

Van Allen Probes Observations of a ULF Wave-Particle Interaction: 2012/10/31 Event

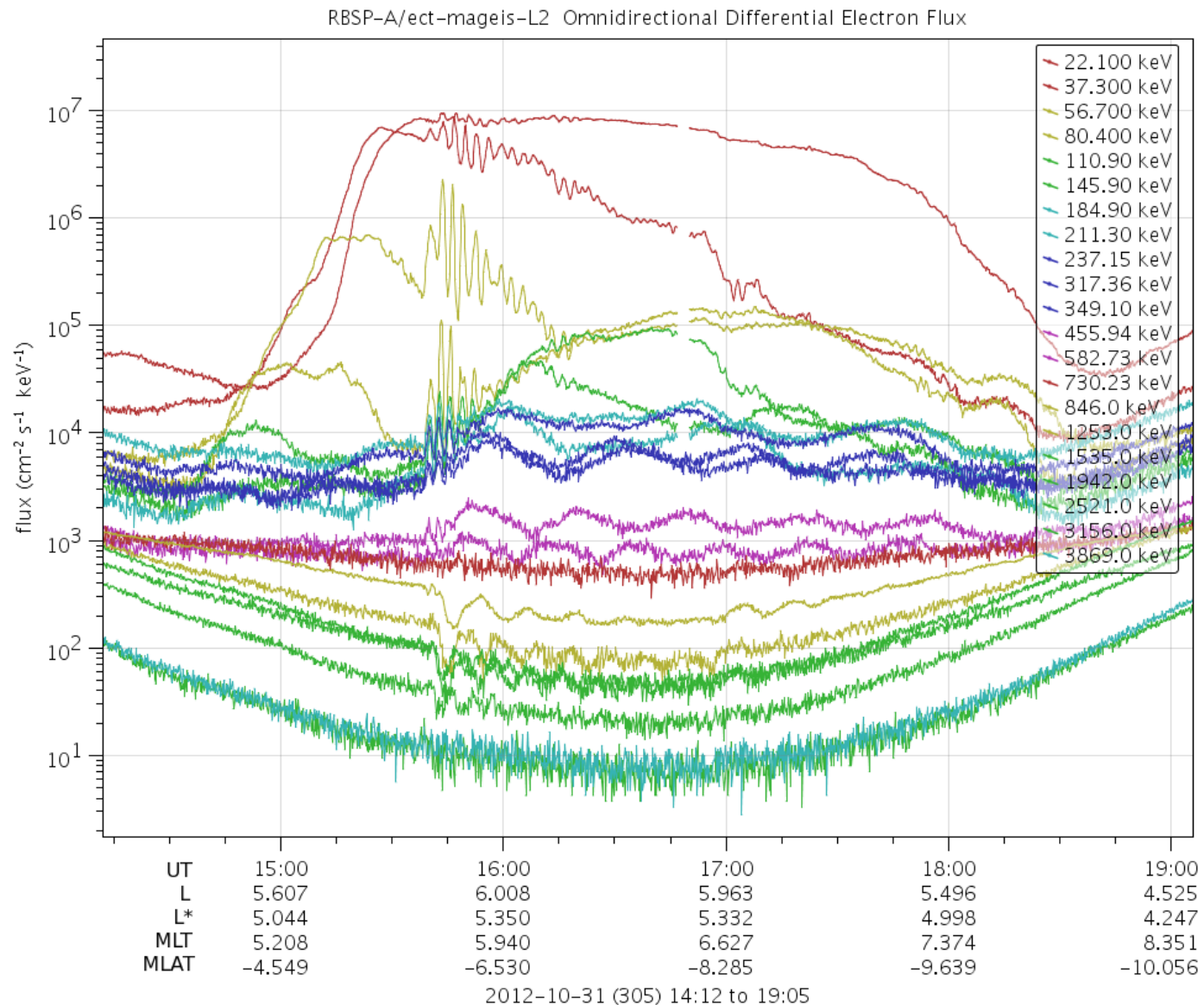
Seth G. Claudepierre
The Aerospace Corporation

Contributors: ECT Team, EMFISIS Team, EFW Team, CARISMA Team
Special Thanks To: Ian Mann, Kris Kersten, Jeremy Faden

Van Allen Probes SWG Meeting
26 February 2013

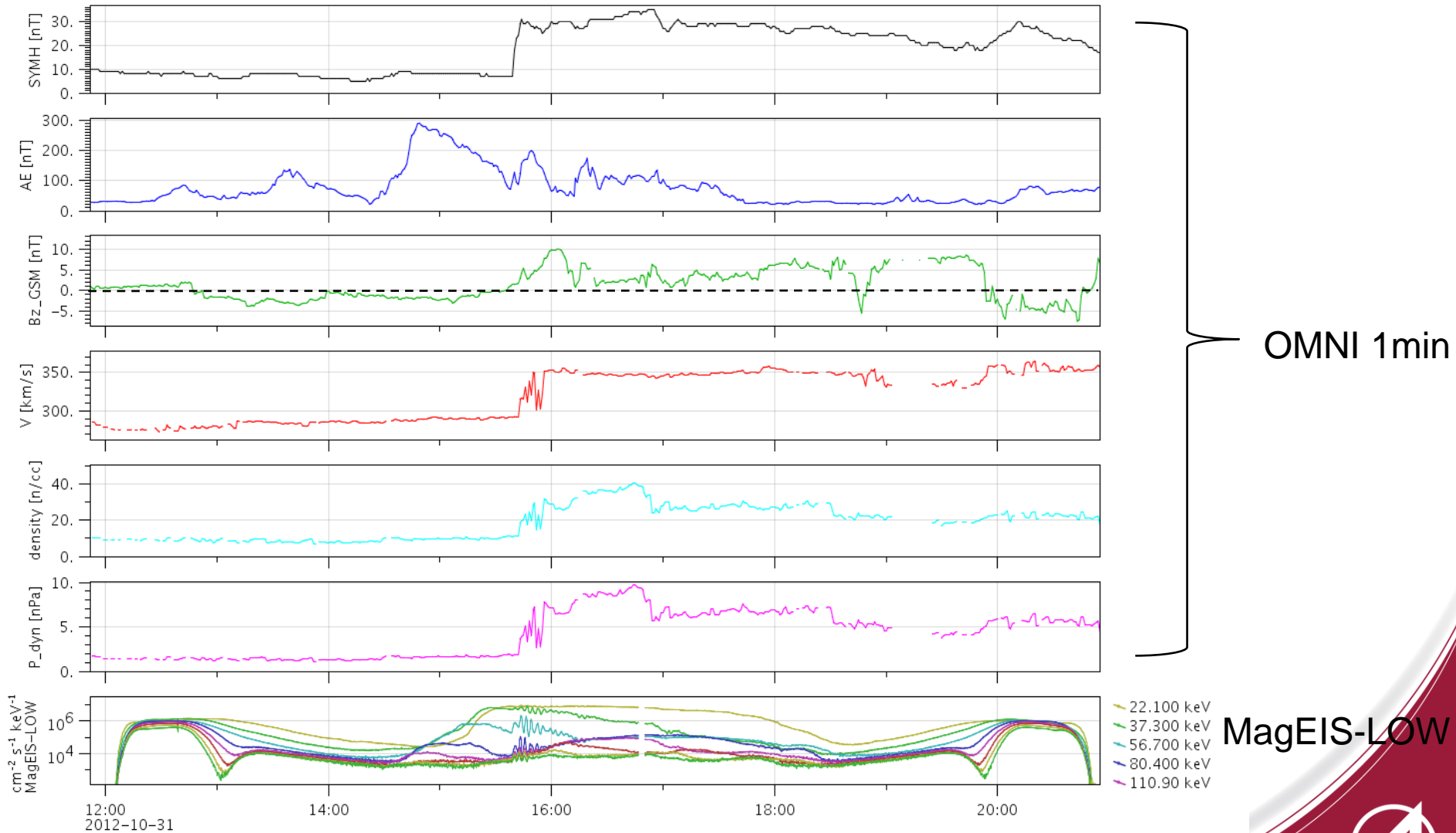
Van Allen Probes A, ECT-MagEIS, Electron Flux

