Combined Effects of Concurrent Pc5 and Chorus Waves on Relativistic Electron Dynamics

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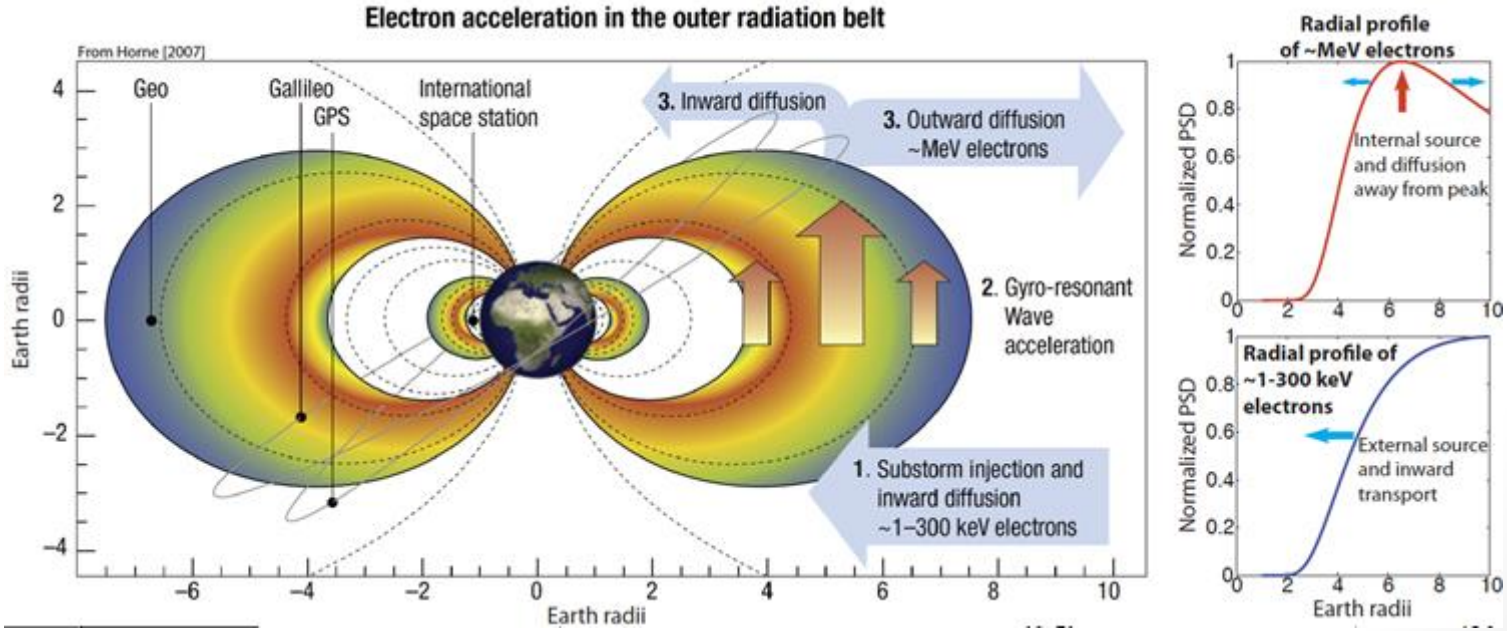
Outline

- Brief introduction
- Data and analysis
- Selected results
- Conclusions

Acceleration

- Inward Radial Transport
- In situ Acceleration

(Wave – Particle Interactions due to whistler chorus mode waves)



Losses

- Magnetopause Shadowing combined with outward diffusion driven by Pc5 waves
- Pitch angle scattering (Wave – Particle Interactions due to whistler chorus mode, plasmaspheric hiss and EMIC waves)

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- Whistler chorus mode waves interact with sub-relativistic electrons (up to 100-200 keV (Li et al. GRL2013).
- Plasmaspheric hiss are limited inside the plasmapause and have a long-term effect (Jaynes et al. JGR2014).
- EMIC waves don't affect equatorial mirroring electrons (Usanova et al. GRL2014).

Motivation – Goal

- **Assess the contribution of various mechanisms to the variability of the outer Radiation Belt** (e.g. inward diffusion, in-situ acceleration via wave-particle interactions, precipitation into atmosphere, magnetopause shadowing combined with outward diffusion) .

- **Investigate the impact of ICMEs on the dynamics of relativistic electrons.**

Data and Methodology

Electron PSD

The electron PSD distribution is calculated from differential fluxes as a function of fixed adiabatic invariants using the method described by *Chen et al., 2005, 2007*.

