What is the thermosphere made out of

A layer of Earth's atmosphere above the mesosphere and below the Earth's atmospheric diagram of the Earth's atmosphere, showing all the layers of the atmosphere to expand the Thermosphere, is the layer in the Earth's atmosphere just above the mesosphere and under the exosphere. In this layer of the atmosphere, ultraviolet radiation causes photoionization / photodissocitation of molecules, creating ions; thus, the thermosphere represents most of the ionosphere. As its name from the Greek περμίς (pronounced thermos), which means heat, the thermosphere begins about 80 km above sea level. At these high altitudes, residual atmospheric gases are sorted in layers according to molecular mass (see turbosphere). The temperature of the thermosphere increases with altitude due to the ingestion of highly energetic solar radiation. Temperatures are highly dependent on solar activity and can lead to 1700 °C or more. Radiation causes the particles of the atmosphere in this layer to become electrically charged particles, allowing radio waves to be broken and thus obtained beyond the horizon. In the exosphere, starting at about 600 km (375 miles) above sea level, the atmosphere becomes an area, although through the assessment criteria set for determining the Cardman line, the thermosphere itself is part of space. The highly attenuated gas in this layer can reach 2,500 °C during the day. Despite the high temperature, an observer or object will experience low temperatures in the thermosphere, because the extremely low gas density (practically solid vacuum) is insufficient for molecules to conduct heat. A normal thermometer will account for well below 0 °C , at least at night, because the energy lost by heat radiation would exceed the energy obtained by the atmospheric gas by direct contact. In the analystic zone over 160 km (169 miles), the density is so low that molecular interactions are too rare to allow the transmission of sound. The dynamics of the thermosphere are dominated by atmospheric tides, which are mainly driven by diuretic heating. Atmospheric waves dissipate above this level due to a collision between neutral gas and yonospheric plasma. The thermosphere is completely uninhabited except for the International Space Station. The International Space Station orbits the Earth in the middle of the thermosphere, between 408 and 410 kilometers. Neutral gas constituents are convenient to divide into atmospheric regions in accordance with the two temperature minimums at about 12 km altitude (tropafusate) and in about 85 km (meopause) (Figure 1). The thermosphere (or upper atmosphere) is the area of height above 85 km, while the region between the tropopause and the mesopaus is the average atmosphere (stratosphere and mesosphere), where the absorption of solar ultraviolet radiation generates a maximum temperature of nearly 45 km in height and causes the ozone layer. 1. Nomenclature of atmospheric regions based on the profiles of electrical conductivity (left), temperature (middle) and density of electronic number in m-3 (right) The density of the Earth's atmosphere decreases almost exponentially with altitude. The total mass of the atmosphere is M = rTA H ≃ 1 kg/cm2 in a column with a square centimeter above the ground (with rA = 1,29 kg/m3 the atmospheric density of the ground at z = 0 m altitude and H ≃ 8 km the average height of the atmospheric scale). 80% of this mass is concentrated in the troposphere. The mass of the thermosphere over 85 km is only 0.002% of the total mass. Therefore, no significant vigorous feedback from the thermosphere to the lower atmospheric regions can be expected. Turbulence causes air in lower atmospheric regions under the turbocharged about 70 miles (110 km) to be a mixture of gases that do not change its composition. Its average molecular weight is 29 g/mol with molecular oxygen (O2) and nitrogen (N2) as the two dominant ingredients. Above the turbocharger, however, the diffuse separation of the different ingredients is significant so that each ingredient follows its barometric height, the height of the scale being opposite to its molecular weight. The atomic oxygen of the lighter (O), helium (He) and hydrogen (H) consistently dominate over about 200 km above sea level and vary according to geographical location, weather and solar activity. The N2/O ratio, which is a measure of the volumetric density of the electron in the yonosphere region, is strongly affected by these differences. [3] These changes are a consequence of the distribution of small constituents through the main gas component during dynamic processes. The thermosphere contains a noticeable concentration of elemental sodium, located in a 10-kilometre range that appears on the edge of the mesosphere, 80 to 100 km above the Earth's surface. Sodium has an average concentration of 400,000 atoms per cubic centimeter. This strip is regularly supplemented by sodium sublimation from incoming meteorites. Astronomers have begun using this rub to create leading stars as part of the optical correction process in the production of ultra-sharp ground observations. [4] Energy budget The thermosphere can be determined by density observations as well as by direct satellite measurements. The temperature relative to the height z of a figure. 