Modeling Coronal Faraday Rotation of Radiation from Extragalactic Radio Sources?

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A better understanding of space weather phenomena, such as coronal mass ejections (CMEs) and the solar wind, requires greater knowledge of the coronal magnetic structure. Faraday rotation (FR), the change in the polarization angle of linearly polarized light due to a magnetized plasma, provides a ground-based method for probing the coronal magnetic field and allows measurement at low heliocentric distances. Power-law models for magnetic field and plasma density provide baseline results that, when combined with measured FR, allow us to more accurately describe the coronal magnetic field. We compare results from four models and present model coronal FR results for extragalactic radio sources corresponding to the trajectory of Parker Solar Probe (PSP) on September 26 and 27, 2020. Our sources range in heliocentric distance from 5.8 to 17.7 solar radii on the 26th and 4.0 to 18.6 solar radii on the 27th. We report model FR results for those dates ranging from +0.712 to +17.9 rad/m2 and from +0.969 to +13.8 rad/m2, respectively, for the default model. Surprisingly, while FR tended to vary inversely with heliocentric distance, we found that the line of sight geometry can cause exceptions to this trend. With the aid of reference FR measurements, which measure FR caused by the interstellar medium, we intend to compare these model results to FR measurements taken by the Karl G. Jansky Very Large Array. Here, we use model results and reference measurements to predict observed FR for these sources.

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