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Quasiperiodic Variations in The Outer Zone

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The temporal characteristics of energetic electron variation in the outer zone are examined using data detected on geosynchronous orbit and middle-earth orbit. The data detected of energetic electron over 2 solar activity cycle on geosynchronous orbit are analyzed, and the data detected on the middle-earth orbit over half a solar cycle are analyzed. Investigating the temporal characteristic of these data, we find that there are some quasiperiodic variations on variable timescales. On large timescale, the energetic electron fluxes in the outer zone are varying correlated with solar activity cycle obviously. The filter analysis in different frequency reveals that there is clear seasonal fluctuation in the outer zone, and 27-day quasiperiodic variation usually emerges in the approach to the solar minimum. Analyzing the seasonal fluctuation in detail, we find that the maximum fluxes of energetic electron occur near the equinoxes with some delay, and the minimum fluxes occur near the solstices. The seasonal fluctuation is correlated with the seasonal variation of efficiency of solar-terrestrial energy coupling. The investigation to the interplanetary conditions reveals that while the 27-day quasiperiodic variation of energetic electron in the outer zone emerges the solar wind speed and interplanetary magnetic field fluctuate in the similar period, and this kind of quasiperiodic variation is correlated with the long-lived coronal hole close to the solar equator.