
PROGRESS

PRediction Of Geospace Radiation Environment and Solar wind parameterS

Work package 6

Forecast of the Radiation Belt
Environment

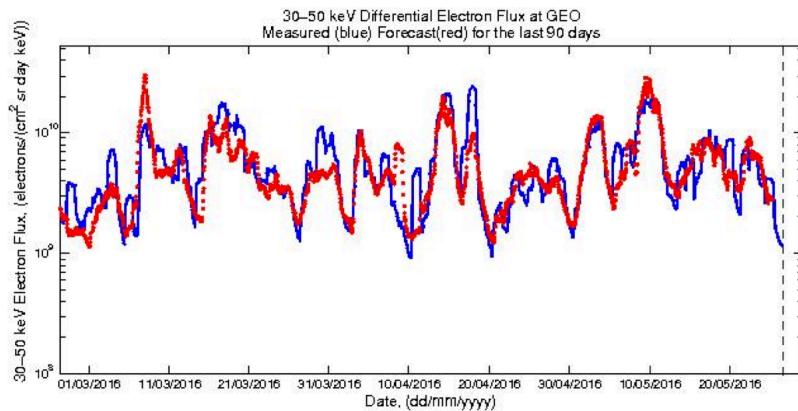
Overview

WP6 – Forecast of radiation belt environment

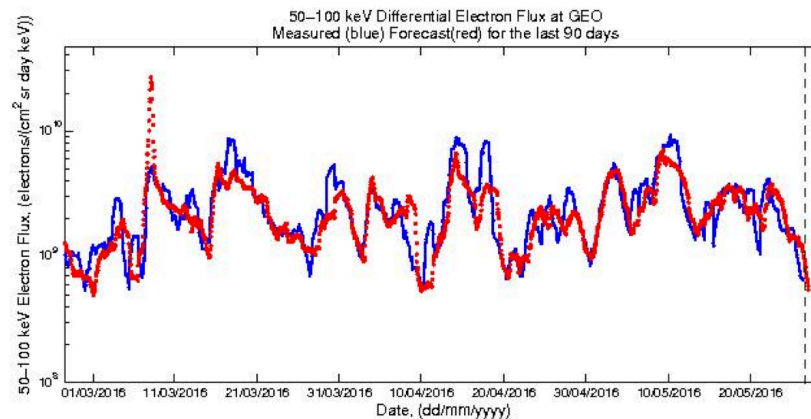
Three tasks

- NARMAX modelling of the energetic electron fluxes at GEO
- Data assimilation extension for VERB
- Development of coupled VERB-NARMAX model