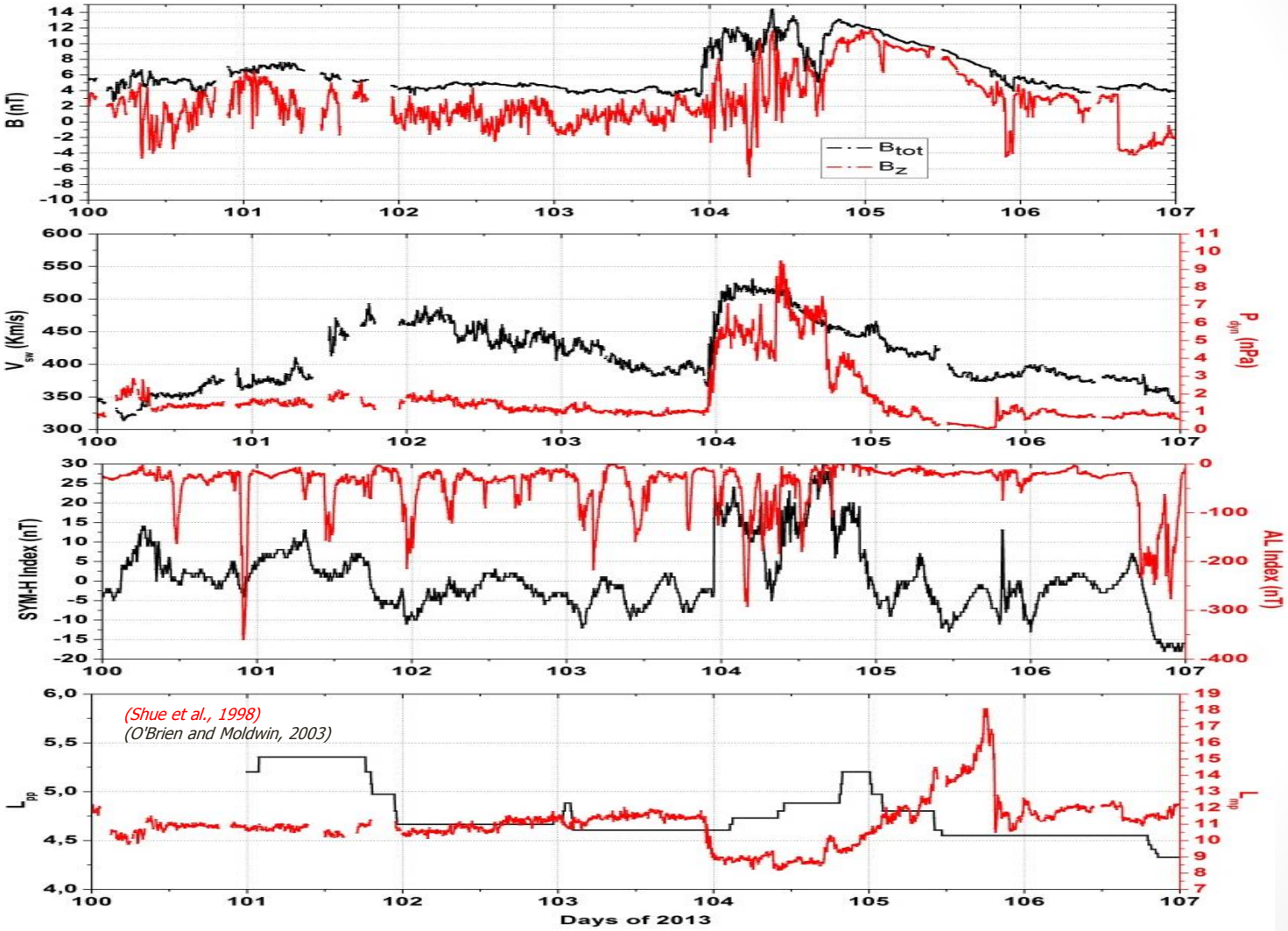
Pc5 waves

Pc5 wave power is calculated from magnetic field measurements using the method described by *Balasis et al., 2013*.

Chorus waves

Chorus wave power is estimated from the POES measurements of precipitating electron fluxes using the method described by *Li et al., 2013*.

