Total Radiation Belt Electron Content *bonus feature* "Multi-Point Electron Dropout Study"

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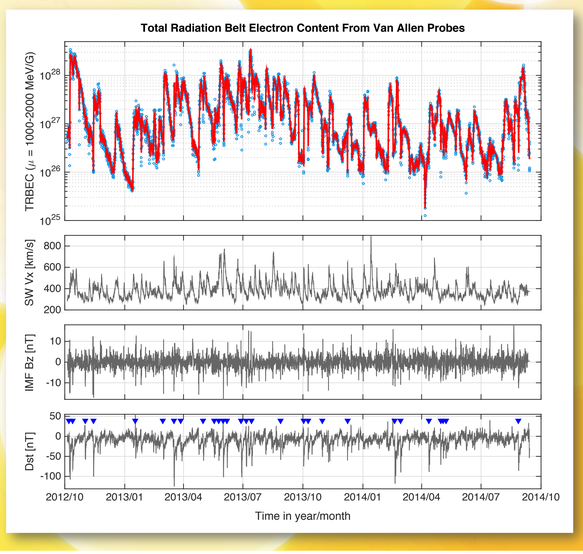
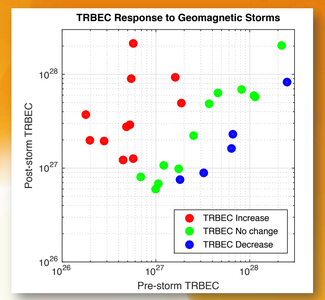
Total radiation belt electron content (TRBEC)

is the half-orbit sum of outer belt electrons over the radiation belt energies and all pitch angles using data from RBSP-ECT instrument on board both spacecraft.

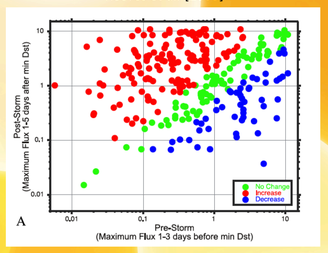
- Method: Integrating the phase space density data
- Time resolution: ~3 hours (compare to 24-hour of *Baker et al.* [2004] using SAMPEX)

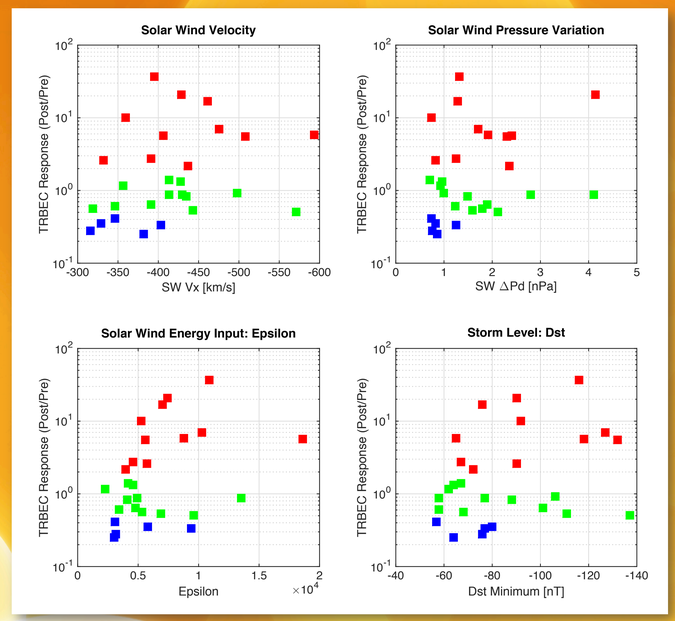
Goal: To characterize statistically the dynamics of the entire radiation belt by comparing TRBEC with solar wind parameters and magnetospheric waves.

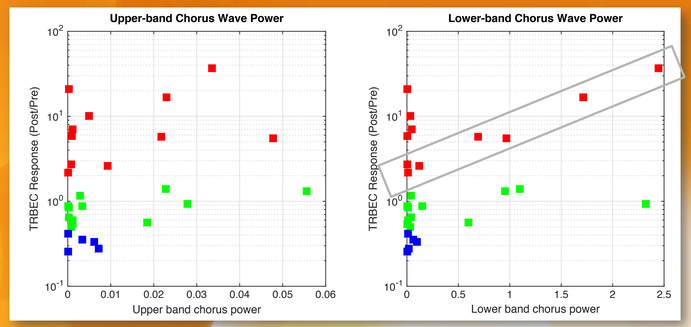




GEO Electron Response to Storms
Reeves et al. [2003]







TRBEC Response to Geomagnetic Storms

- Identified 28 storms (Dst < -50 nT)
- Pre- and post-storm TRBECs are 1-2 days before and 1-4 days after storm main phase
- Pre- and post-storm TRBEC change: **40% increase**, **40% no change**, **20% decrease** (compare to *Reeves et al*. [2003] **50%**, **30%**, **20%**)
- TRBEC Response = Post-storm TRBEC / Pre-storm TRBEC (>1 increase, ~1 no change, <1 decrease)

Analysis Parameters: Solar wind velocity, dynamic pressure variations, solar wind energy input (Akasofu's Epsilon parameter), Dst minimum, and integrated lower-band(0.1-0.5 f_{ce}) and upper-band (0.5-0.7 f_{ce}) chorus wave power.

