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Comparison of the Tidal Signatures in Sporadic E and Vertical Ion Convergence Rate, Using FORMASAT-3/COSMIC Radio Occultation Observations and GAIA Model

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Sporadic E or Es is a transient phenomenon where thin layers of enhanced electron density appear in the ionospheric E region (90-120 km altitude). Es can influence radio propagation, and its global characteristics have been of great interest to radio communications and navigations. The presence of neutral wind shear caused by atmospheric tides will lead ions to converge at E-region heights and form Es layers. The neutral wind shear caused by atmospheric tides can lead ions to converge vertically at E-region heights and form the Es layers. This research aims to determine the role of atmospheric solar and lunar tides in Es occurrence. For this purpose, radio occultation data of FORMASAT-3/COSMIC have been used, which provides complete global coverage of Es events. Moreover, GAIA model simulations have been employed to evaluate the vertical ion convergence induced by solar tides. The results show both migrating and non-migrating solar tidal signatures and the semidiurnal migrating lunar tidal signature in Es occurrence. The seasonal variations of the diurnal and semidiurnal solar migrating components of Es are in good agreement with those in the zonal wind shear. Furthermore, some non-migrating components of solar tides also have a significant effect on the Es occurrence rate.