Stereoscopic disambiguation of solar vector magnetic fields using observations from SO/PHI and SDO/HMI

X. Li, G. Valori, D. Calchetti, S. K. Solanki, J. Hirzberger, and J. Sinjan

Max-Planck-Institut für Sonnensystemforschung, Justus-von-Liebig-Weg 3, 37077 Göttingen, Germany

contact e-mail: *lixiang@mps.mpg.de*

The solar vector magnetic field is inferred from spectropolarimetric observations of the polarization in magnetically sensitive spectral lines. However, the transverse component of the magnetic field has a 180° ambiguity in its orientation. Traditional single-view methods for resolving the ambiguity require assumptions on the properties of the photospheric magnetic field. Solar Orbiter (SO), and its onboard magnetograph (the Polarimetric and Helioseismic Imager, PHI), make it possible for the first time to refrain fromavoid such an assumption, and to remove the 180° ambiguity purely using observations from two different vantage points. The Stereoscopic Disambiguation Method (SDM), which was developed based on this idea, has been successfully tested on simulated data and first science data from the High Resolution Telescope (SO/PHI-HRT) acquired in spring 2022. In this work, we applied the SDM to a number of SO/PHI-HRT datasets and corresponding datasets from the Helioseismic and Magnetic Imager (HMI) on board the Solar Dynamics Observatory (SDO). The SDM successfully disambiguates the vector magnetograms in strong field areas, and for a large range of separation angles between the viewpoints. Quantitative diagnostic metrics on different observational configurations were studied to evaluate the reliability of the SDM in localized areas. Furthermore, we compared the disambiguation results obtained by the SDM and the most widely used, single view-point disambiguation method.