

Supporting Information for

**Phase Space Density Analysis of Outer Radiation Belt Electron Energization and Loss during Geoeffective and Nongeoffective Sheath Regions**

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Figures S1 to S2

**Additional Supporting Information (Files uploaded separately)**

Captions for Movies S1 to S4

**Introduction**

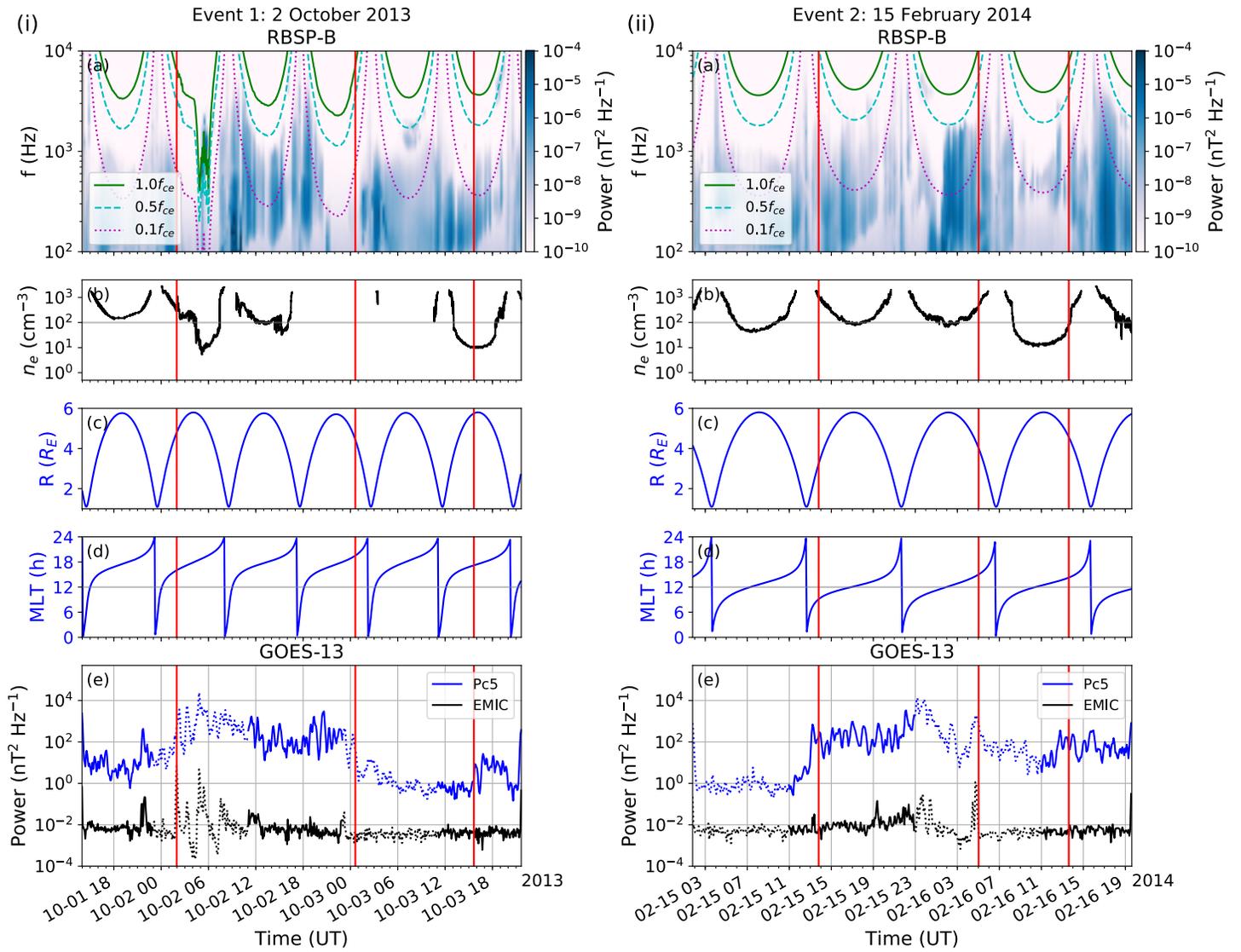
The figures presented here show additional data to complement the figures of the main article. We show wave measurements from different spacecraft and the unbinned phase space density (PSD) radial profiles. In addition, we list here the captions for movies of the PSD radial profiles showing more explicitly the time evolution of the profiles. The movies are uploaded separately.

**Movie S1.** PSD profiles from pass to pass for  $\mu = (300 \pm 10)$  MeV/G in Event 1 (2 October 2013), corresponding to Figure 6i, panel a, in the main article. The current pass is shown in full color with its time indicated by the white triangle in the colorbar, and previous passes are shown faded out. The pass label is shown on the bottom right, indicating whether data for that pass is from the inbound or outbound part of the orbit of Van Allen Probe A or B.

