Microburst Spatial Scale Size Distribution Derived With the AeroCube-6 CubeSats

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Key Points:

- Used the dual AeroCube-6 CubeSats to identify coincident microbursts as a function of spacecraft separation.
- The spatial scale size of coincident microbursts was found to be less than X km in LEO.
- The LEO scale size distribution mapped to the magnetic equator is on the same scale size as whistler mode chorus.

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Abstract

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Plain Language Summary

Test

1 Introduction

OUTLINE

1. Talk about rad belt acceleration and loss mechanisms
2. Introduce microbursts, and some prior work done on them. Why do people think they are important?
3. Why is microbust spatial scale size important? It constrains the parameters needed to estimate the role of microburst precipitation with global losses of radiation belt electrons.
4. Introduce this study, and the basic premise of it.
   (a) What is the hypothesis? Is the LEO microburst scale size a projection of the chorus scale size at the equator?
   (b) While coincident microbursts by themselves only tell you the lower bound of their scale size, many events at varying separations will give you a better idea of the occurrence rate of microbursts with a particular minimum scale size occur, as a function of spacecraft separation.
   (c) The spacecraft separation at which coincident microbursts are no longer observed tells you their maximum scale size.

2 Instrumentation

OUTLINE

1. Introduce AC-6, their orbit, spin rate, attitude control, and how their maintain their separation, confimed with GPS.
2. FIGURE 1: AC-6 separation evolution for the mission duration.
3. Introduce dos1, and why we only use it instead of the other detectors.
4. Mention which MLT sector they are in.

3 Methodology

OUTLINE

1. Microburst identification with wavelets and Paul's burst param.
2. Mention how good these algorithms area. Mention that it is a trade off between false-positives and efficiency. Convince myself, and try to make a claim that both detectors give similar results, so it does not matter which one you use. Or is my wavelet method more general since it is sensitive to a wider range of microburst durations?
3. FIGURE 2: Something about how microburst are detected. Maybe a wavelet filter plot in 3 panels?
4. Discuss how microbursts are matched across both catalogs and merged into one.
5. Mention the by-eye noise and curtain removal step.

6. FIGURE 3: Examples of coincident microbursts observed at small and large separations.
7. Mention how many coincident microbursts were observed.
8. Chance coincidence? Are the larger scale size just due to coincidence?

4 Results

OUTLINE

1. Show the entire microburst scale size distribution of occurrence rates.
2. Discuss the normalization.
3. FIGURE 4: microburst scale size as a function of L.
4. FIGURE 5: microburst scale size as a function of AE.
5. FIGURE 6: Equatorial scale size distribution. Should I try to normalize this?
6. Brifly discuss any interesting patters.

5 Discussion

OUTLINE

1. Discuss how the overall LEO scale compares to prior literature.
2. Discuss the scale size dependence on L and AE.
3. Discuss the equatorial scale size and how it compares to Santolik et al. 2003 and Olekysiy's work.
4. Look into the ¡ 10 km microbursts. How are they different then the other microbursts? Try to do a scale size vs AE plots. Test Paul's theory that they are chance events. Given the fraction of occurrence rates of ¡ 10 km to ¿ 10 km microbursts, what is the equatorial filling factor necessary for this to be true?

6 Conclusion

Acknowledgments

Enter acknowledgments, including your data availability statement, here.