Supporting Information for “Intense chorus waves mitigate the loss of outer radiation belt relativistic electrons during storm main phase”

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1. Figures S1 to S6

Introduction

Figures S1 − S3 show the superposed epoch analyses of integrated chorus wave power, background plasma density, and fractional change of fluxes of relativistic electrons at L* = 4, 5, and 5.5, respectively. The plots are generated in a similar manner as in Figure 1 of the main paper.

Figures S4 − S6 show the distribution of integrated chorus wave power and the correlation between wave power and fractional flux changes during four different phases of geomagnetic storms at $L^* = 4$, 5, and 5.5, respectively. The plots are generated in a similar manner as in Figure 2 of the main paper.

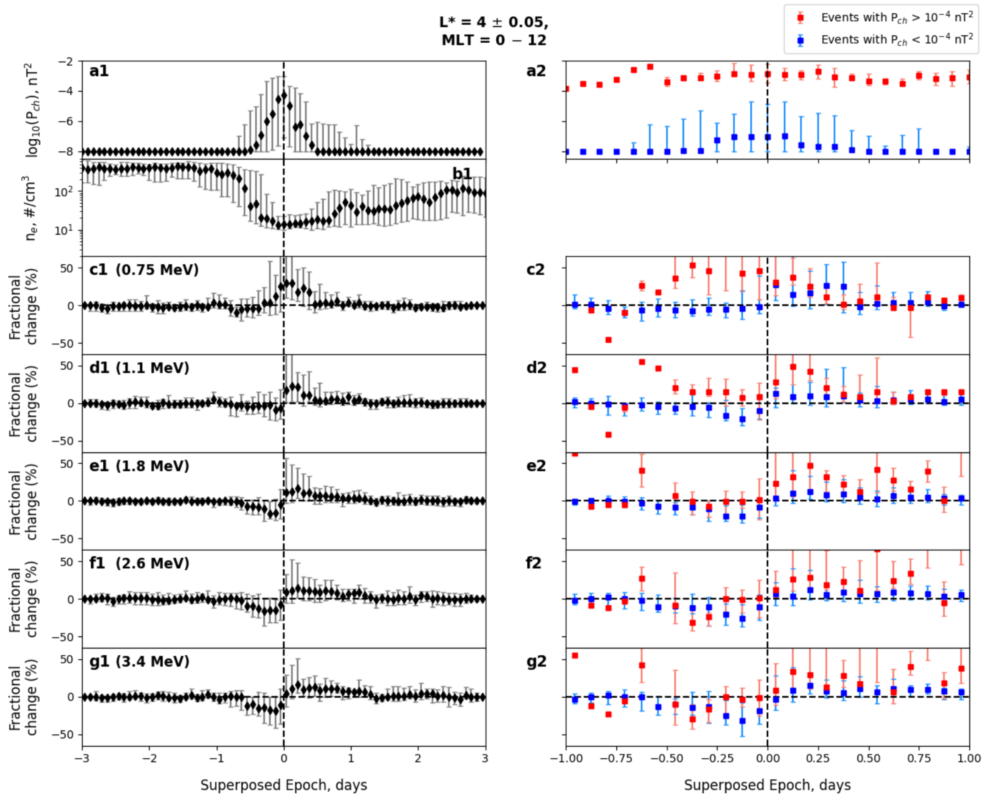

Figure S1. Superposed epoch analysis of (a1) integrated chorus wave power (0.1 – 0.8 f_{ce}), (b1) background plasma electron number density n_e (#/cm^3), and fractional change of trapped electron fluxes of (c1) 0.75 MeV and (d1) 1.1 MeV electrons from the MagEIS instrument, and (e1) 1.8 MeV, (f1) 2.6 MeV and (g1) 3.4 MeV electrons from the REPT instrument at $L^* = 4 \pm 0.05$ and 0 – 12 MLT during ± 3 days around epoch day 0. Panels (a2) and (c2 – g2) show corresponding variations in the integrated chorus wave power and fractional changes in electron fluxes during ± 1 day around epoch day 0 splitting the total power in two ranges. The red data points correspond to events during which the integrated chorus wave power exceeded 10^{-4} nT^2, while the blue data points correspond to events during which the integrated chorus wave power remained low and did not exceed 10^{-4} nT^2. In each panel, the median and interquartile ranges are plotted as a function of superposed epoch days. The vertical dashed line in each panel denotes storm time epoch which corresponds to the time of storm maximum (minimum SYM-H).