1 can be simulated using the so-called Bates profile:[5] (1) T = T ∞ – (T ∞ − T ∞ − T – 0) s (z − z 0) {\displaystyle T=T_ e^/\infty}T_∞ z_{0} T_{0} with T∞ exospheric temperature above about 400 km above altitude, Up to = 355 K, and zo = 120 km reference temperature and height, and is an empirical parameter depending on T∞ and decreases by T∞. This formula is obtained from a simple equation of thermal conductivity. One estimate is of total heat output from Qo≃ 0.8 to 1.6 mW/m2 above zo = 120 km altitude. In order to obtain equilibrium conditions, this input heat qo above zo is thermal conductivity. Exopheric temperature T∞ is a fair measurement of solar XUV radiation. Since solar radio emission F at a wavelength of 10.7 cm is a good indicator of solar activity, the empirical formula for quiet magnetospheric conditions can be applied. [6] T ∞ ≃ 500 + 3.4 F 0 {\disttitil T_{\infty}\simeq 500+3.4F_{0}} with T∞ in K, Fo at 10-2 W m-2 Hz-1 (Kovachever's index) is averaged for several solar cycles. The Covaston index typically ranges between 70 and 250 during a solar cycle, and never falls below 50. Thus, T∞ varies between 740 and 1350 K. Under very quiet magnetospheric conditions, the still continuously flowing magnetospheric energy contributes about 250 K to the residual temperature of 500 K in eq.(2). The rest of 250 K in eq.(2) can be explained by atmospheric waves generated in the troposphere and dissipated in the lower thermosphere. Solar XUV radiation The sun's X-rays and extreme ultraviolet radiation (XUV) at wavelengths < 170 nm are almost completely absorbed into the thermosphere. This radiation causes different iosphere layers, as well as an increase in temperature at these heights (Figure 1). While solar visible light (380 to 780 nm) is almost constant with variability of no more than about 0.1% of the solar constant,[7] solar XUV radiation is highly variable in time and space. For example, X-ray bursts associated with solar flares can dramatically increase their intensity above pre-flute levels by a very order over the course of some time in tens of minutes. In extreme ultraviolet light, Lyman α line at 121.6 nm is an important source of ionization and dissociation at a high level of the ionosphere D. [8] During the quiet periods of solar activity, it contains more energy than the rest of the XUV spectrum. Quasi-periodic changes in order of 100% or more, with periods of 27 days and 11 years, belong to the prominent variations of solar XUV radiation. However, irregular fluctuations on all time scales are present all the time. [1] During low solar activity, about half of the total energy input into the thermosphere is considered solar XUV radiotherapy. The energy input from the XUV sun takes place only during the day, maximizing the equator during the equinox. Solar wind The second source of energy used in the thermosphere is solar wind energy, which is transferred into the magnetosphere through mechanisms that are not well understood. One possible way to transfer energy is through a hydrodynamic dynamo process. Particles from the sun penetrate the polar parts of the magnetosphere, where the geomagnetic lines of the field are vertically directed. An electric field is generated, directed from dawn to dusk. Along the last closed geomagnetic lines with their foot in the evoy areas aligned to the field, electrical currents may flow into the ionofer dynamo region, are closed by electric pedersen and Hall. Hall. the losses of pedersen currents heat the lower thermosphere (see, for example, magnetospheric electrical convection field). Also, the penetration of high-ergic particles from the magnetosphere into the radiant regions dramatically improves electrical conductivity, further increasing electrical currents and thus joule heating. During the quiet magnetosphere, the magnetosphere contributes a quarter to the energy budget of the thermosphere. [10] This is about 250 K of exospheric temperature in eq.(2). However, during very high activity, this heat can increase significantly, with a factor of four or more. This wind occurs mainly in the polar meadows during the day and night. Atmospheric waves Two types of large atmospheric waves in the lower atmosphere exist internal waves with extreme vertical wavelengths that can transport the energy of the wave upwards; and external waves with infinitely large wavelengths that cannot transport the energy of the waves. [10] Atmospheric waves and tides fall to the inner waves. Their amplitudes increase exponentially in height, so that in mesopause these waves become turbulent and their energy dissipates (similar to the destruction of ocean waves along the coast), thereby contributing to heating the thermosphere by about 250 K in eq.