



Observations of Electrons Accelerated Upwards to keV Energies at 1000 km

Wayne Keith, David Winningham, Olle Norberg, Goran Marklund, and Tomas Karlsson

Observed by the MEDUSA instrument aboard the Swedish Astrid-2 Satellite

MEDUSA characteristics:

- 360° FOV in spin plane
- 22.5° azimuthal resolution
- 5° elevation acceptance
- 31 energy steps
- 16 electron spectra per second
- 8 ion spectra per second
- 460 meter electron resolution
- 920 meter ion resolution

MEDUSA modes:

Normal Mode

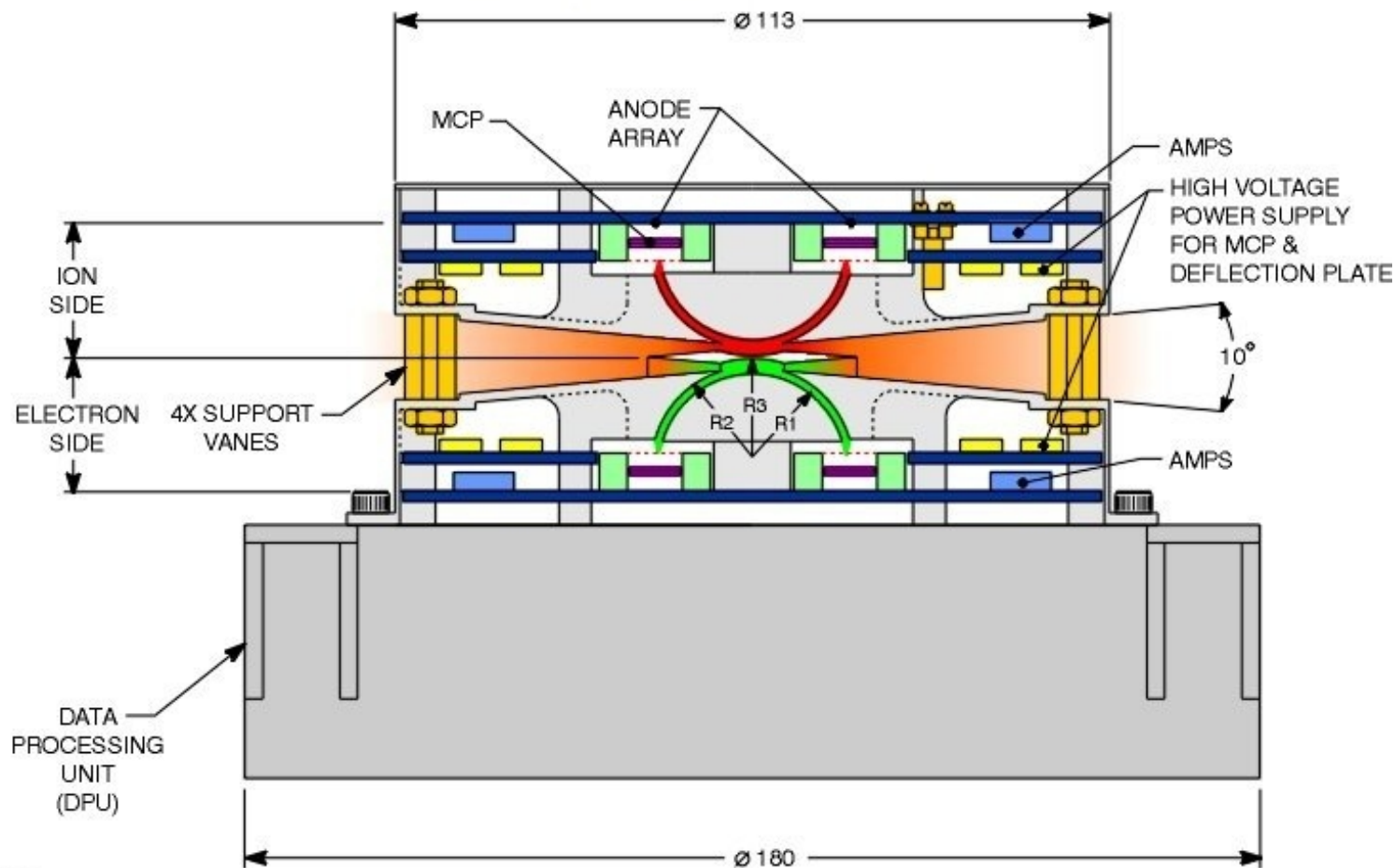
- 16 azimuthal sectors
- Sectors co-rotate with satellite

