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Kris Schroven (ZARM, University of Bremen)

The role of electric charge in the accretion process

Abstract

Many of the high-luminosity phenomena in the observed universe can be traced back to accretion processes. The accretion of plasma gives rise to electromagnetic fields in the accreted matter. Furthermore, external magnetic fields can be present, either produced by the compact, accreting object, or as an interstellar magnetic field. To get an understanding of these powerful processes numerical simulations and analytic models go hand in hand. Analytic models of two different scenarios are presented, which take the presence of electric charges in accretion processes into consideration.

The first scenario discusses the accretion process of hydrogen plasma onto a weakly charged black hole in the test-particle approach. The second scenario attends a charged thick accretion disc around a spinning compact object, which is effected by an external dipole magnetic field. Both scenarios are discussed regarding general relativistic and electromagnetic effects in accretion processes.