Spatiotemporal characteristics on the source region of flash aurora using ray tracing analysis

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Whistler mode waves cause precipitation of high-energy electrons via wave-particle interactions in the magnetosphere. The scattered particles precipitate to the ground along the geomagnetic field line. Then, flush aurora, which is a rapid (less than 1 s) auroral phenomenon, is happened. Flash aurora is important for understanding the spatial evolution of wave-particle interaction region in the magnetosphere. We observed the mainly southward spread of flush aurora. In order to understand the spatial-time variation of wave-particle interaction region, we analyze the propagation effects of whistler mode waves near the magnetic equator region using ray tracing analysis. We calculated the ray paths of whistler mode waves (0.2 fce and 0.4 fce) near the magnetic equator (-10 to +10 degrees of geographic latitude), where fce is the electron cyclotron frequency at the magnetic equator. The initial ray paths put in the assumption of a spatial spread with the wave normal angles of tens of degrees along the magnetic field line at the magnetic equator (a point source). Then, we traced the magnetic field lines from the ray paths of whistler mode waves and estimated the precipitation area of electrons in the ionosphere using the IGRF model. The calculation results showed the precipitation area was not mainly spread southward, but evolved northward in the preliminary study.
In this presentation, we will present the spatiotemporal characteristics of flash aurora and the analysis results of ray tracing in detail.

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