Select Mode

- 3 azimuthal sectors
- Sectors chosen to be closest to B field parallel, perpendicular, and antiparallel



Miniaturized Electrostatic Dual-top-hat Spherical Analyzer



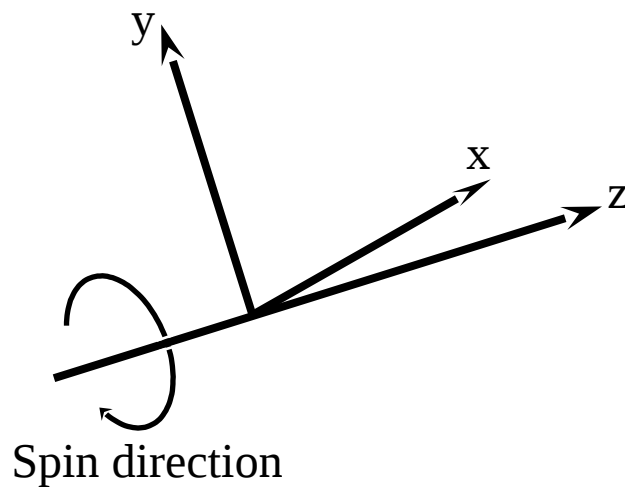
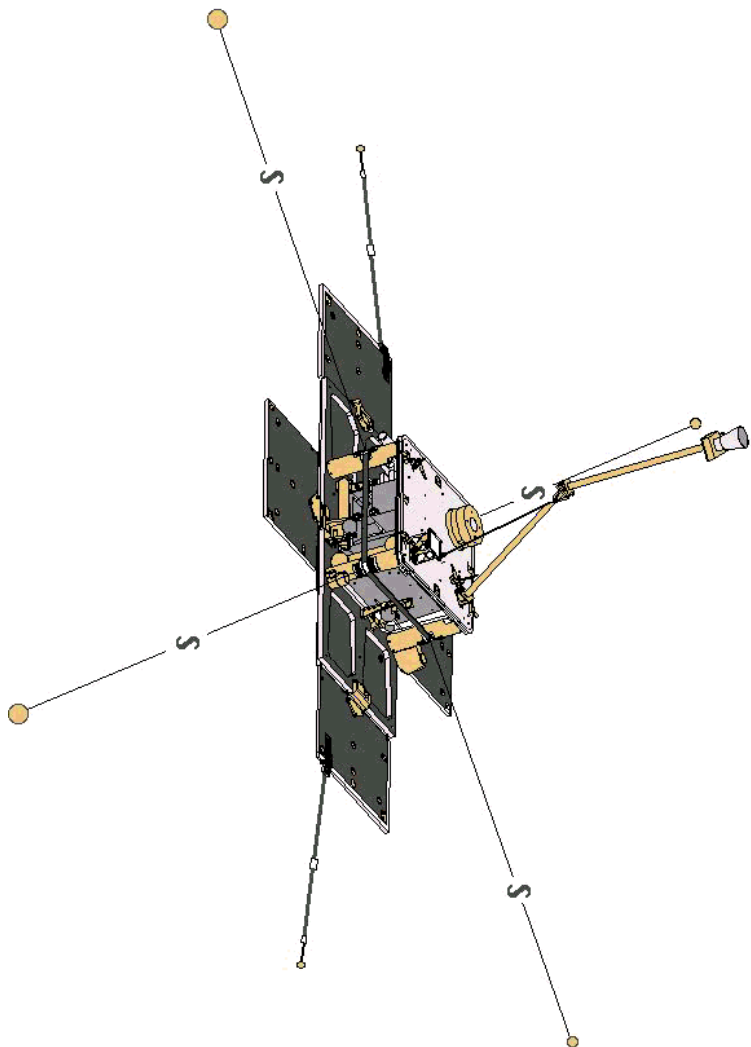
MASS
SENSOR: 600 GRAMS
DPU: 1000 GRAMS
SENSOR POWER: 2 WATTS

