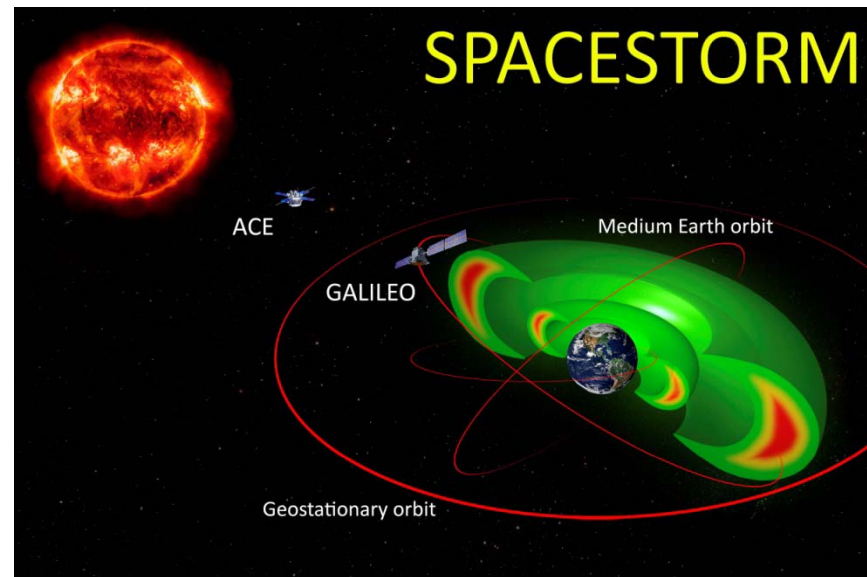




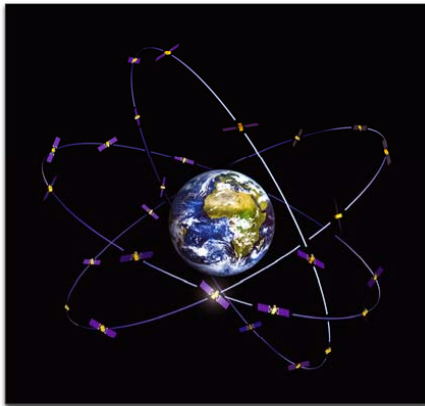
SPACESTORM in the Context of Electric Orbit Raising Missions

Richard B Horne

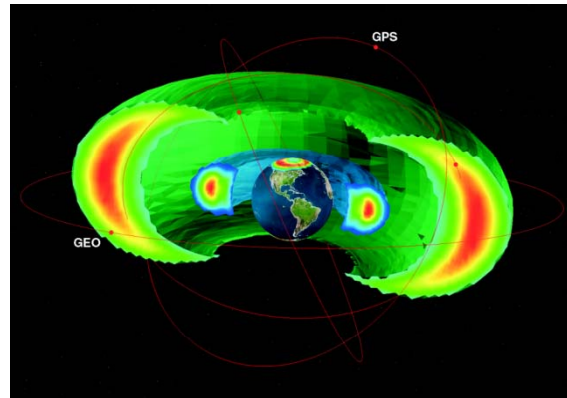


SPACESTORM - The Goal

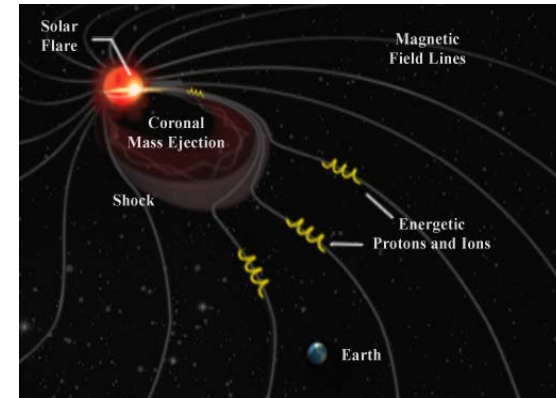
Satellites



Radiation Belts



Solar Energetic Particles



- **Goal**
 - *To model severe space weather events and mitigate their effects on satellites by developing better mitigation guidelines, forecasting, and by experimental testing of new materials and methodologies to reduce vulnerability.*

