Empirical model of vertical plasma drifts above Jicamarca to study their dependence on solar activity

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Abstract

At the Jicamarca Radio Observatory, we have developed an empirical model for equatorial vertical plasma drifts in order to study their seasonal variability and dependence on solar activity. The model was developed using measurements of vertical drifts from the 150km region carried out by the Jicamarca radar operating in CSR (coherent scatter radar) modes. In our model, we have only considered data collected during periods of quiet magnetic activity (Kp<3) between August 2001 and July 2008. In addition, the model only considers daytime drifts from 8am to 4pm (local time), which is approximately the time interval of radar observation of the 150km echoes. The behavior of the drifts over Jicamarca is modeled as a function of local time, day of year, and solar flux (f10.7cm). The interpolation function used to represent the drifts is a third order piecewise polynomial. The number of nodes of our interpolator was chosen applying the goodness of fit criterion. In this work, we show that our empirical model captures the complicated seasonal structure of the drifts, for instance it shows the enhancement of the drift magnitudes during March and September equinoxes, as well as, the decrement of the of the magnitudes during June and December solstices.