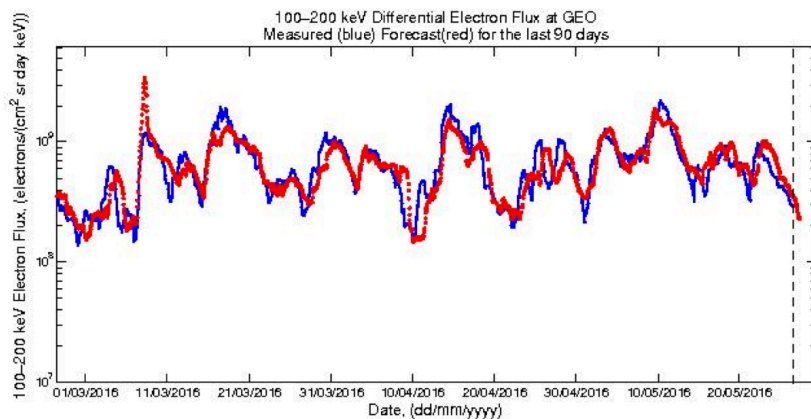
Energy 40keV



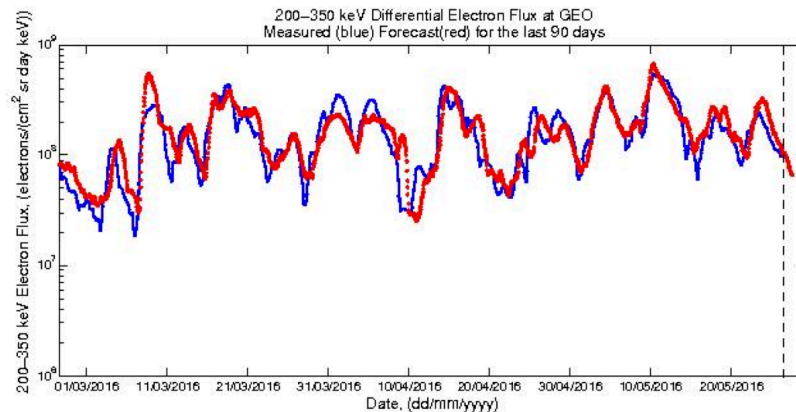
Energy 75keV



Energy 150keV

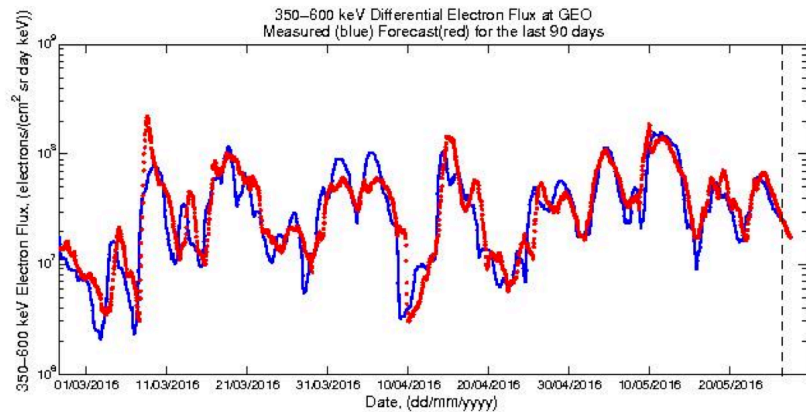


Energy 275keV

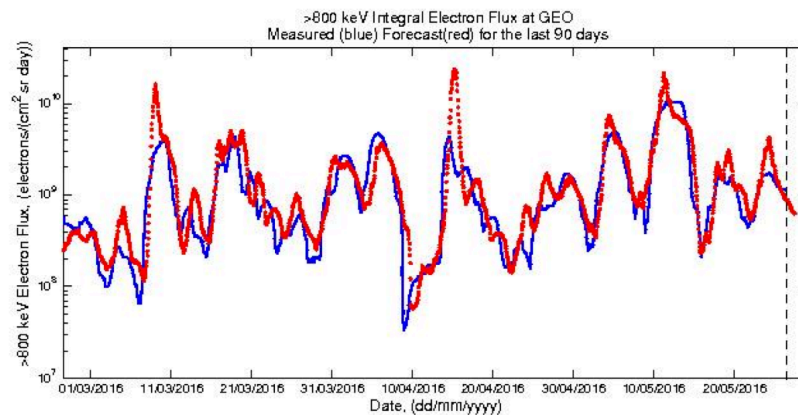


Energetic electron fluxes

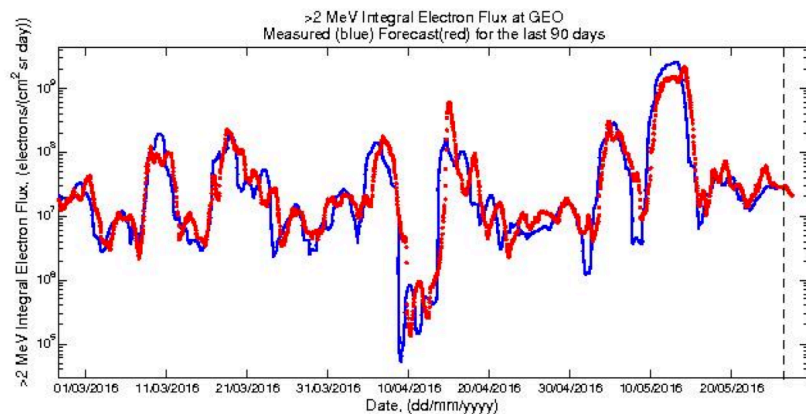
Energy 475keV



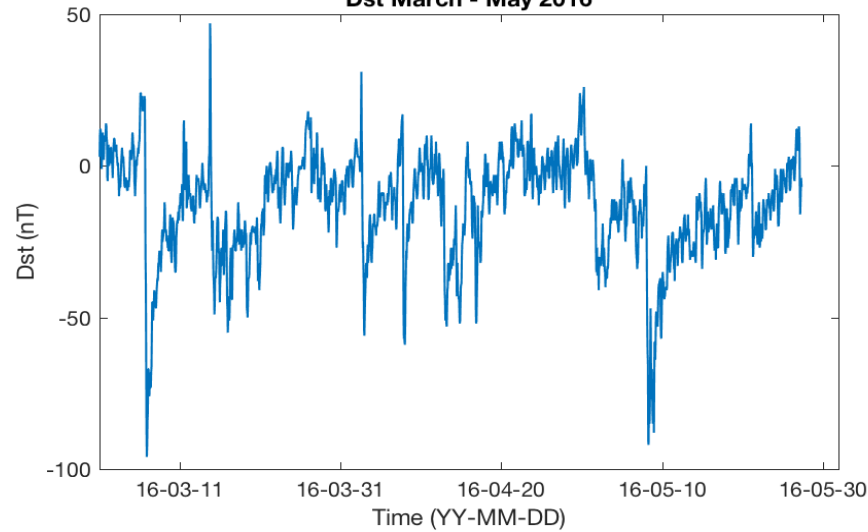
Energy 800keV



Energy 2MeV



Dst March - May 2016



<https://ssg.group.shef.ac.uk/progress2/html/>

VERB inputs

- Kp
- Electron Flux at $\sim 900\text{keV}$ at $L^*=7$ – limit of stable particle trapping

