Supporting Information for

Comparative Study of Dayside Pulsating Auroras Induced by Ultra-low Frequency Waves

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Content of this file:

Videos S1 to S2 (uploaded as separate mp4 files)

Figures S1 to S2

Additional Supporting Information (Files uploaded separately)

Video S1. Movie of pulsating auroras observed at YRS between 07:20-07:50 UT on January 22nd, 2019. (left) Aurora images taken by the 427.8 nm ASI. (middle) Aurora images taken by the 557.7 nm ASI. (right) Aurora images taken by the 630.0 nm ASI. Yellow dashed curves show 71° and 75° latitudes in AACGM coordinates respectively. White dashed curves mark the latitude and longitude that cross the zenith.

Video S2. Movie of pulsating auroras observed at YRS between 09:10-09:40 UT on January 10th, 2016, with the same format as Video S1.

Introduction

This supplementary material contains videos of pulsating auroras observed by three ASIs at YRS and wavelet power spectrograms of ULF waves observed by MMS in the January 22nd, 2019 event and the January 10th, 2016 event respectively.

Videos S1-S2 present original auroral images taken by the 427.8 nm (left), 557.7 nm (middle) and 630.0 nm (right) ASIs at YRS respectively. Yellow dashed curves in Videos S1-S2 show 71° and 75° latitudes in AACGM coordinates, corresponding to the integration area in the main text. Auroral pulsations can be seen between 71°-75° latitudes in the left and middle panels, but cannot be seen in the right panel in both events.

Figures S1-S2 show wavelet power spectrograms of all ULF wave components. In the January 22nd, 2019 event, peaks of magnetic field wavelet power (Figure S1a1-S1c2) are located near ~ 47.6 s (white dashed lines). The power of electric field GSE-y component also peaks near ~ 47.6 s (Figures S1e1-S1e2), but the period of electric field GSE-x component is slightly longer than 47.6 s (Figures S1d1-S1d2). The power of electric field GSE-z component is weaker than that of another two electric field components (Figures S1f1-S1f2), consistent with the magnetohydrodynamic-nature of ULF waves. In the January 10th, 2016 event, periods of electric field GSE-x and GSE-y components (Figures S2d1-S2e2) are both ~ 43.5 s (white dashed lines). Power of magnetic field components mainly peaks near ~ 50-100 s, but there are weaker peaks near 43.5 s (Figures S2a1-S2c2). The power of electric field GSE-z component is also weaker than that of another two components (Figures S2f1-S2f2).

