# Role of pre-reversal enhancement in the generation of equatorial plasma bubble using observation and model simulation

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The equatorial plasma bubble (EPB) or equatorial spread-F (ESF) generated during post sunset hours due to the transition in the E- and F-layers of the ionosphere are well-known due to their unique nature and adverse effects on communication and navigation systems. Although the Rayleigh Taylor instability (RTI) is known to be the governing mechanism of EPB, the exact seeding mechanism is not clear yet. Pre-reversal enhancement (PRE) is believed to be one of the main controlling factor for the generation of EPB in spite of its asymmetric distribution and longitudinal variation. However, the relation between PRE and EPB generation is not explored quantitatively.

In the present study, ionosonde observations at Chumphon (10.7$^o$N, 99.4$^o$E; 0.86$^o$N magnetic latitude) in Thailand and Bac Lieu (9.3$^o$N, 105.7$^o$E; 0.62$^o$N magnetic latitude) in Vietnam are used to calculate the day to day variation of PRE during the equinoxial months of March, April, September and October of 2011-2013. The observations are compared with the whole atmosphere ionosphere coupled model Ground-to-topside model of Atmosphere-ionosphere for Aeronomy (GAIA) consisting of three models (an ionosphere model, a neutral atmosphere model, and an ionospheric electrodynamic model). The virtual height (h'F) are manually scaled from the ionograms at time intervals of 5 min between 17:00 and 24:00 LT (LT = UT + 7 h) during 01-16 March 2011 (equinoxial month) over Chumphon in Thailand. The vertical drift is derived from rate of change of h'F (dh'F/dt with h'F, above 300 km) is considered as an indicator for vertical motion during the evening time. In case of GAIA model simulations, the vertical component of plasma drift due to the zonal component of the electric field E at the magnetic equator is derived using the electric field and magnetic field data (in the eastward, southward and upward direction). The observation period (01-16 March 2011) is classified in two categories: EPB occurrence day (8 days) and non-EPB occurrence day (7 days). It is observed that the vertical drift obtained using ionosonde ranges between 50-55 m/s on the EPB occurrence day and 10-30 m/s during the days with no EPB. In the GAIA model simulations, the vertical drift varies from 40-50 m/s during the days with EPB while it ranges between 30-40 m/s during the non-EPB days. The detailed outcomes of the study will be presented.