Using Compressibility and Electric Field to Characterize Circularly-Polarized Waves Near the Proton Cyclotron Frequency Observed by Solar Orbiter

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We report Solar Orbiter observations of electromagnetic waves near the proton cyclotron frequency during the first perihelion. The waves have polarization close to circular and have wave vectors closely aligned with the background magnetic field. Such waves are potentially important for heating of the solar wind as their frequency and polarization allows effective energy exchange with solar wind protons. The Radio and Plasma Waves (RPW) instrument provides a high-cadence measurement of plasma density and electric field which we use together with the magnetic field measured by MAG to characterize these waves. In particular we compute the compressibility and the phase between the density fluctuations and the parallel component of the magnetic field, and show that these have a distinct behavior for the waves compared to the Alfvénic turbulence. We compare the observations to multi-fluid plasma dispersion and identify the waves modes corresponding to the observed waves. We discuss the importance of the waves for solar wind heating.