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Text S1

Introduction

This Supporting Information provides the expressions defining the complex field amplitudes from the fluid-kinetic dispersion solutions in wave frequency and wavevector.

Text S1.
The field amplitudes are derived from the ion and electron momentum equations, along with Faraday’s and Ampere’s laws as described in Hollweg (1999). In the following these are defined in a field-aligned co-ordinate system with wavevector \( \mathbf{k} = (0, k_y, k_z) \) where \( z \) is along \( \mathbf{B}_0 \) as described in the main text. We firstly define the coefficients,

\[
\hat{A} = \frac{k_z}{k_y} \left[ \frac{\Omega_i^2/\omega^2 [e(T_e+T_i)k_z^2-m_e \omega^2]-e\Omega_i k_y^2 k_z^2}{eT_1 k_z^2 - m_e \omega^2} \right] \tag{S1}
\]

and,

\[
\hat{B} = \frac{i k_z (\omega^2-k_z^2 \nu_A^2)}{k_y \Omega_i \omega} \left[ \frac{eT_e-m_e \omega^2/k_z^2}{e(T_e+T_i)} \right] \tag{S2}
\]

for a singly charged ion species with \( e = |q_e| \) where \( q_e \) is the electron charge. Here \( \omega \) is the wave frequency, \( m_e \) and \( m_i \) are the electron and ion masses, \( \Omega_i \) the ion gyro-frequency, \( \nu_A \) the Alfvén speed and \( T_e \) and \( T_i \) the electron and ion temperatures respectively. The field components are normalized relative to \( E_y \) and are,

\[
E_x = E_y/(\hat{A} \hat{B} + i \Omega_i / \omega), \quad E_y = 1, \quad E_z = \hat{B} E_x \tag{S3}
\]

\[
b_x = (k_y E_z - k_z E_y)/\omega, \quad b_y = k_z E_x/\omega, \quad b_z = -k_y E_x/\omega \tag{S4}
\]