Questions and Answers

The Formation of Stars and Planetary Systems, 2010, September 6-9, Särö, Sweden

Section & Talk by F. Heitsch

Name/Question N. Evans

Why is ~~ab~~ the ability to produce "disguised" by hydrostatic cores a strength? [Do we know that some "hydrostatic" cores are not really hydrostatic (from observations)]

Name/Answer F. Heitsch

It's only a "strength" in the sense that hydrostatic profiles are observed in some cases, and that the models can reproduce such profiles (within limits). It does not ~~sy~~ say anything about whether the observed profiles indeed are hydrostatic or only ~~see~~ just look like that.

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Name/Question P. Caselli

Isn't true that magnetic simulations are easier to "fix" compared to turbulent simulations? The inclusion of basic physical and chemical cooling and processes (e.g. photoelectric heating, basic simple ion-neutral reactions to trace the thermal structure and ionization fraction) may be enough to allow initially subcritical structures to evolve toward supercritical regimes (see e.g. McKee 1989 work). What do you think about this?

Name/Answer F. Heitsch

I don't see the main problem with the magnetically controlled formation scenario in the mechanisms – I agree that ion-neutral drift etc. would lead to more fragmentation. The problem is the choice of initial and boundary conditions. ~~The clouds are not massive to be~~ If one starts with a massive, subcritical cloud, one needs to explain how that cloud is being confined lest it expand. On the other hand, if one assembles the cloud, from the initially subcritical conditions in the ISM, then I don't see any problem – ion-neutral drift and reconnection will break the flux-freezing, and the gas assembly along the field lines will yield the resulting cloud (partially) super-critical. But, to repeat the point, you cannot start with a globally subcritical cloud.

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Name/Question N. Evans

The picture of a cloud with ~~a~~ only a small fraction of its mass able to form stars is fine for local clouds, but in some places, ~~a~~ like starburst galaxies, you need essentially all the gas to be forming stars. How does each of these models do in accounting for differences like this?

Name/Answer F. Heitsch

The key to increasing the efficiency seems to be a question of the depth of the gravitational potential, resulting in substantial star formation __before__ massive stellar feedback can affect the region substantially (and even then, the fragmented nature of the cloud might help reducing the feedback effects – see accretion flows in filaments).

To stay within ~~the~~ the range of each model, for magnetically dominated SF, the easiest way would be the rapid loss (or non-existence) of magnetic support. The turbulence model – as the magnetic model – has the problem that in the current setup, the mass reservoir is limited. The flow-driven cloud formation model has the advantage that mass inflow continues (possibly through massive filaments, see e.g. GLIMPSE SF regions), thus funneling more and more material into the region.

Generally, the problem of high efficiency seems to be one of boundary conditions (open vs closed/periodic) – a problem each of the models addresses in a different way. In other words, the choice of the boundaries for the first two models limits their capability to draw conclusions about open systems.