June solstice equatorial spread-*F* in the American sector:
A numerical assessment of linear stability
aided by incoherent scatter radar measurements

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We present experimental and numerical results related to the generation of quiet-time equatorial spread-F events in the post-midnight sector. Previous studies have suggested that weakening downward equatorial plasma drifts can explain "apparent" F-region uplifts detected by ionosondes, and produce favorable conditions for F -region plasma instabilities. We investigated this hypothesis using numerical simulations aided by measurements, in an attempt to explain equatorial spread-F (ESF) events observed in the American sector during June solstice, low solar flux conditions. We analyzed equatorial plasma drifts and ESF measurements made by the incoherent scatter radar of the Jicamarca Radio Observatory (11.95°S, 76.87°W, ~1° dip latitude). We found adequate measurements during a prototypical, quiet-time event observed on June 4-5, 2008 when the downward drifts weakened and a fully developed ESF event was observed. The measured drifts were used as input for the NRL SAMI2 model of the low and middle latitude ionosphere. SAMI2 reproduced the "apparent" uplift of the ionosphere that was consistent with expectations and observations. SAMI2 also provided thermospheric and ionospheric parameters for estimation of the flux-tube linear growth rates of the Generalized Rayleigh-Taylor (GRT) instability associated with the weakening drift event. We found that the weakening drifts do produce unstable conditions with positive linear growth rate values. The growth rates, however, were slower than those obtained for typical, pre-midnight ESF events. We show, however, that departures in the wind pattern, from climatological model predictions, can produce favorable conditions for instability development. Following the hypothesis of Huba and Krall (Geophys. Res. Lett., 40(7), 1268-1272) and using SAMI2 simulations, we show that equatorward winds could have contributed to the unstable conditions responsible for the ESF event observed on June 4- 5, 2008.