



Analysis of an energetic electron injection at GEO using FalconSEED:

A low SWaP-C, cubesat-compatible instrument for space environments

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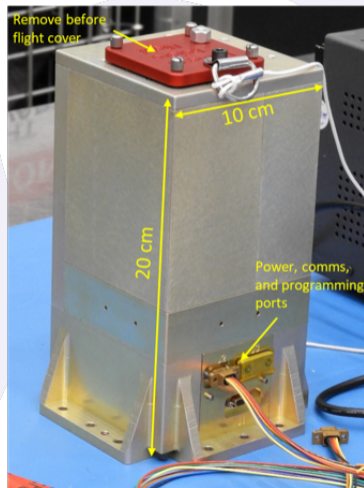
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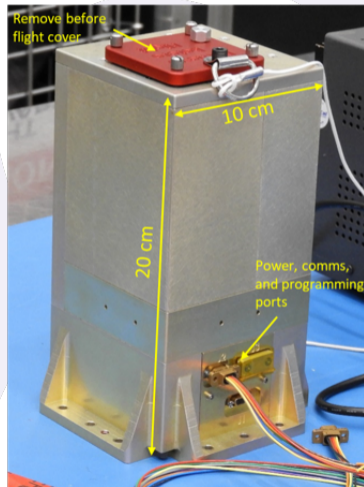
Falcon SEED

- Solid-state Energetic Electron Detector
- Flight volume: 10cm x 10cm x 20cm (2U)
- Flight Mass: 4.3kg
- Nominal Power: 3.4W



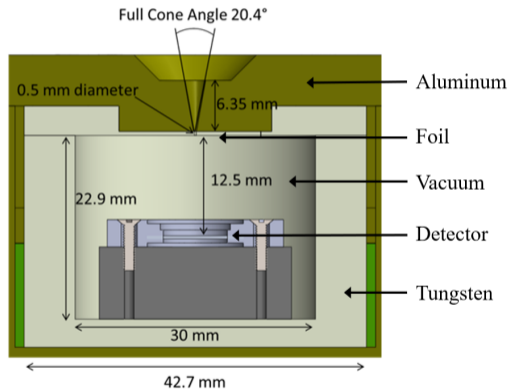
Falcon SEED

- Single-pixel electron energy spectrometer
- Energy range: 14 – 145keV
- Energy Bins (linear): 1024
- Energy resolution: ($\frac{\Delta E}{E} \approx 25\%$)
- Mean Time Resolution (full spectra): 74s



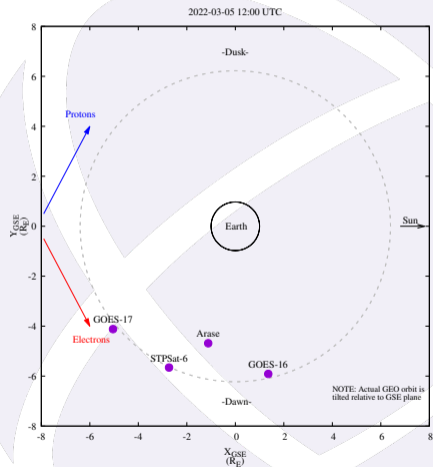
Falcon SEED

- 301 μm -thick silicon solid-state detector
- 0.5 mm diameter aperture with photon-reduction window
- Al collimator sets 20.4° FOV
- Amptek A250 Charge Amplifier feeds DP-5 COTS pulse processor



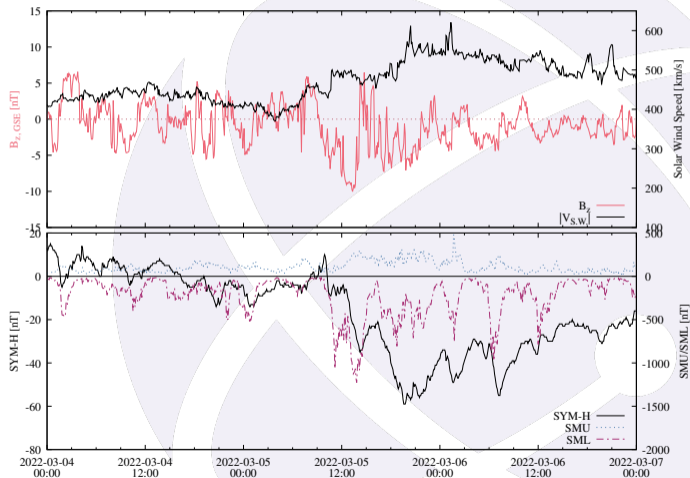
Host Vehicle: STPSat-6

- Sponsored by DOD Space Test Program
- Launched December 2021
- Geosynchronous orbit near 112° W
- LANL science payloads also included

