Colloquium Abstract

Topic: Airglow Imaging and Revival of fossil depletion by associated thermospheric gravity waves.

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Abstract: OI 630.0 nm airglow emission from the F-region (~250 km) is an effective optical tracer of several electrodynamical processes, e.g. equatorial ionization anomaly (EIA), medium-scale traveling ionospheric disturbances (MSTIDs), mid-night temperature maxima (MTM), Equatorial plasma bubbles (EPBs), etc.. Characterized by irregular plasma distributions, EPBs are the ubiquitous feature of the equatorial and low-latitude ionosphere. During the post-sunset, the height rise of the *F* layer, the suitable alignment of the solar terminator with the geomagnetic field lines, absence of the strong transequatorial wind, and necessary seed perturbations set up favourable conditions for initiation of Rayleigh-Taylor instability (RTI) which then generates irregularities/EPBs. Often EPBs are seen as quasi field-aligned intensity-depleted regions in all-sky airglow images and are referred to as airglow depletions (Mendillo & Baumgardner, 1982). Fossil depletions are remnants of airglow depletion or EPBs that have ceased growing; however, continue to persist and move with ambient plasma drift. Observations show that thermospheric gravity waves can interact with these fossil structures and trigger their revival. Gravity-wave-induced neutral wind perturbations generate polarization electric fields that locally enhance vertical plasma drift, steepen density gradients, and reinitiate instability growth. This demonstrates the important role of gravity-wave–ionosphere coupling in modulating post-midnight ionospheric irregularities near the EIA crest.