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Properties of Uniturbulence in weakly compressible MHD

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We are studying MHD plasma turbulence generated by unidirectional surface Alfven waves, called "Uniturbulence."We analyze uniturbulence in the theoretical model with a sharp interface where surface Alfvén wave propagates. We consider an equilibrium configuration in a Cartesian coordinate system with a background magnetic field directed along the z-axis and no background flow. We take inhomogeneity perpendicular to the magnetic field. The surface Alfven waves that propagate along the field carry both Elsässer variables, $\mathbf{Z}^{\pm} = \mathbf{v} \pm \mathbf{B}/\sqrt{\mu\,\rho}$. We calculate explicit expressions for the wave energy and energy cascade rate. We run the 3D ideal MHD simulations using the MPI-AMRVAC code. We demonstrate within a series of numerical simulations that the non-linear self-cascade of unidirectionally propagating waves obey the derived theoretical damping time scale equation:
\begin{equation}
\tau_d = \frac{6\,\sqrt{10}}{10\,V\,k_y}\frac{\zeta+1}{\zeta-1}
\end{equation}
V, k_y, and ζ are the velocity amplitude, wavenumber, and density contrast. This type of unidirectional cascade can play a role in heating the coronal plasma and driving the solar wind.

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