

Space Weather Processing

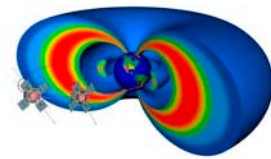
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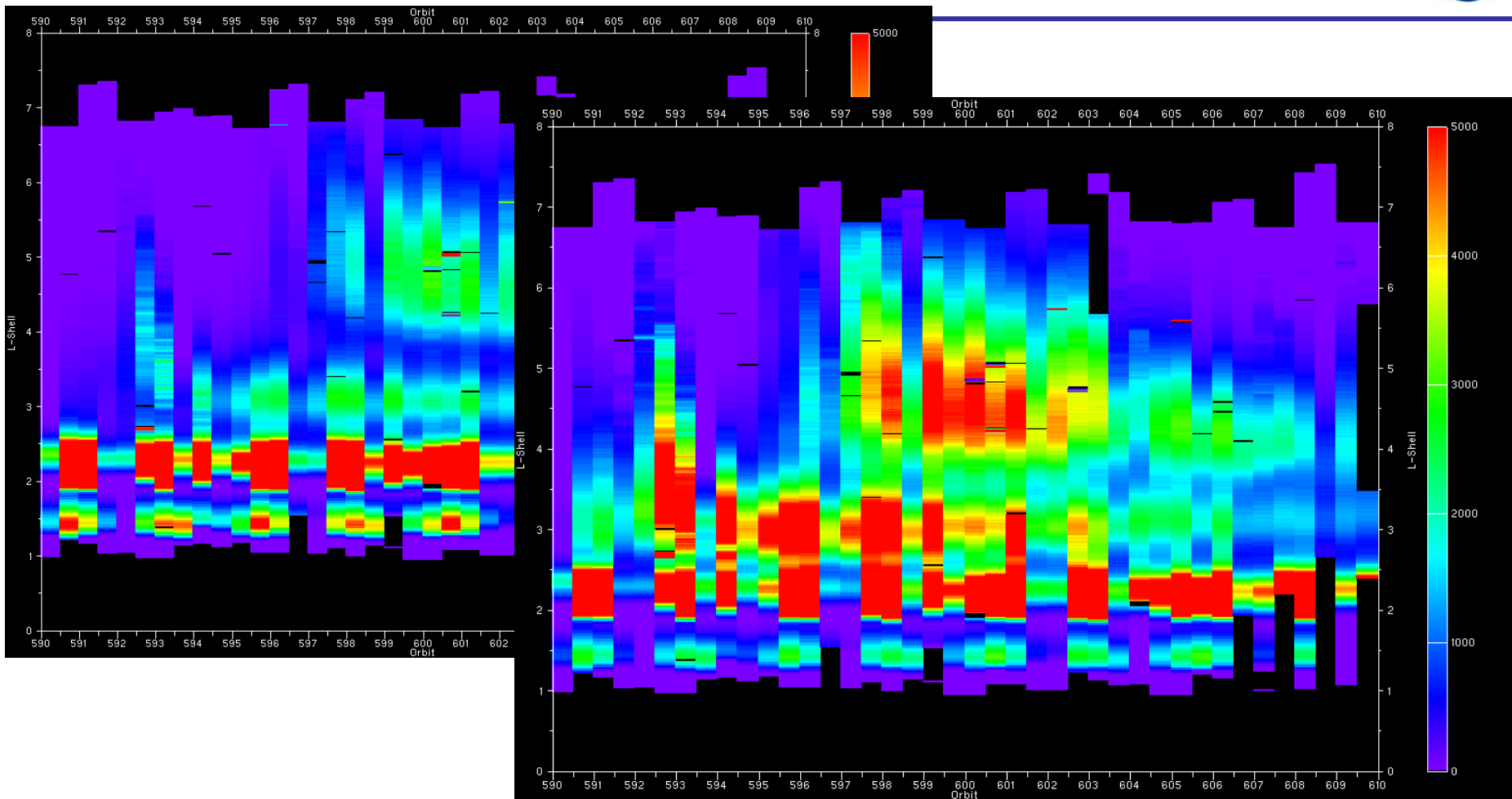
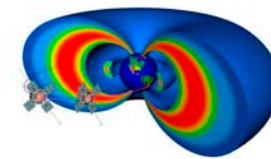
Background



