Dear Referee #1,

Thank you for your comments and remarks. Below is our reply.

Lines 103-114: Please merge this chapter with introduction.

We have followed your suggestion and included the chapter in the introduction.

Lines 136-138: If it is not that important (I guess it is not since it is not shown) it shouldn't be mentioned at all.

We now include the Bz plot in Figure 1 as Bz is an important parameter in determining whether pulsations are produced by internal or external processes.

Line 152: Define cone angle. Also I don't see it anywhere in the figure. Instead I see the three components of speed which are not discussed at all. Figures are already too many (16!!!). Since Kp and speed are not discussed at all remove them and merge figures 1 and 2 (or even better provide the total solar wind speed only).

We followed your advice. We defined the cone angle and included it and the total solar wind speed in Figure 1. We merged Figures 1 and 2. Now there are 14 figures in the paper. We discussed the solar wind speed in the section on testing generation mechanisms.

Lines 170-178: The authors discuss the time-lag between solar wind pressure and compressions at GEO. Is this really important for the conclusions of this work? More-over, I'm left with the feeling that the use of GOES measurements, in general, do not provide any significant observational evidence in this work. If I'm wrong then I believe that it should be discussed more clearly but if I'm not the authors should consider not using it at all.

The GOES data provide important spatial context for understanding this event. In particular, they help to contrast some of the features of the Pc4 and Pc5 waves observed at all four spacecraft. GOES data also confirm the value of data at geosynchronous orbit for monitoring solar wind conditions and the importance of solar wind pressure enhancements for stimulating and even amplifying compressional waves in the dayside magnetosphere. However, because of the much more complete instrumentation available on the Van Allen Probes, the remainder of this paper will focus on the observations from the latter spacecraft.

Lines 187-189: The authors state "Prior to the arrival of the strong solar wind dynamic pressure variations, RBSP-A observed very weak compressional pulsations with Pc5 periods and amplitudes of 1-3 nT from 18:15 to 18:55 UT." This is not shown anywhere.

The weak compressional pulsations observed by RBSP-A are not visible in Figure 3 because of the very large scale in this figure but readers can see some traces of them in Figure 7.

In figures 5 and 6 the authors show the magnetic field in GSM coordinates along with the total magnetic field yet they are referring to compressional pulsations. If the authors mean the Btot they should mention it along with the assumption that Btot is almost the same with Bcomp. Nevertheless, since they are showing the MFA coordinates later in the text, I don't understand the usage of these two figures especially when they also contain the x,y,z coordinates which are not discussed at all.

We changed the text and Figures 4 and 5. Figure 5 shows only data in mean field-aligned coordinates, not including the field magnitude, and only for a shorter time interval. We discuss the pulsations in FAC and comment on the phase relations between the 3 components.

Lines 208-211: Please rename X-Y-Z to Poloidal-Toroidal-Compressional.

The definitions of the field-aligned coordinates that we used are precise, and are strictly based on observations. In the real rather than ideal magnetosphere, ULF waves, whether toroidal, poloidal, or compressional, often have at least some power in 2 or more components in a field-aligned system. Thus we do not label the three components of the magnetic field toroidal, poloidal, and compressional. Nevertheless, Pc5 pulsations are called compressional because of the prominent Bz component.

lines 271-274: The oscillations are of course visible but the rest of the statements are not supported by this plot as the reader can understand nor the exact frequency of these waves neither the phase difference. Maybe a simple filtering would give prominence to these pulsations or even better a spectral analysis.

We changed Figure 10 (formerly Figure 12) to show that that the intensities of electrons with energies from tens of keV to 2 MeV oscillate with Pc5 periods corresponding to those of the magnetic field. The energetic electron fluxes oscillated out of phase with the compressional Bz component of Pc5 magnetic field pulsations and did not display any phase differences across all energies (see an expanded view for some selected energies, Figure 10b). We calculated the dynamic spectra for electrons at all available energies observed by RBSP-A and -B and found pulsations with frequencies similar to those for the compressional Pc5 pulsations (see Figure A of this reply below). The lower energy electron fluxes displayed more noticeable enhancements as a response to the compressions of the magnetosphere.

Line 279: What is P and B? Please define.

We corrected the sentence: . . .the antiphase relation between the plasma and magnetic field pressures suggests that particle pitch angle distributions peak near 90◦.

Figure 13: There is a completely different behavior between low and high energy PA distributions yet the authors do not discuss it at all. I think there is much more information in this figure which should be further discussed.

