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MHD Waves and Instabilities of a Temperature-Anisotropic Plasma in the Solar Corona As a Source of Its Heating

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A strong interaction of MHD waves propagating against the direction of the thermal flux is established to exist in the temperature-anisotropic collisionless plasma with thermal fluxes. Such conditions are typical of the lower corona, where the thermal flux is directed downward, and waves propagate upward from the lower atmosphere. We have shown that aperiodic mirror instabilities of slow MHD waves can develop under solar coronal conditions for weak magnetic fields ($B<$ 1 G), and periodic ion-acoustic instabilities can develop for strong magnetic fields ($B>$ 10 G). It is supposed that the instabilities under consideration can play an important role in the energy balance of the corona and may be considered a large-scale energy source of the wave mechanism of coronal heating. In the process, a self-maintained heating mechanism is formed, i.e., the waves dissipate due to the thermal counter flow, and the downward directed thermal flux itself arises, in turn, because of the plasma heating due to wave dissipation. The growth rates and spatial scales of unstable modes are given for the conditions of the lower corona.