2012/10/31 14:00-19:00 UTC



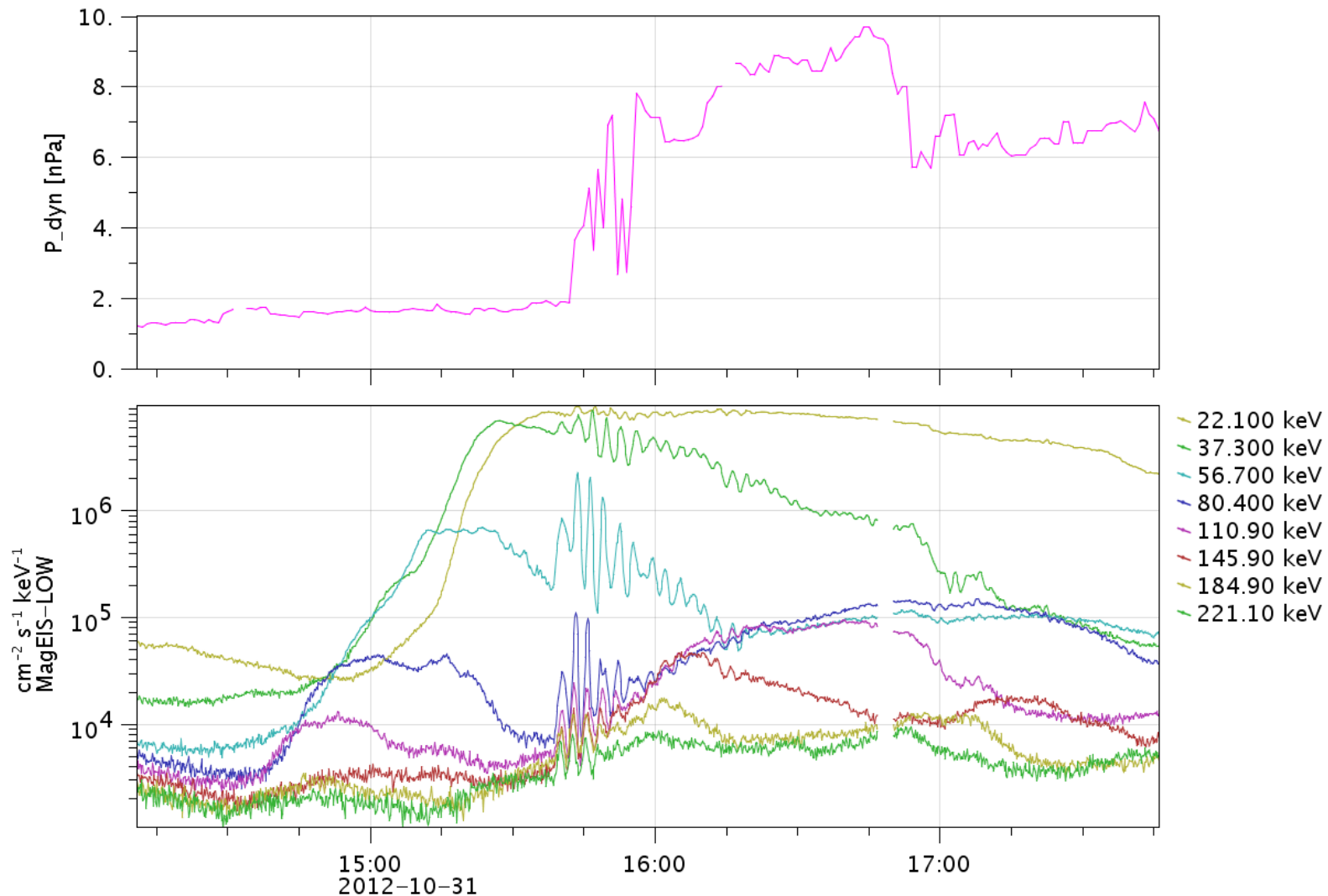
OMNI Solar Wind and Geomagnetic Activity

2012/10/31 12:00-21:00 UTC



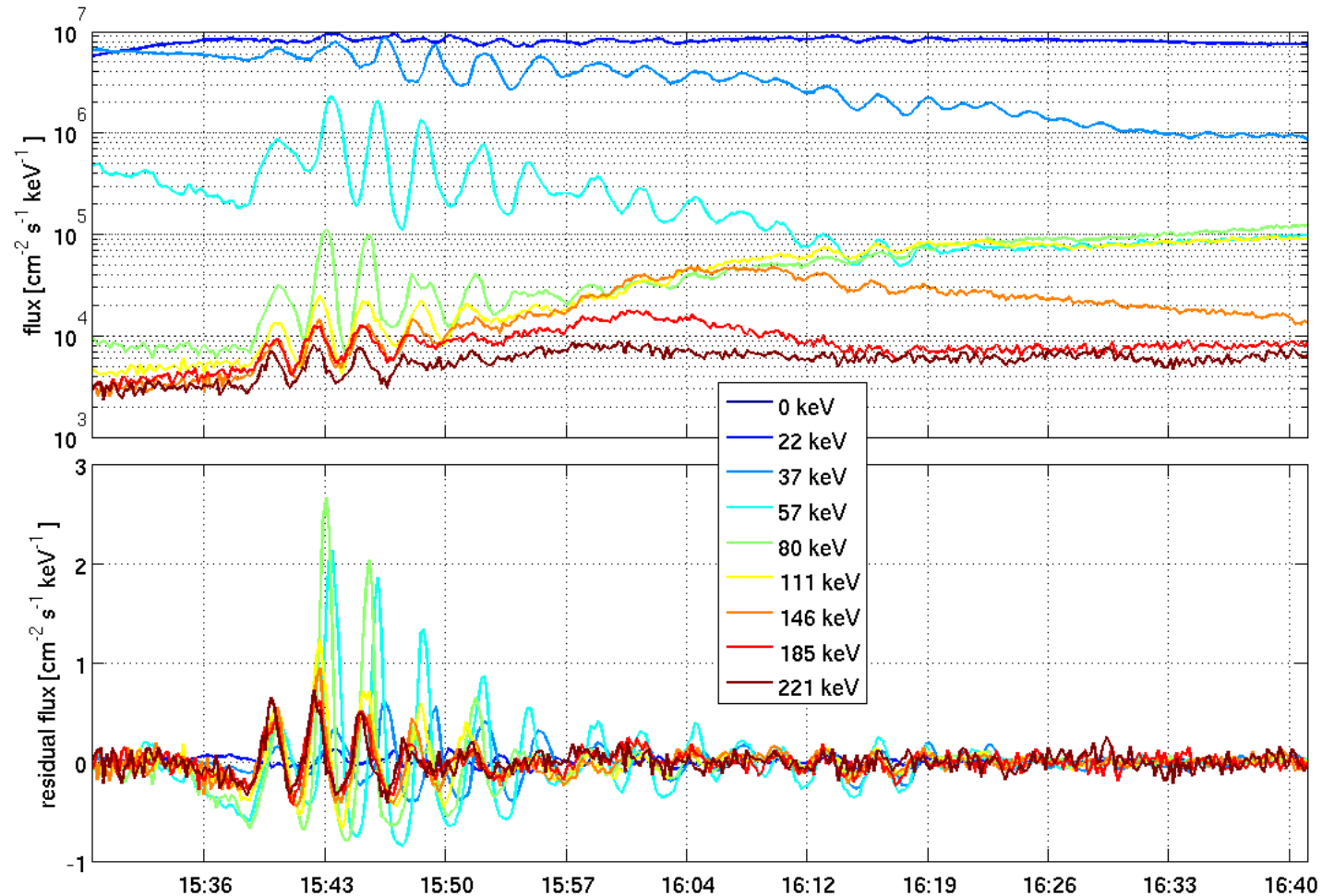
OMNI Solar Wind Dynamic Pressure and MagEIS e⁻ Flux

