Abstract Submitted
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Electron temperature of the solar wind[1] STANISLAV BOLDYREV, CARY FOREST, JAN EGEDAL, University of Wisconsin - Madison — The temperature of the solar wind plasma expanding from the hot solar corona does not decrease with the distance as fast as predicted by the adiabatic expansion law. The non-adiabatic solar-wind cooling is a long-standing problem of space plasma physics. We discuss the analytic results on the temperature of the electron component of the solar wind [1]. We argue that heating of the solar-wind electrons results from the energy exchange of the fast electrons propagating from the corona along the background magnetic field (the beam or strahl) and the electrons trapped between the electric potential and magnetic mirror walls (the core). An analogous mechanism was considered previously in relation to the electron heating in the expanders of the mirror machines (the regions between the mirror throat and the wall of the expanding chamber) [2]. We argue that due to weak Coulomb collisions, the temperature of the electrons declines with the heliospheric distance as $T(r) \sim r^{-2/5}$, in good agreement with the observations. [1] S. Boldyrev, C. Forest,J. Egedal, Electron temperature of the solar wind, Proceedings of the National Academy of Sciences, 117, 9232-9240 (2020). [2] D. D. Ryutov, Axial electron heat loss from mirror devices revisited, Fusion Sci. Technol. 47, 148154 (2005).

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