- Space Weather data is broadcast in real-time through the primary spacecraft RF system, used for science downlink
- S/Cs will broadcast space weather when it is not in a primary mission-related ground contact
- There are no requirements for continuous coverage in near real-time
- Modeled after ACE real-time beacon and STEREO real-time beacon data streams
- Goal: provide this data to the public as soon as possible
- RBSP Instrument Space Weather are documented in the RBSP Space Weather ICD, 7417-9100



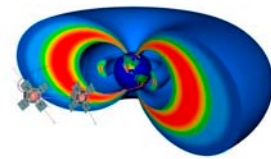
Potential Space Weather Products



RBSP Science Gateway (formerly the Science Data Portal) produces Space Weather products from the RBSP Space Weather Telemetry



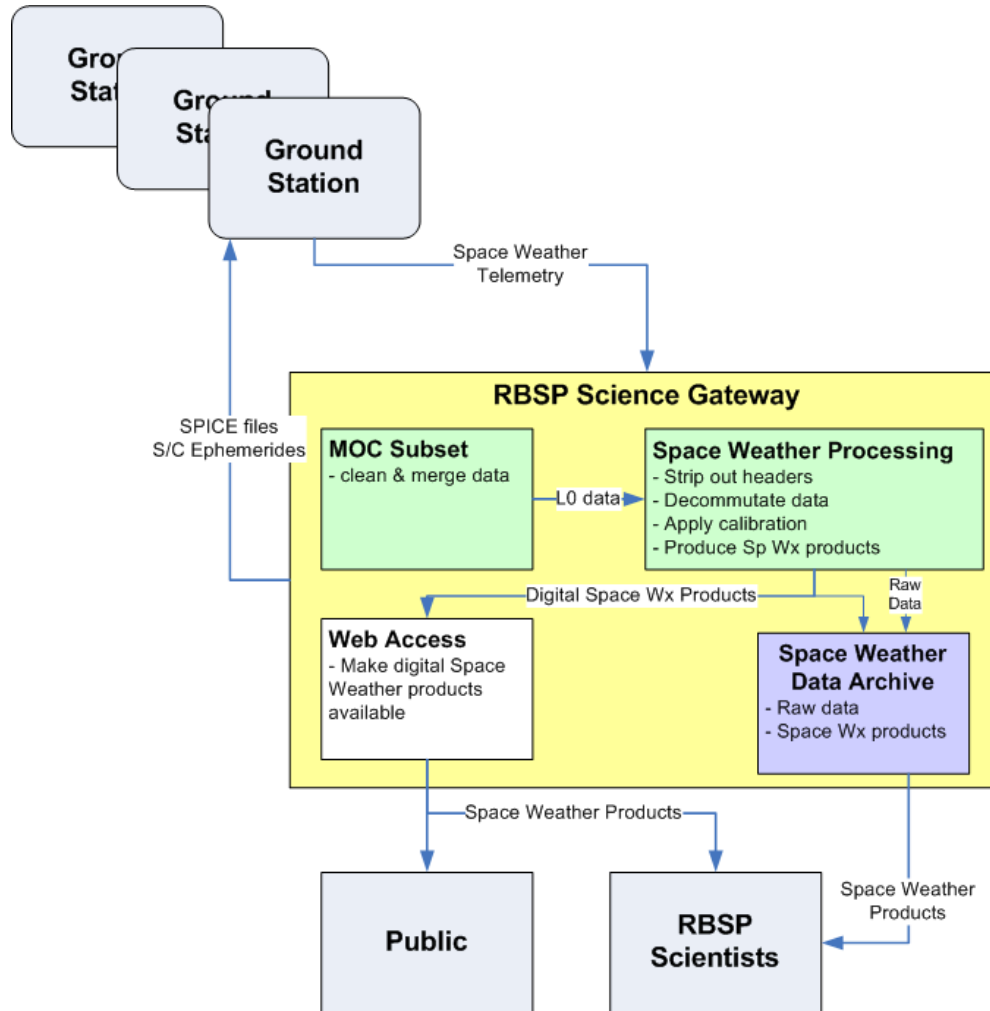
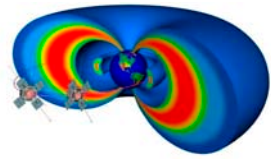
RBSP Space Weather Data



