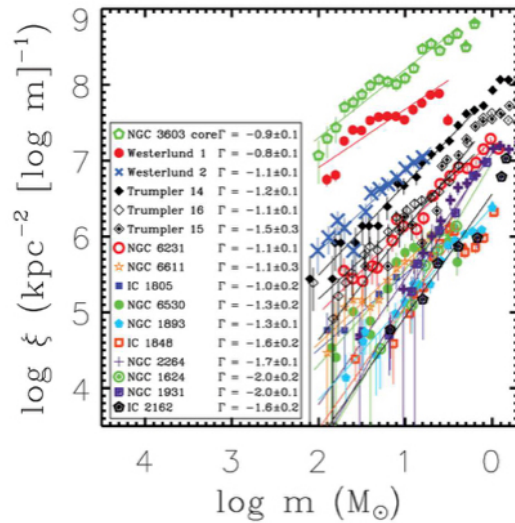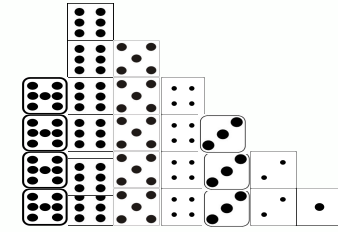# Variations of the CMF and IMF: clues to different modes of star formation ?
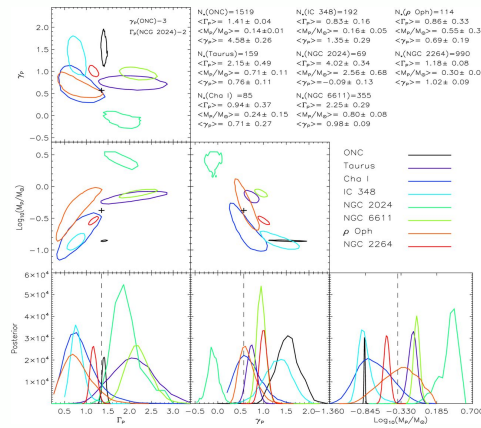
Conveners: Sami Dib, Thomas Nony

- **Evidence for variations of the CMF ?**

- **Evidence for variations of the IMF ?**

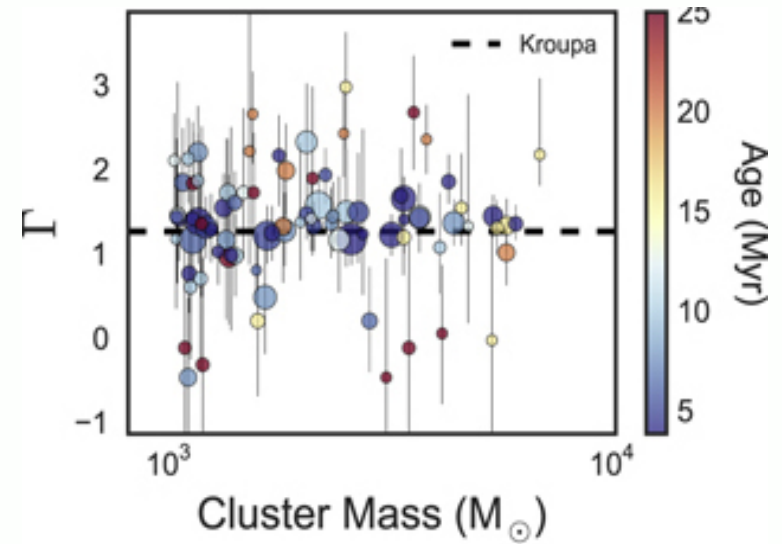- **Physical origins of variations**

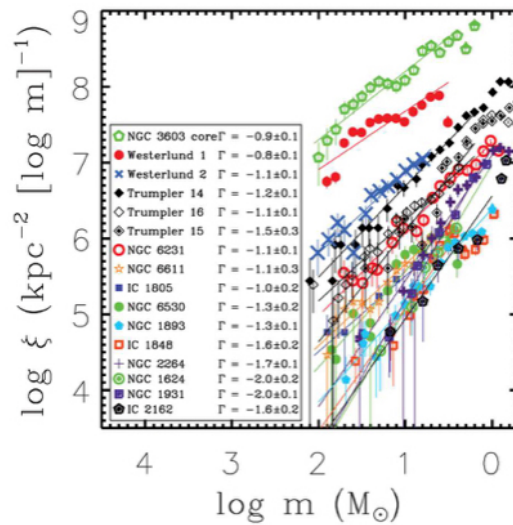# Evidence for variations of the IMF
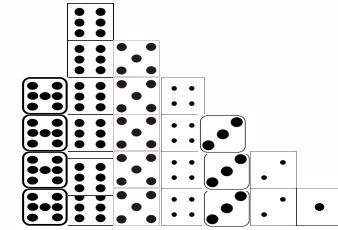

