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Contributions of the Radio Occultation Experiment of FORMOSAT-3/COSMIC to the CAWSES-II Upper Atmospheric Study

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The GPS Occultation eXperiment (GOX) on board the FORMOSAT-3/COSMIC (F3/C) has provided large amount of the ionospheric electron density soundings since the satellite constellation was launched in April 2006. By averaging the electron density profiles distributed global-wide during one- or two-month period, three-dimensional ionospheric electron density maps can be constructed for studying quiet-time ionosphere climatology. Through analysis of the 3-D ionospheric maps during the four years period of the mission, the occultation observations have shown longitudinal variation of the equatorial ionosphere. Its capability of providing information of the altitudinal variation helps to unveil the atmosphere-ionosphere coupling processes. Additionally, the occultation experiment recently observes a new mid-latitude ionosphere structure, namely the mid-latitude summer nighttime anomaly (MSNA). The MSNA is characterized by nighttime (or a period of a larger solar zenith angle) ionospheric density enhancement which shows a greater electron density at night than during daytime (or a period of a smaller solar zenith angle). The MSNA occurs at longitudes where the magnetic equator is offset to the geographic equator during solstices. The anomaly also reveals longitudinal variations, which is likely resulted from asymmetric neutral winds. The longitudinal variations of both equatorial and mid-latitude ionosphere observed by the F3/C can be contributed to CAWSES-II upper atmospheric studies.

Keywords: FORMOSAT-3/COSMIC, Low- and Mid-latitude ionosphere, Ionosphere-Atmosphere Coupling