



Distinctly Different responses of Equatorial F region during Undershielding and Overshielding Conditions

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Disturbed time prompt penetration electric fields are observed to transmit instantaneously from high to low latitudes and are believed to effect the global ionosphere similarly. However, some new observations claim that during disturbed times the F region responses are not uniform and the top side F region can respond differently in comparison to the bottom side. Such observations, which are critical to understating of ionospheric electrodynamic in 3-dimensions, are extremely difficult to make and are rare. The Jicamarca Incoherent Scatter Radar measured vertical plasma drifts up to about 900 Km during 9 November 2004 shows that the F region responded differently during the main and the recovery phases. During overshielding condition, a very strong altitudinal variations is observed indicating stronger westward zonal electric field on the top side as compared to the bottom side. As the higher altitude flux tubes are connected to higher latitudes away from equator, these variations reflects the latitudinal variations during the overshielding period. Our study shows that the effect of storm time drivers are not uniform throughout the F region. It also demonstrates that Jicamarca Incoherent Radar can very effectively be used to make continuous monitoring of F region responses and help give us insight into understanding of such complex F region 3-dimensional dynamics. A modeling study for the event compares the outcome of the observation against results from a physics based model (TIEGCM), and an assimilative model (USU-GAIM). The similarities and the shortcomings will be discussed.