MW clusters (Lim+ 2015)
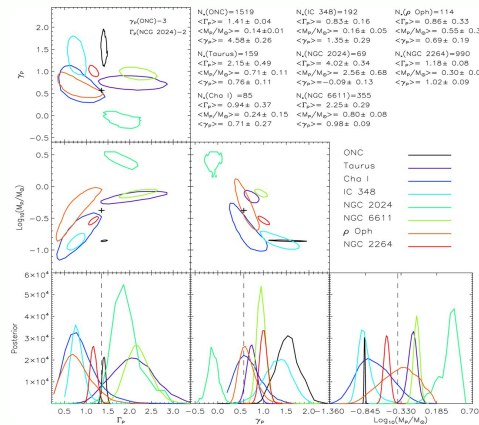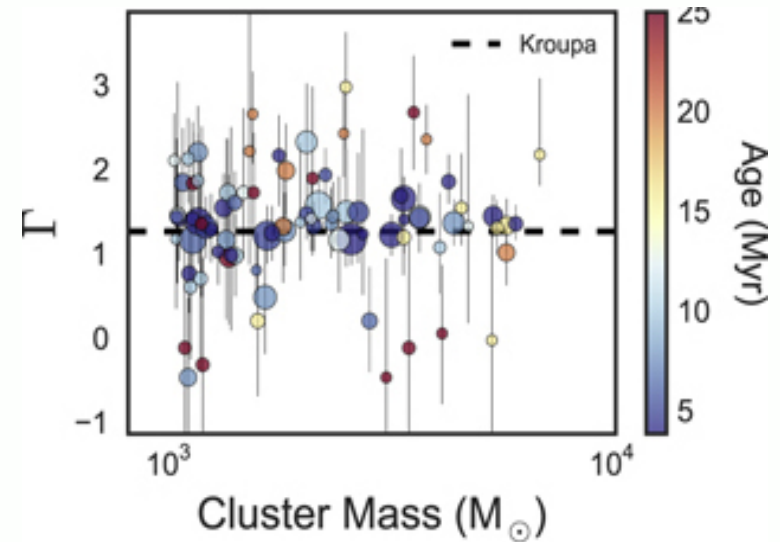

MW clusters (Dib 2014)

M31 (Wiesz+ 2015)

Evidence for variations of the IMF

MW clusters (Lim+ 2015)
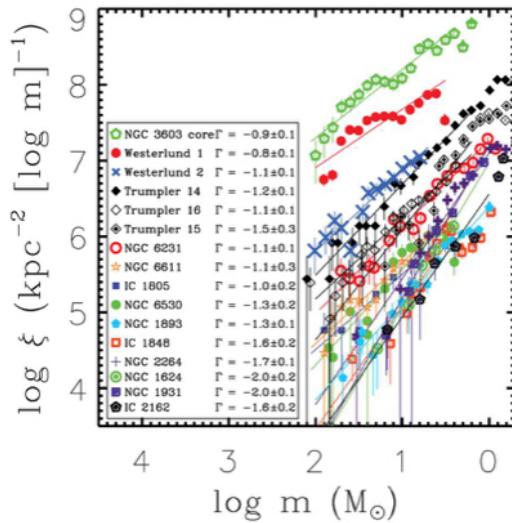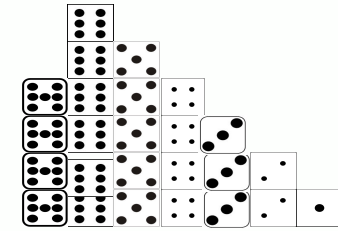
MW clusters (Dib 2014)
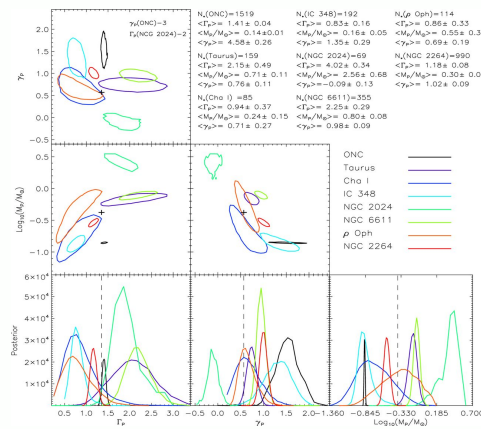
M31 (Wiesz+ 2015)

