

Dawn-Dusk Asymmetry in Dayside auroral Ovals: Surveys of dayside auroral emission and morphology in Arctic and Antarctica

*ZEJUN HU¹

1. Polar Research Institute of China

The synoptic distributions of dayside aurora in the Northern and Southern Hemispheres, acquired from all-sky imagers at Yellow River Station in Arctic and South Pole Station in Antarctica, respectively, present the same two-peak structure, namely, the prenoon 09:00 MLT and postnoon 14:00-15:00 MLT peaks. The auroral intensity presents a hemispheric asymmetry, i.e., the postnoon intensity is less than the prenoon intensity in the Southern Hemisphere but more in the Northern Hemisphere. The hemispheric asymmetry is not changed with the change of IMF's polarity, although 1) the negative (positive) IMF B_y favors the postnoon 557.7/630.0-nm auroral emissions, and the positive (negative) B_y favors the excitation of 630.0-nm auroral on prenoon oval in the Northern (Southern) Hemisphere; 2) the 630.0-nm auroral intensity in dayside oval increases dramatically during the negative IMF B_z . We suggested that 1) the two-peak structure in the dayside oval are predominantly related with the prenoon/postnoon antiparallel reconnection in high-latitude magnetopause produced to the prenoon and postnoon peaks; 2) the IMF B_y should modulate the dayside aurora through the inter-hemispheric current, which is produced by a north-south oriented electric field, and changing the distribution of midday R0-R1 current; 3) the opposite prenoon-postnoon asymmetries of dayside auroral distributions in the two hemispheres are the combined effect of the prenoon-postnoon variations of the magnetosheath density and the variation of the local ionospheric conductivity in the two ground-based observatories.

Based on the morphological characteristics of the four labeled dayside discrete auroral types (include auroral arc, drapery corona, radial corona and hot-spot aurora) on the 8001 dayside auroral images at Yellow River Station in 2003, and by extracting the local binary pattern (LBP) features and using k-nearest classifier, we make an automatic classification to the 65361 auroral images of the Yellow River Station during 2004-2009 and the 39335 auroral images of the South Pole Station between 2003-2005, and finally obtains the occurrence distribution of the dayside auroral morphology in northern and southern hemispheres. The statistical results indicate that the four dayside discrete auroral types present similar occurrence distribution between the two stations: 1) The occurrence distributions of arc auroras show a distinct dawn-dusk asymmetry with a postnoon peak; 2) The drapery corona auroras also show a dawn-dusk asymmetry, but the peak is on the prenoon; 3) The occurrence peak of radial corona is in the midday; 4) The hot-spot auroras most occur in region 1300-1530 MLT and have a distinct small peak around 1330MLT. These distribution characteristics of dayside auroras are related with the distributions of dynamic processes in the magnetopause/magnetospheric boundary layer.

Keywords: dawn-dusk asymmetry, dayside aurora