Non-Storm Event
(April 13-15, 2013)



From Katsavrias et al. GRL2015 (submitted)

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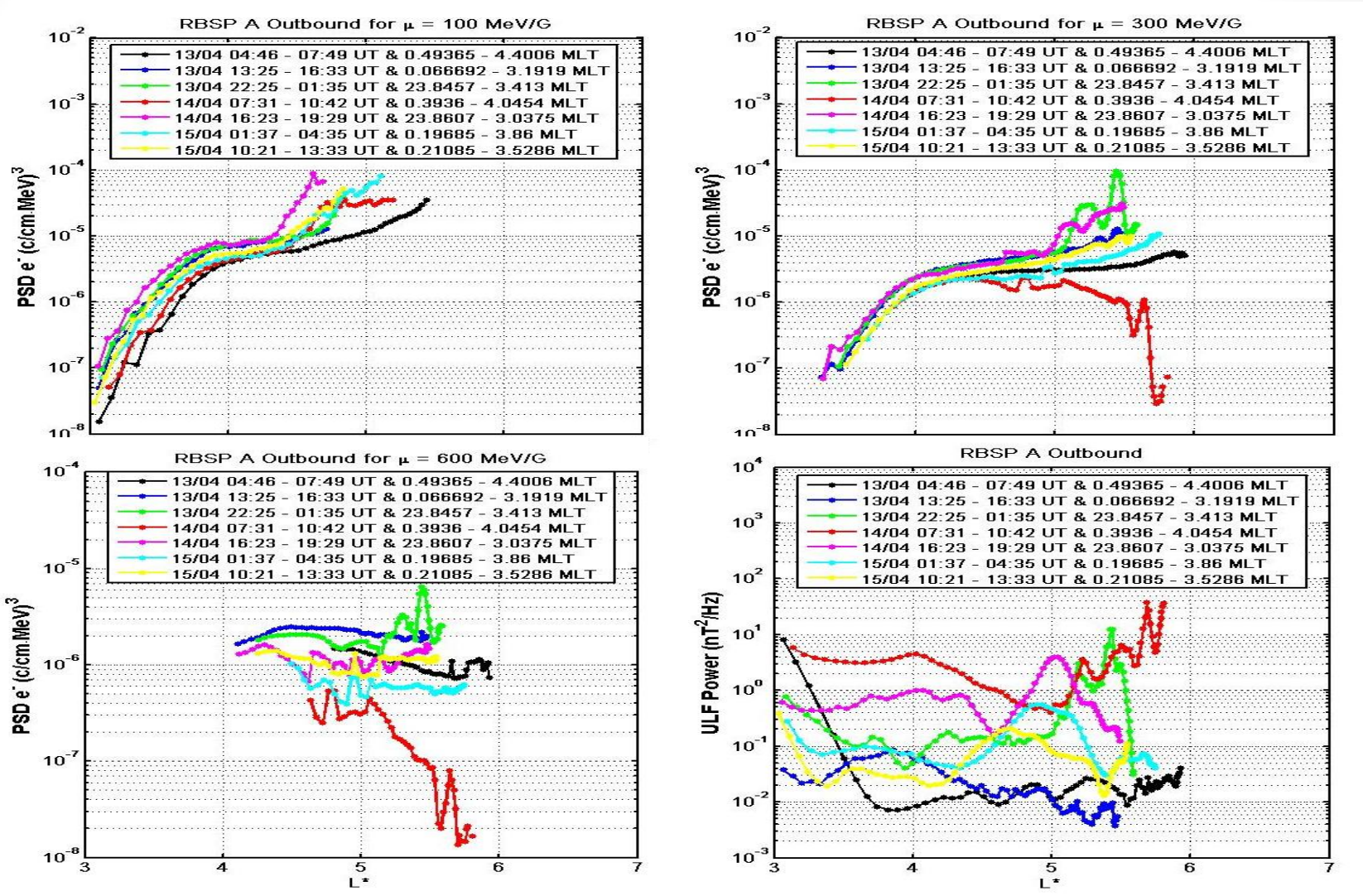

