

The observations of nighttime plasma blob and total electron content enhancement at low-latitude region

Yanhong Chen¹, Guanyi Ma², Jancun Gong¹, Wengeng Huang¹

¹*Center for Space Science and Applied Center, The Chinese Academy of Sciences, Beijing 100080, China*

Email chenyh@cssar.ac.cn

²*The National Astronomical Observatories, Chinese Academy of Sciences*

Plasma density depletions (plasma bubbles) are typically phenomena associated with equatorial spread F (ESF) in the nighttime F region. Sometimes the localized plasma density enhancements (plasma blobs) can be observed associated with the plasma bubbles. The ionospheric total electron content (TEC), as a measurement of the integral plasma density, can also reflect this kind of plasma density enhancement. The characteristics of this kind of TEC enhancements and plasma blobs are analyzed using the dual-frequency GPS data from IGS receivers at low latitude and the plasma density data from DMSP F15. The first concurrently observation of a DMSP F15 plasma density enhancement and a GPS-derived TEC enhancement was reported, which occurred simultaneously at south equatorial anomaly region (27.8° S, 252° E, magnetic latitude, 20° S) on 6 March 2004. The observational results indicate that this kind of TEC or plasma density enhancements are mainly associated with the plasma bubbles and appear at the border of the TEC depletion region. Sometimes the occurrence of the enhancement is asymmetry in the south and north equatorial anomaly region. The plasma enhancements mainly locate at about $\pm 10^{\circ} \sim \pm 20^{\circ}$ magnetic latitude region. However, the observation on 11 April 2002 indicates that the plasma blob can also occur at the topside ionosphere at the magnetic equator while only the TEC depletion observed in the corresponding IGS receiver. The plasma ion velocity observations from DMSP F15 confirm the existence of polarized eastward electric field associated with the plasma blobs, which is suggested to be responsible for the generation of this kind of plasma density enhancements.