Talk Title

Observation of synchronization between the Es layer instabilities and the F layer MSTID along geomagnetic field line by Caion lidar and GPS-TEC Map

Chiao-Yao She, Emeritus, Colorado State University

时间：6月17日 下午3:30

地点：九章大厦A709室

Abstract

The sporadic *E* (*Es*) is a thin plasma layer in the *E*-region ionosphere. Its frequent appearance in the midlatitude ionosphere has fostered considerable investigations and publications with some speculations. Fundamental to the understanding of the Es layer physics is the availability of the distribution of electrons, metallic ions and neutrals in the region. This has proved to be difficult as ground-based well-equipped station with Incoherent Scatter Radar (ISR) and resonant scattering (or laser induced fluorescence) Lidar, detecting electrons and metal ions and neutrals with high vertical resolution (~ 1 km or less) is rare. This is because ISR is expensive and bulky, and the resonance transition wavelength of most metal ions is shorter than 300 nm; these ions cannot be probed from ground. Calcium (Ca) appears to be the only upper mesospheric metal with a strong ion resonance transition with wavelength longer than 300 nm, making Ca+ and Ca lidars, respectively at 393 nm and 432 nm, a choice tool for detecting ions (and the associated atoms) in the *Es* layer.

The focus of this talk is on the recently observed synchronization between the Es layer instabilities and the F-layer medium-scale traveling ionospheric disturbances (MSTID) by concurrent Ca+ lidar and GPS-TEC Map. The material to be presented is based on a soon to-be-published JGR article by Ejiri et al. That the direct synchronization between the Es-layer (~100 km) and the F-layer (~300km) along geomagnetic field line is observed for the first time supports the complicated simulation studies of E-F coupling, showing the manner that the Es instabilities appears to be required for the formation of MSTID. It also makes observations from a single site (even well-equipped with ISR and Lidars) insufficient for the investigation. Fortunately, the increasing availability of GPS-TEC maps and Calcium Lidars will likely usher in a bright future for this type of investigations.