Extended sustenance of scintillations in the post midnight hours during Geomagnetic storm periods

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During the geo-magnetically disturbed periods the electrodynamics and neutral dynamics of the equatorial ionosphere undergo significant changes as a result of the high latitude - low latitude coupling. These changes can sometimes lead to the development of plasma instabilities like Equatorial Spread-F (ESF) and scintillations even at the L-band frequencies. This paper attempts to study the response of the equatorial ionosphere, over the Indian (72E - 92E geographic longitude) sector to a moderate geomagnetic disturbance (-100 nT) during 9-12th March, 2004 using ground based measurements at Trivandrum (8.47N, 76.91E, 0.5N dip) and Waltair (17.7N, 83.3E, 20N dip). Following the sudden commencement of the geo-magnetic storm at 1615 LT (1045 UT) on 9th March 2004, the Sym-H started decreasing from 1635 LT (1105 UT). On this day during the evening hours the virtual height of the F-layer (h'F) over the equator increased above 350 km altitude followed by the onset of intense Spread-F from 2000 LT (1430 UT) which continued till the dawn. On this night (9th) a nearly simultaneous onset of VHF (244 MHz) and L-band (1.5 GHz) scintillations were observed from an off equatorial station Waltair which also continued to exist up to the pre-dawn hours of 10th March. On the following day i.e., 10th March, due to the continued geomagnetic disturbance, we observed strong reversal of the ElectroJet current at the equator. Because of this, the pre-reversal enhancement in the upward ExB drift is marginal and hence the subsequent occurrence of Spread-F/scintillations is inhibited. Due to the onset of another substorm on the subsequent day (11th March) at 1730 LT (which is close to the local sunset), substantial increase in the hćF was seen at the equator followed by the occurrence of Spread-F and scintillations which were also continued to exist till the dawn. It is seen that if the peak excursion in the Sym-H occurs around local midnight to pre dawn hours, the already generated ESF sustains till the next morning. Another such event evidencing the extended sustenance of Spread-F/scintillations is observed on 11th February 2004. These aspects are studied with respect to the role of high latitude - low latitude electro-dynamical coupling phenomena.