國立中央大學太空科學與工程學系

Department of Space Science and Engineering, National Central University

專題演講

A Study on Auroral Precipitating Particles in Terms of Energy Channels

Speaker： 沈涵文

(本系畢業生)

Time： 111 年 6 月 2 日 星期四 14:00-15:00

Place： 健雄館(科四館) S4-917 教室

摘 要/Abstract：

Aurora is a phenomenon generated by collisions of atoms with precipitating particles. These precipitating particles are created by physical mechanisms behind the dynamic magnetosphere. Previous studies on auroral physics usually utilized auroral images or integral fluxes over a substantial energy range of precipitating particles. However, their results are often manifested from combined effects of precipitating particles with different energies. Unlike past studies, we explored the auroral particle precipitation using particle data of four relatively narrow energy channels. The first topic of this study is effects of geomagnetic activity on the spatial distribution of precipitating particles in the whole polar ionosphere. It is found that, regardless of active and quiet times, low-energy (< 1 keV) and high-energy precipitating particles are mostly on the dayside and nightside, respectively. A comparison with past results reveals that high-energy precipitating electrons are mostly due to pitch angle scattering during quiet times and are mainly produced by quasi-static potential structures acceleration and Alfvénic acceleration during active times; while low-energy ones are predominantly caused by the two acceleration mechanisms regardless of quiet and active times. Our results also demonstrate a dawn-dusk asymmetric distribution of nightside high-energy protons/electrons in reference to the geomagnetic state. High-energy precipitating protons and electrons are respectively in the premidnight and postmidnight sectors during quiet times because of the curvature and gradient drifts of magnetospheric particles, but their distributions during active times are swapped due to substorm-related processes in the magnetotail. Our second topic is effects of the IMF B_y polarity on dayside auroral precipitating electrons. The results demonstrate that the response in the energy range of 688–1000 eV is associated with interhemispheric field-aligned currents, and that the response in the energy range of 154–224 eV is related to the direct entry of magnetosheath electrons via antiparallel reconnection. In this topic, we also discovered two types of hemispheric asymmetry in the dayside auroral electron precipitation that may be naturally preexisting. In summary, all the results derived from this study provide a new look at auroral particle precipitation, which can help reveal the secret of the dynamic magnetosphere.

※歡迎聽講※

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