Ray tracing of mode conversion process from magnetosonic mode waves to EMIC waves inside plasmasphere

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Magnetosonic waves (MSWs) are electromagnetic emissions of X-mode waves, which are typically generated at frequencies between the proton cyclotron frequency and the lower hybrid resonant frequency. Our previous studies using the Van Allen Probes EMFISIS data indicated that MSWs converts to EMIC waves inside the plasmasphere when the frequency of MSWs corresponds to the cross over frequency, so that plasmaspheric MSWs can be an origin of plasmaspheric EMIC waves. In order to investigate the mode conversion process from MSWs to EMIC waves inside the plasmasphere in more detail, we perform the ray tracing simulation for MSWs generated inside plasmaspshere, using the code developed by Kanazawa University. In this simulation, the initial wave normal angle is almost 90 deg. The ray of waves depends on wave frequency if the initial wave azimuthal angle is almost 0 deg, i.e., earthward direction. On the other hand, the ray of waves does not depend on the frequency if the initial wave azimuthal angle is larger than 10 deg. Additionally, we confirm the mode conversion from R-mode to L-mode at lower frequency components of MSWs, while higher frequency components of MSWs remain R-mode. The simulation results are consistent with the Van Allen Probes observations which show the conversion of plasmaspheric MSW to EMIC waves.

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