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The 3D structure of the corona and its magnetic field affects the properties and behavior of the solar wind. Studying these structures can improve our understanding of the solar wind's origin, acceleration mechanisms, and interactions with the interplanetary medium and improve our ability to predict and mitigate space weather hazards. Solar rotational tomography provides a unique way to directly reconstruct the 3D coronal electron density from coronagraph images. In this study, we show our recent improvements of this technique on Cartesian and spherical grids and its application to observations from multiple vantage points. We demonstrate the tomographic reconstruction of global coronal electron density from polarized brightness observations of STEREO/COR1-A, COR1-B, and LASCO/C2 during the minimum and maximum of solar cycle 24. Since observations used for the reconstruction are gathered over a short period of time (4-5 days) it significantly reduces the uncertainty in tomography inversion caused by coronal evolution. These 3D electron density models of the corona can provide crucial constraints on inner boundary conditions for solar wind models which are expected to be the major tool for linking 3D flows detected with PUNCH to their source regions in the low and middle coronae. In addition, our technique could help to analyze the data collected by PUNCH/NFI in combination with STEREO/COR2-A and Solar Orbiter/METIS, providing accurate reconstructions of the 3D structure of the corona and helping to validate density models from other methods.
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