Key Objectives

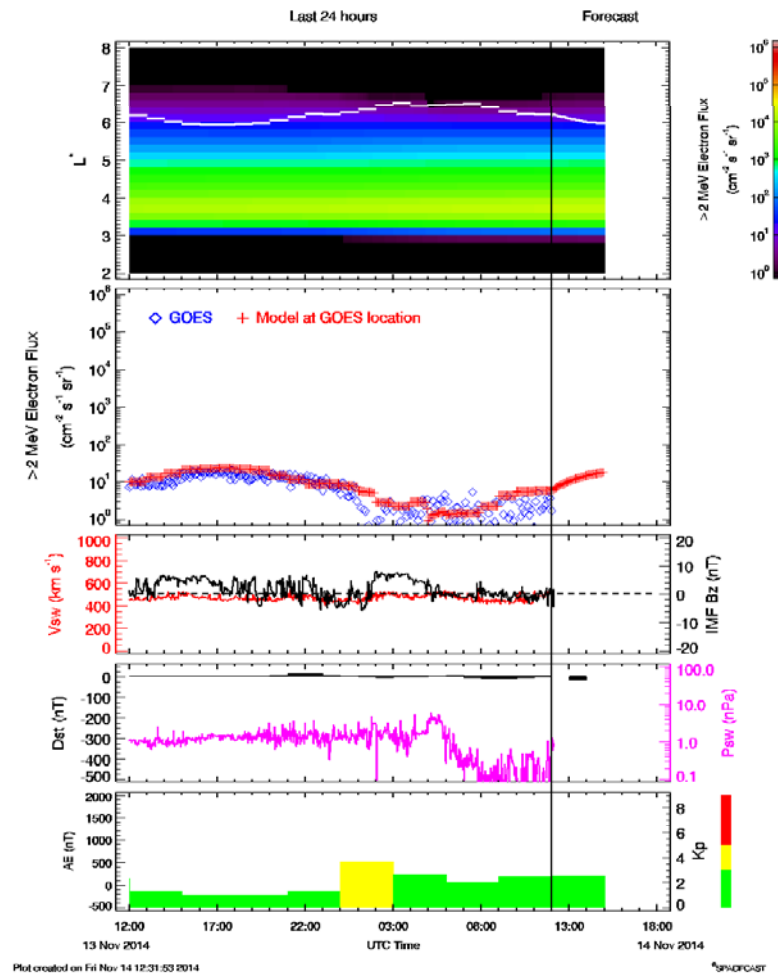
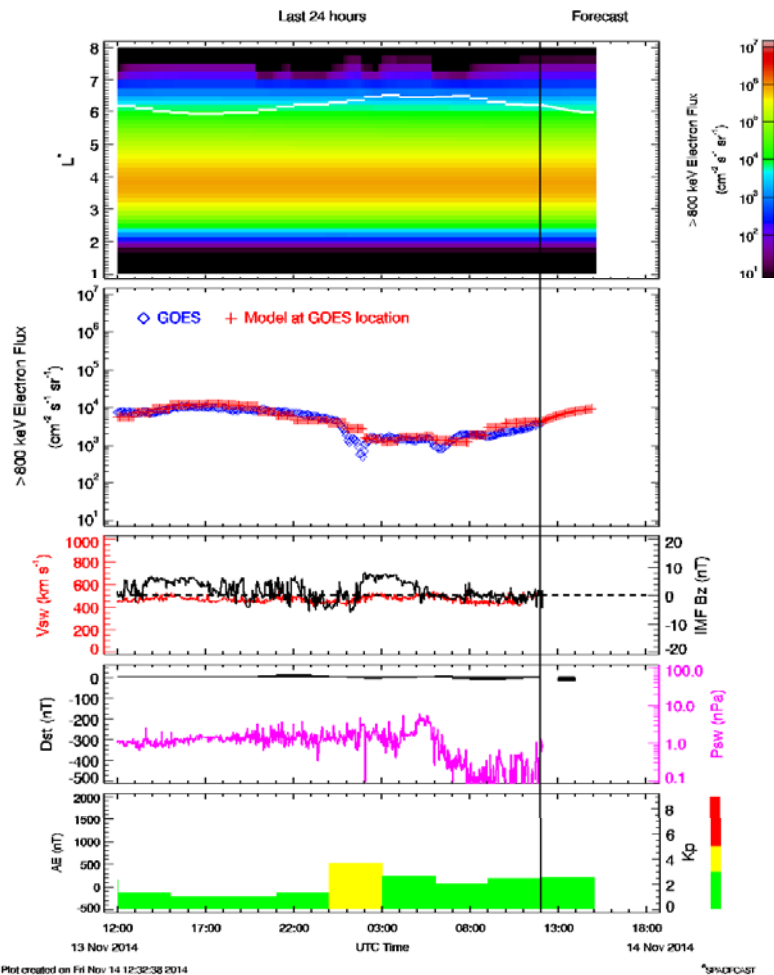
- To determine the space radiation environment for extreme SW events
- To model space weather events using dynamic models
- To construct 30 year dataset for MEO and GEO
- To determine the impact on satellites
- To test new experimental methods of reducing satellite charging
- To develop better mitigation guidelines
- To provide mitigation by monitoring, forecasting and warning

