Self-similar semi-analytical relativistic MHD jet model: a first step towards a more comprehensive jet modelling for data fitting

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Abstract

Jets are ubiquitous and reveal themselves at different scales and redshifts, showing an extreme diversity in energetics, shapes and emission, in objects such as X-ray binaries (XRBs) and active galactic nuclei (AGN), as well as young stellar objects (YSOs) and gamma-ray bursts (GRBs). Observations suggest that jets are an energetically important component, not only to the systems that host them, but also their larger surrounding environments, where they deposit a significant amount of energy that has been extracted from the accretion flow. Therefore, understanding the mechanisms responsible for the formation and emission of jets is a fundamental problem to be addressed.In this talk, I will present a new integration scheme to solve relativistic MHD equations describing collimated, relativistic outflows.For the first time, jet solutions can be reconstructed from the disk mid-plane to downstream of the modified magnetosonic fast point, where there are hints of a recollimation shock.These solutions show a range of jet dynamics (jet Lorentz factor _˜ 1-10) and geometric properties (i.e. shock height _˜ 10ˆ3 - 10ˆ7 Rg), which makes our model suitable for application to many different systems in which relativistic jets are launched.

Keywords: magnetohydrodynamics, jets, XRBs, AGN

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