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Modelling the multi-wavelength Non-thermal Emission of AR Sco.

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AR Sco is a binary system that contains both a white and red dwarf. The spin rate of the white dwarf has been observed to slow down with time, analogous to rotation-powered radio pulsars; it has thus been dubbed a "white dwarf pulsar". We previously fit the traditional radio pulsar rotating vector model to linearly polarized optical data from this source, constraining the system geometry and white dwarf mass. Next, using a much more extensive dataset from the South African Astronomical Observatory (SAAO) HIPPO Polarimeter on their 1.9-m telescope, we also explored the application of the same geometric model to the orbitally phase-resolved optical polarimetric data. These are thought to be the result of non-thermal synchrotron radiation. We constrained the magnetic inclination angle and the observer angle at different orbital phases. Now, we have constructed a much more sophisticated emission model, solving the particle dynamics from first principles, including a generalized radiation reaction force, and implementing similar techniques to what were used in a pulsar emission code developed by A.K. Harding and collaborators to produce sky maps, light curves and spectra. We present the first results of single-particle spectra and light curves, as well as studying the difference of using generalized dynamical equations vs. a super-relativistic approximation only. Finally, we obtain a magnetic mirror scenario, similar to that of Takata et al. (2017), and show the importance of not being constrained by assumptions of super-relativistic particles and small pitch angles.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

PhD

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