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3D Simulations of Turbulent Spectra in Compressible Hall-MHD Plasmas DASTGEER SHAIKH, Center for Space Plasma and Aeronomy Research The University of Alabama in Huntsville Huntsville, AL-35899 , P.K. SHUKLA, Fakultät für Physik und Astronomie, Institut für Theoretische Physik IV, Ruhr-Universität Bochum, D-44780 Bochum, Germany — Turbulent spectral cascades are investigated by means of fully three-dimensional (3D) simulations of a compressible Hall-magnetohydrodynamic (HMHD) plasma in order to understand the observed spectral break in the solar wind turbulence in the regime where the characteristic length-scales associated with electromagnetic fluctuations are smaller than the ion gyroradii. In this regime, the results of our 3D simulations show that the turbulent spectral cascades follow an omnidirectional anisotropic inertial range spectrum close to $k^{-7/3}$, which is associated with the Hall current arising from non-equal electron and ion fluid velocities in our HMHD plasma model. Furthermore, we find that short wavelength (in comparison with the ion skin depth high-frequency kinetic Alfvén waves play a crucial role in producing the density perturbations in the solar wind plasma (SWP), and they lead to a turbulent equipartition between the ion fluid velocity and magnetic field fluctuations. The density perturbations in the SWP are associated with the magnetic and velocity field perturbations, as evident from their respective inertial range spectra.

Dastgeer Shaik
Center for Space Plasma and Aeronomy Research The University of Alabama in Huntsville Huntsville, AL-3589

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