No global overlap in the parameters of the IMF
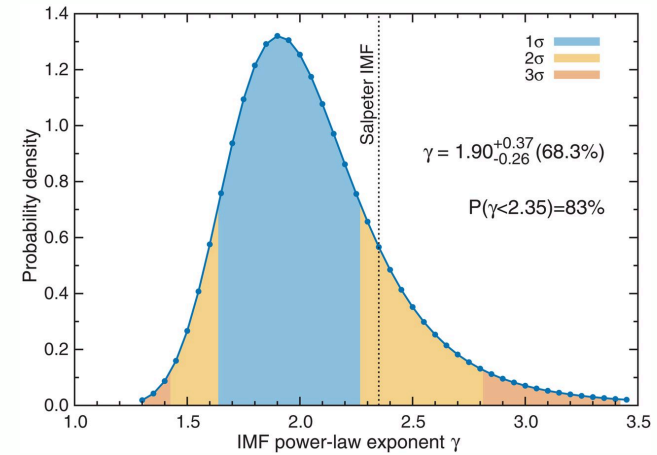
Evidence for variations of the IMF

small samples of clusters

MW clusters (Lim+ 2015)

MW clusters (Dib 2014)
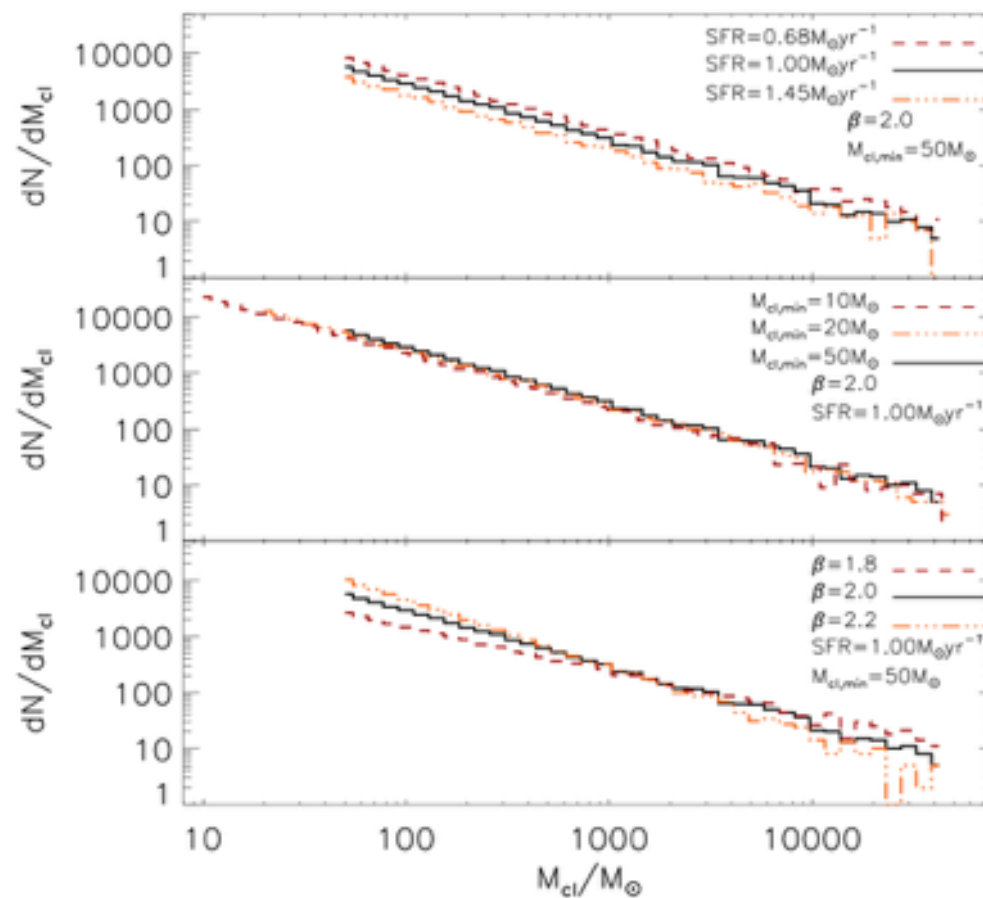

30 Dor (Schneider+ 2018)

