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Application of Self-Similar Kinetic Theory to the Solar Wind: Data and Simulations KONSTANTINOS HORAITES, STANISLAV BOLDYREV, Univ of Wisconsin, Madison, SERGEI KRASHENINNIKOV, Univ of California, San Diego, CHADI SALEM, STUART BALE, MARC PULUPA, Space Sciences Laboratory, UC Berkeley — If the temperature Knudsen number $\gamma(x) \sim T(dT/dx)/n$ in a plasma is constant throughout the system, the collisional kinetic equation for electrons admits self-similar solutions. These solutions have the novel property that the "shape" of the electron velocity distribution function (eVDF) does not vary in space. Such a theory should be applicable to the solar wind in the inner heliosphere, where the density and temperature are observed to vary as power laws with heliocentric distance r such that $\gamma(r)$ $\sim$constant. We present results of numerical simulations, where we find the steady-state eVDF for various γ. We then compare our predictions with observations from the Helios satellite. Our theory successfully produces a strahl population, which we interpret to be comprised of thermal runaway electrons that originated from the corona. For the large (collisionless) Knudsen numbers that are typically observed in the solar wind, this population contributes significantly to the total electron heat flux.

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