The thermosphere: a part of the heterosphere

The heterosphere is the atmospheric region where the composition is not homogeneous. The transition with the homosphere is located on the average at about the 100 km altitude where turbulent mixing is no more sufficient to maintain the air homogeneous. Molecular diffusion becomes the main phenomena. The number density of each atmospheric constituent decreases with height at a rate which is directly proportional to its mass: the concentration of heavy constituents (O2 and N2) decrease faster than that of light constituents (O, He and H) in such a way that the relative abundances of the latter continuously increase with height. On going upward, one meet several belts where molecular nitrogen, atomic oxygen, helium and hydrogen successively become the main constituent. The boundaries of these belts vary with the temperature linked itself to the level of solar activity.

Between the altitudes of 100 and 150 km, molecular oxygen is a strong absorber of solar extreme ultraviolet radiation at wavelengths between 100 and 200 nm: the resulting thermal effect is a large increase of the temperature with height in a region called the thermosphere and located immediately above the mesosphere. In the same time, many oxygen molecules (O2) dissociate into two oxygen atoms (O). Atomic oxygen becomes a main constituent.

Taking into account of the heat transport by conduction, vertical profiles of the temperature can be calculated, depending also on diurnal and solar activity conditions. "Thermopause" is the name of the level at which the temperature stops rising. Its height depends on the solar activity and is located between 250 and 500 km. Above the thermopause, the atmosphere is isothermal and the temperature can take values between 300°C and 1600°C. The so great amplitude of the temperature variations is linked to the extreme dilution of the atmosphere at these altitudes. The isothermal region has no specific name; it is usual to assimilate it also to the thermosphere at least up to the critical level where begins the exosphere.