CAN WE PREDICT TRANSPORT COEFFICIENTS OF HELIOSPHERIC PARTICLES FROM SOLAR WIND OBSERVATIONS?

W. Dröge
Bartol Research Institute, University of Delaware, Newark,DE 19716.

Current theories for parallel diffusion of high energy particles in the Heliosphere are fairly well accepted, and supported by both observations and simulation results, if recently found evidence for the geometry of the magnetic fluctuations is taken into account. However, there are important outstanding questions pertaining at medium to low energies where dynamical effects in the solar wind such as propagation and thermal damping of waves, and time dependent decorrelation of magnetic fluctuations have a strong influence on the scattering mean free path. A model is presented which addresses the above effects, and which is able to explain the observations of particle mean free paths ranging from keV electrons to GeV protons. It is found that the dynamical effects, leading to a strongly non-resonant pitch angle scattering through 90° at low rigidities, can be described by a single parameter which is estimated from the observed density, temperature and magnetic field strength in the solar wind. The predictive power of the model is then basically limited by the current lack of knowledge of the exact decomposition of the fluctuations. Conversely, possiblities to use tens of keV electrons to probe properties of the high frequency range of the fluctuations are discussed.