We are not sure what feature in the figure the referee is addressing. We wish only to note: (1) the fact that pitch angle distributions peak near 90◦ pitch angles, (2) there are successive enhancements in response to compressions of the magnetosphere (for example at 19:40 and 20:05 UT at RBSP-A), and (3) these enhancements are most pronounced at the lower energies. At higher energies, flux variations associated with the radial gradients dominate the instrument response, as indeed can also be seen in Figure 10a.

Line 289: Please rephrase.

We slightly rephrased the sentence: The compressional components oscillated with a frequency twice that of the transverse component.

Lines 310-311: I don’t understand this sentence. What do the authors mean by "most prominent". In figure 9, the double frequency is very pronounced from â´Lij19:54 until after 20:32.

The referee’s reading of Figure 9 (now Figure 7) is correct, but this sentence refers to Figure 12, which presents the same data in a different format that does not include the relatively broad time window feature that is intrinsic to dynamic Fourier spectra. To prevent future confusion, we have added the following words at the end of this sentence: “in these line plots.”

Lines 350-353: I would like to see the filtered time series of pressure or its fourier transform. As Kepko et al., 2002 have shown, the time interval that the authors examine is the ideal one for pulsations originating in the solar wind pressure.

We stated:

First, with the exception of the interval from 19:35 UT to 19:55 UT, the Wind observations shown in Figure 1 provide no evidence for periodic solar wind drivers in the Pc5 range, be they density variations or IMF fluctuations, thus ruling out solar wind pressure pulses as the direct cause of the Pc4-5 pulsations. In what follows we show WIND data time-shifted 53 minutes (consistent with Figure 3), and confirm that solar wind pressure oscillations are not the direct cause of the Pc4-5 pulsations. Figure B of this reply compares dynamic spectra of the WIND solar wind pressure (shifted by 53 min) and of the RBSP-A total magnetic field from 17:30 UT to 22:00 UT on January 1, 2016. There is no evidence for significant solar wind pressure pulsations during this 4.5 hour interval. Only three very weak intensifications of pressure pulsation activity at Wind were observed during short intervals but they began 1.5 hour later than the generation of the magnetic Pc5 pulsations. Figure C presents Wind time-shifted filtered data in the band of frequencies from 2 to 10 mHz. A monochromatic wave packet with frequency of ∼5 mHz only appeared between ∼20:30 and ∼20:50 UT that we marked in the Wind observations (not time-shifted) presented in Figure 1. We thus rule out solar wind pressure pulses as the direct cause of the Pc4-5 pulsations.

Line 369: Please rephrase.

We rephrased this sentence. As Figures 10 (a, b) demonstrate, RBSP-A shows no evidence in the electron observations for any such phase reversal at any relevant energies.