2012/10/31 14:00-18:00 UTC



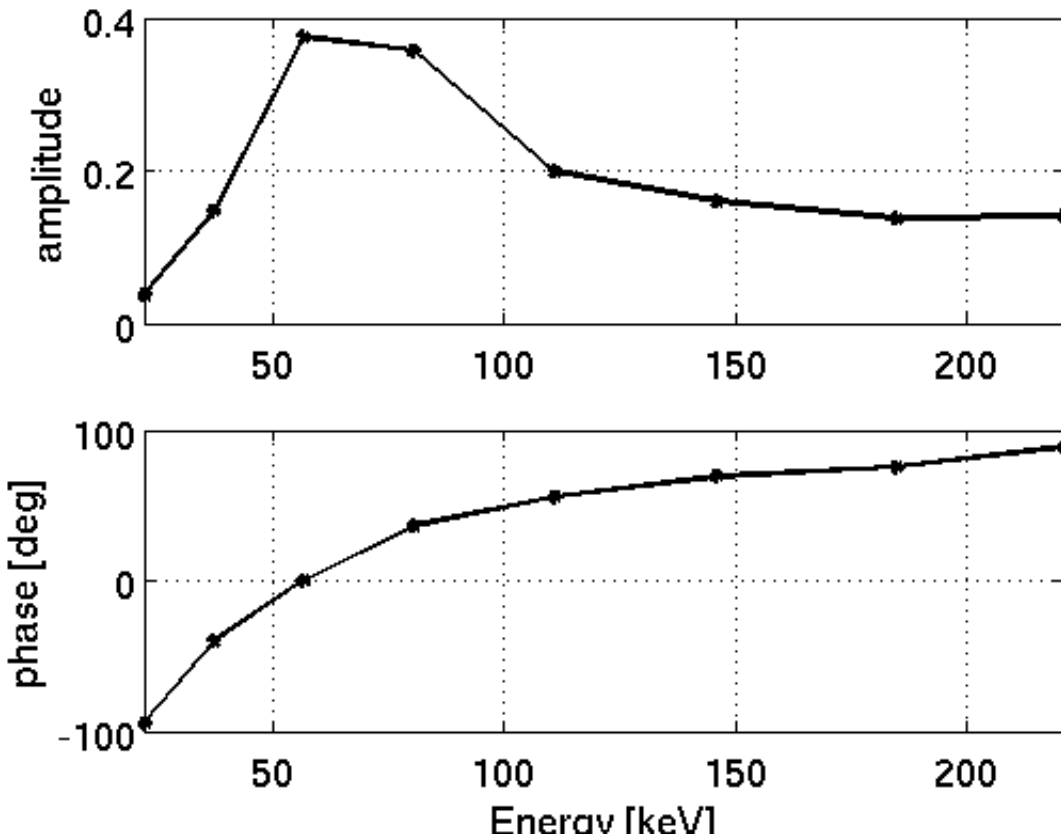
MagEIS Low Energy (20-200 keV) Flux and Residual Flux

2012/10/31 15:30-16:40 UTC



MagEIS Observations Suggest Resonant ULF Wave-Particle Interaction

Amplitude and Phase as Function of Energy

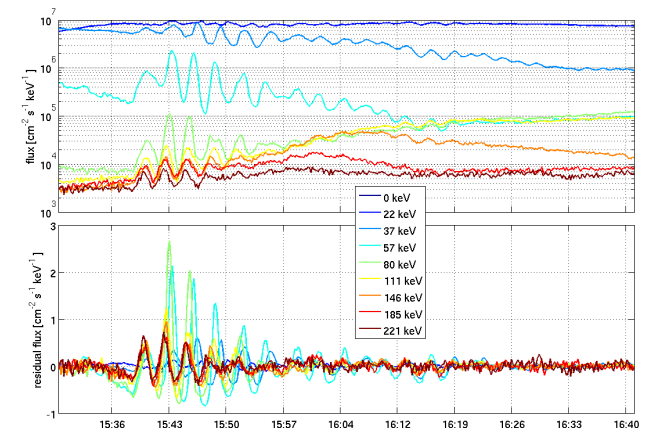


Drift-Resonance Condition

$E_{res} = 57-80 \text{ keV} \Rightarrow f_d = 0.12-0.17 \text{ mHz}$
(assume: dipole field, $L = 5.9$, $\alpha = 90$)

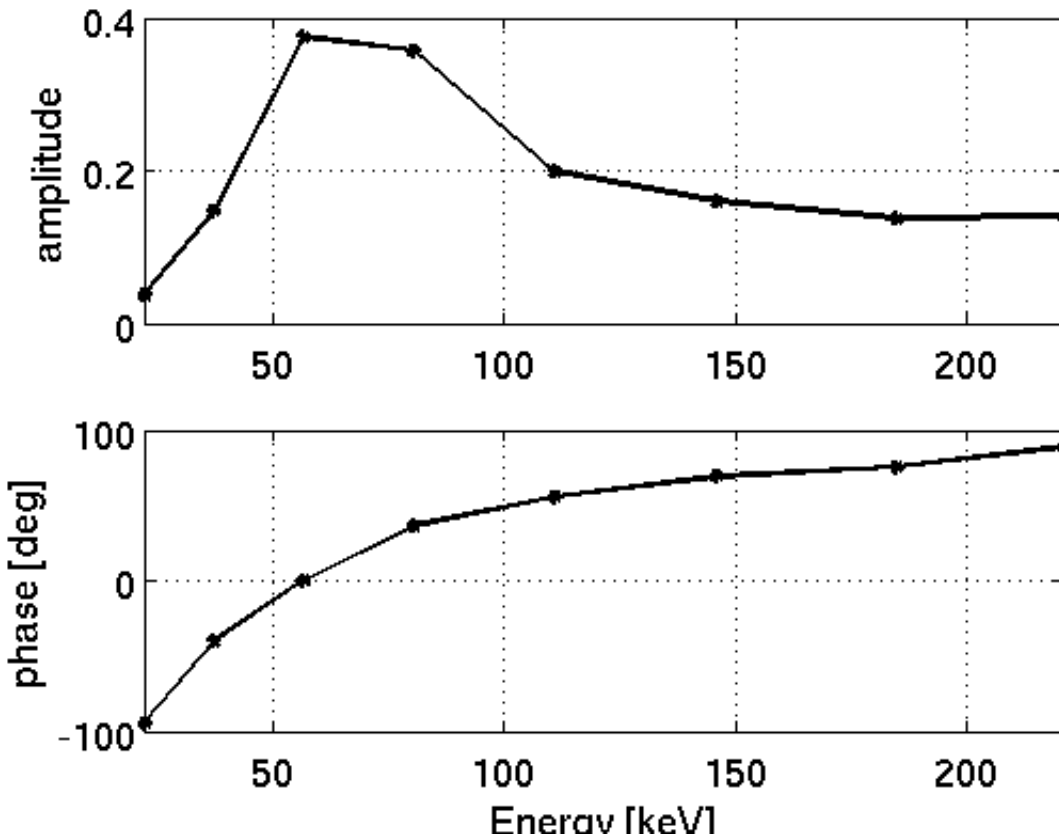
$$\omega = m \omega_d \Rightarrow f = m f_d$$

With $f = 5.5 \text{ mHz}$ and $f_d = 0.12-0.17 \text{ mHz}$
 $\Rightarrow m = 33-46$



