Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

PEM06-P09 会場:3 階ポスター会場 時間:4 月 30 日 18:15-19:30

EISCAT_3D プロジェクトへの応用に向けた一般化オーロラトモグラフィの数値シミュレーション
Numerical simulation of Generalized Auroral Computed Tomography toward its application to the EISCAT_3D project

田中 良昌[1*] ; 小川 泰信[1] ; 門倉 昭[1] ; Gustavsson Bjorn[2] ; 麻生 武彦[3] ; Brandstrom Urban[4] ; 宮岡 宏[1] ; 上野 玄太[5] ; 才田 聡子[6]
TANAKA, Yoshimasa[1*] ; OGAWA, Yasunobu[1] ; KADOKURA, Akira[1] ; GUSTAVSSON, Bjorn[2] ; ASO, Takehiko[3] ; BRANDSTROM, Urban[4] ; MIYAOKA, Hiroshi[1] ; UENO, Genta[5] ; SAITA, Satoko[6]

[1] 国立極地研究所, [2] トロムソ大学, [3] 総合研究大学院大学, [4] スウェーデン宇宙物理研究所, [5] 統計数理研究所, [6] 情報・システム研究機構
[1]National Institute of Polar Research, [2]University of Tromso, [3]The Graduate University for Advanced Studies (Sokendai), [4]Swedish Institute of Space Physics, [5]The Institute of Statistical Mathematics, [6]Research Organization of Information and Systems

The EISCAT_3D is a next-generation phased-array incoherent scatter radar, which is capable of measuring three-dimensional (3D) ionospheric plasma parameters at ten-times higher temporal and spatial resolution. Thus, it is expected that the EISCAT_3D will provide new insights into auroral physics. On the other hand, optical imaging observation will be still useful for studying the auroral dynamics, because high-sensitivity camera can generally measure horizontal 2D distribution of the aurora at higher temporal resolution than the radars. We demonstrate by numerical simulation how useful monochromatic auroral images taken at multi-point camera network are for the study of aurora dynamics in the EISCAT_3D project. We apply the generalized - aurora computed tomography (G-ACT) to simulated observational data from real instruments, that is, the Auroral Large Imaging System (ALIS) and the EISCAT_3D radar. The G-ACT is a method to reconstruct three dimensional (3D) distribution of auroral emission and ionospheric electron density (corresponding to horizontal 2D distribution of energy spectra of precipitating electrons) from multi-instrument data. It is assumed that a core site of the EISCAT_3D radar is located at Skibotn (69.35N, 20.37E), Norway, and scans an area of 0.8 degrees in geographic latitude and 3 degrees in longitude at 130km altitude with 21x21 beams. Two neighboring discrete arcs are assumed to appear in the observation region of the EISCAT_3D radar. The reconstruction results from the G-ACT are compared with those from the normal ACT as well as those from only the electron density observed by the EISCAT_3D radar. It is found that the G-ACT can interpolate the ionospheric electron density at much higher spatial resolution than the original one observed by the EISCAT_3D radar. Furthermore, the multiple arcs reconstructed by the G-ACT are more precise than those by the normal ACT. Even for the case that the reconstruction by the ACT is difficult due to unsuitable location of the camera sites relative to the discrete arcs and/or a small number of available images, the G-ACT allows us to achieve the reconstruction.

キーワード: オーロラトモグラフィ, EISCAT_3D, シミュレーション, 多点カメラ観測
Keywords: aurora computed tomography, EISCAT_3D, simulation, multi-point camera observation