Feeding and feedback of massive protostars

http://astro.kent.ac.uk/mds/capsule.pdf

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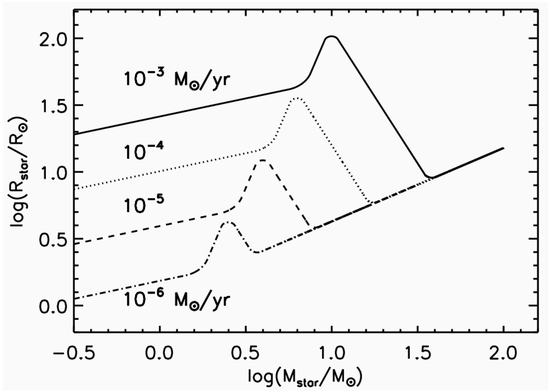
1. The Model

The Model: Scenarios, Mechanisms and Stages

A model for massive stars is constructed by piecing together evolutionary algorithms for the protostellar structure, the environment, the inflow and the radiation feedback. The framework requires the accretion rate from the clump to be specified. We investigate constant, decelerating and accelerating accretion rate scenarios and consider both hot and cold accretion, identified with spherical free-fall and disk accretion, respectively.

Figure 1: The Protostar – hot accretion



2. Method

Piece together evolutionary algorithms for the protostellar structure, the environment, the inflow and the radiation feedback.

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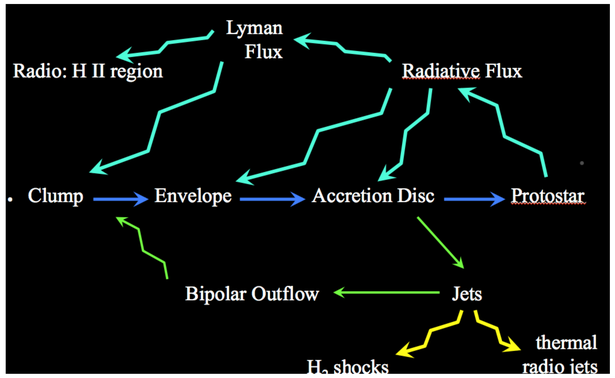
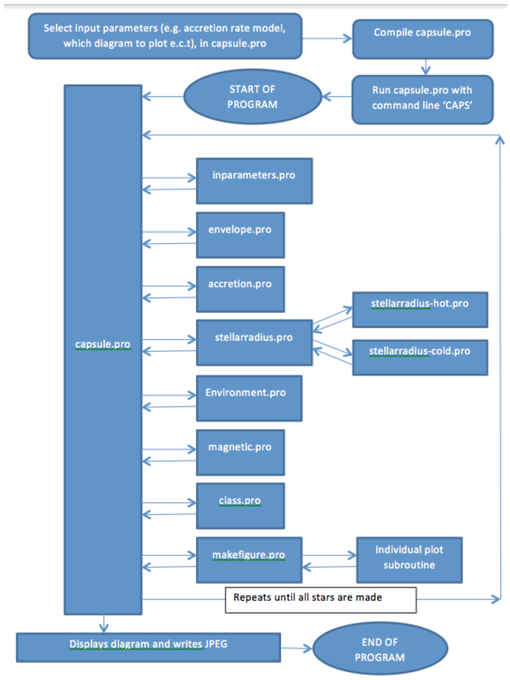
Figure 2



3.The Capsule Code

IDL Flow Chart



4. L_{bol}-M_{clump}-T_{bol} results

We find that accelerated accretion is not favoured on the basis of the often-used diagnostic diagram which correlates the bolometric luminosity and clump mass.

Instead, source counts as a function of the bolometric temperature can distinguish the accretion mode.

Specifically, accelerated accretion yields a relatively high number of low-temperature objects.

On this basis, we demonstrate that evolutionary tracks to fit Herschel Space Telescope data require the generated stars to be three to four times less massive than in previous interpretations.

This is consistent with star formation efficiencies of 10-20%

5.The Lyman Flux: summary

Neither spherical nor disk accretion can explain the high radio luminosities of many protostars.

Nevertheless, we discover a solution in which the extreme ultraviolet flux needed to explain the radio emission is produced if the accretion flow is via free-fall on to hot spots covering less than 20% of the surface area.

Moreover, the protostar must be compact, and so has formed through cold accretion.

Thisthrough suggest that massive stars form via gas accretion disks which, in the phase before the star bloats, download their mass via magnetic flux tubes on to the protostar.

Figure 3: The lyman flux from cold accretion without (left) and with (right) hot spots.