MagEIS Observations Suggest Resonant ULF Wave-Particle Interaction

Amplitude and Phase as Function of Energy



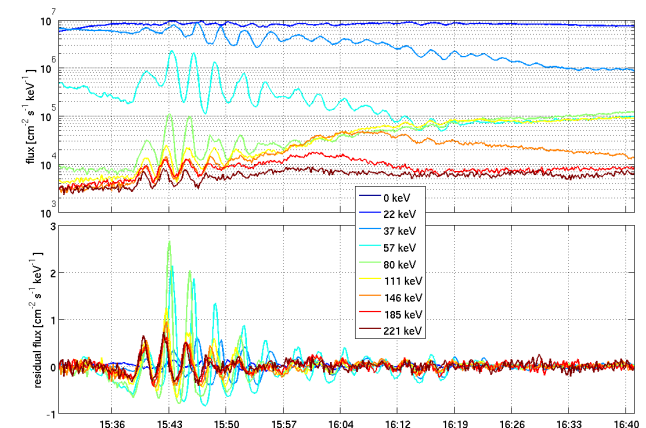
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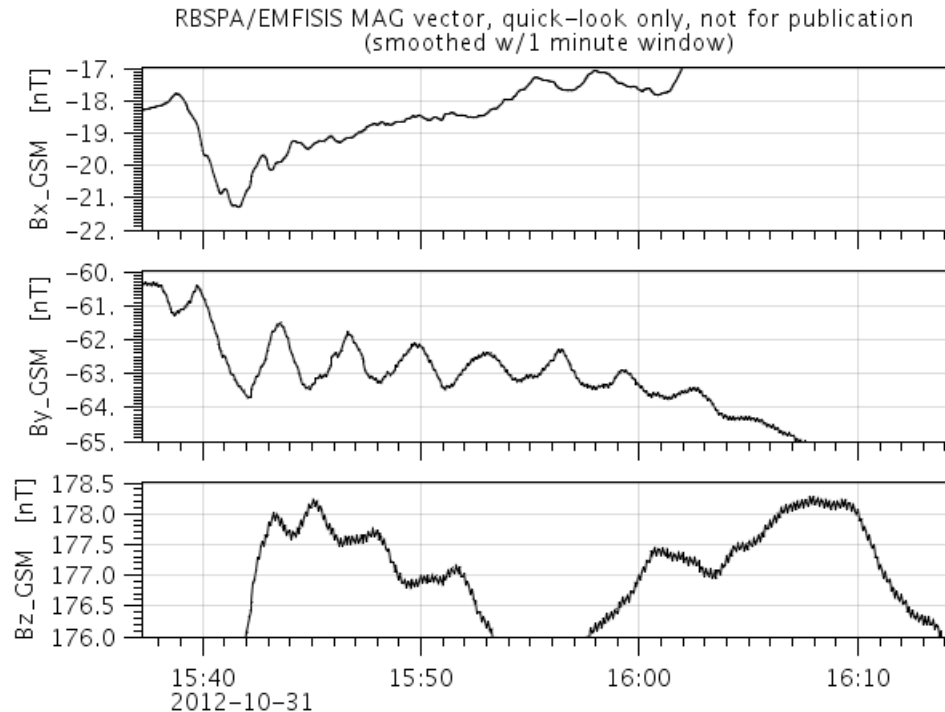
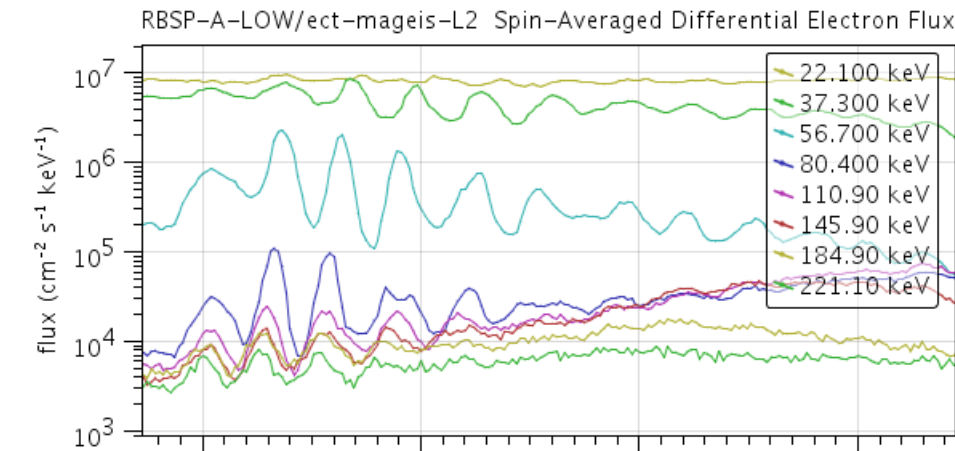
With $f = 5.5 \text{ mHz}$ and $f_d = 0.12-0.17 \text{ mHz}$
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There must be a ULF wave in space causing this.....

