



On the Relation of Wave-Particle Interactions, Particle Dynamics, and Suprathermal Particle Distributions

Harald Kucharek (1), Antoinette Galvin (1), Charles Farrugia (1), Berndt Klecker (2), and Nikolai Pogorelov (3)
(1) University of New Hampshire, Space Science Center, Durham, United States (harald.kucharek@unh.edu), (2)
Max-Planck-Institut fuer Extraterrestrische Physik, Garching, Germany, (3) University of Alabama in Huntsville, Huntsville,
USA

Wave-particle interactions, ion acceleration, and magnetic turbulence are closely interlinked and the physical processes may occur on different scales. These scales range from the kinetic scale to the macro-scale (MHD-scale). These processes are likely universal and the same basic processes occur at the Earth's environment, at the Earth's bow shock, the solar wind, and around the heliosphere. Undoubtedly, the Earth's environment as well as the close interplanetary space are the best plasma environments to study these processes using satellite measurements. Recently, ACE, STEREO, IBEX and Voyager observations clearly showed that turbulence and wave-particle interactions and turbulence are extremely important in interplanetary space and in the heliosphere. Using data from STEREO, Wind, we have investigated the spectral properties of suprathermal ion distributions. The results show that spectral slopes are very variable and depend on the plasma properties. We have also performed 3D hybrid simulations and studied particle dynamics. These simulations show that the particle dynamics in the turbulent magnetic wave field is Levy-Flight like which leads to a kappa distribution, which is often found in various space environments. This result is very significant of future mission such as THOR and IMAP and current operating missions such as STEREO, IBEX, and MMS.