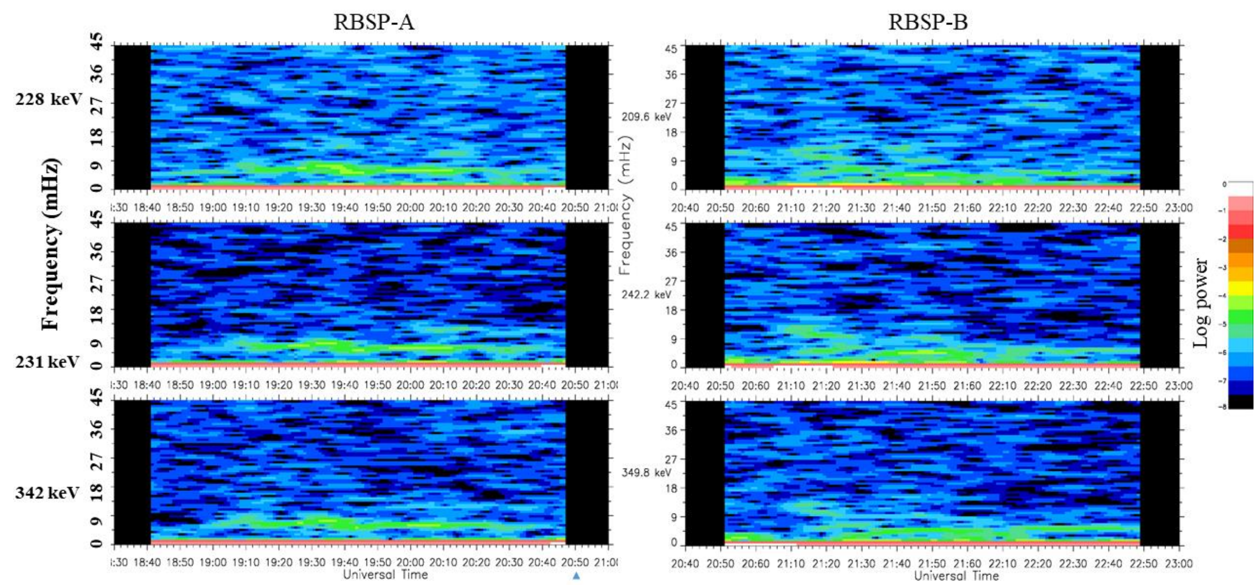

Figure A. Dynamic spectra for electrons with selected energies observed by RBSP-A from 18:30 to 21:00 UT and by -B from 20:40 to 23:00 UT on January 1, 2016

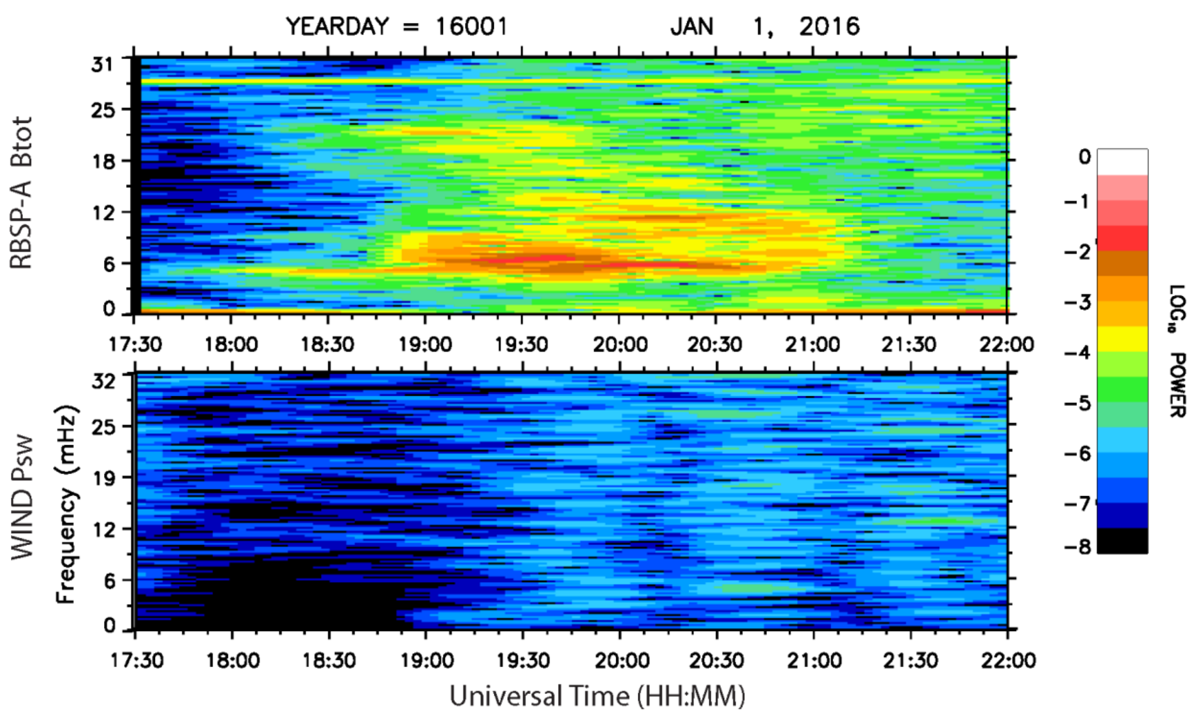

Figure B. Dynamic spectra of the RBSP-A total magnetic field strength and the WIND solar wind pressure from 17:30 UT to 22:00 UT on January 1, 2016.