MagEIS Low Energy (20-200 keV) Flux and EMFISIS MAG

2012/10/31 15:30-16:15 UTC

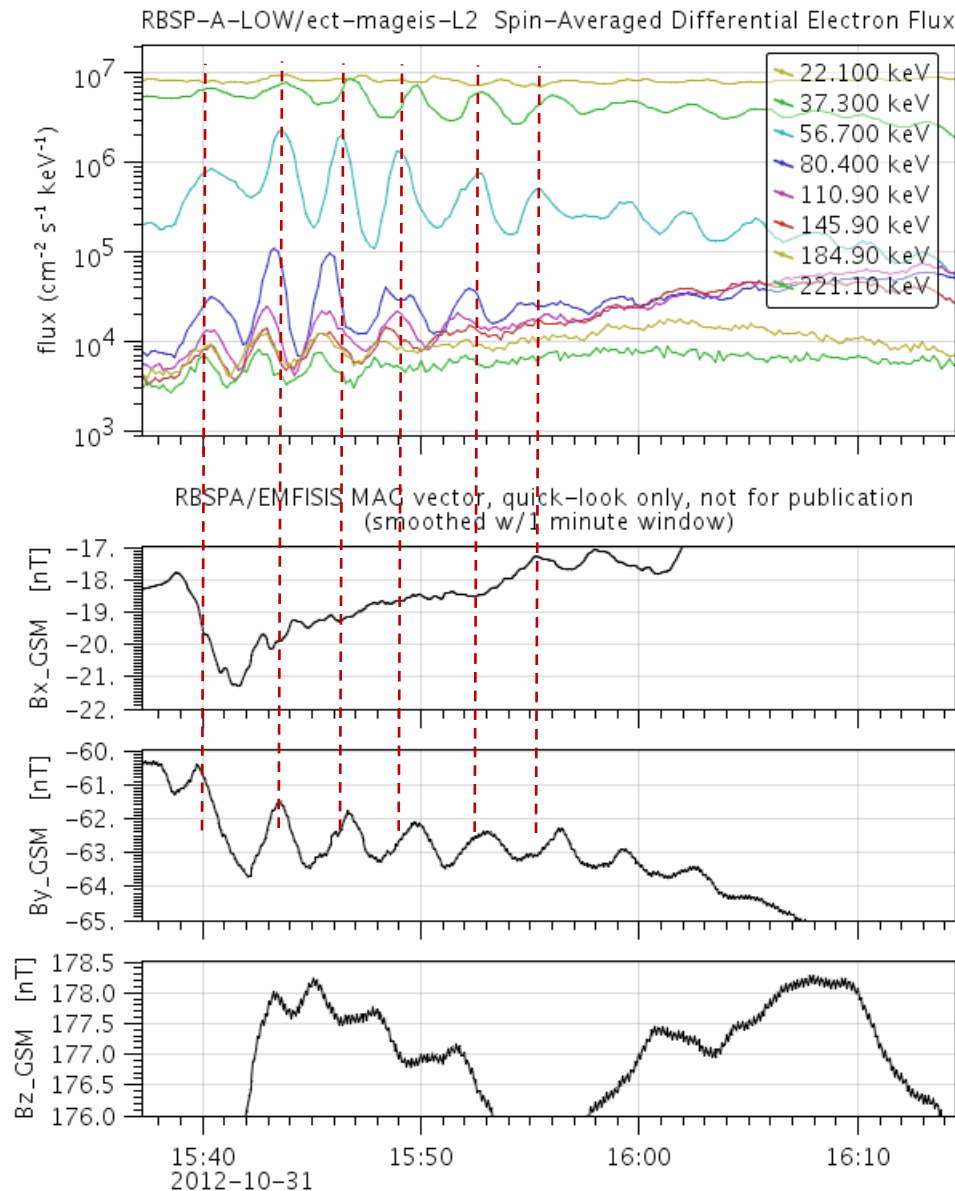


$$B_y \sim B_r \text{ (poloidal)}$$



MagEIS Low Energy (20-200 keV) Flux and EMFISIS MAG

2012/10/31 15:30-16:15 UTC

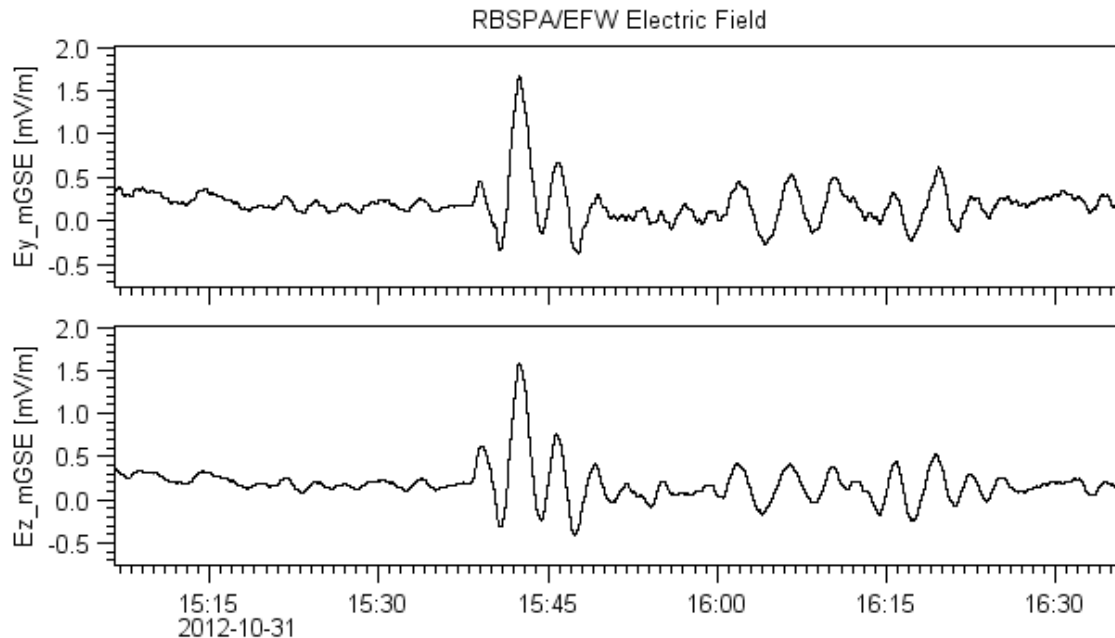
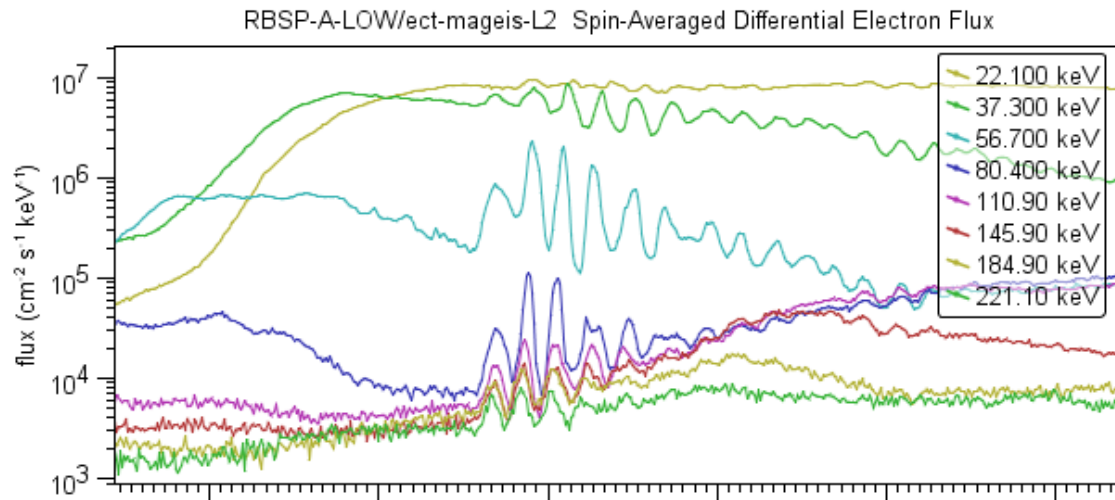


$B_y \sim B_r$ (poloidal)



