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顶部电离层和等离子体层电子密度分布——基于GRACE星载GPS信标测量的CT反演

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Electron density distribution in the upper ionosphere and plasmasphere ——CT imaging based on GRACE GPS data

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摘要

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摘要

本文利用两颗跟飞的GRACE卫星载GPS信标测量数据和基于差分相对TEC的层析算法,实现了全球范围的顶部电离层和等离子体层(450~5000 km)层析成像.反演结果表明,利用低轨道卫星载GPS信标测量数据可以有效地重建顶部电离层和等离子体层的全球二维分布图像.对不同地磁活动条件下的天基层析反演结果表明,等离子体层电子密度随纬度的分布是不均匀的;在低纬赤道带,从顶部电离层向上延伸直到等离子体层,以及等离子体层中局地的电离增强云团,经常出现近似垂直于磁力线的电子密度柱状增强结构.

关键词 电离层, 等离子体层, 层析, 全球定位系统, GRACE卫星, 电子密度增强结构

Abstract:

Based on TEC data measured by the GRACE-borne GPS receivers, and the tomography algorithm with the differential relative TEC, the tomographic imaging of the topside ionosphere and plasmasphere (450 km to 5000 km) has been carried out in this paper. It has been demonstrated that CT reconstruction based on the LEO-GPS data is an efficient technological way to obtain the global 2-D electron density distribution of the topside-ionosphere and plasmasphere. A few topside electron density profiles reconstructed under both quiet and storm conditions show that the electron density distribution with latitude in the plasmasphere is generally uneven. Some interested phenomena have been detected in the low latitude and equatorial zone, which include column-like enhanced electron density structures that usually extend from the topside ionosphere up to the plasmasphere approximately vertical to the magnetic field lines, as well as some local enhanced density cluster in the plasmasphere.

Keywords [Ionosphere](#), [Plasmasphere](#), [Computerized tomography](#), [GPS](#), [GRACE](#), [Column-like electron density enhancement](#)

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