ALL DIMENSIONS ARE IN MILLIMETERS
SCALE: 1/1

R1 = 14.8
R2 = 16.0
R3 = 17.2



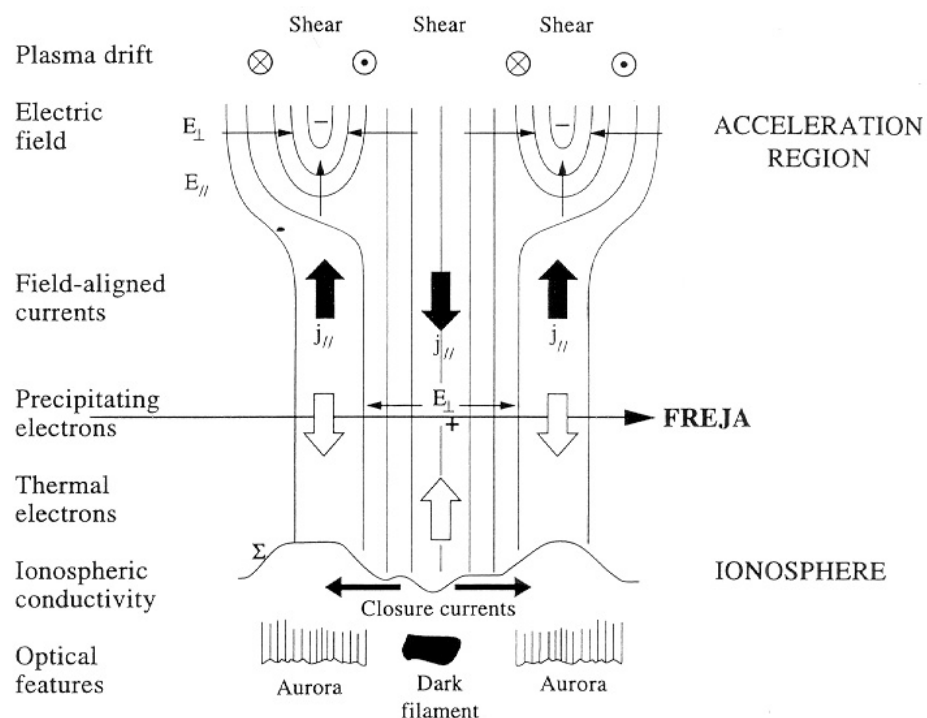
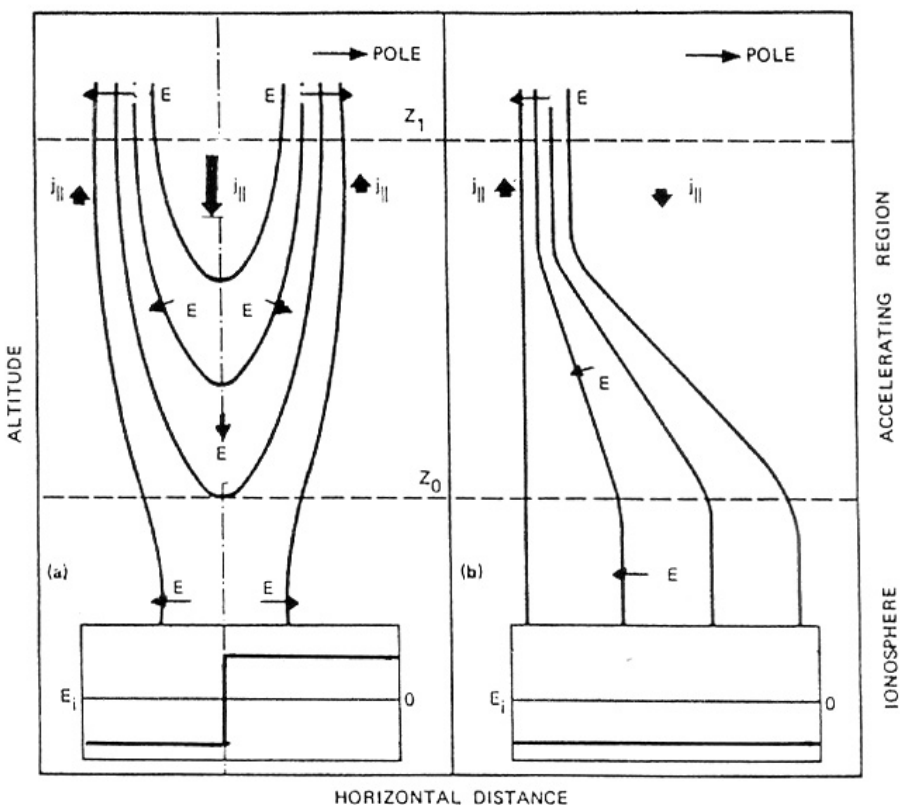
Astrid-2 Coordinate System