- This is strictly best effort and there will be data gaps.
- Space weather data processing will occur in near real-time. Data will not be reprocessed.
- Only 15 days of space weather products will be publicly available from the Science Gateway
 - there will not be multiple sites processing and displaying data
- Only space weather plots/images will be publicly available
 - no public dissemination of digital data
- There will be a clear disclaimer above the Space Weather indicating that the data are not intended for Scientific Use
- Raw data and space weather products will be archived

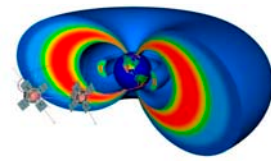


Space Weather Conceptual Flow





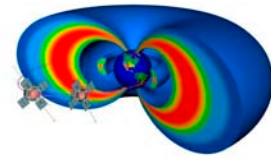
Space Weather Data Flow through the Science Gateway



- Space weather data will be periodically retrieved from external ground stations by the Science Gateway
- The data will be cleaned and merged (using legacy MOC software)
- The Science Gateway will apply calibration algorithms (supplied by the instrument teams) to generate space weather products
- The Science Gateway will generate and display plots/images of the space weather data
 - Only 15 days of space weather products will be publicly available from the Science Gateway
 - Raw data and space weather products will be archived
 - Digital data will not be publicly available



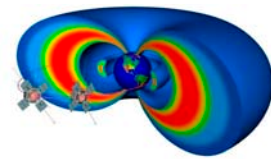
RBSP Space Weather Testing during I&T



- During MSIM 3, there will be a test of instrument capability to send out Space Weather data
 - The instrument teams will:
 - Verify space weather packets are correctly formatted (using existing GSEOS packet decoders)
 - Verify the data is consistent between the regular science data and the space weather subset



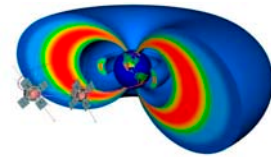
From Instrument Teams



- Prior to launch
 - Algorithm/code to decommutate their Space Weather instrument data
 - Algorithm/code/documentation to calibrate data for the generation of space weather products
 - It is anticipated that the algorithms/codes that will be used during I&T can be made available to APL for these purposes with little additional burden on the teams
 - A modest amount of support provided to space weather POC as they work with the data stream and algorithm
 - Notification to POC if it is necessary to update these calibration algorithms
 - Examination of Space Weather data plots/images produced by the Science Gateway and confirmation that they are correct



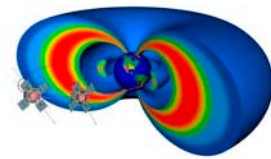
From Instrument Teams



- During early operations and Phase E
 - Verify occasionally that the plots/images produced by the Science Gateway look reasonable
 - If calibration algorithms change notify POC
- Note: There will only be a single point of contact for Space Weather Products and updates – Michele Weiss



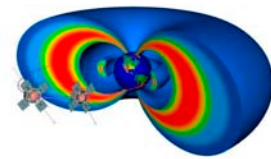
RBSP Space Weather Data Products



| Instrument | Measurement | Energy |
|---------------|--|--|
| EMFISIS/MAG | Vector Magnetic Field | N/A |
| EMFISIS/Waves | VLF Wave Power | N/A |
| EFW | Vector Electric Field Spacecraft Potential | N/A N/A |
| ECT/HOPE | Electrons Protons Oxygen Ions Helium Ions | 25 eV, 300 eV, 10 keV, 40 keV 25 eV, 300 eV, 10 keV, 40 keV 25 eV, 300 eV, 10 keV, 40 keV 25 eV, 300 eV, 10 keV, 40 keV |
| ECT/MagEIS | Energetic Electrons Energetic Protons | 30 keV, 60 keV, 100 keV, 300 keV, 600 keV, 1 MeV, 2 MeV 1 MeV |
| ECT/REPT | Very Energetic Electrons Energetic Protons | 2 MeV, 5 MeV, 10 MeV >20 MeV, >50 MeV, > 70 MeV |
| RBSPICE | Energetic Protons | 50 keV, 100 keV, 150 keV, 300 keV, 1 MeV, 10 MeV |
| PSBR/RPS | Energetic Protons Dosimeter Data | >50 MeV, >400 MeV Linear and Log outputs (Volts) |



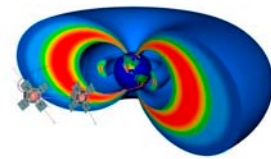
Potential Space Weather Users



- Possible use by DoD users are currently being explored
- DREAM
 - Inputs:
 - Raw counts of HOPE, MagEIS and REPT
 - Possibly fluxes from RBSPICE for ring current modeling