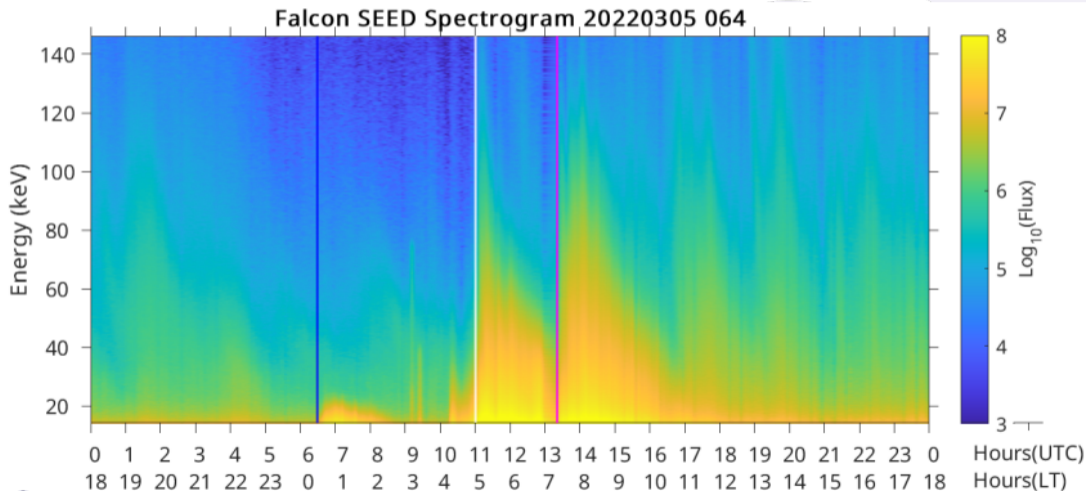


2022-03-05: Overview / Context

- Several hours of oscillating IMF B_z
- Solar Wind speed increases \sim 0300UTC
- IMF B_z sharply southward (< 0) \sim 0900UTC
- Minor Geomagnetic Storm $D_{ST} \approx -60nT$
- Strong substorm activity $AL < -1000nT \sim$ 1100UTC

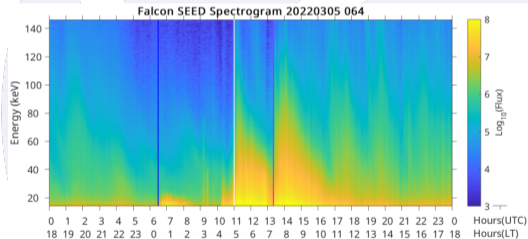


2022-03-05: SEED Observations

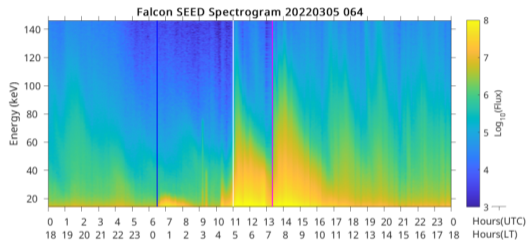


2022-03-05: SEED Observations

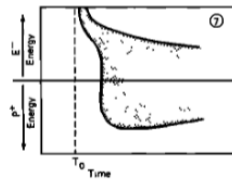
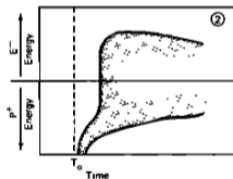
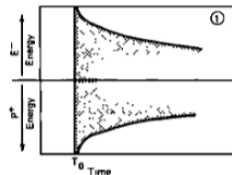
- Energetic particle injections associated with Substorms
- Electron injections aligned with drops in *AL*
 - White line: 1100 UTC
 - Violet line: 1320 UTC
- Categorization of injections (ala Mauk&Meng, 1983)



