Spatial coherence of interplanetary coronal mass ejection-driven sheaths at 1 AU

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We report on the longitudinal coherence of sheath regions driven by interplanetary coronal mass ejections (ICMEs). ICME sheaths are significant drivers of geomagnetic activity at the Earth, with a considerable fraction of ICME-driven storms being either entirely or primarily induced by the sheath. Similarly to Lugaz et al. (2018; doi:10.3847/2041-8213/aad9f4), we have analyzed two-point magnetic field measurements made by the ACE and Wind spacecraft in 29 ICME sheaths to estimate the coherence scale lengths, defined as the spatial scale at which correlation between measurements falls to zero, of the field magnitude and components. Scale lengths for the sheath are found to be mostly smaller than the corresponding values in the ICME driver, an expected result given that ICME sheaths are characterized by highly fluctuating, variable magnetic fields, in contrast to the often more coherent ejecta. A relatively large scale length for the magnetic field component in the GSE y-direction was found. We discuss how magnetic field line draping around the ejecta and the alignment of pre-existing magnetic structures by the preceding shock may explain the observed results. In addition, we consider the existence of longitudinally extended and possibly geoeffective magnetic field fluctuations within ICME sheaths, the full understanding of which requires further multi-spacecraft analysis.