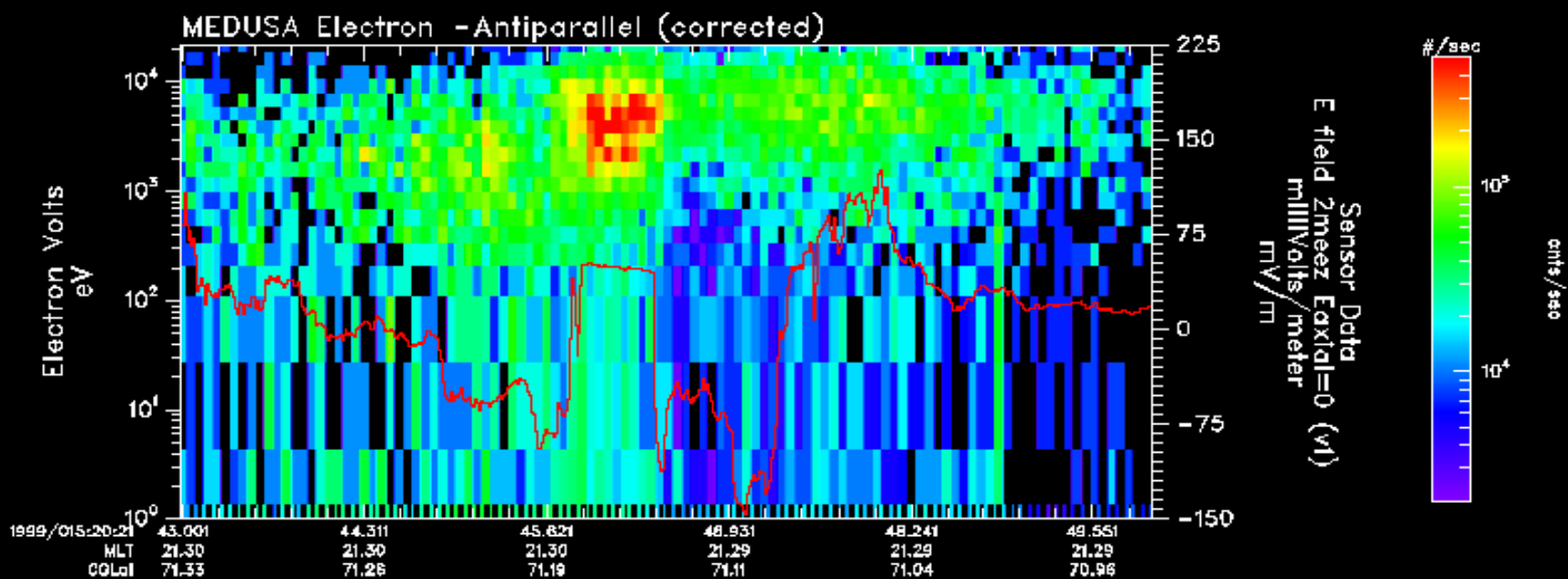
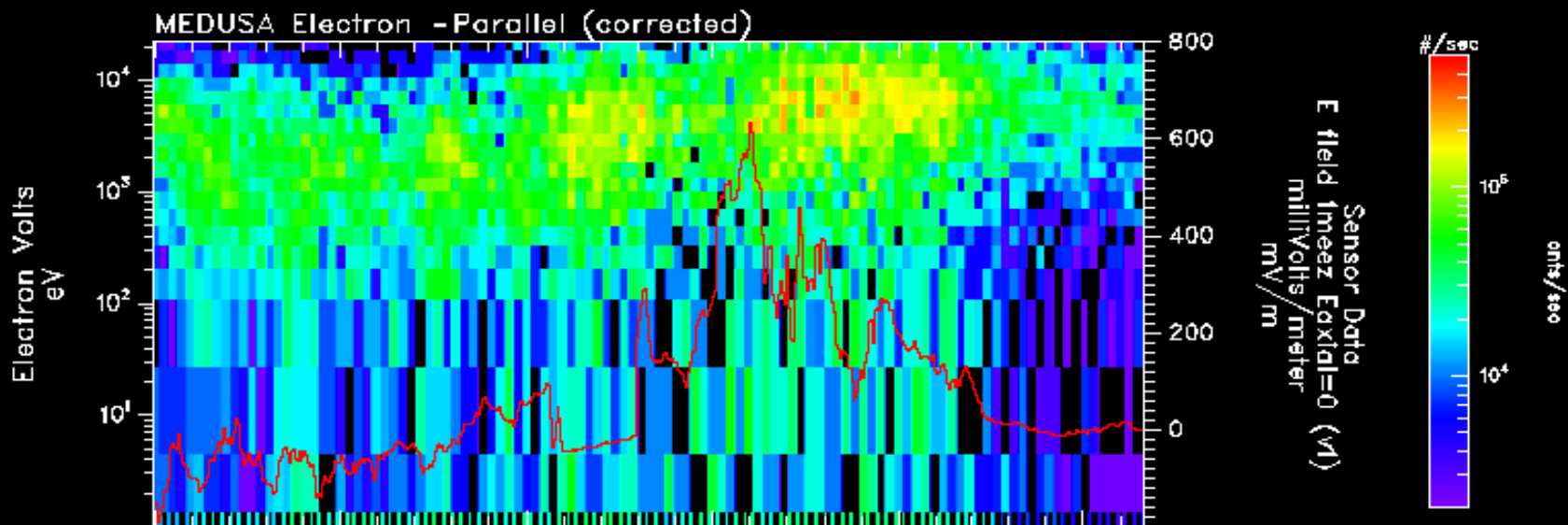


