

# Supporting Information for “Constraining the Location of the Outer Boundary of Earth’s Outer Radiation Belt”

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## Contents of this file

1. Figure S1

## Introduction

We present Figure S1 to support the choice of model numbers required to confirm an  $L^*$  existing for a given datapoint in Section 3.1 of the manuscripts. This figure presents the fraction of data in a given radial bin which has an  $L^*$  value associated with it. The titles in each panel designate whether the distribution is for the dawn or dusk sector, as well as the number of models being used to decide whether or not an  $L^*$  exists for a given datapoint. The models used are listed in Section 3.1.

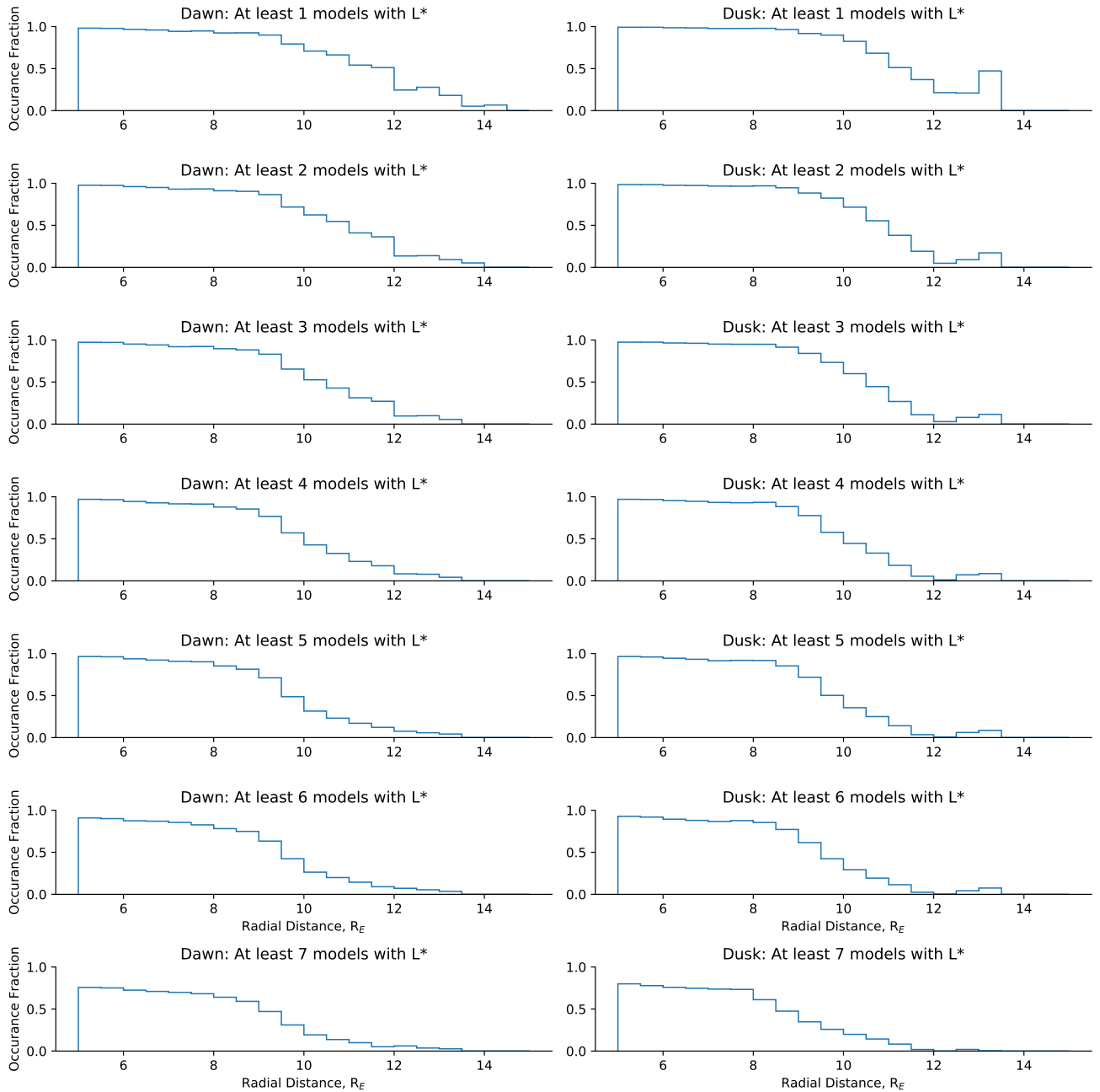
When we use the least conservative measure of  $L^*$  existing - if at least one model returns an  $L^*$  then  $L^*$  exists for that point (despite 6 models not returning an  $L^*$ ) - then we obtain

distributions in dawn and dusk that where  $\approx 50\%$  of the data measured at  $11 R_E$  has an  $L^*$ . In contrast, if we use the most conservative measure - requiring all of the models to return an  $L^*$  - then we obtain a distribution where even at  $5 R_E$   $L^*$  is only defined for  $\approx 75\%$  of the data. Both of these extremes present a picture of the radiation belts at odds with the generally accepted view of the radiation belts, where at the lowest L-shells almost all of the electrons are trapped, and at high L-shells the majority of the electrons are un-trapped (Li & Hudson, 2019).

To decide which number of models to use in our  $L^*$  analysis, we choose the least conservative middle-ground between the extremes. We choose 4 models as this middle ground, as it not only represents a majority agreement between the models, but because the distributions of requiring at least 5 or 6 models are qualitatively equivalent, showing little evolution of the occurrence distribution.

## References

- Li, W., & Hudson, M. (2019, 11). Earth's Van Allen Radiation Belts: From Discovery to the Van Allen Probes Era. *Journal of Geophysical Research: Space Physics*, 124(11), 8319–8351. Retrieved from <https://onlinelibrary.wiley.com/doi/abs/10.1029/2018JA025940> doi: 10.1029/2018JA025940



**Figure S1.** This figure presents the occurrence fraction of  $L^*$  values as a function of radial distance, separated by MLT sector, and the number of models required to confirm whether a point has an  $L^*$  or not.