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Cosmic ray accelerator in the inhomogeneous heliosphere and its impact on the inhabitants of the Earth

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Using the helio-sphere as an example, we have investigated the hypothesis that stellar winds or cosmic rays originate in stars and accelerate in their star spheres in electric field shock waves. We have proved that a nonequilibrium inhomogeneous giant gas discharge occurs in the helio-sphere at large values of the parameter E/N, which determines the electron temperature. This quasi-stationary discharge determines the main parameters of the slow solar wind (SW) in the helio-sphere. In connection with the development of space technologies and the exit of man into outer space, the problem of the nature of SW is acute. The Pannekoek-Rosseland-Eddington model does not take into account the important role of high-energy runaway (from the Sun) electrons and, accordingly, the duality of electron flows in the helio-sphere (from the Sun and towards the Sun). According to the alternative model formulated by us, high-energy (running away from the positively charged Sun) electrons leave the Sun and the helio-sphere, and low-energy, unable to leave the Coulomb potential well - the positively charged Sun and the helio-sphere, return to the positively charged Sun. The weak difference between the counter currents of high-energy (running away from the Sun) electrons and low-energy (returning to the Sun) electrons is compensated by the current of positive ions and protons from the Sun - SW. These dynamic processes maintain a quasi-constant effective dynamic charge of the Sun and the entire helio-sphere. Quasi-neutrality on the Sun and the helio-sphere is well performed up to 10*-36. According to experiments and analytical calculations based on our model [1]: 1) the plasma in the corona is non-equilibrium; 2) maximum electron temperature Te ˜ 1-2 million degrees; 3) Te increases from 1000 km from the Sun and 4) the role of high-energy electrons emitted from the plasma leads to a significant increase in the effective: solar charge and electric fields in the helio-sphere in relation to the Pannekoek-Rosseland-Eddington model. This is due to the absence of a compensation layer screening the effective solar charge. It does not form due to the runaway of high-energy electrons from the entire helio-sphere with high temperatures above the surface of the Sun. The runaway process of high-energy electrons forms the internal EMF of the entire helio-sphere and a giant accelerator of protons and α-particles in the SW. This process manifests itself in the generation of two counter streams of particles: 1) neutral or with a small charge (toward the Sun) and 2) in the form of high-energy electrons (escaping from a positively charged Sun) and 3) the formation of a solar wind with positively charged ions with Z/M ≥ 0.107 (from the positively charged Sun). The calculated values of the ion parameters in the solar wind are compared with experimental observations. The velocities of protons in the SW are determined by their birthplace in the helio-sphere and can exceed 1200 km/s. The influence of SW protons on the well-being of the inhabitants of the Earth is discussed.

[1] Vysikaylo P.I. Quantitative Investigation Nonequilibrium Inhomogeneous Plasma of the Helio-sphere with Runaway Electrons IEEE Transactions on Plasma Science 2022, V.50, Issue 4, pp. 810-816. DOI: 10.1109/TPS.2022.3160189

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