MagEIS Low Energy (20-200 keV) Flux and EFW E-Field

2012/10/31 15:15-16:30 UTC

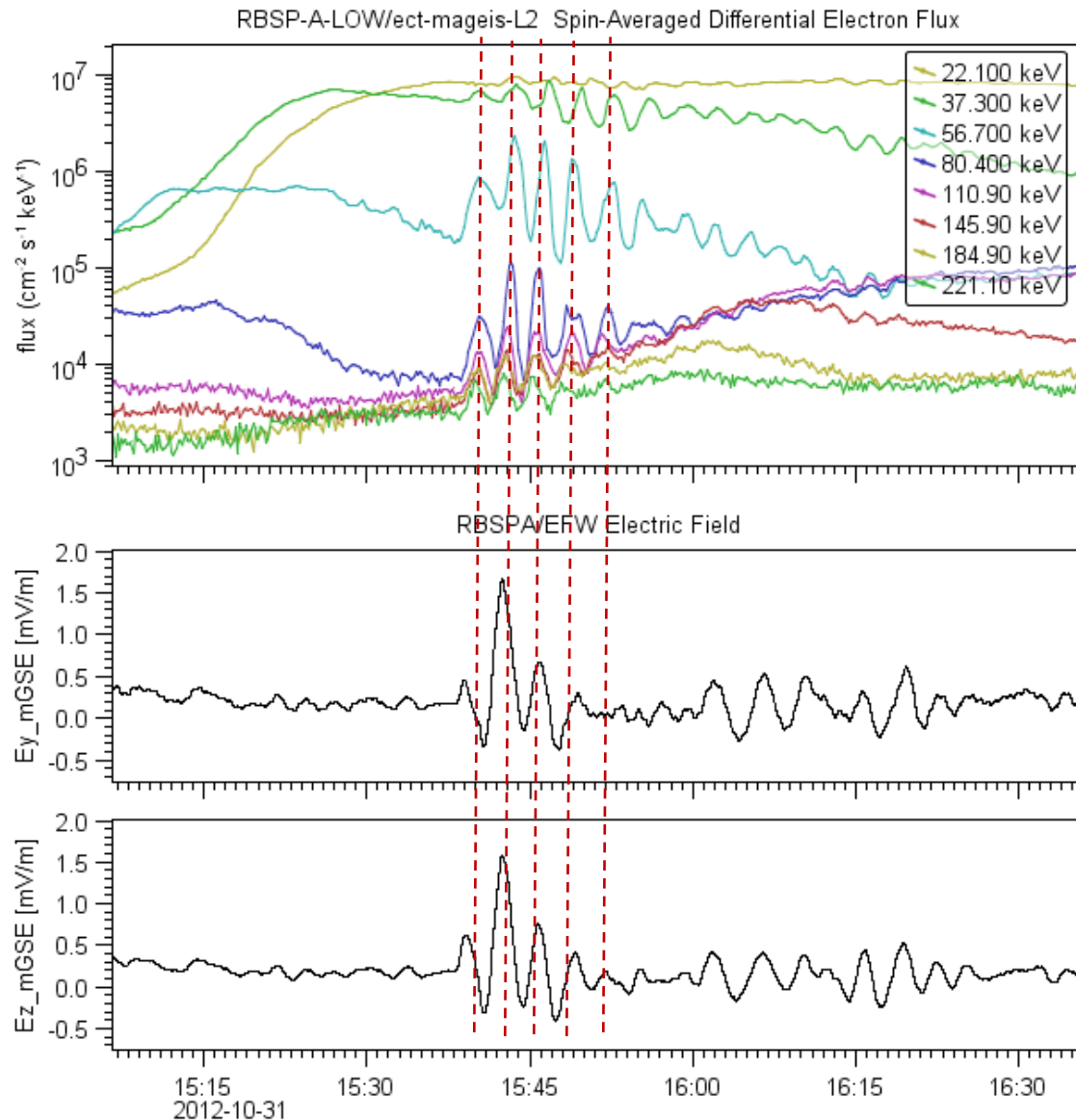


$$E_{y_mGSE} \sim E_{y_GSE} \sim E_r \text{ (toroidal)}$$



MagEIS Low Energy (20-200 keV) Flux and EFW E-Field

2012/10/31 15:15-16:30 UTC

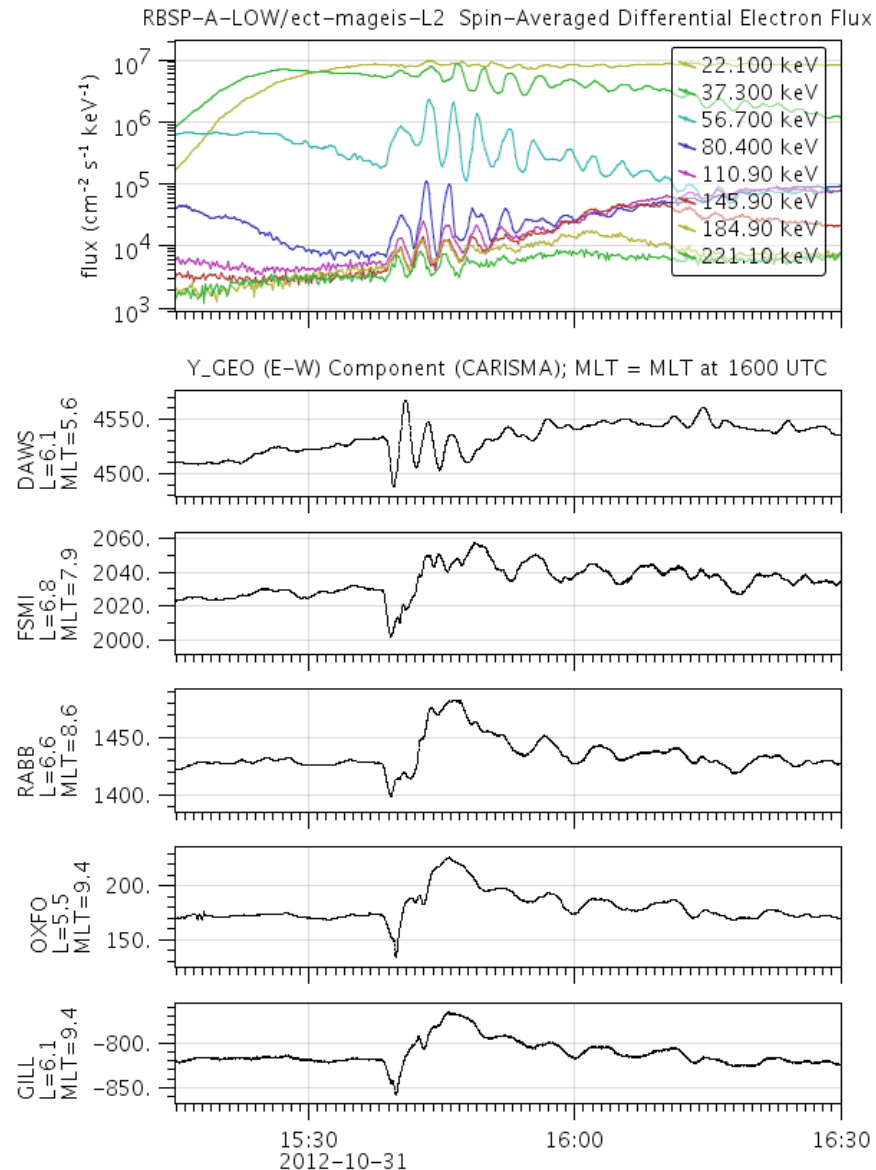


$$E_{y_mGSE} \sim E_{y_GSE} \\ \sim E_r \text{ (toroidal)}$$



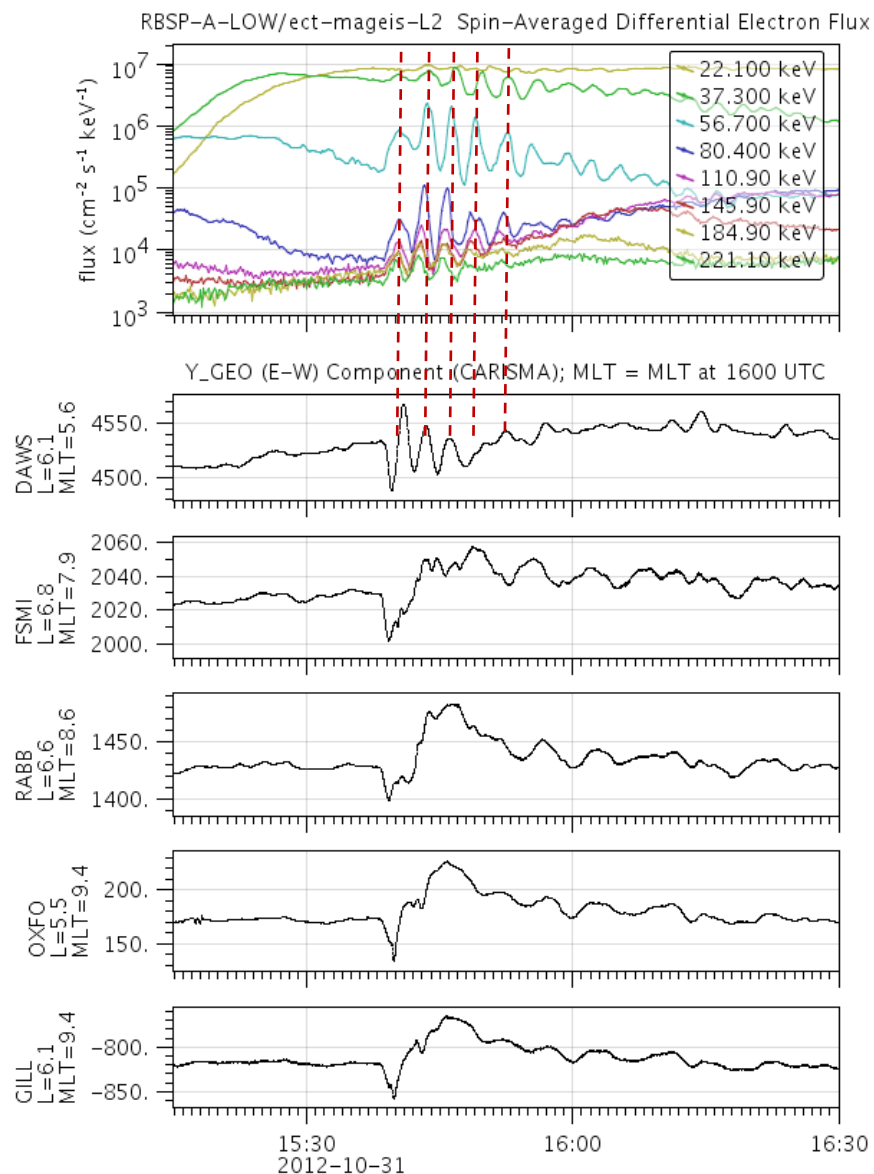
MagEIS Low Energy (20-200 keV) Flux and CARISMA MAG

