EUV polarimetry of coronal E1 transition lines: Potential, Challenges and Future

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Coronal magnetism lies at the heart of many long-standing questions in solar physics, such as million-degree energization of the solar corona, initiation and acceleration of the solar wind, massive eruption of energetic particles through solar flares and coronal mass ejections (CMEs). The lack of routine measurements of the vector magnetic field has limited our understanding of the occurrence of these physical processes in the corona. An ad hoc observation of the linear polarization of O VI at 1032 Å– achieved by rotating the Solar and Heliospheric Observatory (SOHO) satellite– helped in deriving the coronal magnetic field by utilizing the instrumental polarization and the Hanle effect. This unoptimized measurement of resonance scattering induced linear polarization in an extreme-ultraviolet (EUV) line demonstrated that EUV linear polarization measurements from space has the potential of probing the vector magnetic field in the corona. To measure the coronal magnetic fields, we need to measure the observables– the linear polarization signals (Stokes I, Q, U)– which are sensitive to the magnetic fields via the Hanle effect. In a series of studies exploring the potential and challenges of EUV polarimetry, we have identified several magnetically sensitive lines in the 100 to 1000 Å spectral range, which form at similar coronal plasma temperatures and lie close to each other in wavelength. At the SPW11 meeting, I will present on the analysis of synthesized scattering polarization for one of these EUV permitted (electric-dipole transition) lines, examining how the polarization varies across different phases of a solar cycle under the influence of electron collisional excitation and magnetic fields. I will also discuss the challenges and future prospects of EUV polarimetry, in tandem with the Hanle effect, as a powerful diagnostic tool for mapping the vector magnetic field of the solar corona.