Geophysical Research Abstracts
Vol. 13, EGU2011-647, 2011
EGU General Assembly 2011

Compressive high-frequency waves riding on an Alfvén-cyclotron wave in a multi-fluid plasma

Daniel Verscharen and Eckart Marsch
Max-Planck-Institut für Sonnensystemforschung, Sonne und Heliosphäre, Katlenburg-Lindau, Germany (verscharen@mps.mpg.de)

We study weakly-compressive high-frequency plasma waves which are superposed on a large-amplitude Alfvén wave in a multi-fluid plasma consisting of protons, electrons, and alpha particles. For these waves, the plasma environment is inhomogeneous due to the presence of the low-frequency Alfvén wave with large amplitude, a situation that may apply to space plasmas such as the solar corona and solar wind. The dispersion relation of the plasma waves is determined from a linear stability analysis using a new eigenvalue method that is employed to solve the set of differential wave equations which describe the propagation of plasma waves along the direction of the constant component of the Alfvén wave magnetic field. This approach allows one to consider also weak compressive effects. In the presence of the background Alfvén wave, the dispersion branches obtained differ significantly from the situation of a uniform plasma. Due to compressibility, acoustic waves are excited and couplings between various modes occur, and even an instability of the compressive mode. In a kinetic treatment, these plasma waves would be natural candidates for Landau-resonant wave-particle interactions, and may thus via their damping lead to particle heating.