Ionosphere Encyclopedia Article

Ionosphere

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Contents

Ionosphere Encyclopedia Article.....1

Contents.....2

Ionosphere.....3

Ionosphere

The ionosphere is a layer of the earth's atmosphere that is weakly ionized, and thus conducts **electricity**. It is located approximately in the same region as the top half of the **mesosphere** and the entire **thermosphere** in the upper atmosphere, from about 40 mi (60 km), continuing upward to the magnetosphere.

In the ionosphere, the molecules and atoms in the air are ionized mostly by the Sun's ultraviolet, x-ray, and corpuscular radiation, and partially by cosmic rays, resulting in ions and free electrons. The ionization process depends on many factors such as the Sun's activity (e.g., sunspot cycles), time (e.g., seasonal or daily changes), or geographical location (different at polar regions, mid-latitudes or equatorial zones).

The ionosphere can be further divided into sub-regions according to their free electron density profile that indicates the degree of ionization, and these sub-regions are called the D, E, and F layers. The D layer is located lowest among them, and it does not have an exact starting point. It absorbs high-frequency radio waves, and exists mainly during the day. It weakens, then gradually even disappears at night, allowing radio waves to penetrate into a higher level of the ionosphere, where these waves are reflected back to Earth, then bounce again back into the ionosphere. This explains why AM radio signals from distant stations can easily be picked up at night, even from hundreds of miles. Above the D layer, the E layer (or Kennelly-Heaviside layer) can be found, which historically was the first one that was discovered. After sunset, it usually starts to weaken and by night, it also disappears. The E layer absorbs x rays, and it has its peak at about 65 mi (105 km). The F layer (or Appleton layer) can be found above the E layer, above 93 mi (150 km), and it has the highest concentration of charged particles. Although its structure changes during the day, the F layer is a relatively constant layer, where extreme ultra-violet radiation is absorbed. It has two parts: the lower F1 layer, and the higher and more electron-dense F2 layer.

The free electrons in the ionosphere allow good propagation of electromagnetic waves, and excellent radio communication. The ionosphere is also the home for the aurora, a light display mostly in the night sky of the polar areas, caused by excited and light-emitting particles entering the upper atmosphere.

See Also

Atmospheric Composition and Structure; Aurora Borealis and Aurora Australialis