Simultaneous observations of coherent waves and associated particle distribution functions from the Wind spacecraft in the near magnetotail

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We present an analysis of simultaneous observations of electromagnetic waveforms and ion and electron distribution functions by the WAVES and the 3D-Plasma experiments onboard the Wind spacecraft in the near Earth's magnetotail. The WAVES experiment is composed of state-of-the-art high-time resolution spectral receivers and waveform analyzers sampling electric and magnetic signals up to 120000 samples/sec. The 3D-Plasma experiment provides measurements of the full 3D, spin resolution (3s) ion and electron distribution functions with a high sensitivity, wide dynamic range, and good energy and angular resolutions. The dataset analyzed here comes from one Wind perigee pass in 1995 during a magnetically quiet period at radial distances between 5 and 8 Earth radii and local time between 15:00 UT and 06:00 UT. Analysis of the data show several types of coherent waveforms above 50 Hz and up to few hundreds of kHz, such as quasimonochromatic waves with frequencies close to the electron cyclotron frequencies, solitary-like structures, low frequency whistlers, electron Bernstein waves, as well as coherent burts of Langmuir waves or upper-hybrid waves, and very peculiar particle distribution functions at times of wave activity.

We discuss the nature and detailed properties of the observed wavemodes, and we look for one-to-one correlations between occurence and type of waves with particular features in the corresponding ion and/or electron distribution functions, in an attempt to identify the source(s) of the waves and understand the plasma micro-instability process(es) leading to these coherent fluctuations. Correlations between wave activity and auroral and magnetospheric activity are also investigated.