(2). On the other hand, the main daily tide with the inscription (1, −2), which is most effectively excited by solar radiation, is an external wave and has only a negligible role in the lower and middle atmospheres. However, at thermospherical heights, it turns into the prevailing wave. It drives the electric so-called black hole. Heating, mainly through tidal waves, occurs mainly at lower and middle latitudes. The variability of this heating depends on the weather conditions in the troposphere and the average atmosphere and can not exceed about 50%. Dynamic Figure 2. Schematic cross-sectional section of the height of the meridian of the symmetrical part of wind (P20), (b) of an antisymmetric component (P10) and (d) of the symmetrical two-day wind component (P11) at 3 h and 15 h local time. The upper right panoramic vins (c) shows the horizontal vectors of the wind part of the daily component in the northern hemisphere depending on the local weather. Within the thermosphere above about 150 km in height, all atmospheric waves consistently turn into external waves and no significant vertical wave structure is visible. Atmospheric wave modes are degenerate to spherical functions Pnm with m wave meridian number and n: zone tendency flow; m = 1: daily tides; m = 2: seminal tides, etc.). The thermosphere becomes an oblique oscillator system with low-frequency filter characteristics. This means that smaller waves (higher numbers (n,m)) and higher frequencies are suppressed in favour of large waves and lower frequencies. If you are very quiet magnetospheric disturbances and constant average exospheric temperature (averaged in the sphere), the observed time and spatial distribution of exospheric temperature distribution can be described by a sum of spherical functions:[12] (3) T (φ , λ , T) = T ∞ { 1 + Δ T 2 0 P 2 0 (φ) + Δ T 1 0 P 1 0 (φ) by [ω a ~ t ~ t)] + Δ T 1 1 P 1 (φ) by (τ) + ⋯ } {\ indicates style T(\varphi , t)=T_{\infty}\{1+\Delta T_{2}^{0}P_{2}^{0}(\varphi)+\Delta T_{1}^{0}P_{1}^{0} (\varphi)\[\omega_{a}(t-t_{a})]+\Delta T_{1}^ {1}P_{1}^ {1}(\varphi)\cos(\tau_\{d})+\cdots \}} Here, φ is latitude, λ length, and t time, ωa the angular frequency of a year, ωd the angular frequency of a sunny day and τ = ωdt + λ local time. ta = 21 June is the date of the northern summer solstice, and τd = 15:00 is the local time of the maximum daily temperature. The first term in (3) on the right is the global average exospheric temperature (in the order of 1000 K). The second term [with P20 = 0.5(3 sin2(φ)−1)] is a heat surplus at lower latitudes and corresponding heat deficiency at higher latitudes (Fig. 2a). Thermal wind system develops with wind to the poles in the upper level and winds away from the poles in the lower floor. The coefficient ΔT20 ≈ 0.004 is small because the heating of Joule in the glow regions compensates that the overflow of heat even under quiet magnetospheric conditions. However, under disturbed conditions, this term becomes a dominant, changing sign, so now a thermal excess is transported from the poles to the equator. The third term (with P10 = sin φ) is an excess of heat in the summer hemisphere and is responsible for transporting excess heat from summer to the winter hemisphere (Fig. 2b). Its relative amplitude is in the order of ΔT10 ≃ 0.13. The fourth term (with P11(φ) = cos φ) is the dominant depth wave (tidal mode (1,−2)). It is responsible for transporting excess heat from the daily hemisphere to the night hemisphere (Fig. 2d). The relative amplitude is ΔT11≃ 0.15, so in order of 150 K. Additional conditions (e.g. semi-annual, semi-terms and higher order terms) must be added to eq.(3). However, they are of negligible importance. The corresponding amounts can be developed for density, pressure and the different gas constituents. [6] Thermospherical storms, unlike solar XUV radiation, magnetic disturbances indicated on the ground by geomagnetic variations show unpredictable impulsiveness, from short periodic disturbances from the order of hours to prolonged giant storms lasting several days. The reaction of the thermosphere to a large magnetospheric storm is called a thermosphere storm. Since the heat input into the thermosphere takes place at high latitudes (mainly in the meadows of symmetry), the heat transfer is represented by the term P20 in eq.(3) is reversed. Also, due to the impulsive form of interference caused by however, which have short break-up times and thus quickly disappear. The sum of these modes determines the travel time of the interference in the lower latitudes and thus the reaction time of the thermosphere in relation to the magnetospheric disturbance. Important for the development of a yonospheric storm is the increase in the N2/O ratio during a thermospherical storm in medium and higher latitude. [14] An increase in N2 increases the process of loss of yonospheric plasma and leads to a decrease in electrical volume within the ionospheric F-layer (negative yonospheric storm). References ^ Duxbury & quot;Duxbury":. Introduction to the world's oceans. 5ed. (1997) ^ The temperature at which iron melts ^ Pröles, G.W., and M. K. 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