2012/10/31 15:15-16:30 UTC



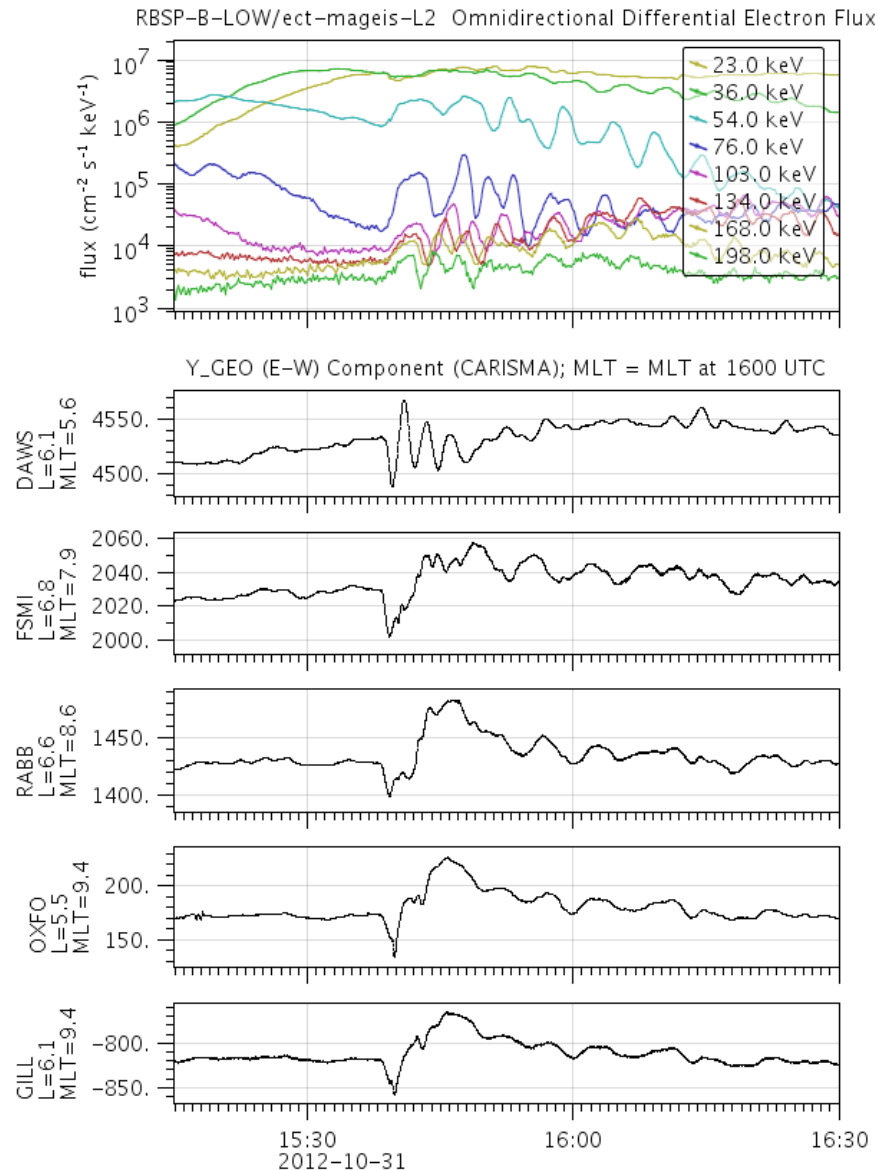
MagEIS Low Energy (20-200 keV) Flux and CARISMA MAG

