AGU PUBLICATIONS

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Supporting Information for

The Impenetrable Barrier: Suppression of Chorus Wave Growth by VLT Transmitters

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Introduction

The Foster et al. (2016) study of the prompt recovery of multi-MeV electron fluxes immediately outside L ~ 2.8 during the March 17-18, 2015 event (c.f. Figure 1a) described conditions and effects markedly similar to those observed on 09 September 2017. These included contraction of the plasmapause earthward of L=2.8, strong (1000x) enhancement of the 21.5 kHz transmitter signal at the outer edge of the VLF bubble, and suppression of risers and other natural whistler-mode emissions at frequencies immediately below the enhanced transmitter signal. Here we present MagEIS low energy electron observations for the March 18, 2015 event that indicate the precipitation of resonant electrons spatially localized with the enhancement of the transmitter signal.

Text S1.

For the 09 Sept. 2017 event, the MagEIS electron energy channels and pitch angle coverage needed to show precipitation loss for electrons resonant at the transmitter frequency were not provided by either RBSP-A or B. However, for the event on 18 March 2015 reported by Foster et al. (2016), the electron energies resonant with the transmitter frequency at low pitch angles (50-300 keV) were well observed by MagEIS-A. For that event, Figure S1 shows an enhancement of the transmitter signal beyond the plasmapause and a localized decrease in the fluxes of resonant electrons similar to those presented in Figure 4 (panels a and b) in the main text. Figure S2 presents MagEIS-A electron energy / pitch angle distributions indicating resonant-energy (~100 keV) electron precipitation across the region of VLF transmitter signal enhancement (L = 2.6 to L = 3.1). Pitch angle measurements 0 - 150 deg were available across the L range of interest and electron flux enhancements in the lowest pitch angle bin were confined to the region of transmitter wave power enhancement.

