The Role of Electron Thermodynamics for the Multi-Scale Evolution of the Solar Wind

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The electron distribution function in the solar wind consists of:

- Core
- Halo
- Strahl
- Super-Halo
Important Effects

- Heat Flux
- Instabilities Driven by Kinetic Deviations from Equilibrium
- Coulomb Collisions
- Ambipolar Electric Field
How can we understand the nature of the electron distribution functions in the inner heliosphere?

What determines the observed electron-temperature profiles (heat flux and/or additional heating)?

What are the relevant micro-instabilities driven by electrons in the solar wind?

How do we model the electron heat flux in global solar-wind models, and how do the different electron components contribute to the total heat flux?
Science Questions 2

- What are the effects of the turbulent cascade for electron heating?
- How can we understand electron-ion coupling better (through the electric field, collisions, etc.)?
- How can we understand the role of kappa-distributions for the thermodynamics of the solar wind?
- Where do super-halo electrons come from, how are they accelerated, and what are their effects?
- Which new observations are needed for a better understanding of electron physics in the inner heliosphere?