Abstract Submitted
for the DPP08 Meeting of
The American Physical Society

Modeling the Heating of the Solar Wind: Turbulence and Electron Heat Conduction BEN BREECH, University of Delaware, WILLIAM MATTHAEUS, Bartol Research Institue, University of Delaware, STEVEN CRANMER, JUSTIN KASPER, Harvard-Smithsonian Center for Astrophysics — We employ a turbulence transport model to explore the heating of the solar wind by turbulence. The essential effect is the deposition of internal energy associated with kinetic effects that terminate the MHD cascade at small scales. A simple transport model determines the radial dependence of three (coupled) quantities that characterize interplanetary turbulence—the energy per unit mass, the cross helicity or Alfvénicity, and a similarity length scale. Two other integrated quantities, the electron and proton temperatures, are modified by heat deposition through turbulent dissipation, modeled through a von Karman – Taylor phenomenological model. The involvement of the electron temperature raises several new and interesting issues; How should the electron heat flux be modeled? How long is the collision time between protons and electrons? How much turbulence dissipation goes into heating the electrons and how much goes into heating the protons? Using Voyager and Ulysses observational data, we begin to explore these issues. We find that the inclusion of electron conduction effects provides a more complete description of the solar wind plasma and may help explain the observed temperature profiles.

Ben Breech
University of Delaware

Date submitted: 18 Jul 2008 Electronic form version 1.4