NARMAX provides electron fluxes

- GSO ($L\sim 6.2$)
- Energies >2000 , >800 , 475 , 275 , 150 , 75 , 40 keV

Problem

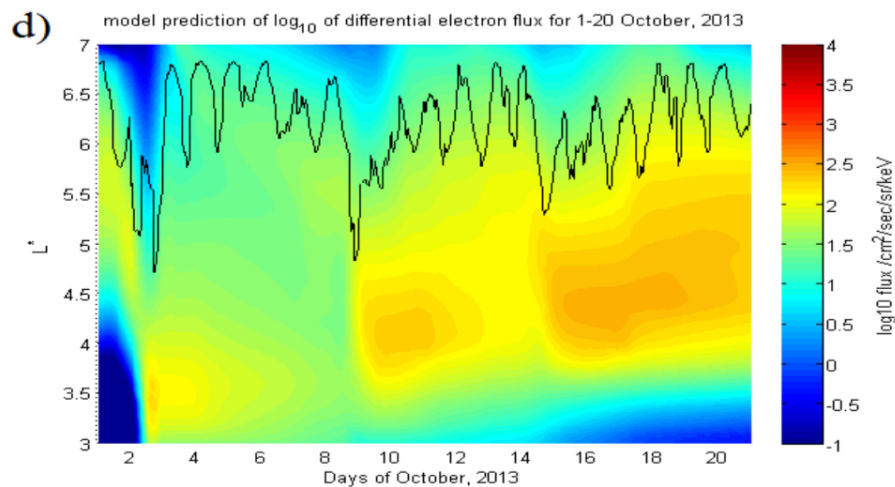
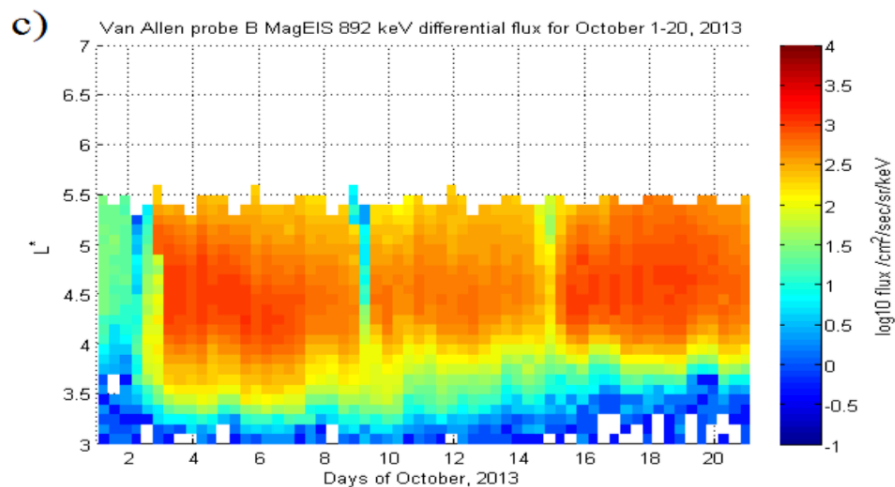
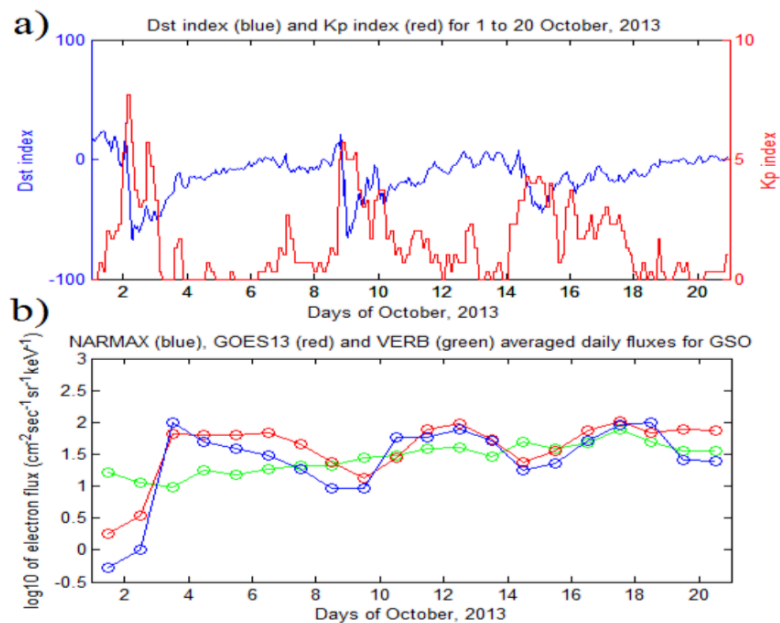
- Calculate VERB electron flux based on NARMAX forecasts

Solution

- Assume a single Maxwellian distribution

$$f = \lambda_1 \exp\left(\frac{\lambda_2 m v^2}{2kT_0}\right)$$

- Current solution uses NARMAX fluxes at 2 energies to determine the two unknown constants
- Estimate flux at 900 keV
- Assume average L shell of GSO ~ 6.2
- Mapping L to L* assumes constant PSD



VERB-NARMAX

