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Observations of whistler waves in solar wind with Cluster mission

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We study magnetic field fluctuations with the STAFF instrument onboard Cluster spacecraft. The Spectral Analyser of STAFF allows to make measurements in the $[8-4000]$ Hz frequency range. Taking into account the instrumental noise level, magnetic spectra up to ~ 400 Hz are resolved. A large statistical study of nearly 200 intervals in the free solar wind, during the first 5 years of the Cluster mission, shows the presence of whistler emissions in $\sim 10\%$ of the studied cases. These waves have a direction of propagation quasi-parallel to the mean magnetic field, and a polarisation quasi-circular and right-handed. Their appearance in the solar wind is sometimes related to sudden changes in the proton density and temperature, and always related to changes in the magnetic field direction. The presence of these magnetic whistler waves could thus be related to magnetic sector boundaries or to stream interaction regions : using electric field waveforms on Stereo, Breneman et al. (2010) have found large amplitude whistler waves, obliquely propagating with a large electrostatic component, at stream interaction regions. We look at the pitch angle distributions of electrons when magnetic whistlers are observed.