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EGU21-955
https://doi.org/10.5194/egusphere-egu21-955
EGU General Assembly 2021

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Recent studies of the solar wind sunward of 0.25 AU using the Parker Solar Probe spacecraft reveal that that solar wind can be bimodal, alternating between near quiescent regions with low turbulent fluctuation amplitudes and Parker-like magnetic field direction and regions of highly turbulent plasma and magnetic field fluctuations associated with ‘switchbacks’ of the radial magnetic field.

The quiescent solar wind regions are highly unstable to the formation of plasma waves near the electron cyclotron frequency (fce), possibly driven by strahl electrons, which carry the solar wind heat flux, and may provide one of the most direct particle diagnostics of the solar corona at the source of the solar wind. These waves are most intense near ~0.7 fce and ~fce. The near-fce waves are found to become more intense and more frequent closer to the Sun, and statistical evidence indicates that their occurrence rate is related to the sunward drift of the core electron population.

In this study, we examine high time resolution burst captures of these waves, demonstrating that each wave burst contains several distinct wave types, including electron Bernstein waves and extremely narrow band waves that are highly sensitive to the magnetic field orientation. Using properties of these waves we provide evidence to support the identification of their likely plasma wave modes and the instabilities responsible for generating these waves. By understanding the driving instabilities responsible for these waves, we infer their ability to modify electron distribution functions in the quiescent near-Sun solar wind.