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High accuracy analysis of whistlers measured simultaneously on ground station and on board of the DEMETER satellite

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Examining the mechanism and effect of the coupling of the electromagnetic signals from the lower ionosphere into the Earth-ionosphere waveguide (EIWG) can be maintained with the analysis of simultaneous broadband VLF recordings acquired at ground station (Tihany, Hungary) and on LEO orbiting satellite (DEMETER) during nearby passes.
Single hop whistlers, selected from concurrent broadband VLF data sets were analyzed with high accuracy applying the matched filtering (MF) technique, developed previously for signal analysis. The accuracy of the frequency-time-amplitude pattern and the resolution of the closely spaced whistler traces were further increased with least-square estimation of the parameters of the output of MF procedure. One result of this analysis is the fine structure of the whistler which can not be recognized in conventional spectrogram. The comparison of the detailed fine structure of the whistlers measured on board and on the ground enabled us to select reliably the corresponding signal pairs.
The remarkable difference seen in the fine structure of matching whistler occurrences in the satellite and the ground data series can be addressed e.g. to the effect of the inhomogeneous ionospheric plasma (trans-ionosperic impulse propagation) or the process of wave energy leaking out from the ionized medium into the EIWG. This field needs further investigations.

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