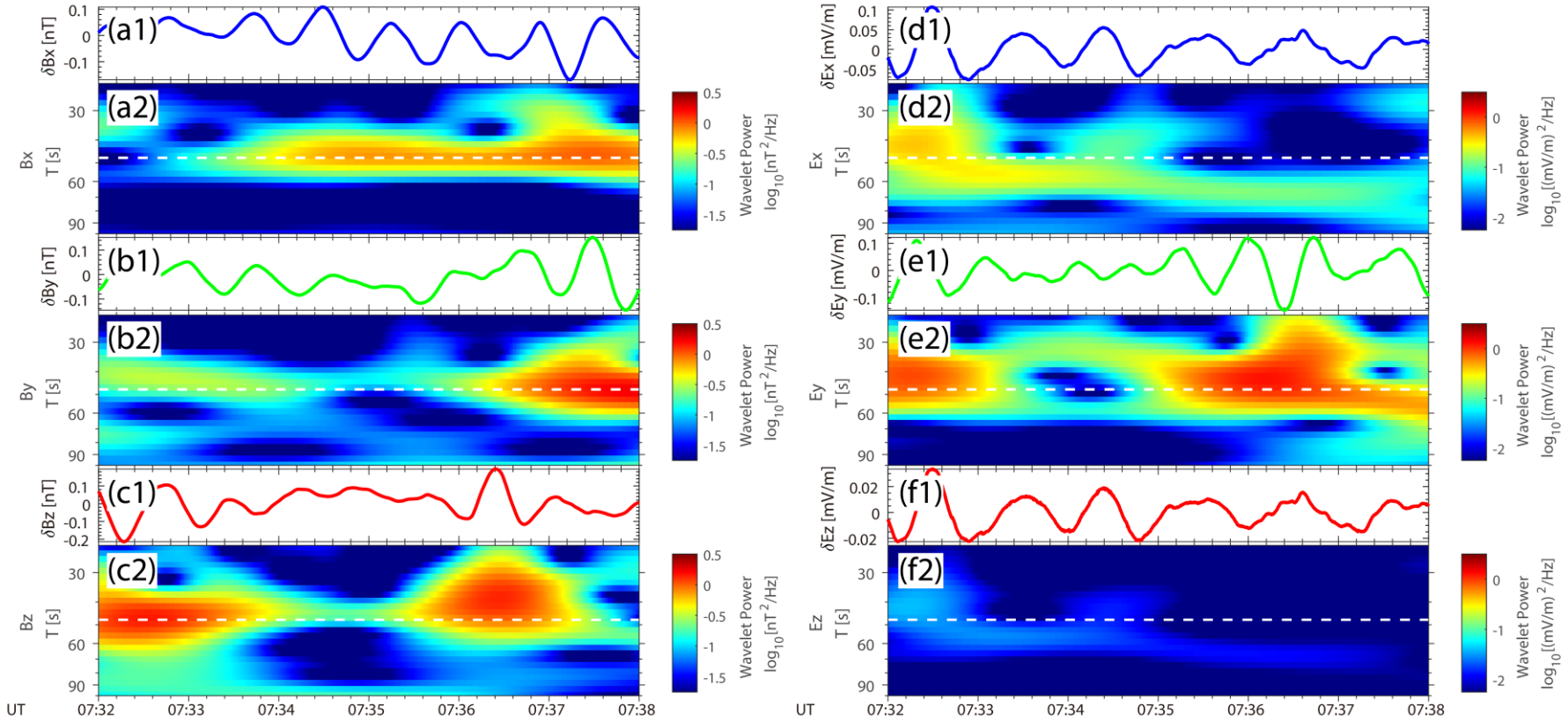

Figure S1. Wavelet power spectrograms of ULF wave components in GSE coordinates between 07:32-07:38 UT on January 22nd, 2019. (a1-a2) Magnetic field GSE-x component. (a1) 90-s detrended wave field, derived from FGM data. (a2) Wavelet power spectrogram of the measured field. Panels (b1-b2) and (c1-c2) are in the same format as (a1-a2), except that they apply to the GSE-y and GSE-z components of magnetic fields, respectively. (d1-d2) Electric field GSE-x component. (d1) 90-s detrended wave field, derived from EDP data. (d2) Wavelet power spectrogram of the measured field. Panels (e1-e2) and (f1-f2) are in the same format as (d1-d2), except that they apply to the GSE-y and GSE-z components of electric fields, respectively. White dashed lines in (a2), (b2), (c2), (d2), (e2) and (f2) mark the period of 47.6 s.

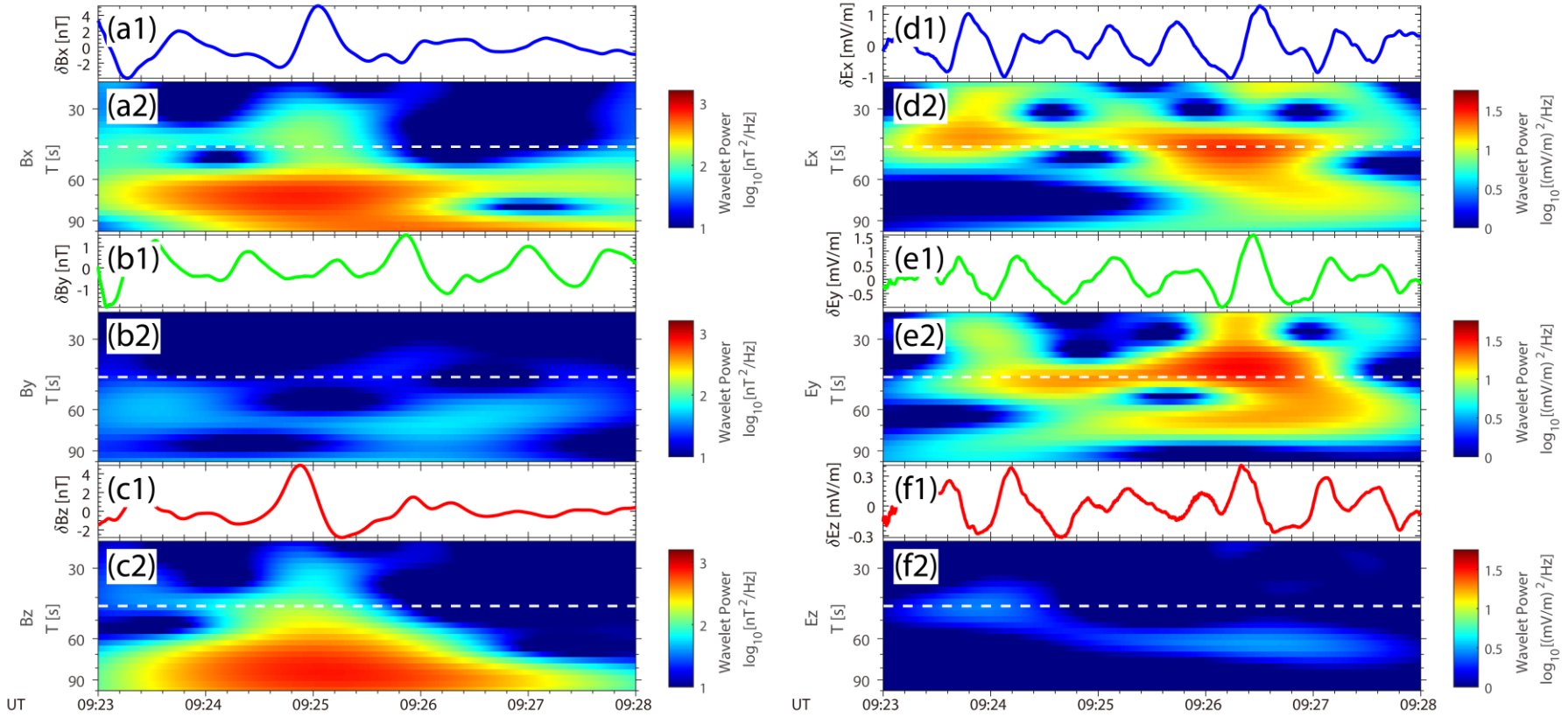

Figure S2. Wavelet power spectrograms of ULF wave components in GSE coordinates between 09:23-09:28 UT on January 10th, 2016, with the same format as Figure S1. Wave fields in (a1), (b1), (c1), (d1), (e1) and (f1) are detrended with a 60-s time window. White dashed lines in (a2), (b2), (c2), (d2), (e2) and (f2) mark the period of 43.5 s.