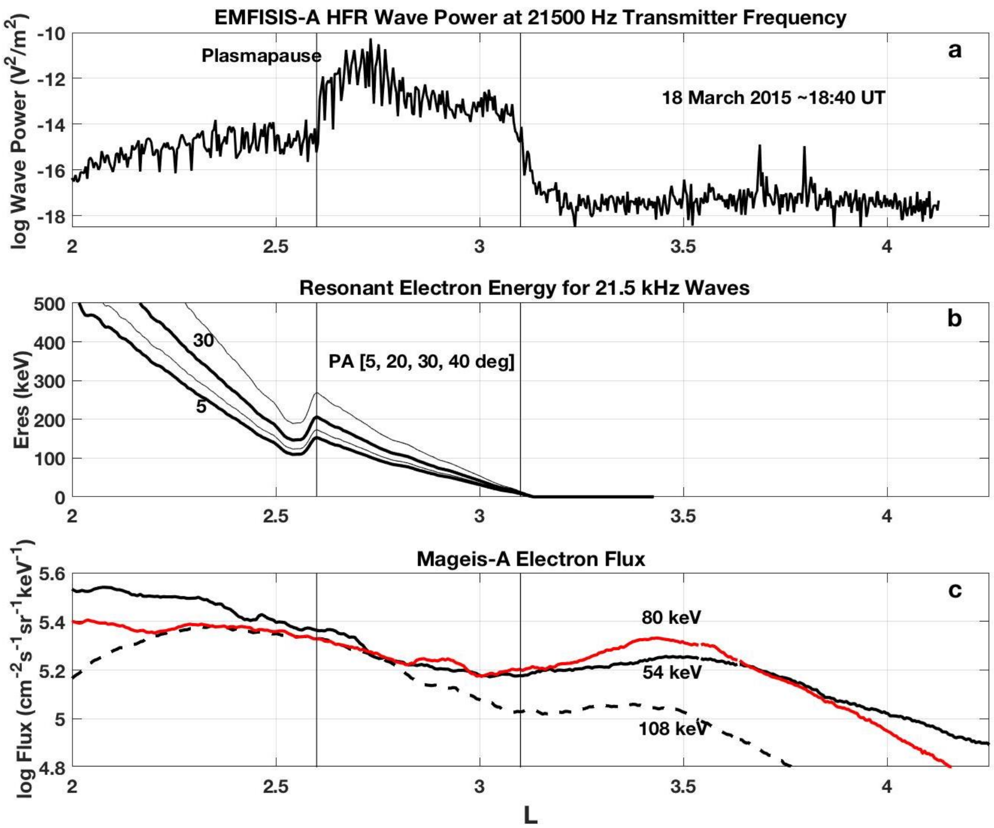

Figure S1. (a) Transmitter wave power increased 1000x across the outer edge of the VLF bubble. The plasmapause was at L ~ 2.6 at this time during the 18 March 2015 event (from Foster et al., 2016).
(b) Cyclotron (n = 1) resonant energy with 21.5 kHz waves (10 deg wave normal angle) are shown for electrons with pitch angles < 40 deg. Resonant energy was calculated using the observed profiles of electron density and magnetic field strength.
(c) MagEIS electron flux profiles at energies resonant at 21.5 kHz across the region of transmitter wave enhancement outside the plasmapause.

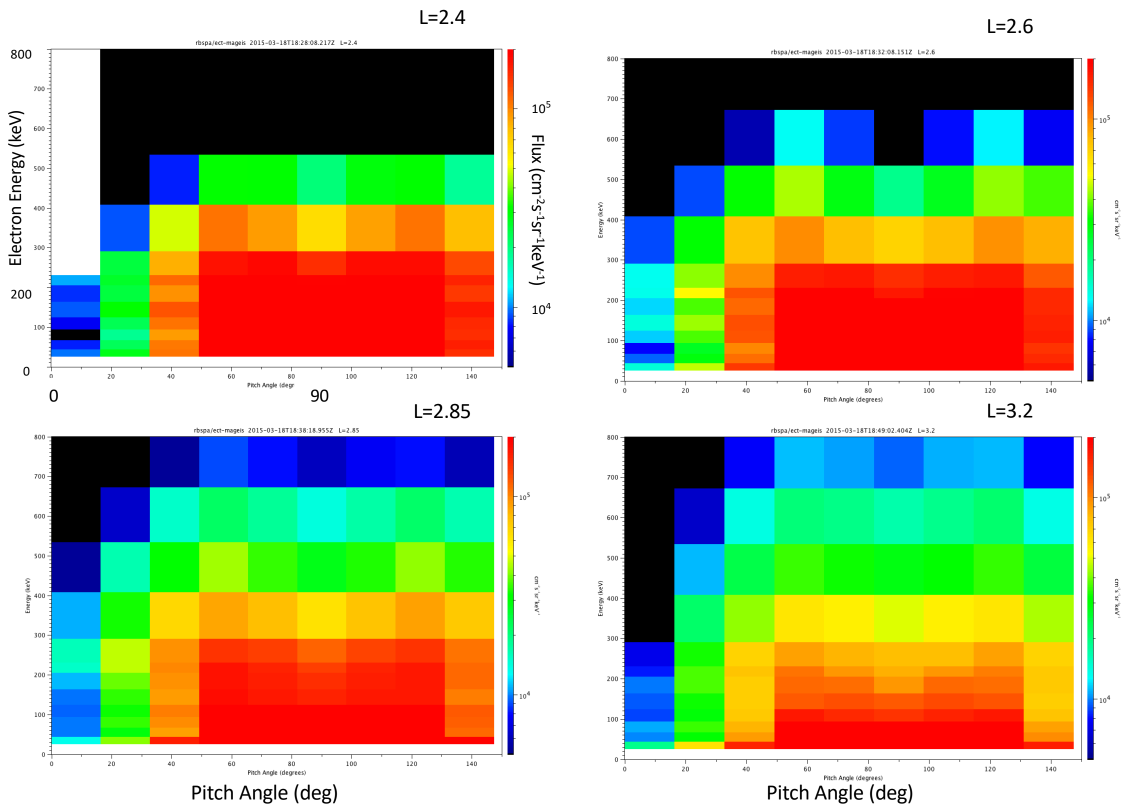

Figure S2. MagEIS-A electron pitch angle distributions at 4 values of L (cf. Figure S1) indicate precipitation of ~100 keV resonant electrons in the region of transmitter wave enhancement outside the plasmapause at L = 2.6.