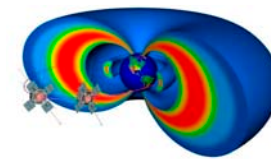
CCMC as a Potential Space Weather User



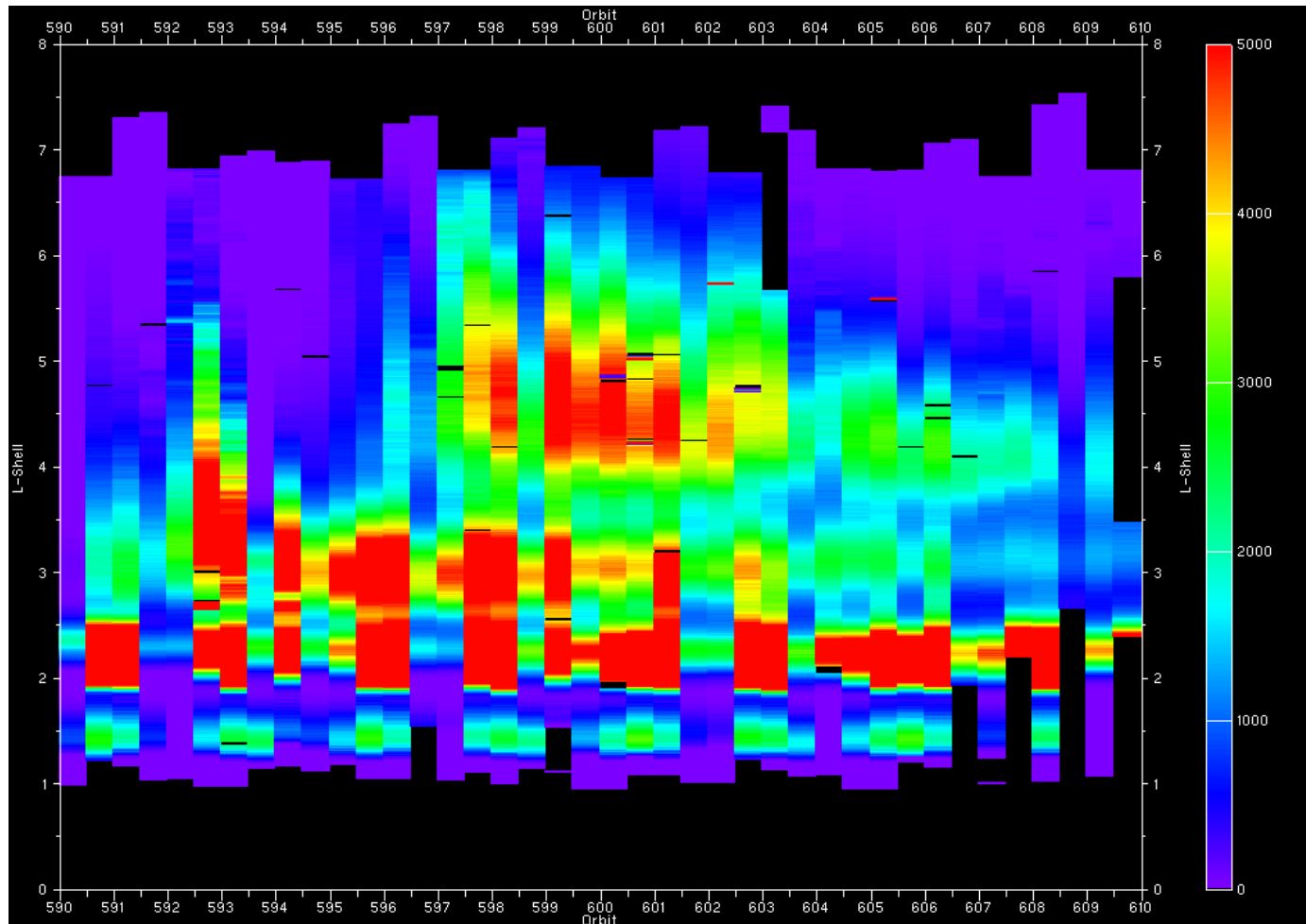
- CCMC
 - Desired inputs:
 - Fluxes
 - Energy channels
 - Means to convert between counts and fluxes
 - Orbit ephemeris
 - Outputs:
 - Modeled output of expected environment, i.e. fluxes across different energy channels, etc.
 - Ability to over plot RBSP space weather data in conjunction w/ model data