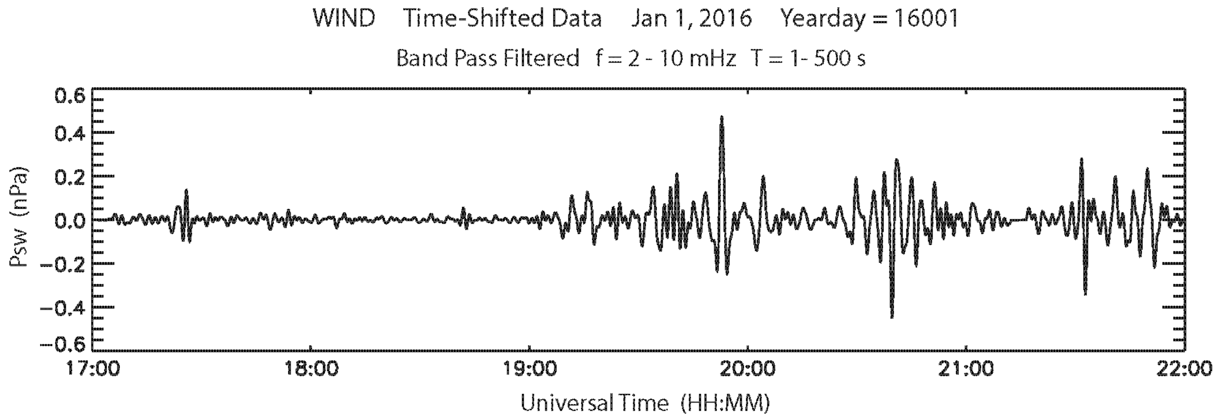

Figure C. **Wind time-shifted filtered data in the band of frequencies from 2 to 10 mHz from 17:00 UT to 22:00 UT on January 1, 2016.**

Dear Referee #2,

Thank you very much for your comments and corrections. We have adopted all them. Enclosed, please find our replies to your remarks.

Line 58: "They have several Re wavelengths". Suggest "The have wavelengths of several **R_E" –**

We corrected the sentence: They have wavelengths of several Earth radii.

Line 108: please define what you mean by "mode of the waves" and "nodal structure". Are we referring to azimuthal mode structure and latitudinal node structure? Or does "mode" refer to, e.g., compressional vs transverse waves? –

We changed the sentence as follows:

We investigate the type of pulsation (compressional versus transverse), their harmonic mode, and their latitudinal nodal structure.

Line 138: since solar wind observations have not yet been introduced as a figure, suggest removing the words "(not shown)".

We now show the solar wind observations in the final version of the paper.

Lines 163 et seq, and Figure 4. Please describe how the solar wind values are lagged. Is this a simple ballistic propagation estimation, a best fit estimation, or are propagation techniques such as those used in producing OMNI solar wind data used? –

To determine the lag time between the Wind and GOES-15 observations we related individual magnetosphere compressions to corresponding dynamic pressure variations.

The good correspondence of GOES magnetic field enhancements to solar wind dynamic pressure pulses at the beginning and the end of the interval facilitated this task. Additionally, we confirmed these empirically derived lag times with simple ballistic estimates based on the solar wind velocity and the distance of Wind from Earth. Finally, we confirmed our estimates by examining the OMNI parameters.

Line 234: "min" -> "minute" –

We changed min to minute

Line 282: remove spurious period (".") between words "distribution" and "peak".

We removed period between words distribution and peak.

The figure confirms that pitch angle distributions

Line 359: "Therefore, we conclude like many previous researchers that the...". Please provide citations for previous conclusions, or remove words "like many previous researchers". –

We changed the sentence: Therefore, we conclude that the compressional Pc5 pulsations were excited by processes internal to the magnetosphere.

Lines 379 et seq. HOPE, EMFISIS, and RBSPICE contributions should be noted and described in Section 2, "Resources".

We added additional descriptions of the RBSP instruments.

This paper employs observations of the most abundant ion components as well as electrons, over the 0.001–50 keV energy range of the core plasma populations from the HOPE instrument, populations of 20-4000 keV ion and electrons from the MagEIS instrument [Blake et al., 2013] in the Energetic Particle, Composition, and Thermal (ECT) suite [Spence et al., 2013], fluxes of ions over the energy range from ∼20 keV to ∼1 MeV and electrons over the energy range ∼25 keV to ∼1 MeV (RBSPICE) [Mitchell et al., 2013] in conjunction with observations from the magnetometer in the Electric and Magnetic Field Instrument Suite and Integrated Science suite (EMFISIS) [Kletzing et al., 2013], and the Electric Field and Waves (EFW) [Wygant et al., 2013] instrument. We examine electric and magnetic field measurements with 11 s and 4 s time resolution, respectively, and differential particle flux observations with ~11 s (spin period) time resolution.

Thank you again for your help,

Regards,

Galina Korotova.