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Abstract:

New Insights Into the Properties and Evolution of Solar Wind Core, Halo and Strahl Electrons

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We present a statistical analysis of solar wind electrons at 1AU using several years of accurate core, halo and strahl electron parameters using a newly developed electron dataset from the Wind 3DP experiment.

We investigate the properties of these different populations and the physical processes that likely act to control and regulate them.

We review new results obtained on (1) the electron temperature anisotropies and their variation with collisions and/or solar wind fluctuations and instabilities, (2) the properties of core and halo drifts in the solar wind proton frame, (3) the electron heat flux, and (4) the electron strahl. These new observations emphasize the non-negligible role of Coulomb collisions in shaping the electron distribution function and regulating of the thermal and supra thermal electrons, but that the solar wind electron expansion and compression are limited fundamentally by some instabilities under certain conditions. The relationship between solar wind electron properties and turbulent fluctuations is discussed.