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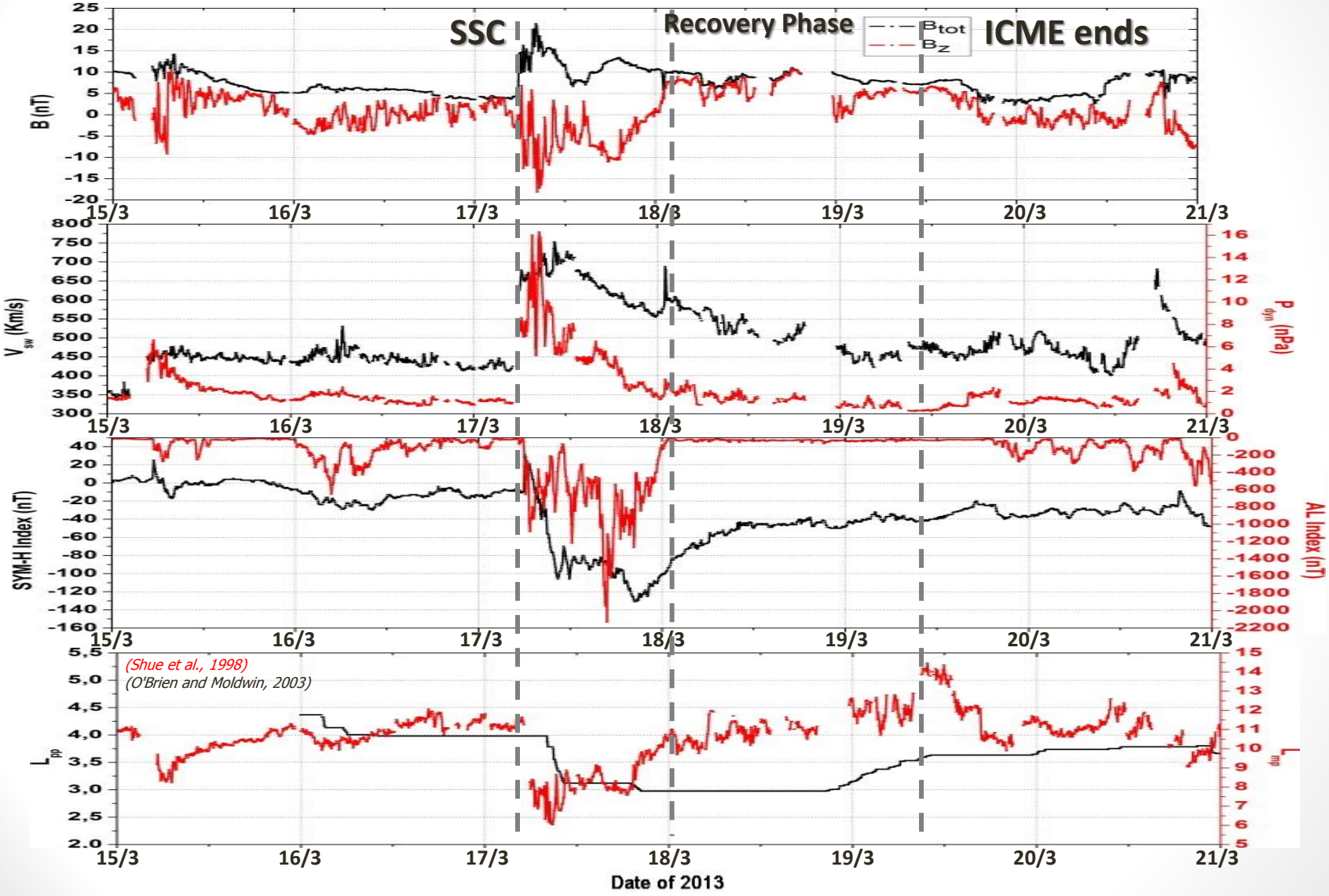
Electron Enhancement Event

(Severe Storm of March 16-18, 2013)



