



Multi-scale wave activity and cross-field ion energization in space plasmas

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Strong cross-field energization of ions, observed in the solar corona at 2-5 solar radii, at the magnetopause, and in the auroral zones, is nearly always accompanied by a high level of MHD wave activity. The presence of the finite-amplitude MHD waves, polarized in the sense of Alfvén and/or fast magneto-acoustic wave, gives rise to the non-linear excitation of small-scale kinetic Alfvén waves (KAWs) via three-wave resonant interaction [Voitenko Y. and Goossens M., Phys. Rev. Lett., 94, id 135003 (2005)]. In turn, short transversal wavelengths of the order of the proton gyroradius make KAWs accessible for the super-adiabatic acceleration of ions in the vicinity of demagnetizing wave phases [Voitenko Y. and Goossens M., Astrophys. J., 605, L149 (2004)]. We discuss the advantages of the super-adiabatic acceleration as compared to previously employed ion-cyclotron and stochastic heating mechanisms for ions.