

# Investigation on the seeding mechanisms of Equatorial Plasma Bubbles

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Equatorial plasma bubbles (EPBs) correspond to sharp depletions in the ionospheric plasma observed during post-sunset hours in the equatorial and low-latitude regions. EPBs and their generation mechanisms have been investigated for decades, and although Rayleigh Taylor (RT) instability is widely accepted as the mechanism behind the development of EPBs, understanding the day-to-day variability of EPBs is still a challenge. Previous studies have associated such variability to the changes in the magnitude of the pre-reversal enhancement (PRE) of the zonal eastward electric field, suggesting that the PRE controls the day-to-day variability of EPB. Other studies have also suggested that thermospheric winds may also play a role in suppressing the RT instability and therefore, controlling the day-to-day variability of EPBs. In addition, atmospheric gravity waves acting as seeding mechanisms have also been hypothesised as a contributor to the EPB day-to-day variability [1, 2]. In this study, we conduct a multi-instrument investigation into the role of different mechanisms in the variability of EPB occurrence observed in a case study in August 2022. The analysis includes EPBs observations obtained from the Global-scale Observations of the Limb and Disk (GOLD) satellite, along with travelling ionospheric disturbances observations derived from GNSS data, and thermospheric wind data obtained from the Ionospheric Connection Explorer (ICON) satellite. The results of the investigation suggest that disturbed eastward zonal winds may have contributed to the observed day-to-day variability.

- [1] B. A. Carter et al., J. Geo. Res.: Space Physics, An analysis of the quiet time day-to-day variability in the formation of post sunset equatorial plasma bubbles in the Southeast Asian region, **119**, (2014).
- [2] E. Aa et al., Front. Astron. Space Sci., Multi-instrumental analysis of the day-to-day variability of equatorial plasma bubbles, **10**, 1-14 (2023).