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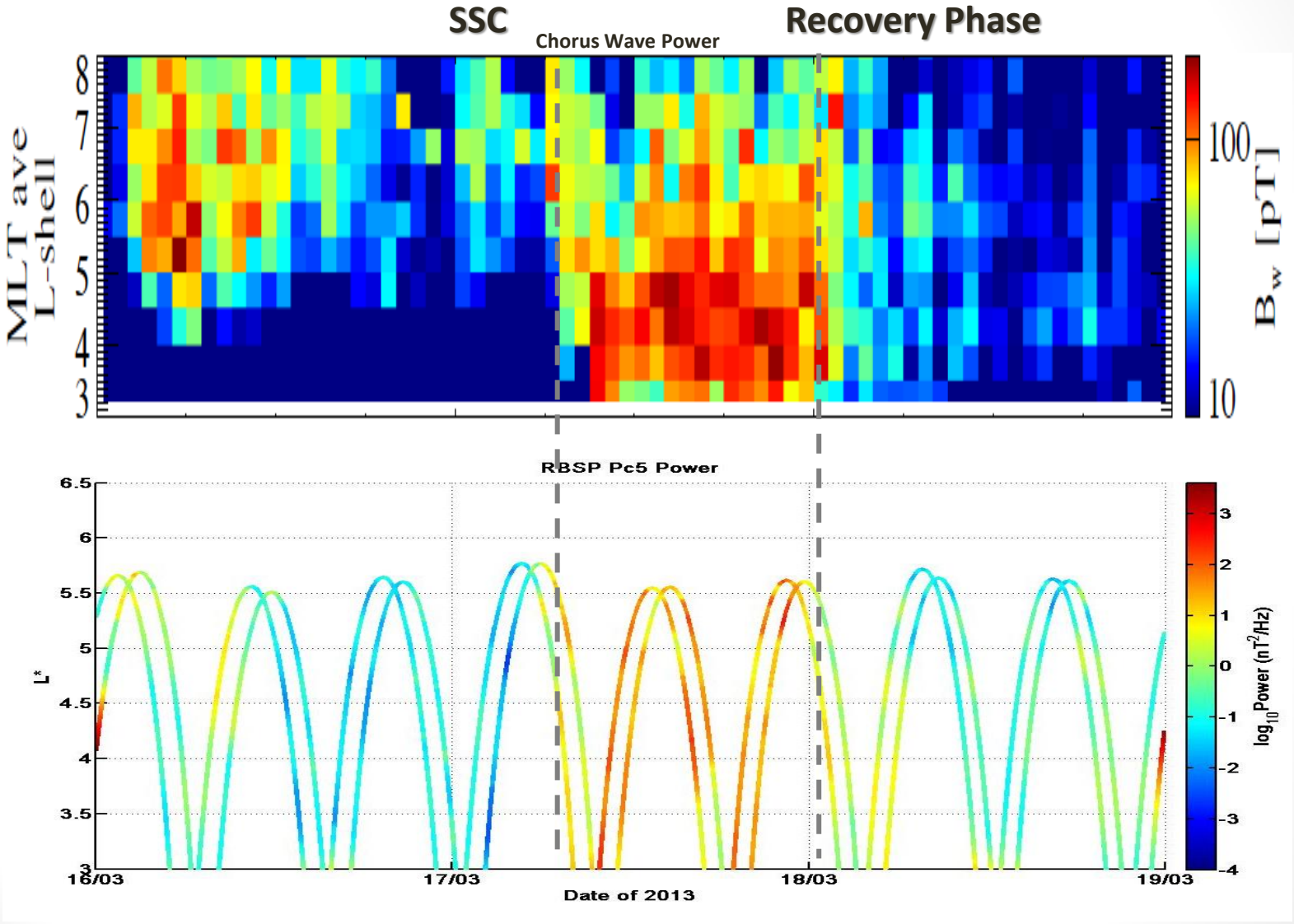