Real Time Displays – 24/7

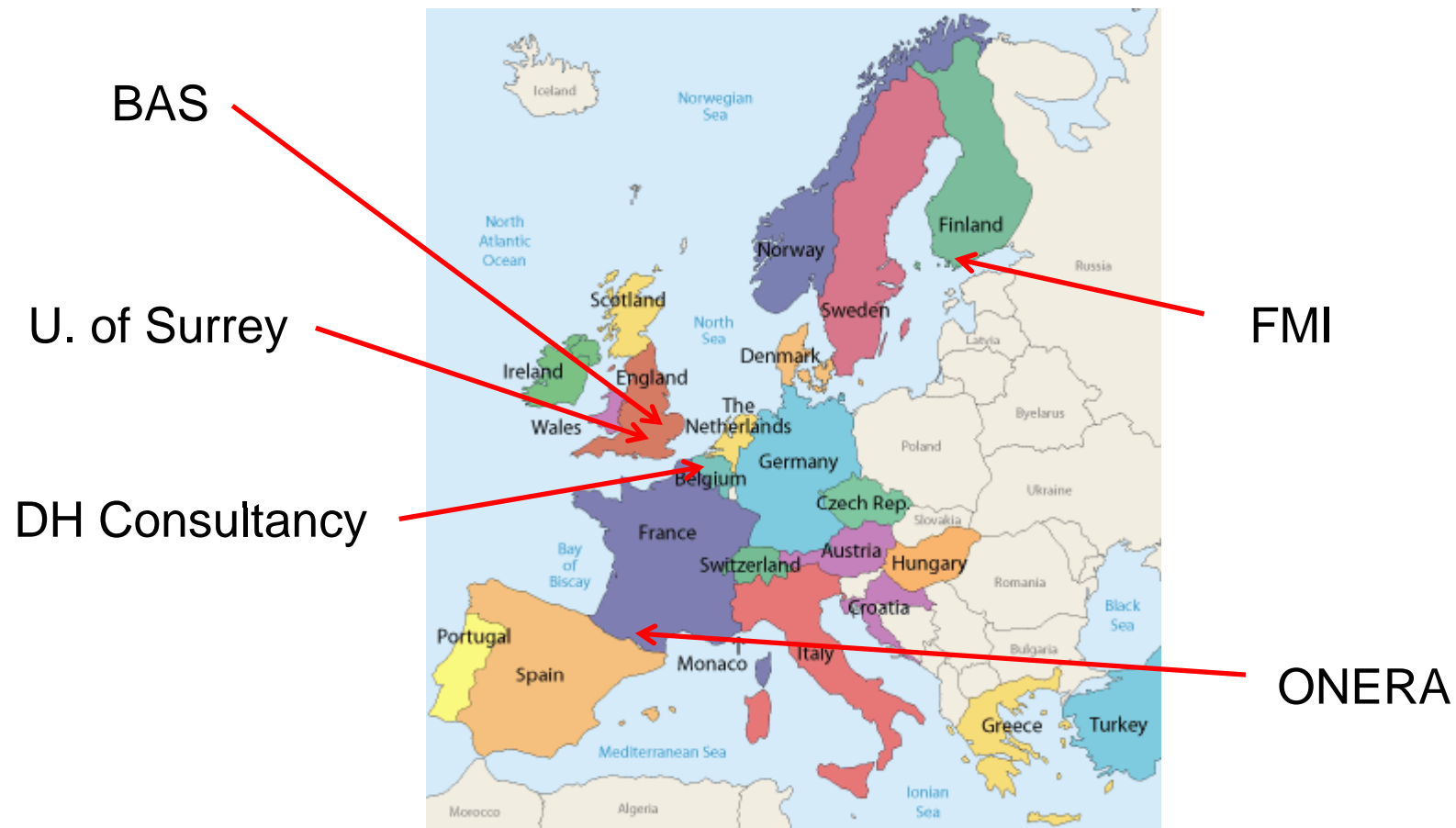
- Situation awareness
- Much improved modelling for regions where there is little/no data
- Models being verified against data – RBSP, Proba V in future

