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Plasma bubble observed with the C/NOFS satellite and multiple ground-based diagnostics in Oct 2008

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Comparison of equatorial ionospheric disturbances observed with C/NOFS in-situ measurements and ground-based observations is performed on two days in Oct 2008. Electron density at 400-850km altitudes in the equatorial ionosphere is measured with a Planar Langmuir Probe (PLP) on the Communications/ Navigation Outage Forecast System (C/NOFS) satellite, which was launched in April 2008 in order to monitor and forecast ionospheric scintillation. In early October, 2008, the C/NOFS satellites flew over the American sector around the dip equator at the perigee altitude at dusk. On 5 Oct, strong 250MHz scintillation occurred at the Ancon SCINDA site without much electron density disturbance in C/NOFS measurements. On the other hand, on 10 Oct., lower scintillations were observed with severe electron density disturbance in C/NOFS data. On 5 Oct, the bottom-side irregularities did not reach the C/NOFS perigee altitude. Latitudinal total electron content (TEC) profiles obtained by Low-latitude Ionospheric Sensor Network (LISN) over South America shows smaller latitudinal gradient of TEC on 5 Oct. than on 10 Oct. The under developed Equatorial Ionization Anomaly (EIA) at dusk on 5 Oct can be an evidence of the absence of irregularity upwelling. The high TEC at the dip equator would enhance the scintillation level on 5 Oct. On 10 Oct, the upwelling of the irregularities was also observed by 50MHz radar backscatter observations at Jicamarca. Latitudinal TEC profile of LISN shows well-developed EIA. This allowed the irregularity bubbles to reach the C/NOFS perigee height. LISN-TEC also shows lower values around the equator, which could contribute to lower scintillation levels. Such day-to-day variability of irregularities remains an unresolved issue during solar minimum as well. We will try to understand this variability better by obtaining spectral measurements of high-resolution in-situ data to provide insight into plasma processes, optical and digisonde observations to provide information regarding the bottom-side of the F-region and using observed vertical drifts to model electron density profiles using the SAMI2 model for comparison with the TEC.

Keywords: plasma bubble, C/NOFS, scintillation, ground-based GPS receivers, LISN network