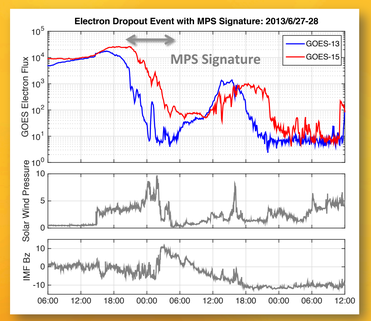
Summary: TRBEC response to geomagnetic storm is correlated to solar wind velocity, dynamic pressure variation, Dst, and chorus wave, and somewhat dependent to solar wind energy input.

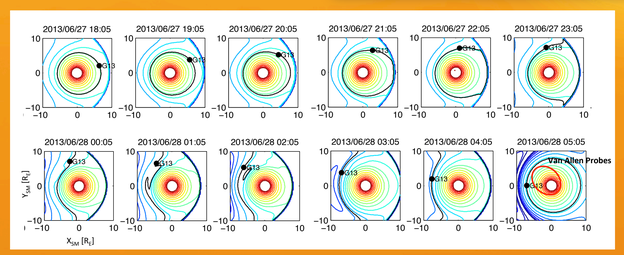
Conclusion: The effect of geomagnetic storms on radiation belt electrons is a delicate and complicated balance between acceleration and loss.

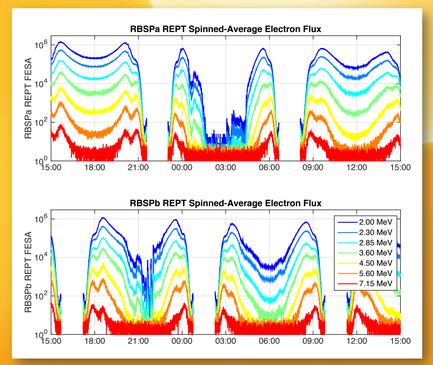
What's Next? (1) Calculate acceleration timescales to find acceleration mechanism, (2) Correlate seed populations, and (3) Find the solar wind condition that enhance the radiation belt.

Electron Dropout Due to Magnetopause Shadowing

- 2013 June 27-28 (with Dst min -98 nT), **GOES-13 and -15** observe >2 MeV electron dropout, possibly due to magnetopause shadowing
- Solar wind pressure pulse and southward IMF Bz are responsible for the drift magnetopause loss

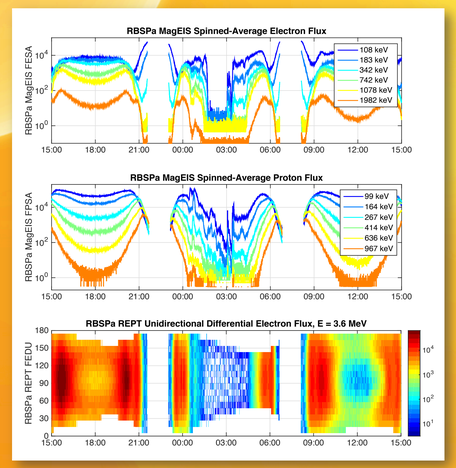






GOES MPS Signature

Question: Drift magnetopause loss or lobe encounter? RBSPa was on open drift orbit during the electron flux dropout.



Van Allen Probes Particle Observations

- RBSPa and RBSPb REPT electron data show dropout signature as close as L~ 4.3 &
- The electron flux dropout extends from 100 keV to 7 MeV and in all pitch angles
- The proton flux also decrease rapidly, but recover faster possibly due to injection
- Electron flux dropout time is energy-dependent

Summary: The increase of solar wind dynamic pressure and southward IMF Bz are both essential to generate relativistic electron's drift magnetopause loss. Van Allen Probes provide comprehensive evidence of drift magnetopause loss.

What's next? (1) Generate last closed drift shell (L^*_{max}) dataset as a function of electron energy, pitch angle and solar wind conditions, (2) Calculate total drift magnetopause loss using TRBEC

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