

# Supporting Information for ”Spectral properties of whistler-mode waves in the vicinity of the Moon: A statistical study with ARTEMIS”

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## Introduction

The supporting materials are consist of a table and text describing the table. The table shows the result of an algorithm test.

## Text S1.

We tested the algorithm used in our study by applying it to the Time History of Events and Macroscale Interactions during Substorms (THEMIS) SCM onboard FFT spectra, which are equivalent to the ARTEMIS data used in the manuscript. Here the data are obtained by THEMIS D and E from Apr. 24, 2010 to Mar. 21, 2011 when the FFT spectra were obtained in a 64-bin resolution. On applying them to Earth’s inner magne-

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tosphere, we slightly changed the criteria from the lunar analysis presented in the paper. The threshold power spectral density for event identification is changed to  $p_{th} = 10^{-7}$  nT<sup>2</sup>/Hz (an order of magnitude larger than in Teng et al. (2019)) to take into account the relatively small noise floor at a frequency range of whistler-mode wave generation in the inner magnetosphere. In addition, following Teng et al. (2019), observations in the plasmasphere are excluded with a condition that the number density of electrons exceeds 100 cm<sup>-3</sup>. The result is shown in Table S1. We note that the ratio of lower band only events is far larger than that of Teng et al. (2019). This may be because the relatively large  $p_{th}$  compared to Teng et al. (2019) results in underestimation of typically weak upper band waves (Gao et al., 2019). One another possibility comes from the difference that we did not visually checked the events and therefore some other events may be included such as hiss emissions. In any case, the ratio of banded to no-gap is approximately 2, generally reproducing the results of Teng et al. (2019) ( $\sim 3$ ) and Gao et al. (2019) ( $\sim 2$ ). Hence, we conclude that the algorithm and FFT spectra of THEMIS-ARTEMIS are sufficient for distinguishing the gap of whistler-mode waves.

**Table S1.** Number (ratio) of four types of whistler-mode events observed by THEMIS.

Lower	Upper	Banded	No-gap
500,711 (93.0%)	11,840 (2.2%)	17,567 (3.3%)	8,570 (1.6%)