

# Wrap-up session 1: Where and How do Stars Form?

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“post-processing”  
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# context

- Gravo-turbulent paradigm of star formation

- turbulence creates high-density seeds, gravity selects

- 3 barriers** to overcome for grav. contraction

- thermal pressure

- angular momentum

- magnetic flux

- \* **end of product**: the stellar mass spectrum

# The big 5 (questions):

- origin of ISM turbulence
- formation of molecular clouds
- low star formation efficiency
- star formation: slow or fast
- origin of the IMF

PS. role of the magnetic field

# The big 5 (questions):

1) origin of ISM turbulence

shocks and thermal instability drive  
supersonic (sub-Alfvenic) turbulence

energy sources: supernovae et al.  
magneto-hydrodynamics ?

2) formation of molecular clouds

converging flows due to MHD turbulence,  
multiple compressions, filamentary structure

cloud mass growth by collisions  
cloud-cloud collisions: clusters

3) low star formation efficiency:

most filaments subcritical, outflow feedback,  
photo-dissociation and photo-ionisation

FIBERS ?? Basic building blocks?  
FEEDBACK from massive stars

4) star formation: slow or fast:  $\sim 1$  Myr after H<sub>2</sub>,  
once destroyed, H<sub>2</sub> takes some time to reform

above  $A_V = 8$  threshold, fast  
core mass  $\rightarrow$  stellar mass fct  
lognormal + power-law tail

5) origin of the IMF: turbulent power spectrum +  
Press-Schechter formalism (Chabrier),  $n=11/3$ ,

PS. role of the magnetic field

magnetic braking and channeling gas flows

non-ideal MHD important  
(flux loss, flows parallel B)

# Memorable “take home messages”

- Inutsuka: thermal instability drives supersonic turbulence
- Andre: filament formation precedes star formation
- Hacar: there are sterile and fertile filaments (Taurus 4:1)
- Bontemps: super-Jeans cores have been discovered
- Inoue: shock passing a blob creates converging flow along B
- Nakamura: cloud-cloud collisions triggers cluster formation
- Chen: core lifetime is  $\sim 1$  Myr, chemical clock (CCS, H<sub>2</sub>D<sup>+</sup>)
- Peters: viewing angle explains morphology of UCHII regions
- Mottram: WISH and WILL – water traces different than CO
- Men’shikov: getfilaments vs. DISPERSE algorithms, blind test?