strange type of lightning occurs in the mesosphere. This lightning is referred to as 'sprites' or 'elves'.

Together the layers of the atmosphere help to protect the earth from greenhouse gases, working like a blanket of insulation surrounding the planet.

The atmosphere around the earth, including the mesosphere, helps to keep the earth's climate and weather patterns as regular as possible.

The area where the mesosphere transitions into the thermosphere is called the mesopause. This is the coldest area of the mesosphere.

In the lower mesosphere the zonal winds blow from the north to the south, while in the upper mesosphere they blow from east to west.

**Thermosphere Facts**

The thermosphere is one of five layers of the earth's atmosphere. The other four layers include the troposphere, stratosphere, the mesosphere, and exosphere. The thermosphere is the atmosphere's fourth layer, located above the mesosphere and below the exosphere. The thermosphere begins at a distance of approximately 53-56 miles above the earth's surface and extends to between 311 and 621 miles from the earth, where the exosphere begins and extends into space. Just as in the stratosphere, the temperature in the thermosphere increases as the distance from earth becomes greater. The word 'thermosphere' is derived from the Greek word 'thermo' which means 'heat.' The temperature at the thermosphere's greatest height can reach more than 2000 degrees Celsius.

Interesting Thermosphere Facts:

The temperature in the thermosphere is largely influenced by solar activity. The time of day also affects the temperature, with higher temperatures in the day than at night - similar to the earth's surface, but much, much hotter.

The transitional area between the thermosphere and mesosphere is referred to as the mesopause.

The transitional area between the thermosphere and the exosphere is referred to as the thermopause.

Although still considered part of the earth's atmosphere, the thermosphere has such low air density that it is often considered to be part of space.

The International Space Station and the space shuttle orbit the earth in the thermosphere layer of earth's atmosphere. The International Space Station is located approximately 200 to 240 miles from earth's surface.

The main components of air in the thermosphere include helium, atomic nitrogen, and atomic oxygen.

The thermosphere absorbs a lot of the UV radiation and X-ray given off by the sun. When the sun is more active and the thermosphere heats up more, this layer of earth's atmosphere increases in size.

Much of the circulation in the thermosphere occurs because of the tides and waves in earth's atmosphere.

One of the most amazing sky phenomena occurs mostly in the thermosphere. It is called the aurora borealis or northern/southern lights.

The northern or southern lights occur when ions, protons, and electrons from space collide with the molecules and atoms in the thermosphere, creating high energy that emits light. These light displays are the northern and southern lights.

The thermosphere is the largest layer of the earth's atmosphere.

Although it is known that temperatures in the thermosphere can reach 2000 degrees Celsius or more, actually reading the temperature is difficult for scientists. This is because the air is so thin.

In order to measure the thermosphere's temperature, scientists measure its air density which helps to determine temperature.

The charged particles in the thermosphere make it easier for long distance communication via radio.

Because outer space is believed to begin at 62 miles above the earth's surface, the thermosphere could be considered part of space.

When large magnetospheric storms occur in the thermosphere's atmospheric layer, thermospheric storms are produced.

It is estimated that approximately 99.99% of the earth's atmosphere is below the thermosphere, despite its size. This is because the air is so thin.

**Exosphere Facts**

The exosphere is one of the five layers of earth's atmosphere. The other layers include the troposphere, stratosphere, mesosphere, and thermosphere. The exosphere is the fifth and outermost layer of the atmosphere, beginning at the upper boundary of the thermosphere and lower exosphere, referred to as exobase, exopause, and the 'critical altitude'. Because the upper boundary of the thermosphere varies from 311 to 621 miles, the beginning point of the exosphere also varies within this distance. The word 'exosphere is derived from the Greek word 'exo' meaning 'outside' or 'external.' Where the exosphere ends space begins.

Interesting Exosphere Facts:

The exosphere begins at a distance of 311 to 621 miles from the earth's surface, and ends at approximately 6200 miles from the earth's surface.

Although the exosphere is the most distance layer of earth's atmosphere it is the layer that is the planet's first line of defense against the sun's rays. It is also the first layer to come into contact and protect the earth from meteors, asteroids, and cosmic rays.

The temperature in the exosphere varies greatly and can range from 0 to over 1700 degrees Celsius. It is colder at night and much hotter during the day.

The air in the exosphere is very thin, and is made up mostly of helium, and hydrogen. Traces of other gases such as atomic oxygen and carbon dioxide can also be found.

The upper level of the exosphere is the farthest point from earth that is still affected by earth's gravity. However this distance would be halfway to the moon, and is only considered to be true in a technical sense. Because of this the true boundary of the exosphere is debatable among scientists.

If the boundary of the exosphere is considered to be where it is still affected by earth's gravity then the exosphere would be the largest part of earth's atmosphere. If the boundary of the exosphere is considered to be approximately 6200 miles from the earth's surface, as many believe, then the thermosphere is the largest portion of the earth's atmosphere.

The geocorona is the name for the exosphere's part that is seen from earth.

The exosphere is perfect for placing satellites as there is very little friction and they are able to orbit fairly easily without being disrupted.

Most of the molecules that exist in the exosphere end up being pulled back into earth's lower atmospheric levels by gravity. Some do make it into outer space however because of the low level of gravity and pressure in the exosphere.

The pressure in the exosphere is created by solar wind storms that compress it.

The exosphere extends into a black/dark blue region beyond the earth, while the mesosphere is dark blue, and closer to the earth are the cloudy areas of the stratosphere and troposphere.

Because the air is so thin in the exosphere the molecules do not collide like they do in lower layers of the atmosphere. Most of the molecules make it back into lower layers of the atmosphere but some zoom out into space instead.