The relation between *hmF2* and radio occultation scintillation amplitude index RO-S4 index observed using FORMOSAT-7/COSMIC-2

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Six FORMOSAT-7/COSMIC-2 (F7/C2) satellites were launched into 24 degrees inclination low Earth orbit on June 25th 2019, The data from the primary Tri-GNSS Radio occultation System (TGRS) space weather products: relative total electron content (TEC), scintillation amplitude index (S4), and electron density (Ne) profile have been released. This study focuses on the comparison of F7/C2 radio occultation scintillation amplitude (RO-S4) index and Ne profiles acquired within a time difference of 30 minutes and spatial difference of 110 km (1 degree of longitude and latitude). These nearly collocated observations are examined to clarify, the relation between S4 index and the height of peak electron density in *F2* layer (*hmF2*), and how S4 index and *hmF2* play roles in the occurrences and growth rate of equatorial plasma bubbles (EPBs) due to plasma uplift. The S4 observations at low latitudes derived from the F7/C2 radio occultation experiment are compared with range-time-intensity (RTI) maps of the 50 MHz radar near Jicamarca and the Global scale Observations of the Limb and Disk (GOLD) mission observed 135.6 nm airglow depletions by *Chen et al.* (2020), and the results show that RO-S4 intensities can be utilized to identify EPBs of specific scales. On the other hand, the longitudinal and seasonal distributions of the *hmF2* observed by FORMOSAT-3/COSMIC during the growth phase of EPBs from 2008 to 2013 by *Chou et al.* (2020) indicates that the casual relationship of EPBs and the *hmF2* should be examined in more detail. *Ghosh et al.* (2020) presents that the *hmF2* elevated to higher altitudes by prereversal enhancement (PRE) around evening terminator due to eastward electric field at the magnetic equator, while Ne in the *F* region shows negative correlation with peak PREs that could be driven by fountain effect. The comparison of different local time periods and locations is analyzed and discussed in this study as well, in order to improve our understanding of the relation between ionospheric structure and the generation mechanism of plasma irregularities.

Keywords: S4 index, hmF2, Equatorial plasma bubbles (EPBs), FORMOSAT-7/COSMIC-2 (F7/C2)

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