ID de Contribution: **15** Type: **Non spécifié**

Constraining the structure of X-ray emitting jets close to the launching site

jeudi 24 mai 2018 10:30 (20 minutes)

Observations of stellar jets show evidence of X-ray emitting shocks close to the launching site. In some cases, including YSOs at different stages of evolution, the shocked features appear to be stationary (e.g. HH 154 and DG Tau). We study the case of HH 154, the jet originating from the embedded binary Class 0/I protostar IRS 5, and the case of the jet associated with DG Tau, a more evolved Class II disk-bearing source (CTTS), both located in the Taurus star-forming region. We aim at investigating the effect of perturbations in X-ray emitting stationary shocks in stellar jets, and explore the differences from Class 0 to Class II sources. We performed a set of 2.5-dimensional MHD numerical simulations modelling supersonic pulsed jets ramming into a magnetized medium, exploring different parameters for the model. We consider two cases: a jet less dense than the ambient medium (HH 154), and a jet denser than the ambient (DG Tau). In both cases, we found that the jet is collimated by the magnetic field forming a quasi-stationary shock at the base which emits in X-rays even when perturbations are present. From the comparison of the count rate synthesized from the simulations with Chandra X-ray observations, we also derived the physical parameters that can give rise to X-ray emission consistent with observations of HH 154 and DG Tau and provided an estimation of the maximum perturbations that can be present.

Contribution

Talk

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Classification de Session: S5 Simulations