Supporting Information for Microburst Scale Size Distribution Derived with AeroCube-6

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Introduction

Text S1: Analytic Derivation of $\bar{F}(s)$ Here we derive the integral form of the $\bar{F}(s)$ under the assumptions that microbursts are circular with radius r and have a uniform spatial density of microbursts around AC6. Assuming the microburst viewing area of each AC6 unit in Fig. 5a-c and $A(r,s)$ given in Eq. 4 in the

$$A(r,s) = 2r^2 \cos^{-1}\left(\frac{s}{2r}\right) - \frac{s}{2}\sqrt{4r^2 - s^2}. \tag{1}$$

Quarantine this section Now we develop the analytic $\bar{F}(s)$ given $p(r)$. For now we assume a one-sized $p(r)$ i.e., a delta function in r. Then the ratio of the circle intersection areas at two distinct AC6 separations s_1 and s_2 is the ratio of the number of microbursts observed at those two separations

$$\frac{n_1}{n_2} = \frac{A(r, s_1)}{A(r, s_2)}. \tag{2}$$

Similar to the MC model Move derivation to SI

Then the analytic $\bar{F}(s)$ represents how quickly the fraction of microbursts observed by AC6 decreases as a function of s.

Furthermore the hypothesized $p(r)$ is the relative occurrence of microbursts at various r and is effectively a weighting factor on $A(r, s)$ which must integrated out (marginalized) since AC6 is observing the cumulative effect of microbursts of all r. Lastly, a cumulative integral over a dummy variable s' is applied to the normalized areas to calculate $\bar{F}(s)$. With these considerations the analytic $\bar{F}(s)$ is given by

$$\bar{F}(s, \theta) = \frac{\int\limits_{s}^{\infty}\int\limits_{0}^{\infty} A(r, s')p(r, \theta)drds'}{\int\limits_{0}^{\infty}\int\limits_{0}^{\infty} A(r, s')p(r, \theta)drds'} \tag{3}$$

where as in the Monte Carlo model the denominator normalizes $\bar{F}(s)$ to unity. End of quarantine

Mention rain bucket analogy

Text S2: Comparison of microburst to whistler mode chorus $\bar{F}(s)$