Potential Derived Space Weather Product

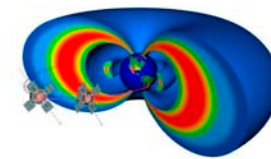


Time series particle flux using CRRES data

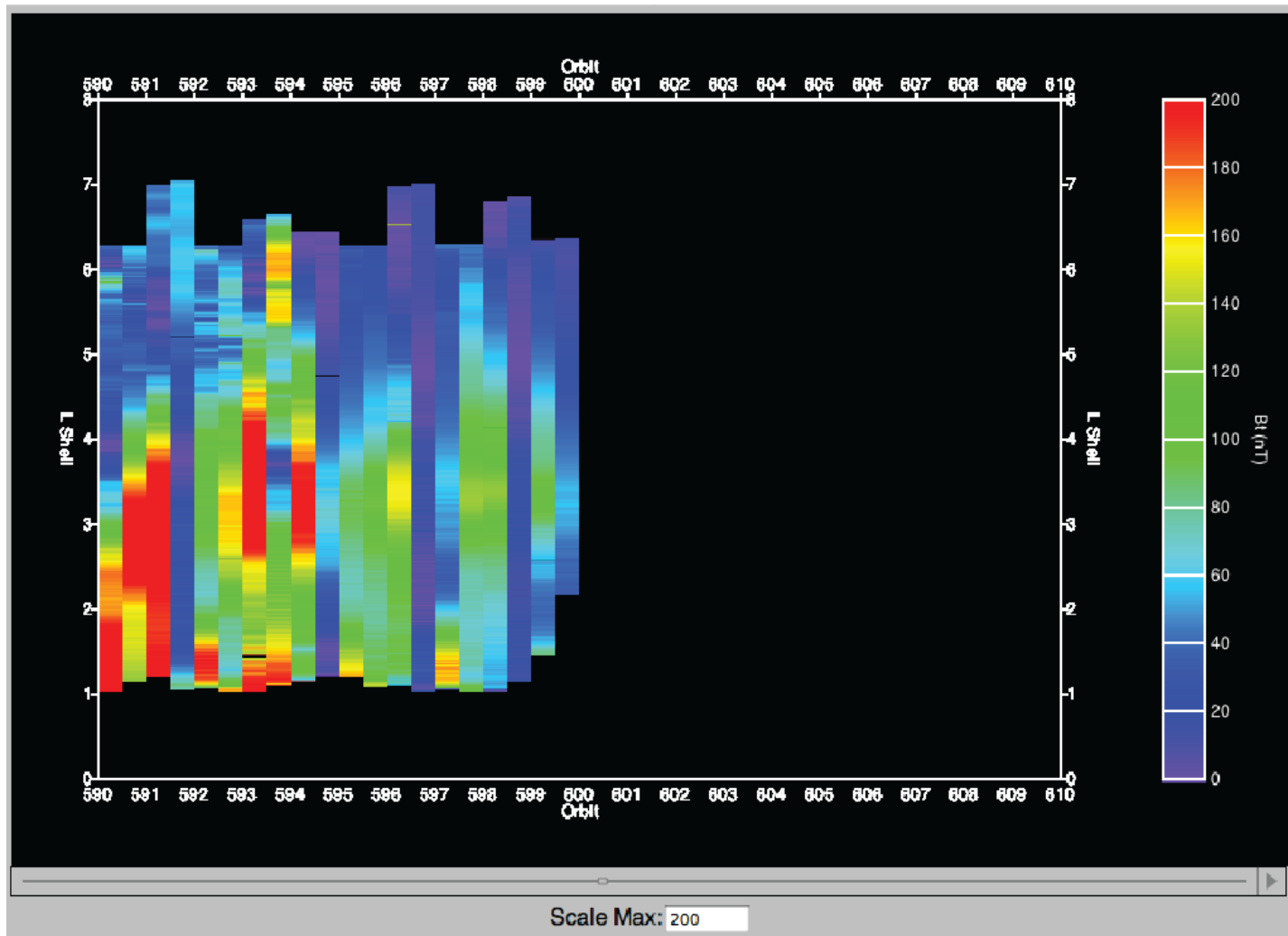




Potential Derived Space Weather Product

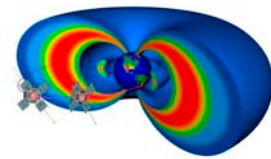


