Responses of the Equatorial Electrojet Current to Intense Solar Flares Under Storm Time Electric Fields.

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The equatorial electrojet (EEJ) current can be drastically modified due to sudden increase in the solar ionizing radiation flux in the X-rays and EUV bands that marks a solar flare. The EEJ response characteristics under flare radiation transients have been extensively investigated and documented in the literature. Besides the sudden increase in the ionization density by the flare radiation, the EEJ enhancement is shaped also by the background electric field. Large changes in the electric fields associated with magnetospheric disturbance sequences that may some times be present during a solar flare, can cause profound impact on the nature of the EEJ response to such flares. We have studied the EEJ responses at widely separated longitudes during two X-class flares, which occurred at different magnetic activity phases of the moderate to super intense storm activity that marked the 28 - 29 October 2003 period. For the first time we have observed intense westward electrojet in the sunrise sector under the influence of disturbance dynamo electric field over Jicamarca, in response to the X class flare of 28 October. A second flare, on 29 Oetober, took place when AE activity was recovering rapidly following its large intensification, where upon an over-shielding electric field of westward polarity in the afternoon over Jicamarca caused significant delay in an expected EEJ eastward growth due to the flare induced ionization enhancement. This EEJ response feature provided a measure of the decay time of the shielding layer maintained by the storm time Region 2 FAC. This paper will present a detailed analysis of the EEJ responses during the two flares, including quantitative evaluations of the flare induced conductivity enhancements and constraints on the roles of disturbance electric fields.