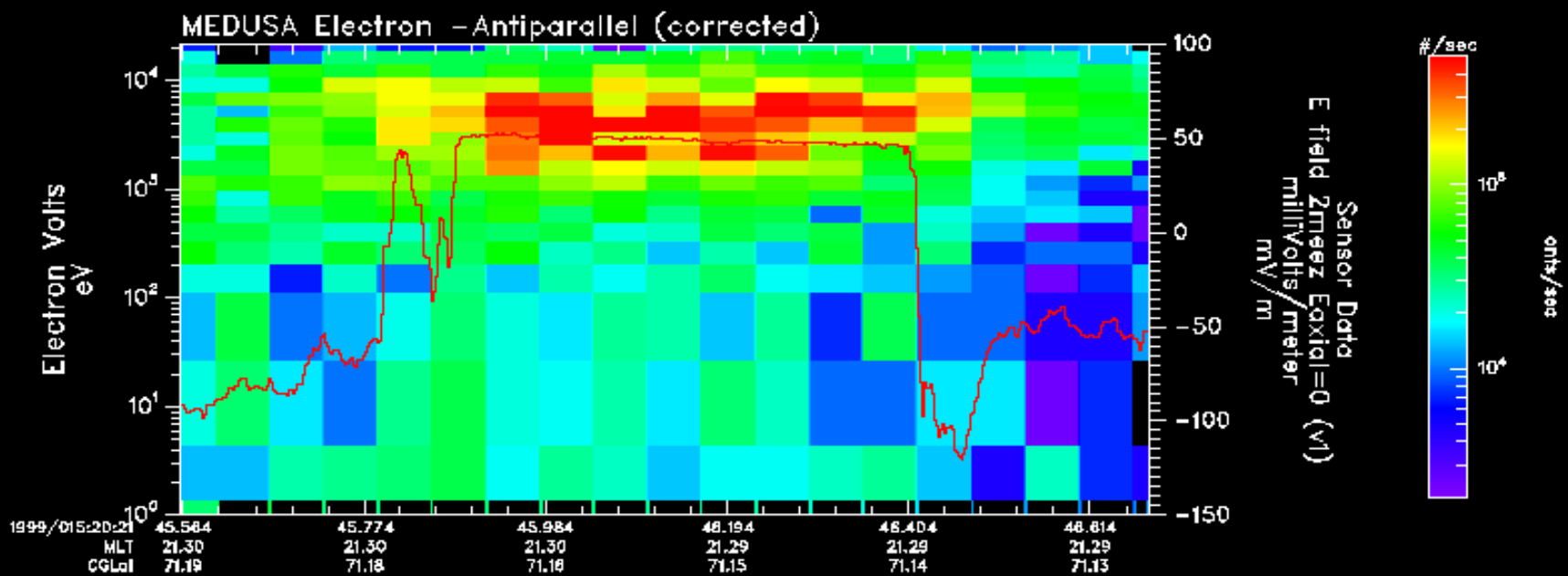
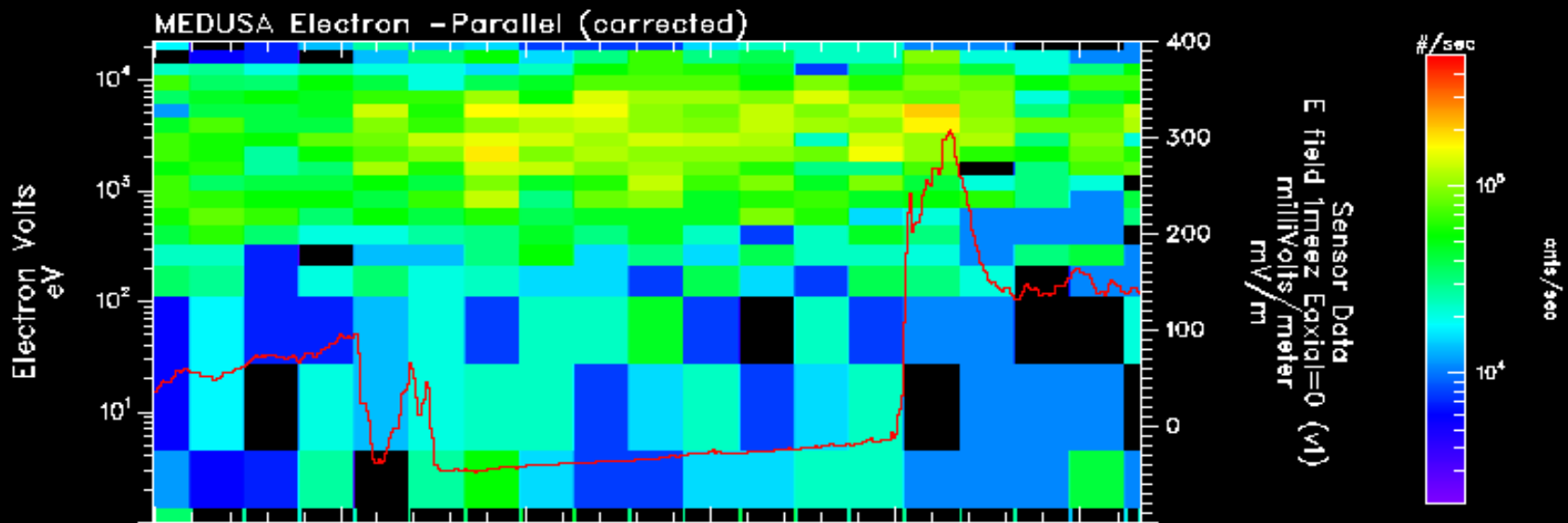
- Sun is in $-z$ direction
- MEDUSA is always anti-sunward
- Aperture plane $\pm 3^\circ$ of spin plane
- E-field measured in spin plane

