Local time dependent response of post-sunset ESF during geomagnetic storms

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ABSTRACT

Development or inhibition of ESF during magnetically active periods has been an important space weather feature of interest during the recent past in view of its implications in the satellite based navigational systems. Particularly, the post-sunset period exhibits significant variability in the storm time development of ESF versus longitude. In this paper, we report the results of a multi-instrumental (ground based and space borne) and multi-station study on the development/inhibition of post-sunset ESF during five moderate to intense geomagnetic storms occurred during the low and descending phase of the solar activity, 2004 – 2006. It has been observed that, the prompt penetration of eastward electric fields into low latitudes and subsequent development of ESF taking place in all longitudinal sectors where the local time corresponds to the post-sunset hours during the entire main phase of the storm. In this paper, we show the development of plasma bubble irregularities over a wide longitudinal extent of 92° owing to the dusk time penetration of eastward electric fields into low latitudes during the storm of May 15-16th 2005. Further, these studies reveal that either the sudden increase in AE-index and/or a marked decrease in Sym-H index may be used as proxies to determine the occurrence as well as the time of penetration of electric fields into equatorial and low latitudes. However, in such cases where the AE-index does not represent any sudden increase, the dSymH/dt seems to be the better index to determine the time of penetration of electric fields. In this paper, is also presented an interesting case where the prompt penetration eastward electric fields dominated the existing strong westward electric fields of disturbance dynamo origin and subsequently caused the onset of spread-F and scintillations at both VHF (244 MHz) as well as L-band (1.5 GHz) frequencies.

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