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Modelling Optical Emission and Polarization of Relativistic AGN Jets Using RMHD Simulations.

Poster Presentation //

Active Galactic Nuclei (AGNs)

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Radio loud Active Galactic Nuclei (AGN) exhibit non-thermal emission observed to span the entire electromagnetic spectrum. The majority of the emission at lower energies (from radio to soft X-rays) is produced by synchrotron emission of non-thermal electrons within a relativistic jet. The structure and kinematics of these relativistic jets can be simulated using relativistic magnetohydrodynamic (RMHD) simulations. This study aims to investigate how the jet kinematics affects the observed (or predicted) intensity and polarization. In this study, a 3D RMHD simulation was set up with the PLUTO code that consisted of a uniform background medium with a less dense jet. A domain size of 5 pc was used for the simulations so as to model the sub-parsec region. The jet was separated into two regions, namely the spine (the inner region of the jet) and the sheath (the outer region of the jet). The spine had a radius of 0.033 pc and a maximum bulk Lorentz factor of Γ_{max} = 10, while the sheath had a radius of 0.1 pc and a maximum bulk Lorentz factor of Γ_{max} = 3. A helical magnetic field orientation was utilized where the spine and sheath had a maximum magnetic field magnitude of B = 50 mG and B = 5 mG, repectively. Lagrangian particles were injected at the base of the jet with an initial power-law distribution, and were allowed to evolve with time. The synchrotron and linear polarization emission coefficients were then integrated along a user defined line of sight to produce the I, Q and U Stokes parameters. We present the initial results from this study showing the spectral energy distribution (SED) and wavelength dependent polarization.

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