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The development of data based low energy electron flux models for geostationary orbit

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The low energy electrons within the radiation belts can can interfere with satellite electronic systems through the process of surface charging. Therefore, the prediction of these low energy electrons is vital to mitigate hazards to spacecraft. At Geosynchronous Earth Orbit, the fluxes of electrons with energies up to several hundred keV can vary widely in Magnetic Local Time (MLT). This study aims to develop a Nonlinear AutoRegressive Moving Average eXogenous (NARMAX) models that accounts for the spatial variation in MLT. This is difficult for data based techniques such as NARMAX, since there is sparse data availability of the electron fluxes at different MLT. To solve this problem we investigated two different approaches. The first approach binned data from GOES 13 and 15 by MLT and deduced a separate NARMAX model for each bin using solar wind inputs then conjugated these into one spatio-temporal forecast. The second approach employed the MLT at the point of measurement as an input along with solar wind parameters to deduce one NARMAX model. This work has been supported by the European Union's Horizon 2020 grant agreement No 637302 (PROGRESS).