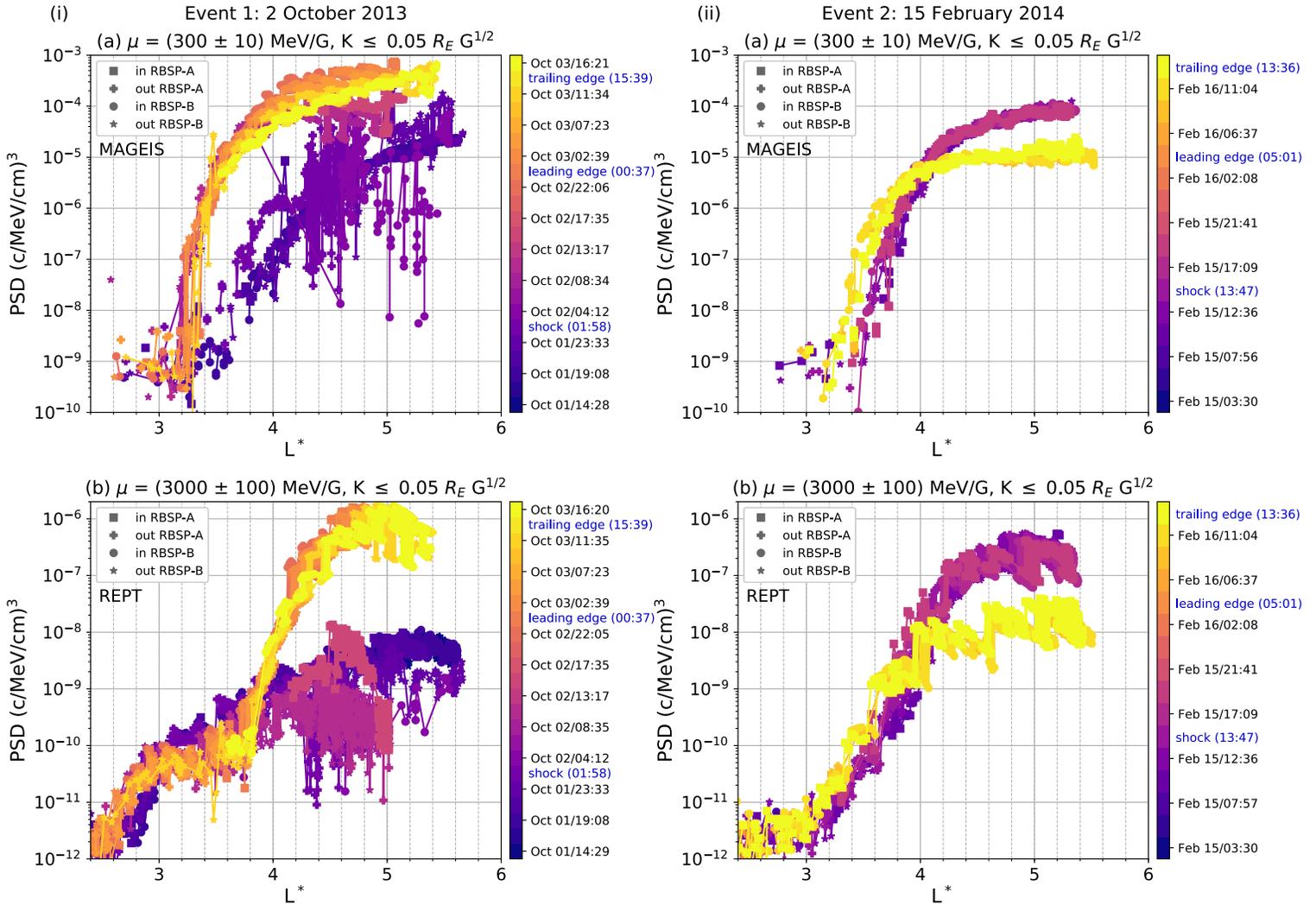
**Movie S2.** PSD profiles from pass to pass for  $\mu = (3000 \pm 10)$  MeV/G in Event 1 (2 October 2013), corresponding to Figure 6i, panel b, in the main article.

**Movie S3.** PSD profiles from pass to pass for  $\mu = (300 \pm 10)$  MeV/G in Event 2 (15 February 2014), corresponding to Figure 6ii, panel a, in the main article.

**Movie S4.** PSD profiles from pass to pass for  $\mu = (3000 \pm 10)$  MeV/G in Event 2 (15 February 2014), corresponding to Figure 6ii, panel b, in the main article.



**Figure S1.** Same as Figure 2 in the main article but showing VLF wave activity measured by Van Allen Probe B and ULF wave powers from GOES-13.



**Figure S2.** Same as Figure 6 in the main article except the PSD profiles have not been averaged in  $L^*$  to smooth them. Fluctuations that originate from finding PSD points corresponding to the chosen ranges of  $\mu$  and  $K$  at multiple energy channels at similar  $L^*$  are visible.