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Relativistic electron flux prediction at geostationary orbit based on multi-variate autoregressive model

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The flux of relativistic electrons at energies of a few to ten MeV in the outer radiation belt often largely increase at geostationary orbit a few days following high speed solar wind approach to the Earth. The enhancement of the relativistic electrons cause the anomalies on numerous geostationary spacecrafts due to deep- dielectric charging. Recent papers reported that solar wind dynamic pressure and north-south component of interplanetary magnetic field also control the amplitude of geostationary relativistic electron flux variation. We developed multi-variate autoregressive model for the prediction of its one-day average flux using time-series of the solar wind speed, dynamic pressure, and north-south component magnetic field observed by the ACE spacecraft and the geostationary electron flux at energies higher than 2 MeV observed by the GOES spacecraft for five years in 1999-2003. The comparison analysis showed that the multi-variate autoregressive model provides more accurate prediction values than commonly-used linear prediction filter which uses solar wind speed only as an input.

Keywords: Outer radiation belt, relativistic electron, prediction model