



HAL
open science

On the upper frequency limit of whistler mode waves observed by low-altitude spacecraft

Frantisek Nemeč, Ondřej Santolík, Michel Parrot

► To cite this version:

Frantisek Nemeč, Ondřej Santolík, Michel Parrot. On the upper frequency limit of whistler mode waves observed by low-altitude spacecraft. 22nd EGU General Assembly, 2020, Online, France. 10.5194/egusphere-egu2020-2432 . insu-03560754

HAL Id: insu-03560754

<https://hal-insu.archives-ouvertes.fr/insu-03560754>

Submitted on 8 Feb 2022

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution| 4.0 International License

EGU2020-2432

<https://doi.org/10.5194/egusphere-egu2020-2432>

EGU General Assembly 2020

© Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.



On the upper frequency limit of whistler mode waves observed by low-altitude spacecraft

Frantisek Nemec¹, Ondřej Santolík^{2,1}, and Michel Parrot³

¹Charles University, Faculty of Mathematics and Physics, Department of Surface and Plasma Science, Prague, Czechia (frantisek.nemec@gmail.com)

²Department of Space Physics, Institute of Atmospheric Physics, The Czech Academy of Sciences, Prague, Czech Republic

³LPC2E/CNRS Orléans, Orléans, France

Frequency-latitude plots of electromagnetic wave intensity in the very low frequency range (VLF, up to about 20 kHz) observed by the low altitude DEMETER spacecraft are analyzed. Apart from electromagnetic waves generated by plasma instabilities in the magnetosphere, a significant portion of the detected wave intensity comes from ground-based lightning activity and VLF military transmitters. These whistler mode waves are observed not only close to source locations, but also close to their geomagnetically conjugated points. There appears to be an upper frequency limit of such emissions, where the wave intensity substantially decreases. Its frequency roughly corresponds to half of the equatorial electron cyclotron frequency at a respective magnetic field line, suggesting a relation to wave ducting in ducts with enhanced density. However, it seems to exhibit a non-negligible longitudinal dependence and it is different during the day than during the night. We use a realistic model of the Earth's magnetic field to explain the observed variations. We interpret the observations in terms of ducted/unducted wave propagation, and we compare the wave intensities in the source hemisphere with those measured in the hemisphere geomagnetically conjugated.