OBSERVATIONS OF A MAGNETOSPHERIC WAVE GENERATED BY A MOVING PLASMA INHOMOGENEITY

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Although ultra low frequency waves in the magnetosphere are known to interact both with energetic protons and electrons, observations of electron–wave resonance are relatively rare. A case of an eastward-propagating wave interacting with a cloud of energetic electrons is studied. The wave was registered with the Magnetospheric Multiscale Mission spacecraft in the postmidnight sector of the magnetosphere at a distance of about 11 Earth radii. It had the frequency of about 3 mHz and the azimuthal wavenumber $m \sim +25$. At first, the wave had a mixed polarization with a considerable field-aligned component. Later during the observation period of about 45 minutes, it transformed to predominantly azimuthally polarized oscillations, which complies with the theory of Alfvén wave transformation due to the phase mixing.

Simultaneously, a cloud of substorm-injected energetic electrons was registered by the spacecraft. The particle flux was modulated with the wave frequency. The oscillations were induced via the drift resonance, with the resonance energy of electrons of about 113 keV. Withal, the conditions for a wave generation by a plasma instability were not met. The generation process can be explained by the moving source theory, as the electron cloud represents a moving finite inhomogeneity that can be seen as an alternating current.