- >800 keV

- > 2 MeV



The SPACESTORM Team



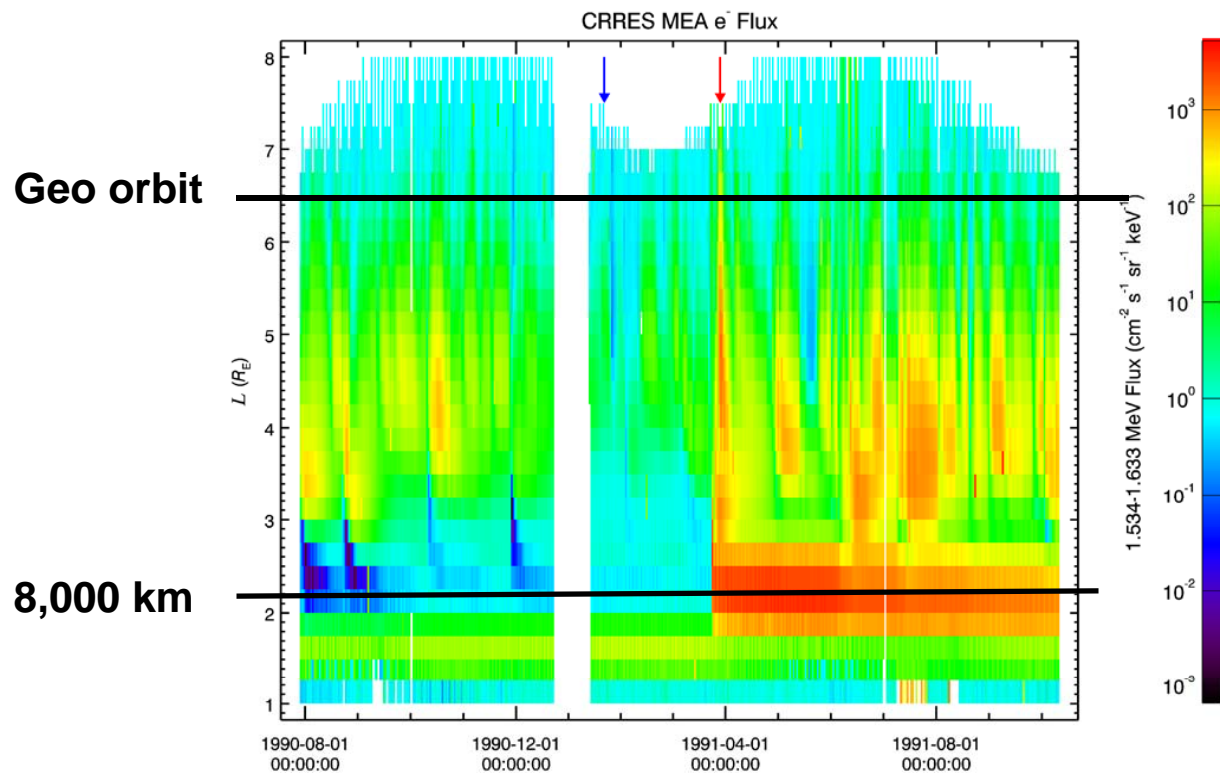
**And many other international collaborations
common for research projects**

