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Modelling the large scale morphology of AGN jets using fluid-particle hybrid simulations

Radio loud Active galactic nuclei (AGN) emit synchrotron emission over a wide region of the electromagnetic spectrum. In these types of AGN the synchrotron emission is predominantly produced by non-thermal electrons in a relativistic jet. In order to study how the observed large scale radio morphology of these jets relates to the jet's their physical properties, fluid dynamic simulations can be employed. In this contribution we present 3D RMHD simulations of relativistic jet environments created using the PLUTO code. The jet model consists of a kinetically dominated jet with a helical magnetic field, injected into a stratified background medium. To model the sychrotron emission that would be produced by these simulated environments we implemented the particle hybrid module in PLUTO. This module allows for the injection of Lagrangian particles that are representative of non-thermal electrons. The Lagrangian particles are injected with a pre-determined power law distribution and then evolved with time. By making use of this module we can calculate the simulated synchrotron-self absorption spectrum and integrate it along a line of sight to produce intensity maps for the simulated environment. The calculated intensity maps take into account relativistic and geometric effects. We present the simulated intensity maps at different frequencies from radio up to optical. In addition to this the effects of viewing angle with respect to the axis of the jet is presented.

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