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The Coronal Heating Process

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One of the "Big Questions" of the solar physics, which are listed on the NASA's website

(http://science.nasa.gov/ssl/PAD/SOLAR/quests.htm) is the unsolved heating mechanism of the Sun corona. The aim of this study is to present the mechanism leading to the observed distribution of temperature in the Sun's corona.

On the base of the basic laws of thermodynamics we must draw a conclusion that the free way between the collisions for the particles of the solar gas is the longest towards the decreasing pressure, i.e. towards the space vacuum. The most probable direction of movement for the particles is therefore the direction "from the Sun towards the space vacuum". This anisotropy of thermal movements causes that the fastest i.e. the hottest particles of the solar gas run away from the Sun the fastest (with the biggest velocity). The initial increase of the chromosphere's temperature is caused by the escape of the fastest electrons. Because of the smaller radius they have much bigger free way between the collisions, what allows them to transfer their kinetic energy to the higher layers of the chromosphere. Similar escape of the hottest atoms and ions in the transitional layer causes acceleration of the increase of the temperature in the gas of the Sun corona.

The rapid temperature's increase of the Sun's atmosphere's gas is therefore the effect of the escape of the fastest (the hottest) particles towards the decreasing pressure, i.e. towards the space vacuum.

The intensive escape of the hot (fast) electrons and ions in the magnetic field of the sunspots causes that the temperature of corona above the active regions is much higher (over 2,000,000˚C) than the temperature of coronal holes (ca. 1,000,000˚C). From the above described mechanism we can draw a conclusion that after the disappearance of the magnetic field of the sunspots the hot chromosphere's gas "evaporates" into the

space vacuum. Because the fast electrons and atoms have been "pumped out" from the lower layers to the chromosphere and the corona, then after the "evaporation" of the hot chromosphere's gas in the place of the active regions the mean kinetic energy of the particles (i.e. temperature) of the chromosphere and the Sun corona decreases. The lack of the fastest electrons is also the cause of decrease of the intensity of X-radiation. Therefore, it means that after the disappearance of the magnetic field of the sunspots the active regions change into the coronal holes. Confirmation of this mechanism is the, observed already in 1973 by *Skylab*, correlation of periods of fast solar wind with the rotation of coronal holes. Long-term observations of the active regions of Sun's atmosphere will certainly prove the unmistakable space correlation between the active regions and following them coronal holes. The process of heating and evaporating of the gas above the active regions of the Sun's atmosphere is therefore very similar to the well known in physics process of liquids' boiling. The only difference is that the solar gas is open from the side of the space vacuum.

As we can see, the increase of temperature of chromosphere and the Sun corona is not exactly the same process of heating, i.e. providing energy to the system, that we know from physics. It is a process of pushing out into the space vacuum the particles having the biggest velocity, i.e. the biggest kinetic energy in a gas opened from one side to the space vacuum.

Every hydrogen atom remains as long in the transitional layer as after sufficiently strong collision under the proper angle flies into the space vacuum as a particle of the solar wind.

This "final collision" is the final thermodynamic contact of the Sun matter atoms with their mother star and subsequently the beginning of their journey through the infinite Universe.