



Case study on unusual enhancements in NmF2 and total electron content enhancements at low latitudes during low geomagnetic activities

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The unusual enhancement of electron concentrations in the ionosphere before geomagnetic storms is one of the open questions. Using ionosonde observations and regional total electron content (TEC) maps from Global Positioning System (GPS) measurements along longitude 120°E as well as global GPS TEC maps produced by Jet Propulsion Laboratory (JPL), we analyzed some unusual low latitude enhancement events in the Asia/Australia sector. All events show quite similar features. These enhancements are regional events, having longitudinal and latitudinal dependences. The regions of these TEC enhancements tend to occur at narrow longitude ranges of center around longitude 120°E. The strong enhancements during these events are simultaneously presented in foF2 and TEC; and enhancements have latitudinal dependence. The latitudinal belts of maxima of enhancements locate around the northern and southern equatorial ionization anomaly (EIA) crests. This is quite different from what reported by Burešová and Laštovka [2007] for middle latitudes. They found no systemic latitudinal dependence in pre-storm enhancements over Europe. It is argued that solar flares are not the main drivers for the enhancements, at least for low latitude events. Main features of unusual low latitude enhancements before geomagnetic activities do not coincide with the solar flare effects. We postulate that the vertical plasma drift or zonal electric field is a likely cause for the low latitude pre-storm enhancements. Its existence is supported by the facts of stronger EIA, the latitudinal coverage of the enhancements as well as the lift of the F layer peak height at an equatorward station during the pre-storm enhancements. Some events are pos-

sibly of contributions from auroral/magnetospheric origins, while the 6 January 1998 event is more likely related with planetary wave sources in the atmosphere itself or from below. More investigations are deserved to separate contributions from possible sources.