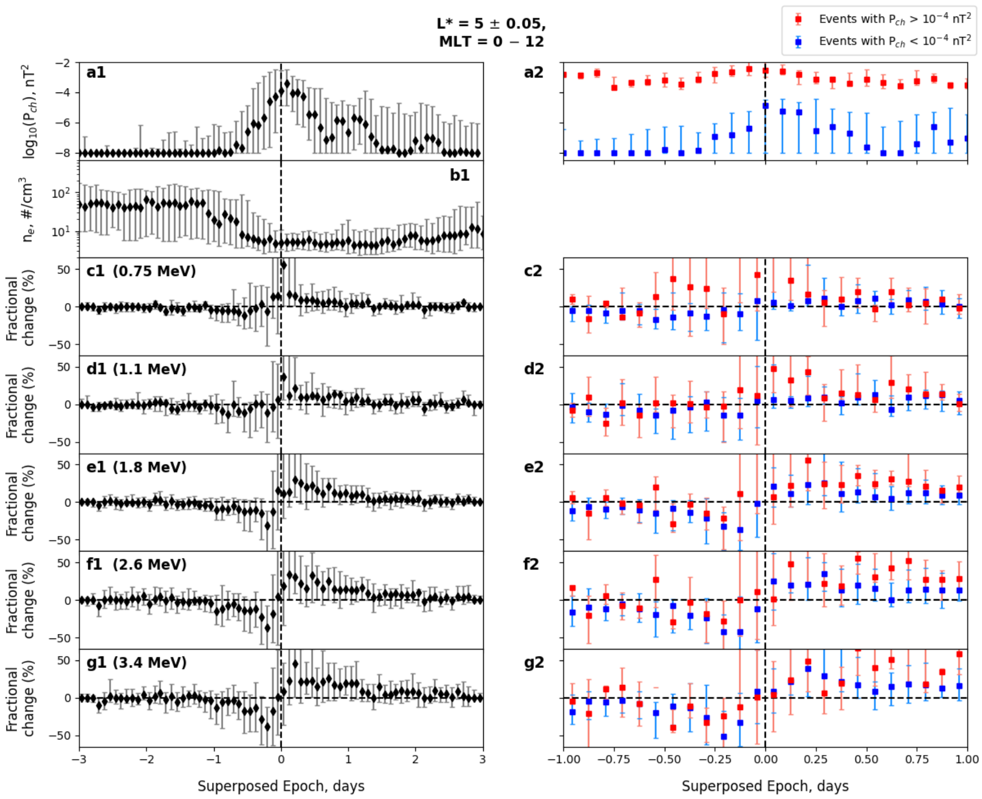

Figure S2. Same as in Figure S1 but for L* = 5 ± 0.05 and 0 – 12 MLT.