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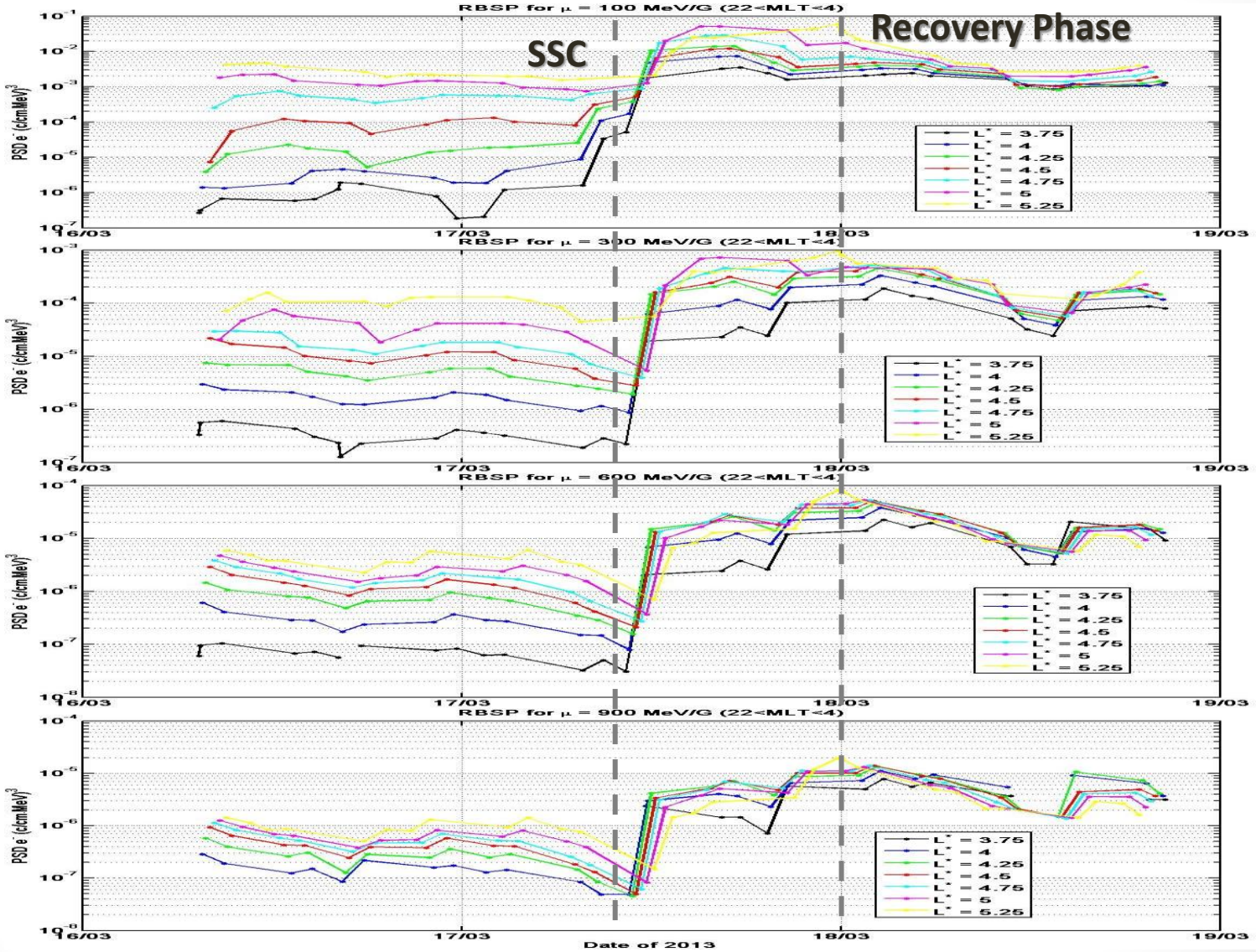
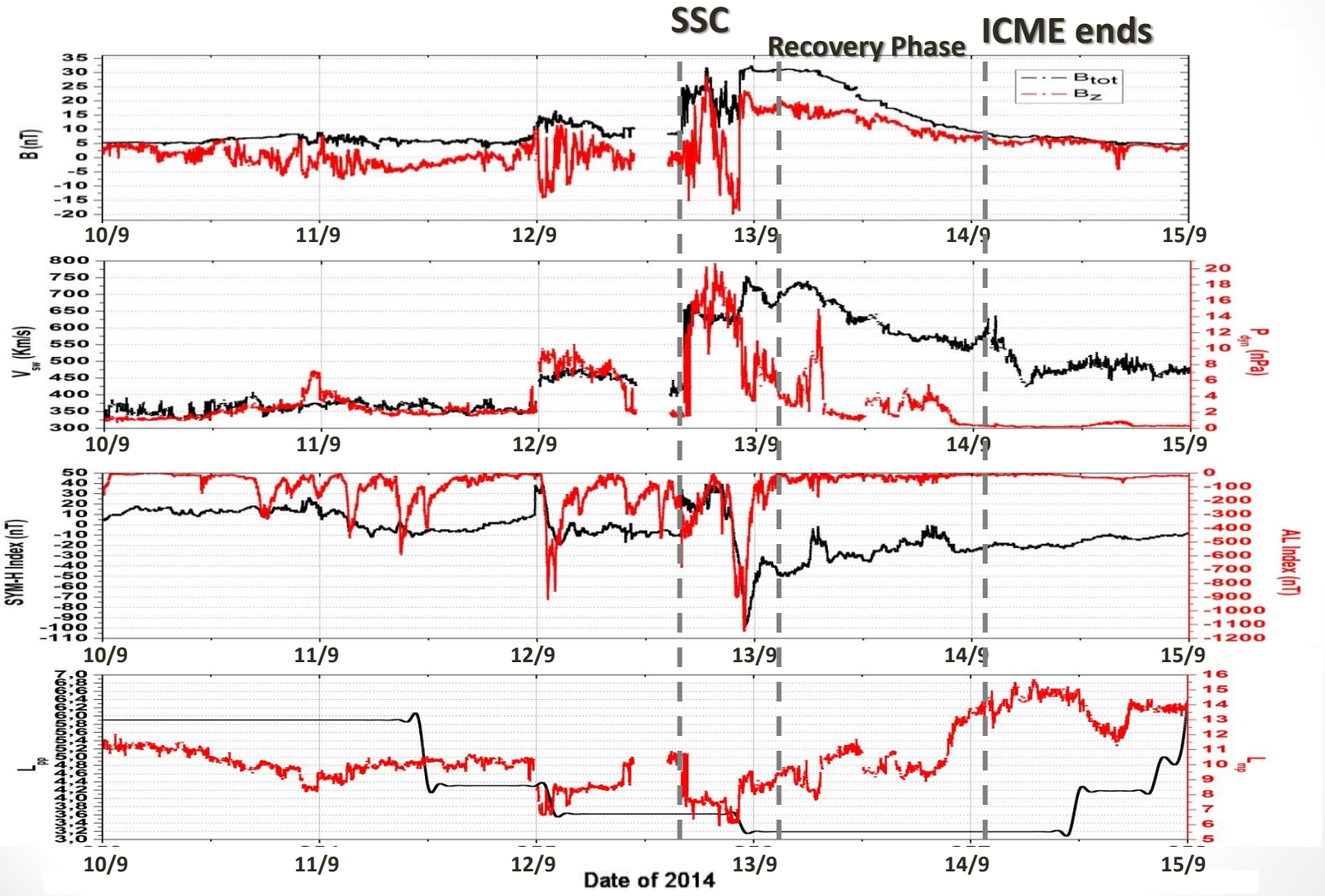