Time series magnetic field using CRRES data

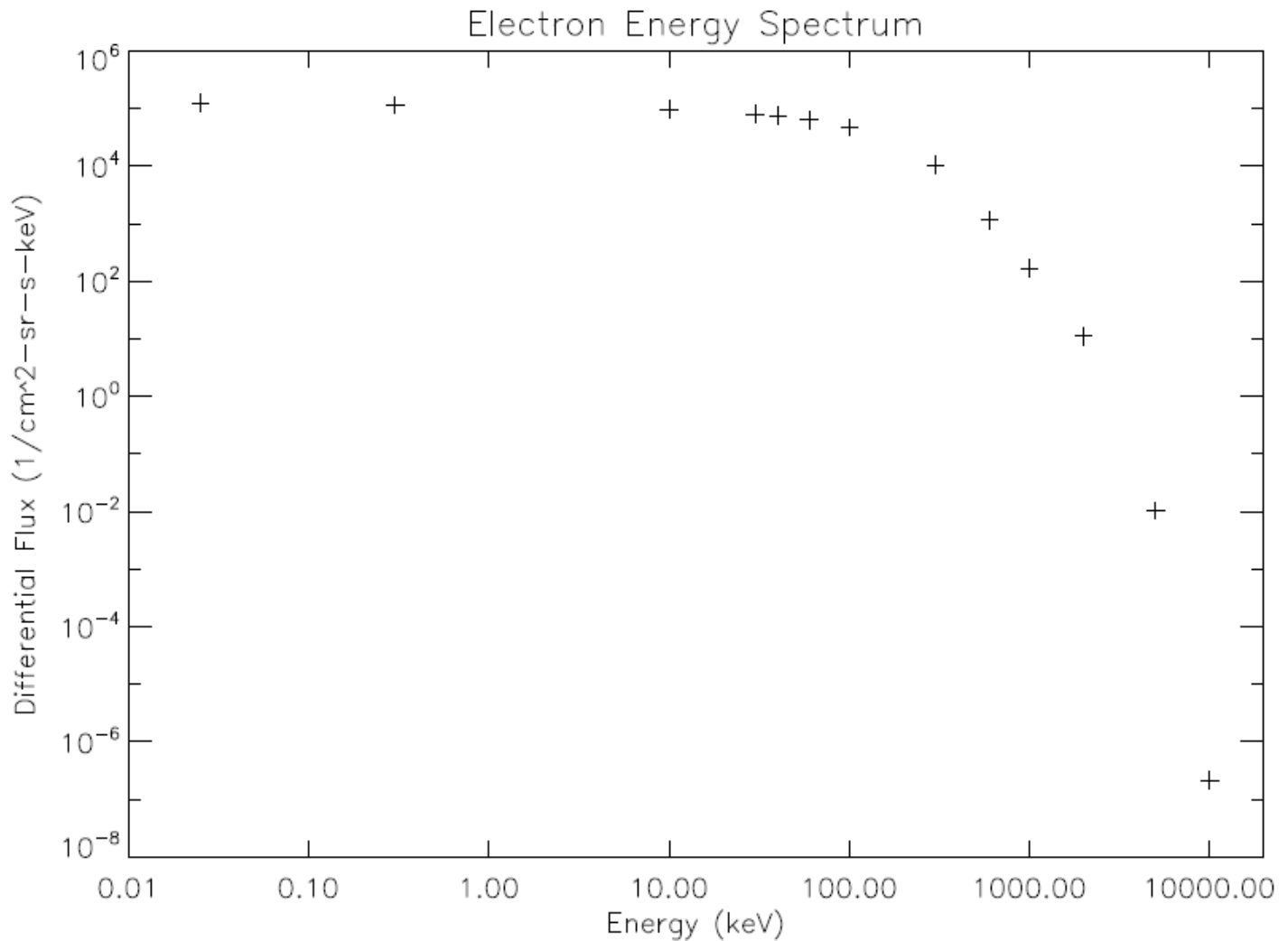




Potential Space Weather Derived Product



Electron
spectrum using
AE8 model
spectrum from
SPENVIS





Potential Space Weather Derived Product

