NON-LINEAR PREDICTION OF THE RELATIVISTIC ELECTRON FLUENCE IN THE OUTER RADIATION BELT

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The radiation environment of spacecraft in Earth orbit is governed by processes on the Sun and by the solar wind / magnetosphere interaction. There are considerable practical benefits to be gained by predicting and forecasting this environment. This paper describes the use of non-linear models in the prediction of relativistic electron flux in the outer radiation belt, based on solar wind characteristics, magnetic indices and sunspot number

Models used are based on self-adaptive time-series methods using Radial Basis Functions (RBF). These techniques are exactly equivalent to the back-propagation methods more widely used in neural network modelling. Separate models are produced using low resolution daily averaged data and high resolution hourly averaged data both of which offer their own benefits.

The success of these models is quantitatively assessed and compared to that obtained using 'persistence' and 'recurrence' models. Our results are presented using normalised root-mean-square errors (NRMSE) which allows fair comparison with other predictive models.

The models presented offer performance benefits over previously presented models found in the literature and further development should reduce the errors further.

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