Electron Depletion Event

(Severe Storm of September 11-13, 2014)



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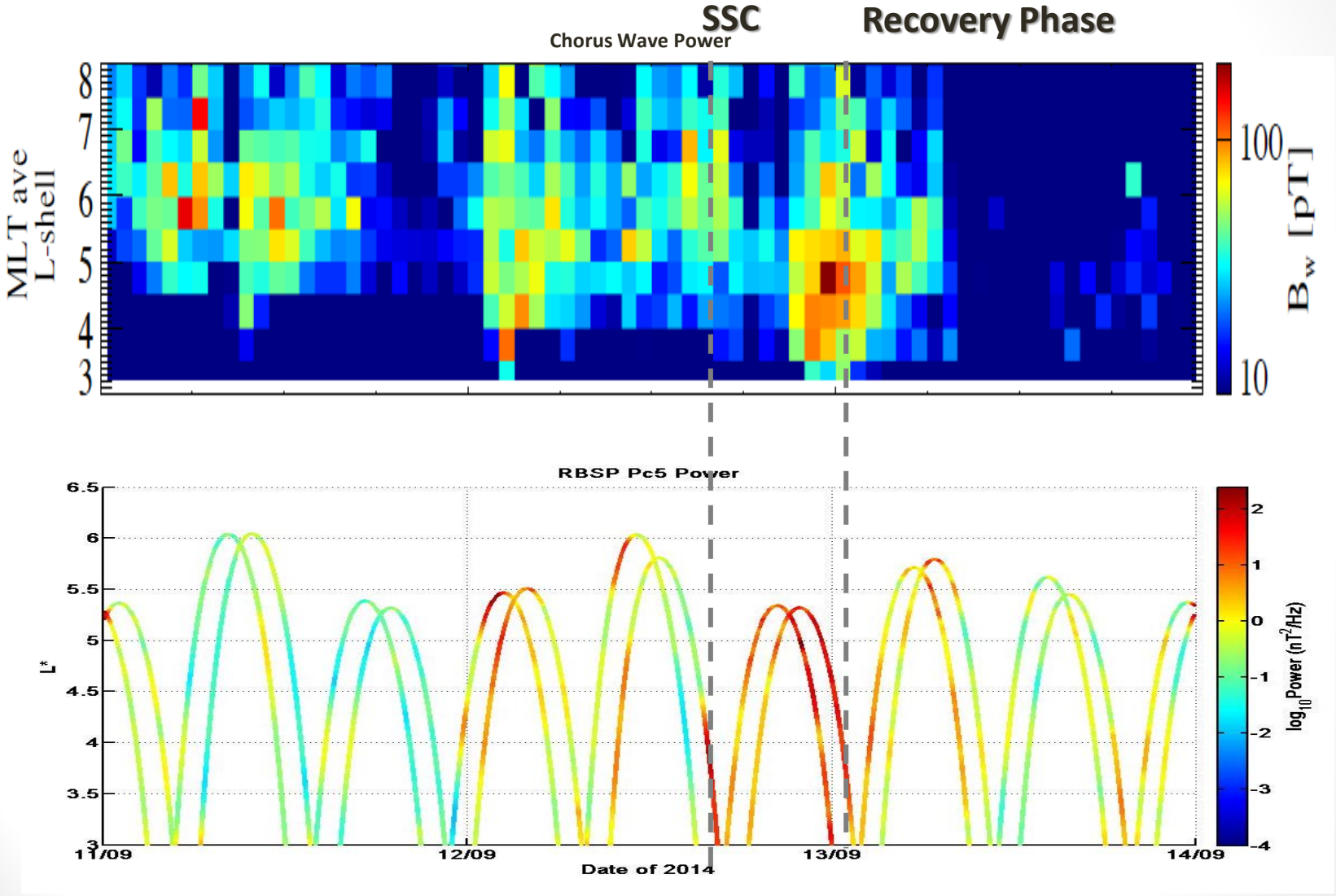