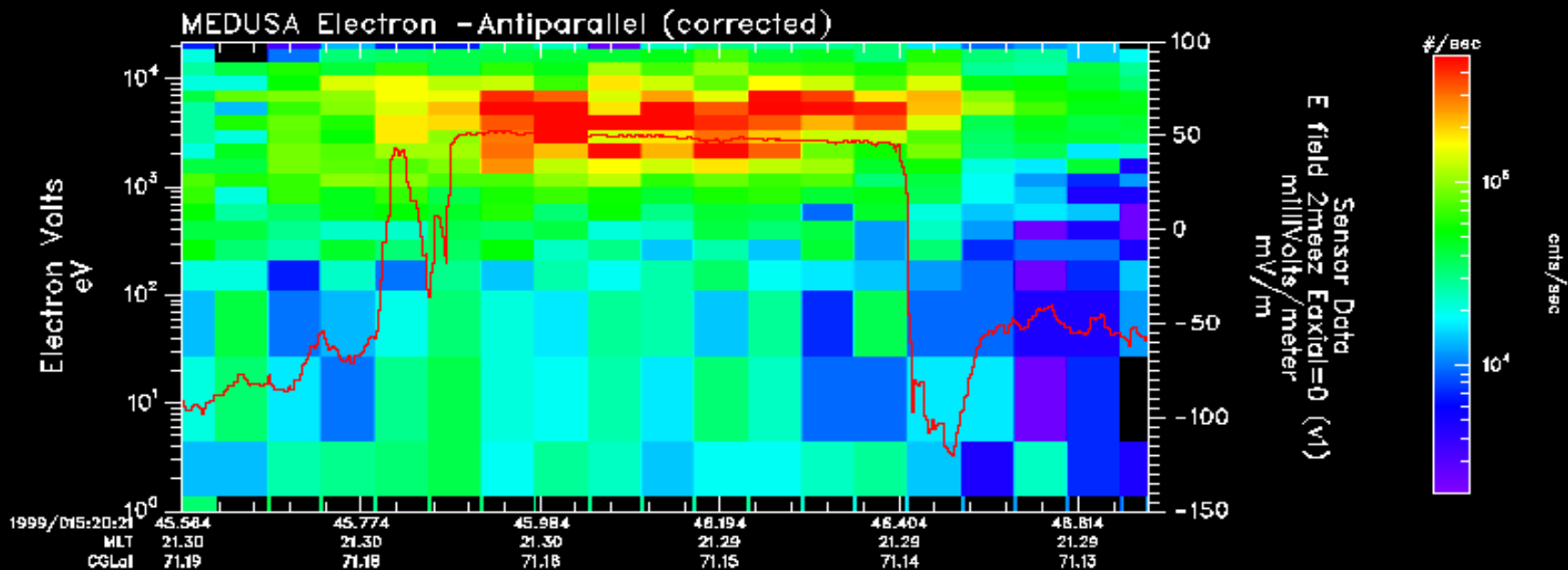
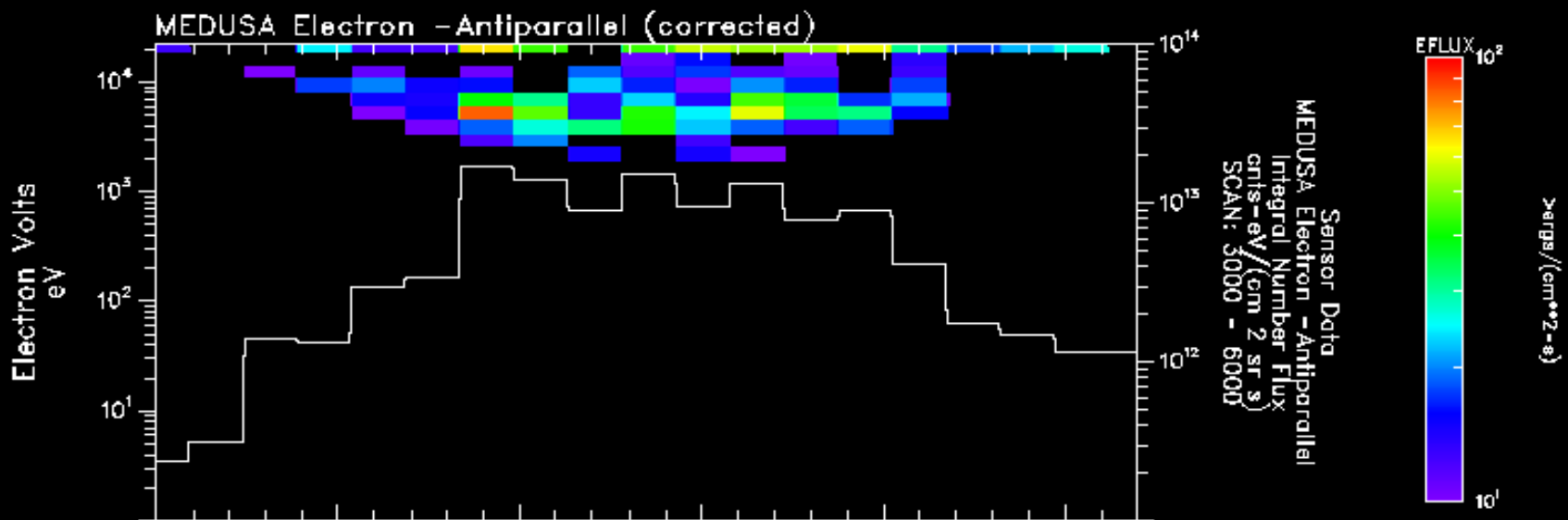


