# Magnetosphere-Ionosphere Coupling by Alfvén waves during Geomagnetic Storms

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We present observations from the Van Allen probes which show the coincident occurrence of Alfvénic fluctuations in the equatorial plane, field-aligned electrons and outflowing energized ionospheric ions during geomagnetic storms. Based on these observations we build a model for the observed wave-fields and the particle acceleration that occurs within them. It is shown how Alfvén waves extract ions from the topside ionosphere and through the action of trapping and stochastic acceleration drive the acceleration of these ions to energies which may exceed 100 keV in the equatorial plane. The agreement in the form and evolution of the observed and simulated ion distributions provides confidence in the veracity of the modelling and simulation results. It is estimated for observed wave amplitudes and ion densities that this process may make a significant contribution to magnetospheric ion energy density. This is supported by statistical results which reveal an inverse correlation between the time rate of change of Dst and Alfvén wave spectral energy density.

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