

多点イメージャとEISCATレーダーで得られたオーロラ放射及び電子密度プロファイルの定量的比較

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Quantitative comparison of auroral emission and electron density profiles obtained by multiple imagers and the EISCAT radar

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We have studied the magnetosphere - ionosphere coupling process in the auroral region by using data obtained from ground-based optical, radar, and magnetic measurements. We analyzed monochromatic (427.8nm) images taken at a sampling interval of 10 seconds simultaneously at seven stations in Northern Europe and the ionospheric data along the magnetic zenith obtained by the EISCAT UHF radar at Tromso, Norway, during 22-24 UT on March 14, 2015. During this interval, wave/vortex structures along discrete arcs were observed and followed by auroral breakup, poleward expansion, and pulsating auroras.

For some auroral wave/vortex events, we applied the tomographic inversion technique to the auroral images to reconstruct 3D distribution of the 427.8nm emission and quantitatively compared it with height profile of the ionospheric electron density observed by the EISCAT radar. The results indicated that the height profiles are very similar between the 427.8nm emission and the electron density. In addition, the electron density profiles estimated from the auroral images by modeling the auroral emission and ionization processes due to the electron precipitation were smaller than the actually-observed one by a factor of about 2. Such a small difference of the electron density obtained by two methods indicates that the auroral tomography analysis is promising to derive the spatial distribution of the ionospheric electron density and conductivity. In the presentation, we will further show results from statistical analysis and the generalized auroral tomography method, which combines both the imager and radar data for the 3D reconstruction.