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Magnetic field and plasma fluctuations in CME-driven sheath regions

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Coronal mass ejection (CME)-driven sheath regions exhibit large-amplitude interplanetary magnetic field and dynamic pressure fluctuations, which may enhance the solar wind-magnetosphere coupling and lead to larger geomagnetic activity. The internal structure of CME sheath region is extremely complex as it gradually forms when the CME propagates from the Sun to the orbit of the Earth. In this study we perform a statistical superposed epoch analysis of the magnetic field and dynamic pressure fluctuations in sheath regions observed by the ACE spacecraft near Lagrangian point L1 using the wavelet analysis. In particular, we investigate where in the sheath the fluctuation power is strongest and how its level and distribution within the sheath depends on the CME properties (speed, strength and the closest approach distance from the CME center). We found that there is a sharp decrease in the magnetic field Ultra Low Frequency (2-15 minutes) power between the sheath and the CME leading edge. We suggest that this decrease can be used as a proxy for the CME front boundary.