Stakeholder Advisory Team

- Dave Pitchford SES (Luxembourg)
 - Justin Likar UTAS (USA)
 - Dave Wade Atrium Insurance (UK)
 - Richard Thorne UCLA (USA)
 - Janet Green Geo-synergy (USA)
-
- Close collaborations for research, and links to ESA, NASA
 - Plus about 30 stakeholders for ESWW11,12,13
 - We invite you to contact and join us as stakeholders

All Electric Propulsion Satellites

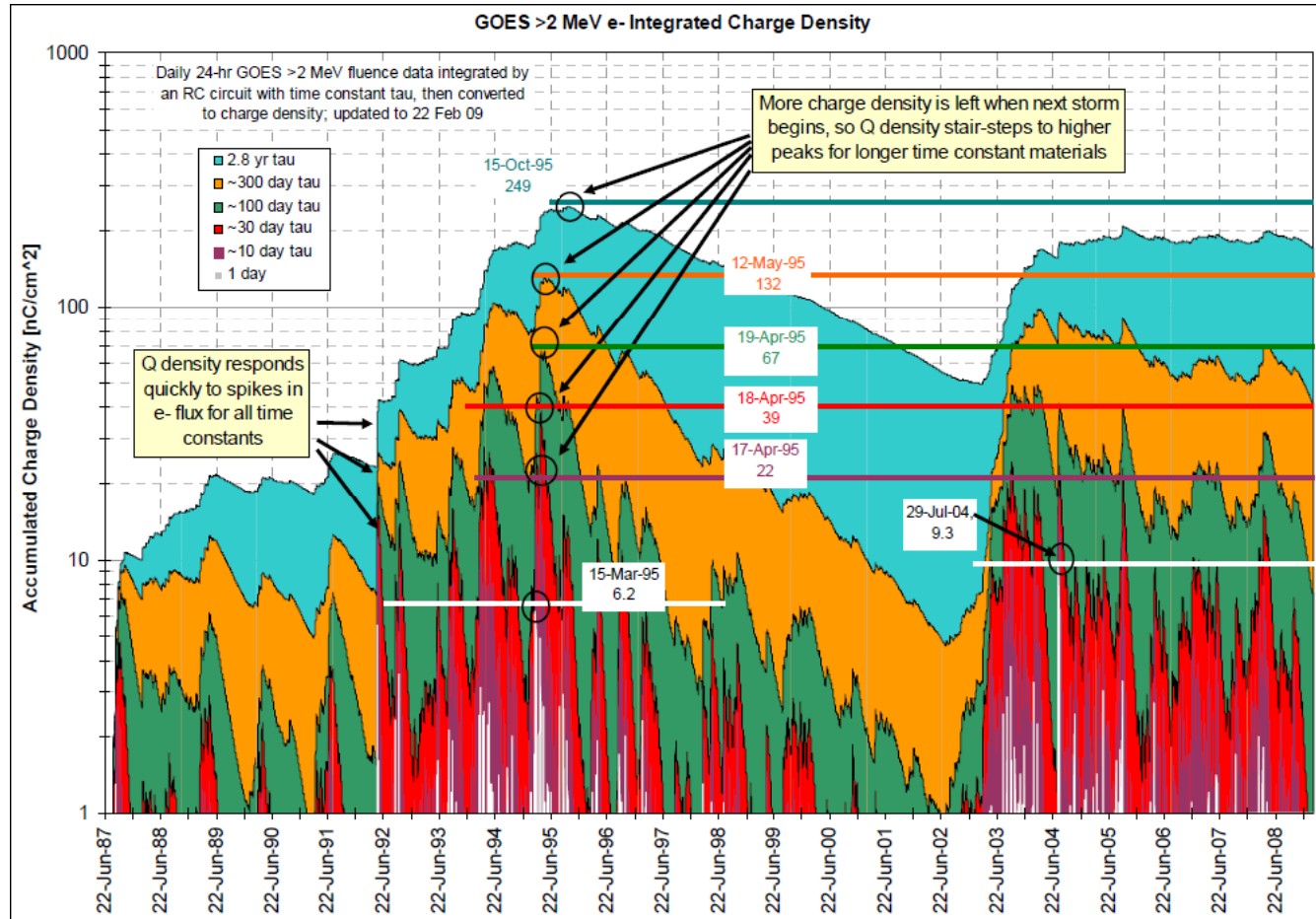
- Launch to orbit ~ 100 – 180 days
- Needs full assessment of variable radiation environment
- SPACECSTORM will cover the whole outer belt – electron flux, fluence, charging