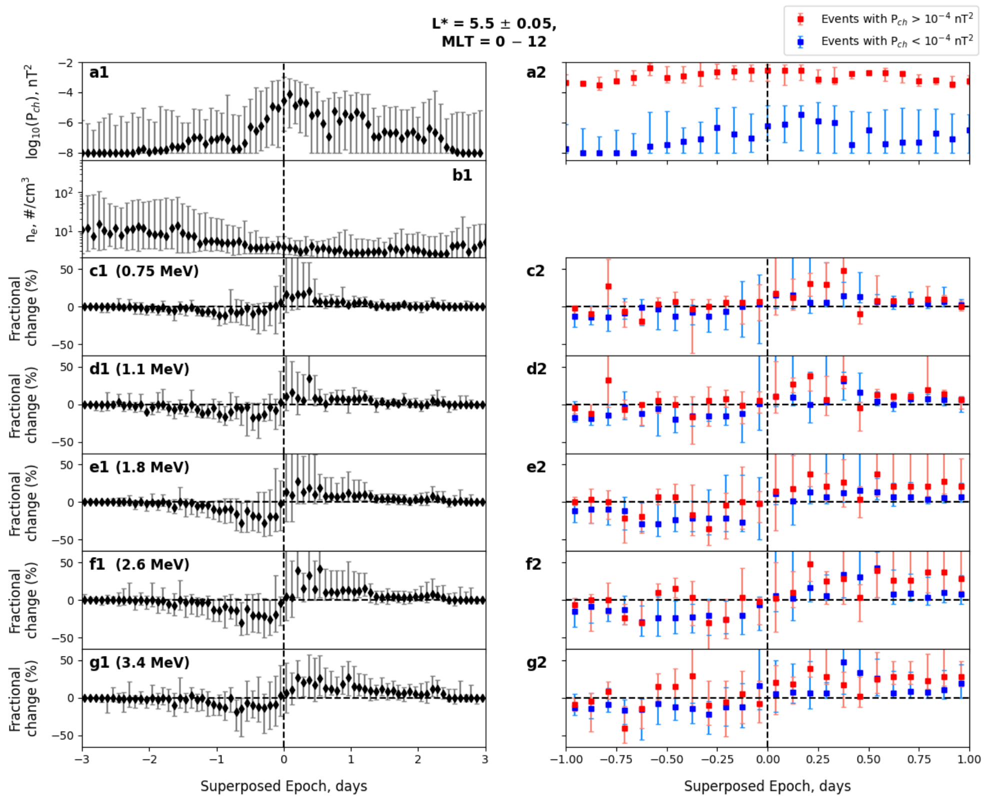

Figure S3. Same as in Figures S1 and S2 but for L* = 5.5 ± 0.05 and 0 – 12 MLT.

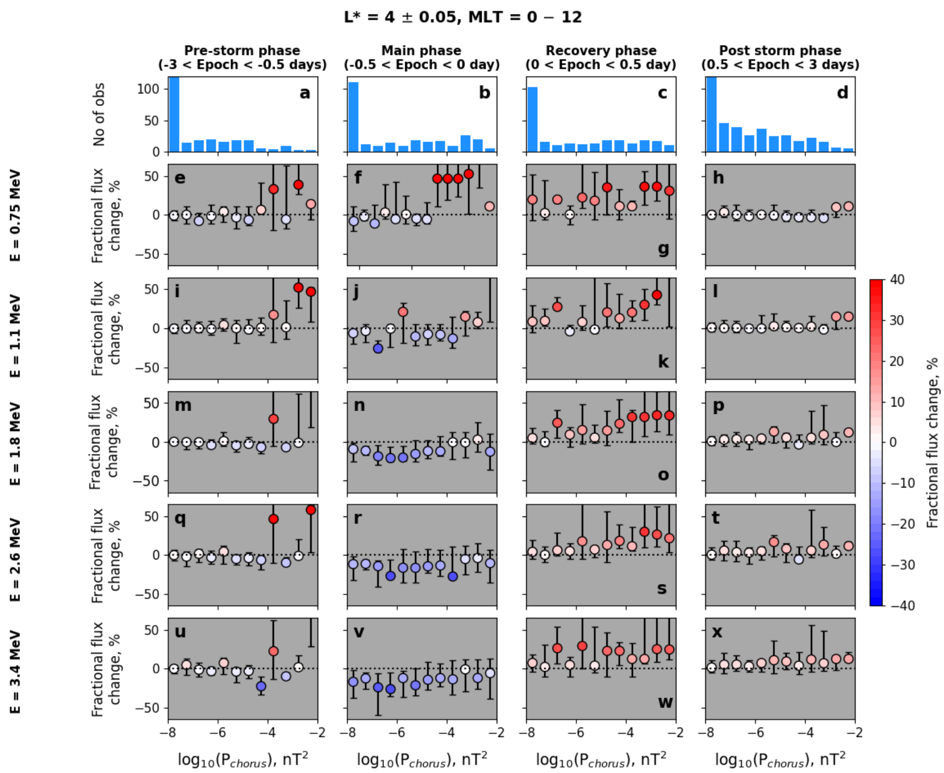

Figure S4. Correlation between integrated chorus wave power and fractional change of electron fluxes during four phases of geomagnetic storms: pre-storm phase ($-3 <$ Epoch day < -0.5), main phase ($-0.5 <$ Epoch day < 0), early recovery phase ($-0 <$ Epoch day < 0.5), and late recovery phase ($0.5 <$ Epoch day < 3) at $L^* = 4 \pm 0.05$ and 0 – 12 MLT. Panels (a – d) show the number of observations in each wave power bin during the four storm phases. Panels (e – x) show the medians and interquartile ranges. The colorbar at the right denotes the fractional changes in electron fluxes, where red indicates a positive change, white indicates no/a small change, and blue indicates a negative change.

