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Abstract of the doctoral thesis titled „Heating of the solar atmosphere and generation of the solar wind as central problems of heliophysics”

This doctoral dissertation aims to analyze the mechanisms of solar atmosphere heating and solar wind generation, which are the central problems in heliophysics. The work thoroughly discusses selected theories related to our star, including solar plasma models and magnetohydrodynamic (MHD) waves. To understand these issues, it is essential to be introduced to the theoretical opening and the results of numerical simulations. In particular, Alfvén waves and their interactions with other phenomena are studied in the context of solar atmosphere heating and plasma outflow generation. Magnetoacoustic waves also play a significant role in the heating process of the chromosphere. Previous research has shown that collisions between ions and neutral particles lead to the damping of Alfvén and magnetoacoustic waves, resulting in the thermalization of their energy. Moreover, there are numerous theories regarding the influence of Alfvén waves on plasma outflow generation and the formation of solar wind. Some studies indicate the necessity of using more complex models, such as the two- and three-fluid plasma models, to understand better the phenomena occurring in the lower layers of the solar atmosphere.

In summary, this work aims to expand our knowledge of the complex physical processes occurring in the solar atmosphere, which is crucial in the context of central problems in heliophysics.