Possible Electric Field Configurations



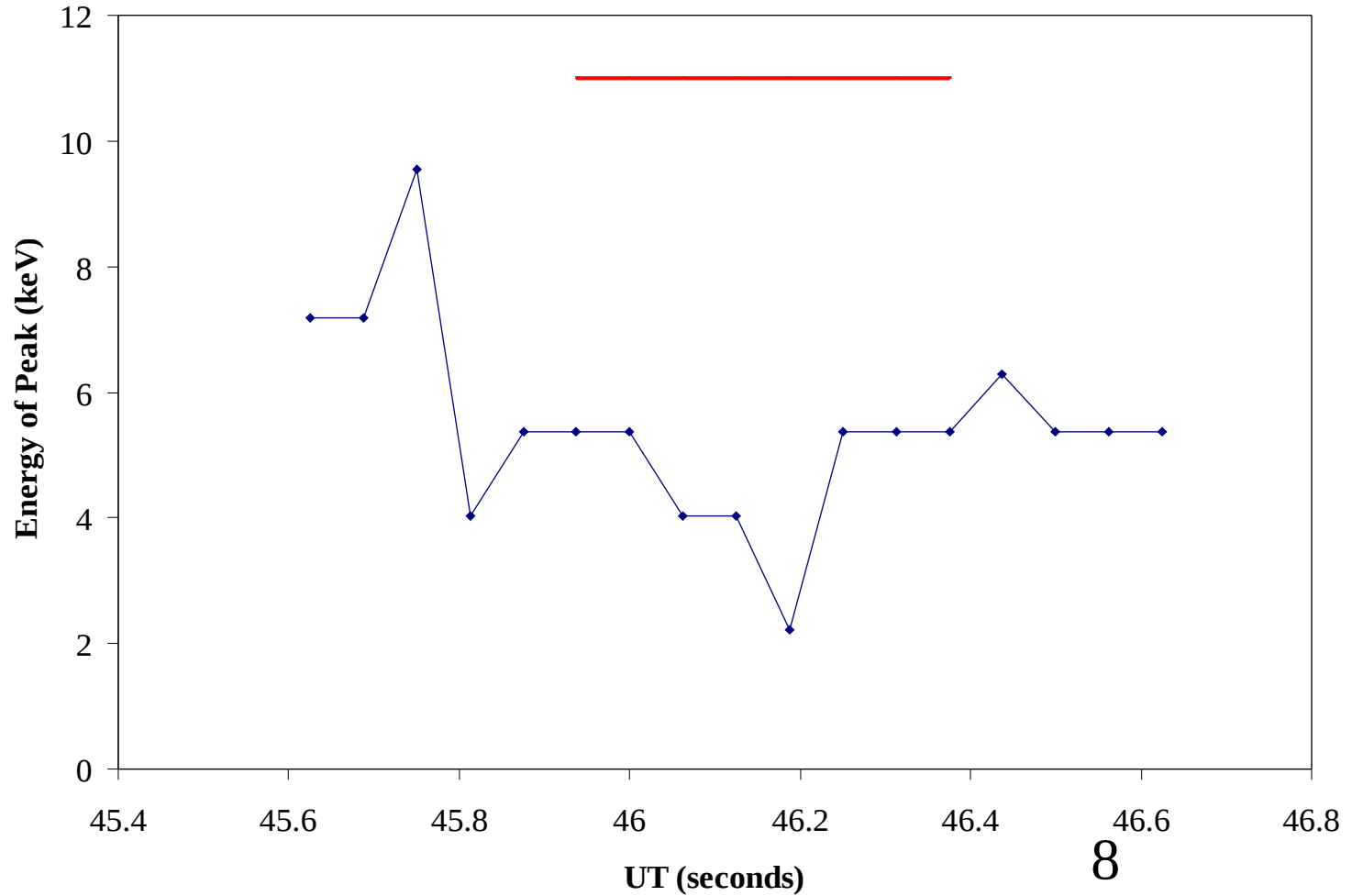








Energy of Peak Electron Intensity





Conclusions

Upward electron acceleration as seen by Freja at about 1750 km are observed by MEUDSA to occur below 1000 km with keV intensities. This raises the intensity of the electric field required for such accelerations and lowers the altitude at which acceleration occurs.