How energy electrons respond to geomagnetic disturbance at sun-synchronous orbit

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The energetic electrons fluxes of space radiation environment are strongly modulated by geomagnetic activity. The mechanism by that medium energy ($>$30keV) electrons fluxes and high energy electrons ($>$2MeV) fluxes are modulated are very different .The fluxes of medium energy electrons are closely associated with the geomagnetic storms and substorms. However, the high energy electrons fluxes are primarily modulated strong geomagnetic storms, and are not directly correlated with the substorms.

In this paper we utilize the data of Fengyun-1 meteorologic satellite Space Particle Component Detector from 1997 to now, the data of ZY-2 satellite SEM system from 2004 to now, the data of American NOAA satellite SEM system MEPED from 1998 to now and observational result of geomagnetic activity to analyze the response characteristics of energy electrons fluxes to geomagnetic activity in the range of high-latitude at sun-synchronous orbit (about 500$\sim$900km). The results present that the enhancement mechanism and time characteristics of high-energy electrons remarkably distinguish with the medium-energy electrons. At the sun-synchronous orbit, the fluxes of high-energy electrons in the range of high-latitude only respond to strong geomagnetic storms (Ap$>$100), and have little response to substorms. While strong geomagnetic storms happen, the fluxes of high-energy electrons usually enhance 1 order of magnitude. The response characteristics of high-energy electrons to geomagnetic storms during solar activity peak are different from during solar activity descending. During solar activity peak, after a strong geomagnetic storm, high-energy electrons fluxes sustain at a very high level for a long time. That is a considerable hazard to space missions. The fluxes of medium energy electrons are nearly correlated with geomagnetic storms and substorms, the geomagnetic disturbance stronger, the enhancing of medium energy electron flux higher. And there is several days delay between the peak of geomagnetic disturbance and the peak of medium energy electrons fluxes. This is an advantage for predicting medium energy electrons storm.