ON THE ORIGIN OF HH OBJECTS.

F. De Colle, J. Gracia, *Dublin Institute for Advanced Studies (DIAS), 5 Merrion Square, Dublin 2, Ireland*, Gareth Murphy, *Laboratoire d'Astrophysique de Grenoble, CNRS, Université Joseph Fourier, B.P. 53, F-38041 Grenoble, France*.

1 Abstract

We suggest that the origin of knots in protostellar jet may be a periodic variation of the stellar magnetic field. The outflow, coming from ejection-reconnection events in the inner disk produced by the disk-stellar magnetosphere interaction, would be modulated by the dipolar stellar magnetic field with a typical period of $\sim$ 10 yr, similar to the one observed in HH objects.

2 Introduction

The presence of knots in stellar outflows is usually explained by periodic variations in velocity at the base of the jet (Raga et al. 1990) but the origin of such a variability is unclear. The typical periodicity is $\sim$ 10 yrs (e.g. HH30 - Burrows et al. 1996; HH111 - Reipurth et al. 1992; RWAur - Lopez-Martin et al. 2003).

3 A cyclic stellar magnetic field ?

We base our model on the following hypothesis:

- The dipolar component of the magnetic field dominates the disk dynamics at the inner edge (and beyond) (e.g. Johns-Krull 2007).
- A dynamo mechanism operates in protostars (e.g. Chabrier & Kuker 2006).
- The interaction of the magnetic field with the disk produces periodic outflows (e.g. Goodson et al. 1999).

4 Discussion and conclusions

A cyclic stellar magnetic field can explain the creation of knots in stellar jets (on typical scales of $\sim$ 10 yr). In particular, a calculation of the average outflow velocity ejected by the star-disk system (De Colle et al. in preparation, see also Fig. 1) shows that a small ($\sim$ 20 %) cyclic variation in the magnetic field produces a variation in the average velocity of the same order of magnitude, and large enough to produce the observed knots.

Therefore, it seems that the stellar magnetic field may play a key role in the evolution of the system (by the lost of angular momentum and by the ejection of the outflow). The physics of the interaction between the stellar magnetic field and the disk is the key to understand the ejection process (in particular, wind-up/reconnection events).

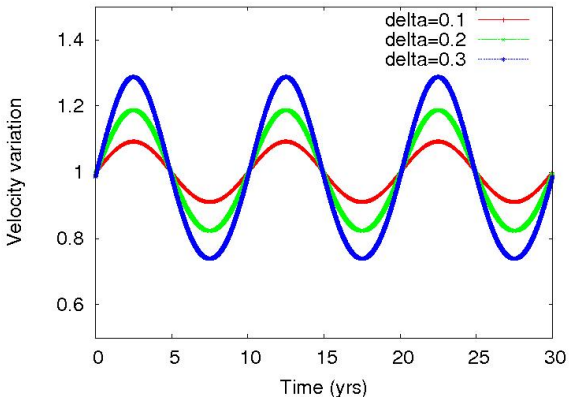

Figure 1: Velocity variation as function of the time for different amplitute δ of the magnetic field variation.

5 References

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