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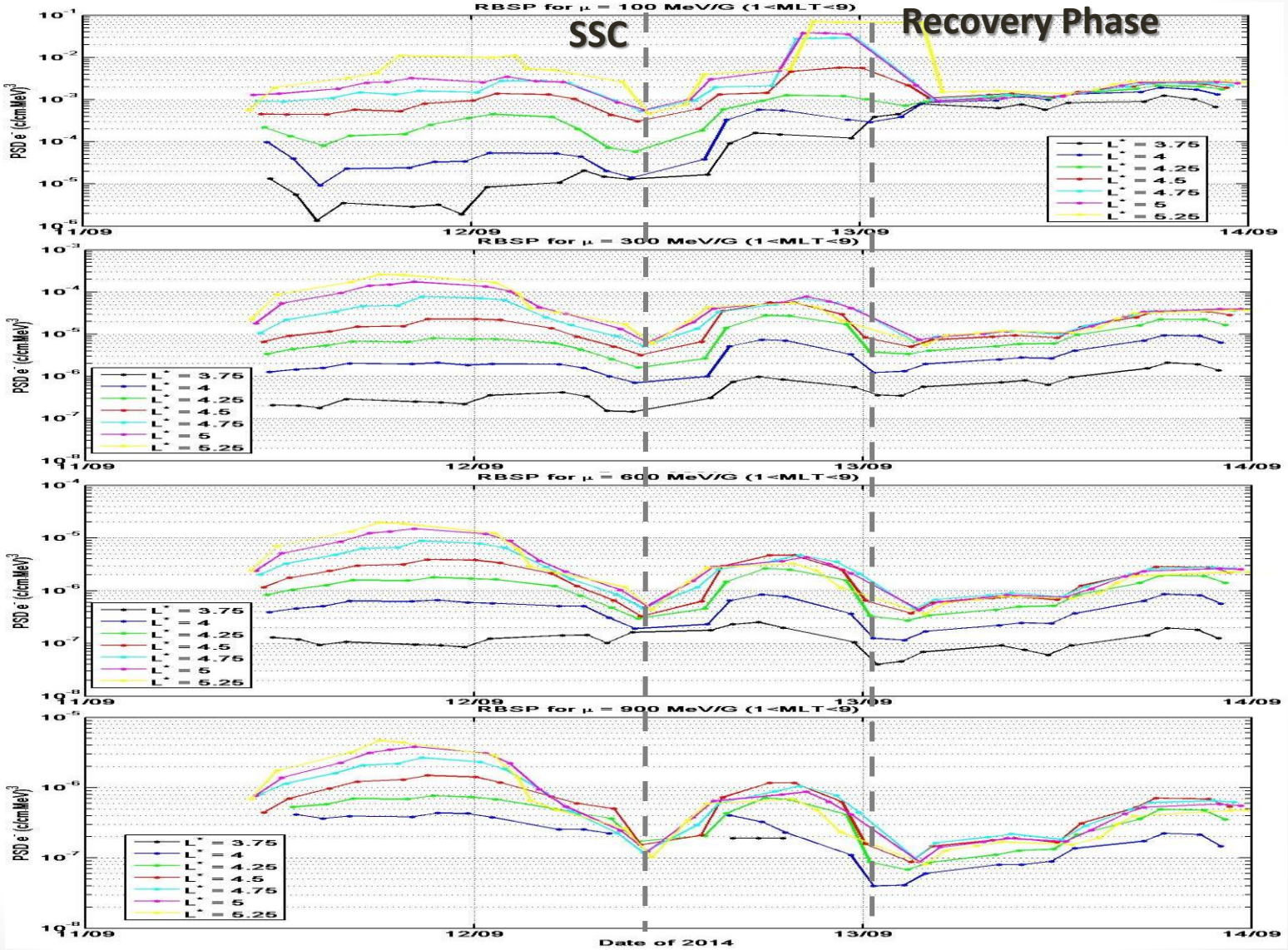

Conclusions

- Outward diffusion driven by Pc5 waves (combined with MP shadowing) is the dominant mechanism for relativistic electron losses.
- The comparison of the two contradicting events shows that – for similar duration and power – acceleration by chorus waves exceeds outward diffusion driven by Pc5 activity.
- There is a 300 MeV/G limit in μ above which Pc5 waves can diffuse electrons.

Thank you for your attention