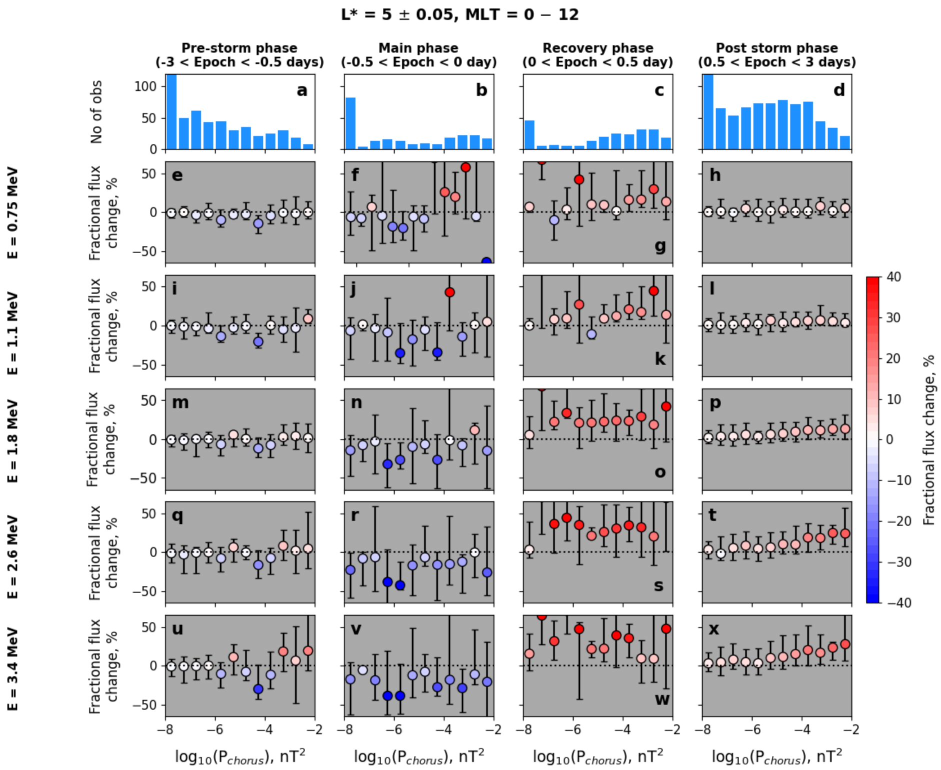

Figure S5. Same as in Figure S4 but for L* = 5 ± 0.05 and 0 – 12 MLT.

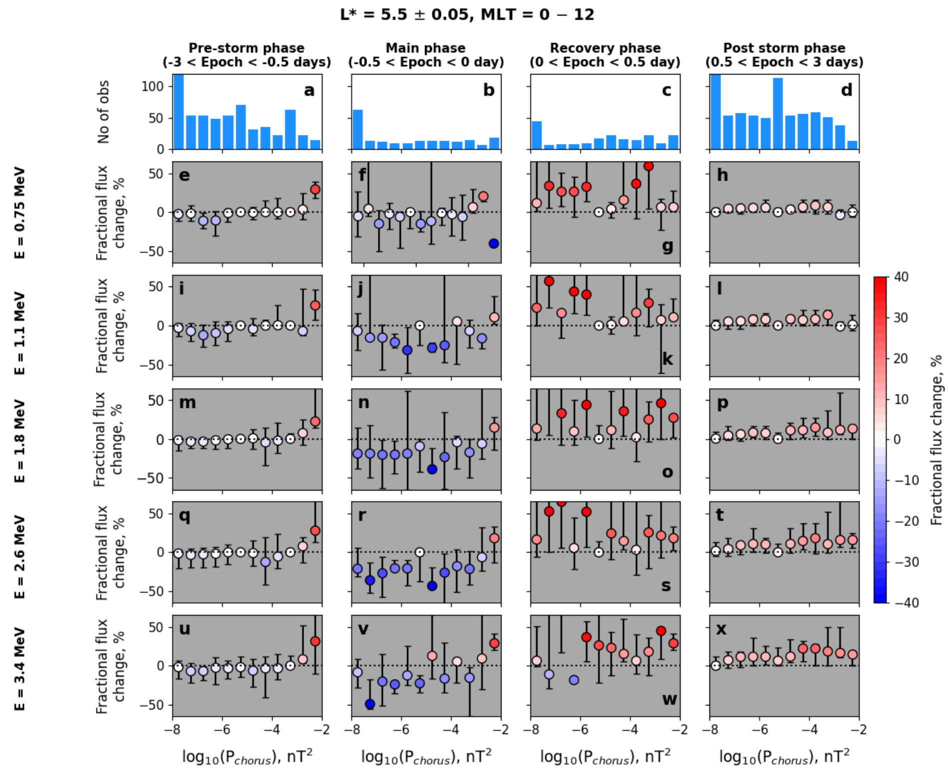

Figure S6. Same as in Figures S4 and S5 but for L* = 5.5 ± 0.05 and 0 – 12 MLT.