2012/10/31 15:15-16:30 UTC

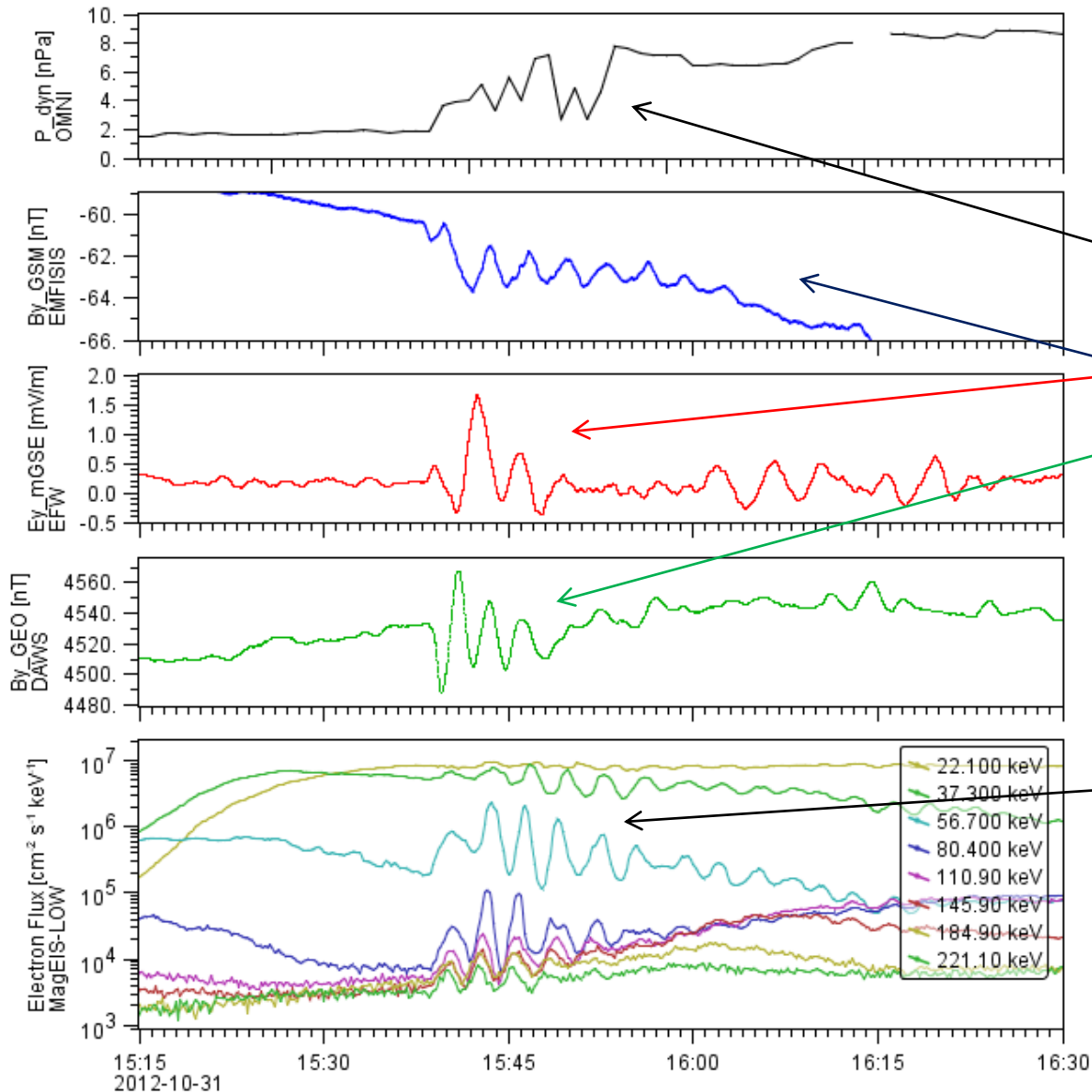


MagEIS Low Energy (20-200 keV) Flux and CARISMA MAG

2012/10/31 15:15-16:30 UTC



Summary

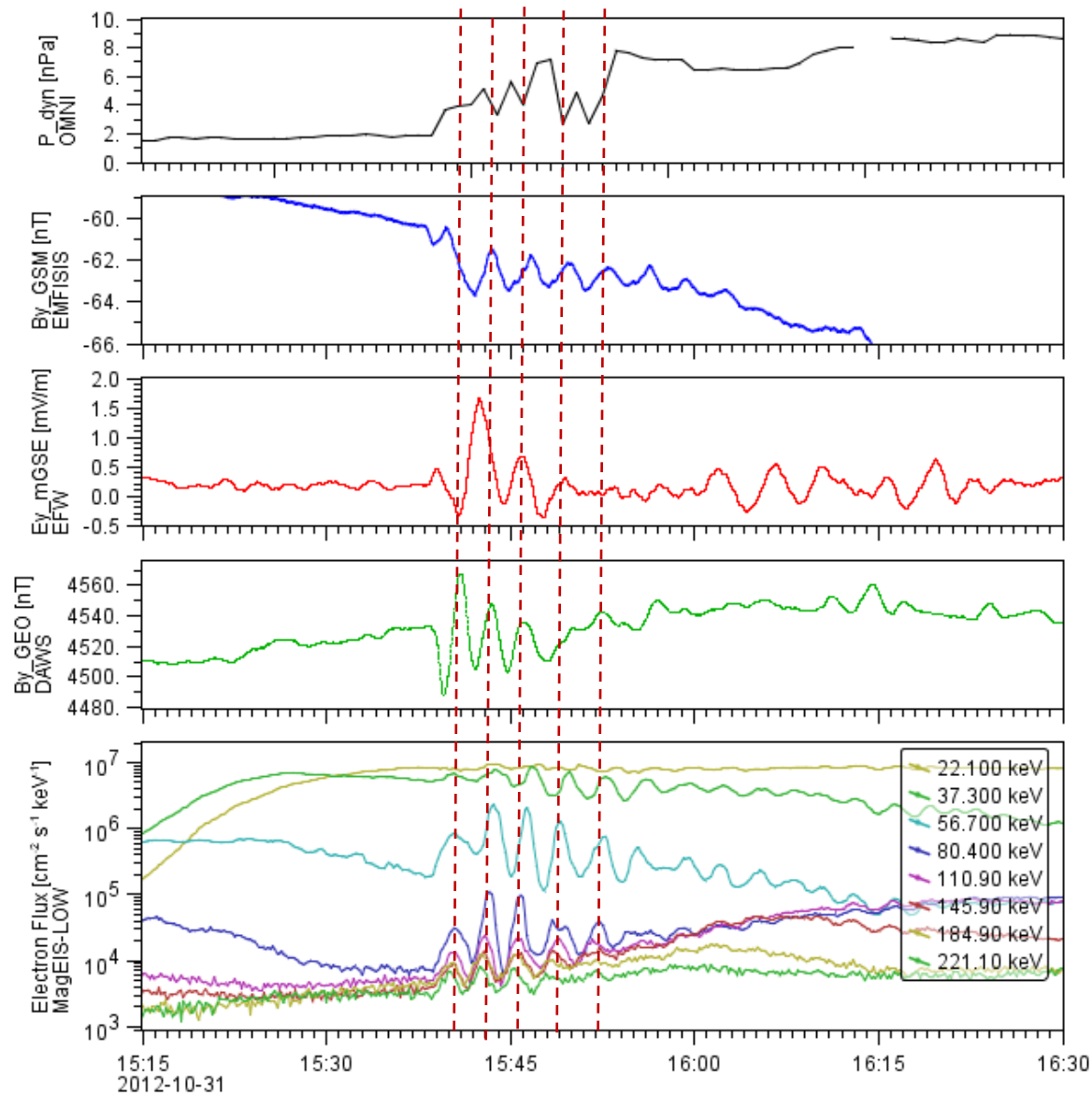


Solar wind P_{dyn} fluctuations drive ULF waves observed in **space** and on the **ground**.

ULF waves interact with radiation belt electrons.



Summary



Solar wind P_{dyn} fluctuations drive ULF waves observed in space and on the ground.

ULF waves interact with radiation belt electrons.



BACKUP

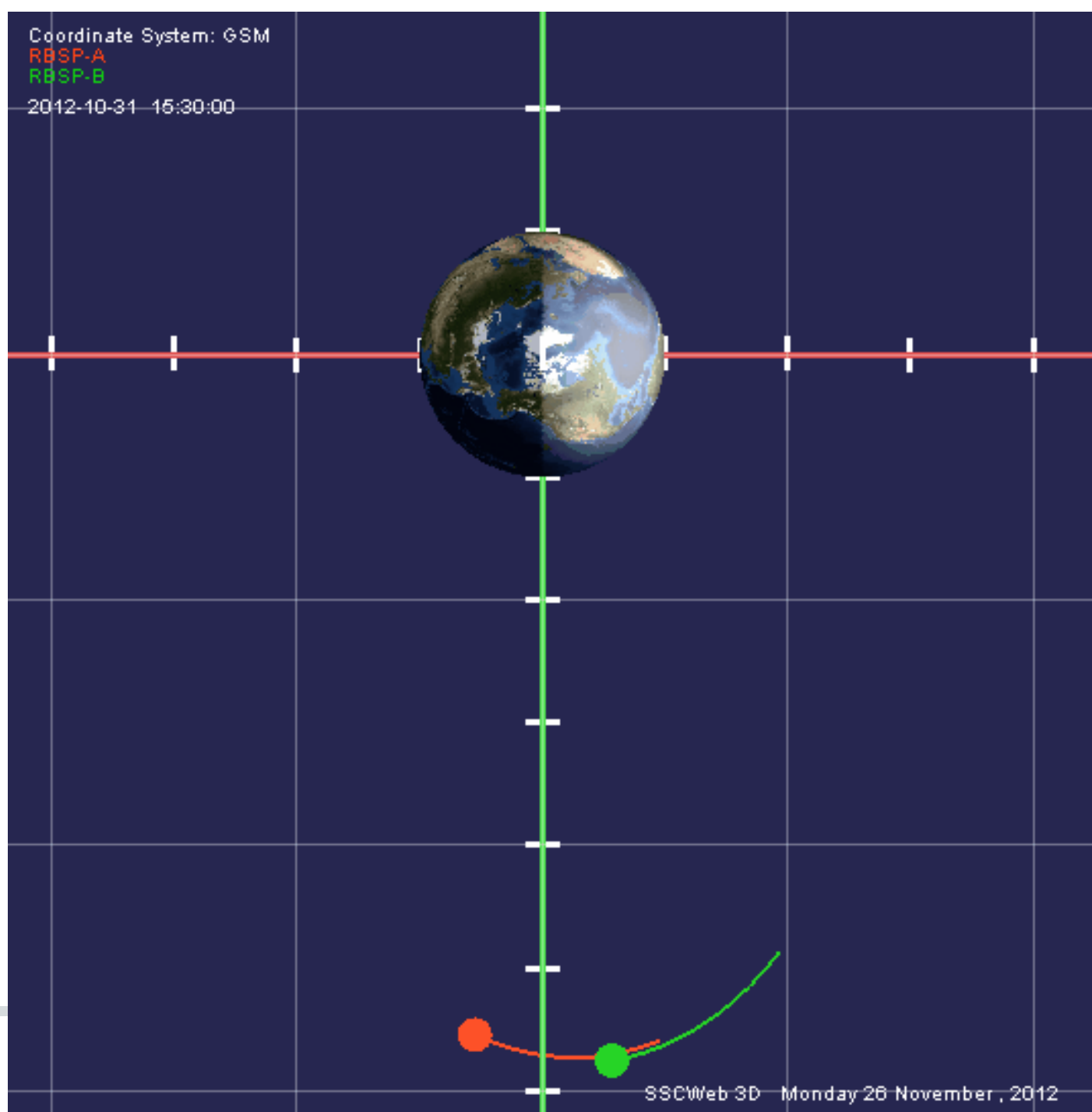


Coordinate System: GSM

RBSP-A

RBSP-B

2012-10-31 15:30:00



SSCWeb 3D Monday 26 November, 2012



