POLAR Project: numerical modeling of the accretion column

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Abstract

Polars, also called magnetic cataclysmic variables, are binary systems containing a highly magnetized white dwarf accreting material from a Roche lobe-filling companion. The white dwarf magnetic field forces the flow to follow field lines when leaving the inner L1 Lagrange point preventing the formation of an accretion disk. Material is led directly toward magnetic pole where it forms accretion column. Most of radiation coming from those systems is emitted in a narrow region close to the basis of the column and shows spectroscopic clues of the presence of shocks in the accreted material. This region undergoes numerous processes of high-energy density physics, which makes it particularly interesting to study. A hydrodynamical code, HydroCool, has been developed in order to deal with high Mach number flow and is currently improved to produce a numerically modeled accretion column. New numerical results will be presented as well as a discussion about the non-stationary evolution of the column. Links with the laboratory experiment of the POLAR project will also be presented.