Effects of solar zenith angle to Auroral microscopic structures evaluated by Reimei satellite - I

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The dependence of the auroral activity to the solar zenithal angle (SZA) of footprint came to be known by the satellite observations in 1990s. The established dependence are (1) the occurrence frequency of high energy electron events [cf. Newell et al., 1996], (2) the occurrence frequency and radiation flux of AKR [Kasaba et al., 1997; Kumamoto and Oya, 1998], and (3) the altitude and intensity of Inverted-V electric field [Morooka and Mukai and 2003].

All of them indicate that the large-scale electron acceleration is more enhanced when the footprint is in shadow, associated with variation of ionization ratio, electrical conductivity, and plasma density. The influence on the fine structure is not identified. The comparison of north-south auroral emission by all-sky imagers are investigated, but the evaluation by the satellite observation is not yet. This is because the high time resolution, several 10s msec, is required to resolve the micro acceleration structure with the width of 0.1-several km. For such studies, we need the satellite which can observe the auroral region (1) by continuous electron and imaging observations with high time resolution (2) at many observation locations with different SZA for statistical analyses.

The Reimei satellite is the first one which satisfies the Condition-(1), by the fix of FOV with 3-axis stabilized attitude control system. The satellite has caught dispersive electron acceleration features [Asamura et al., 2008]. However, the main target of this satellite is the auroral imaging. So it is hard to fill Condition-(2) because the operation is concentrated in the region with SZA larger than 90deg.

At present, the electronic observation data by ESA aboard Reimei is investigated for the evaluation of qualitative and quantitative possibility of such dependence studies. Considerable existence of the aurora electronic observation data under the condition with SZA larger than 100deg = Dayside ionosphere, so it will be used for the evaluation. First, we are investigating the SZA dependence by Inverted-V acceleration events, and will extend to the diffusive electron events. Subsequently, the detection conditions of global / fine acceleration will be set for automatic selection procedure. Based on those, the relationship of the Inverted-V / micro structure and Ionospheric condition will be verified. Combination with imaging data by Reimei-MAC and Selene-UPI and the electron density data by Akebono-PWS is also the next step.