Supporting Information for "On differentiating multiple types of ULF magnetospheric waves in response to solar wind periodic density structures"

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Contents of this file

Additional Supporting Information (Files uploaded separately)

1. Caption for large Table S1
2. Caption for Movie S1

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Introduction

The magnetic field response at ground was investigated using 181 ground observatories from the SuperMAG collaboration (Gjerloev, 2012). Information about the stations used in our analysis are in Table S1. We apply our spectral analysis procedure (Di Matteo et al., 2020) to the the north-south (B_N) and east-west (B_E) magnetic field component at each observatory to reveal the occurrence of ULF waves at discrete frequencies. The movie S1 shows an overview of the results from 17:09 UT on November 9, 2002, to 01:30 UT on November 10, 2002. The analysis is performed for a running 91-minute interval with 3-minute steps. The parameters for the spectral analysis are the ones described in the main text. The maps are qualitative representation of the global power distribution obtained interpolating on a regular grid (Isaaks & Srivastava, 1989) the integrated power spectrum over five frequency ranges: (I) ≈1.3–2.1 mHz; (II) ≈2.2–2.8 mHz; (III) ≈2.9–3.3 mHz; (IV) ≈3.4–3.9 mHz; (V) ≈4.4–5.1 mHz. We indicate the occurrence of a discrete ULF waves with white/black dots at the location of the ground observatory. Note that in dark blue regions of the maps (i.e., very low values of integrated power), short isolated identifications are more likely to results from the selection of false positives.

Table S1. List of geomagnetic observatories. From the left: IAGA code, station name, chain name, geographic latitude and longitude, magnetic latitude and longitude.

Movie S1. Top left: sym-H and AE indices compared with the solar wind dynamic pressure shifted forward of 27 minute. The vertical lines are the same of Figure 7. The green patch indicates the running 91–minute time interval over which we apply our spectral analysis. Panel I–V, global maps of the integrated power spectrum for the B_N (left) and B_E (right) components in five frequency ranges, namely: (I) ≈1.3–2.1 mHz; (II) ≈2.2–2.8 mHz; (III) ≈2.9–3.3 mHz; (IV) ≈3.4–3.9 mHz; (V) ≈4.4–5.1 mHz. At the locations of the ground observatories used for the analysis (grey dots), white and black dots indicate the identification of a wave with the γ and γ+F test, respectively, within 10 minute from the map time. The dashed lines represent the auroral oval boundaries.

References

Di Matteo, S., Viall, N. M., & Kepko, L. (2020). *SPD_MTM: a spectral analysis tool for the SPEDAS framework.* Retrieved from `https://zenodo.org/record/3703168` doi: 10.5281/zenodo.3703168

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