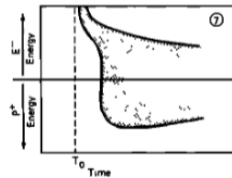
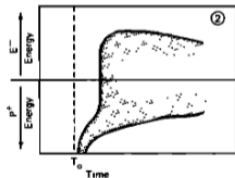
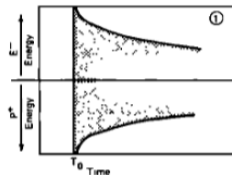
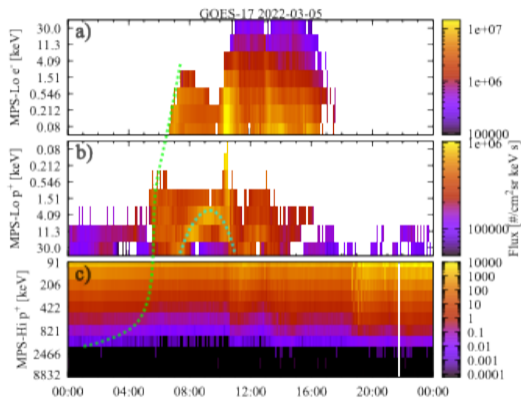
2022-03-05: SEED Observations



- White line: Type 1 (Dispersionless)
- Violet line: Type 1 (Dispersionless)
- Blue line: Type 2?

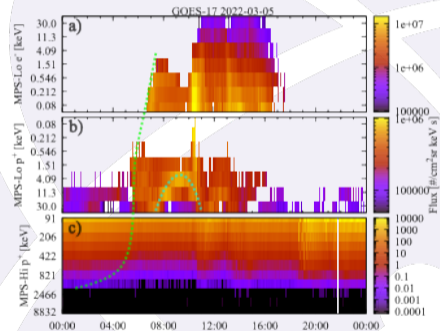
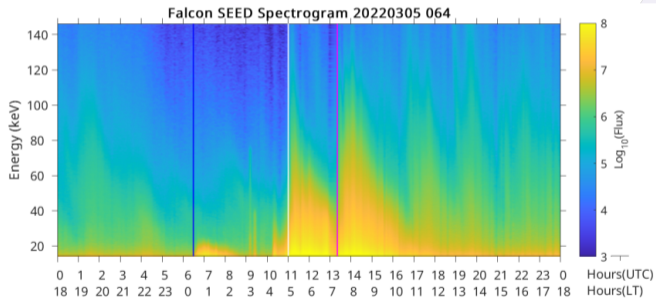


2022-03-05: GOES-17 Observations



- Type 2 ~ 0600

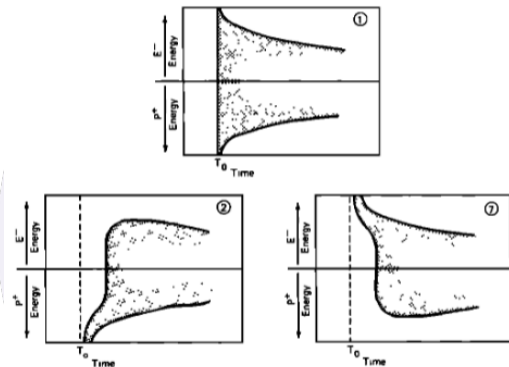
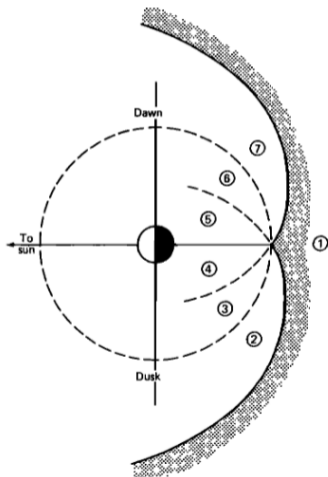
2022-03-05: Combined Observations



BACKUP



BACKUP



Mauk & Meng (1983)