SM43B-1329
Substorms
Posters

Variations of Substorm Recovery Time Scales

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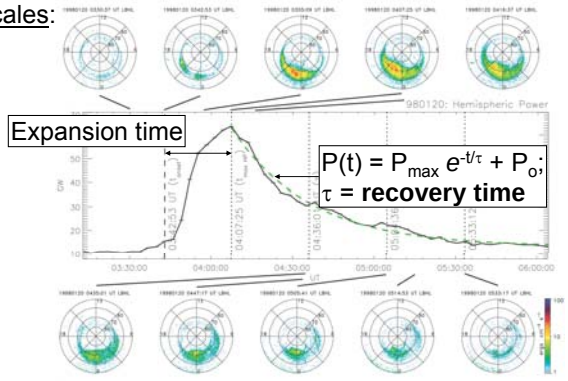
Introduction and Previous Work

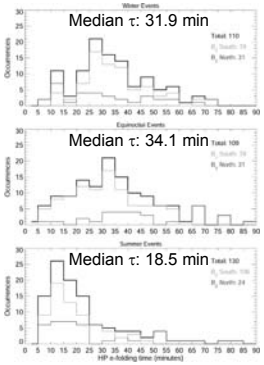
Quantitative description of auroral substorm development:

1) Energetics:
Hemispheric Power, HP = $\sum Q_{i,j} A_{i,j}$
where $Q_{i,j}$ = energy flux; $A_{i,j}$ = area of pixel(i, j)

2) Time scales:



- *Chua et al.* [2004] analyzed 350 substorms observed by Polar UVI
- Recovery time scales during winter & equinox ~ 2X that during summer



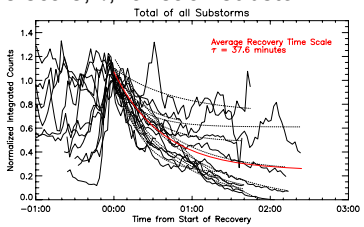
Implications for auroral conjugacy:
- Statistically, auroral substorms last longer in darkness (winter) than in sunlight (summer)

➔ More energy deposited in dark hemisphere

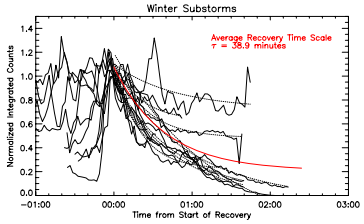
New results

- Our goal: extend the analysis of *Chua et al*. [2004] to include ~4000 substorms observed by IMAGE FUV compiled by *Frey and Mende* [2006]
- We start with (*very*) small subset:
12 substorms → 10 during winter, only 2 during summer
- Determine recovery time scale, τ, for each substorm

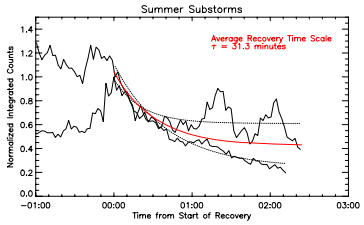
Total of all substorms:
Average τ:
37.6 ± 19.7 minutes
Median τ:
41.3 minutes



Winter substorms:
Average τ:
38.9 ± 21.0 minutes
Median τ:
46.2 minutes



Summer substorms:
Average τ:
31.3 ± 14.1 minutes
Median τ:
41.3 minutes



Interpretation, Summary, & Conclusions

- Our observed median winter substorm recovery time scale is 10 – 15 minutes longer than *Chua et al*.'s [2004]
→ Caveats: 1) small sample size: 10 vs. > 200 substorms
2) differences in instruments/filter responses may lead to discrepancies (?)
- We find no significant seasonal variation in substorm recovery time scales in contrast to *Chua et al*. [2004]
→ However, we used a statistically **in**significant data set (especially for summer substorms – only 2!)

Why should there be seasonal variations in substorm recovery time scales?

- Suppression of auroral in sunlight [e.g., Newell et al., 2001]: Increased solar EUV flux → increased cold plasma density & ionospheric conductivity
- Cold plasma effectively "shorts out" parallel electric fields (or, to put it another way,)
- Cold plasma density is sufficient to carry current driven by the magnetosphere without parallel potentials
- Intense auroral structures have shorter lifespans in sunlight

→ Conductivity can play a major role in substorm dynamics

Future Work

- Include (**many**) more IMAGE FUV substorms
- Investigate how differences in instruments/filter responses impact recovery time scales
- Simultaneous, conjugate substorm observations