- 1.5 MeV electrons flux from CRRES
- Much higher charging environment after March 1991
- Charging depends on materials
- Note 8,000 km for O3b satellites

- Heynderickx [2014]

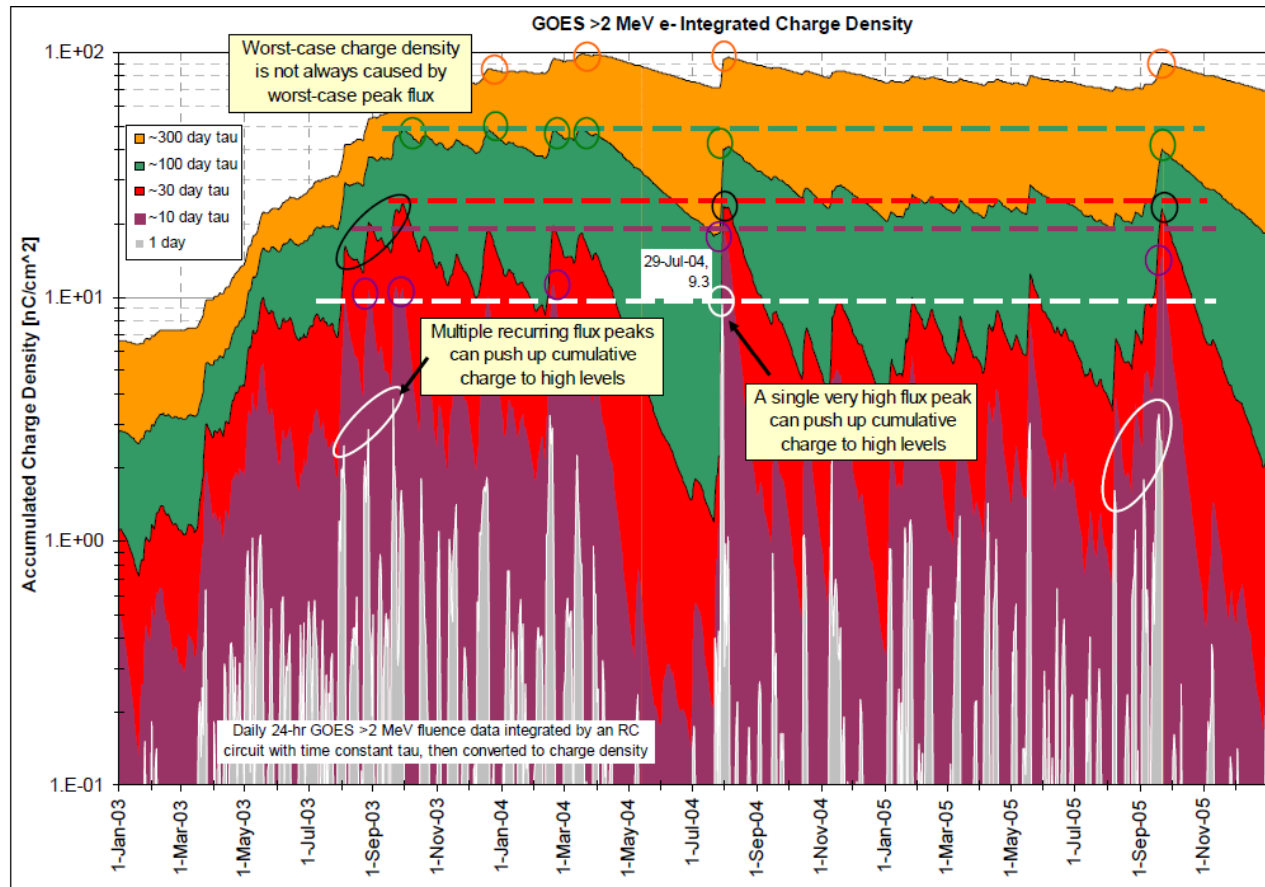
Satellite Charging – Time Constants



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Satellite Charging – Time Constants



- CME driven events are important – but may not be the only type of extreme event we need to study – fast solar wind streams