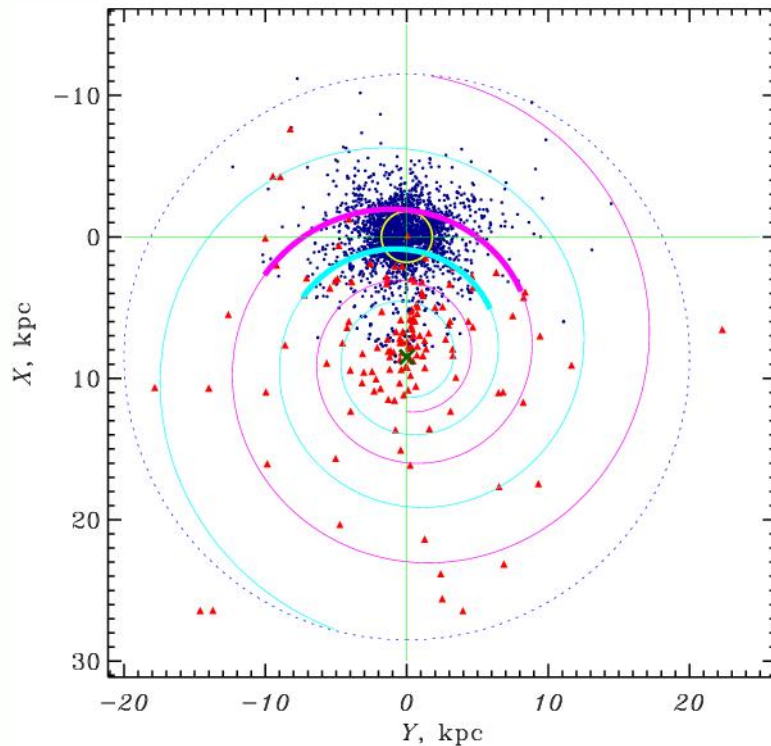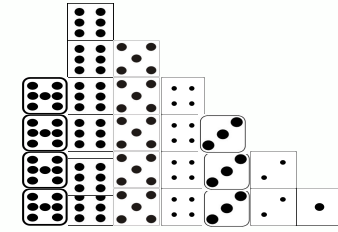## No global overlap in the parameters of the IMF

But there is a problem:

But there is a problem: statistics

The MW forms 10⁴-10⁵ clusters per cycle of 10-12 Myrs

Improving the statistics
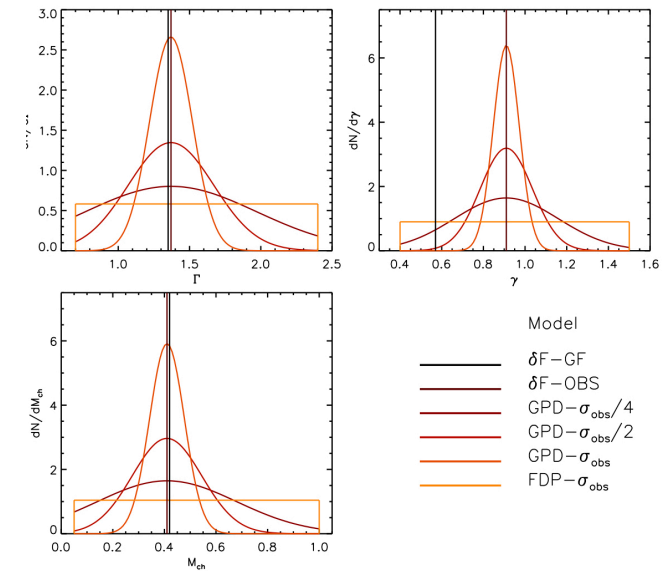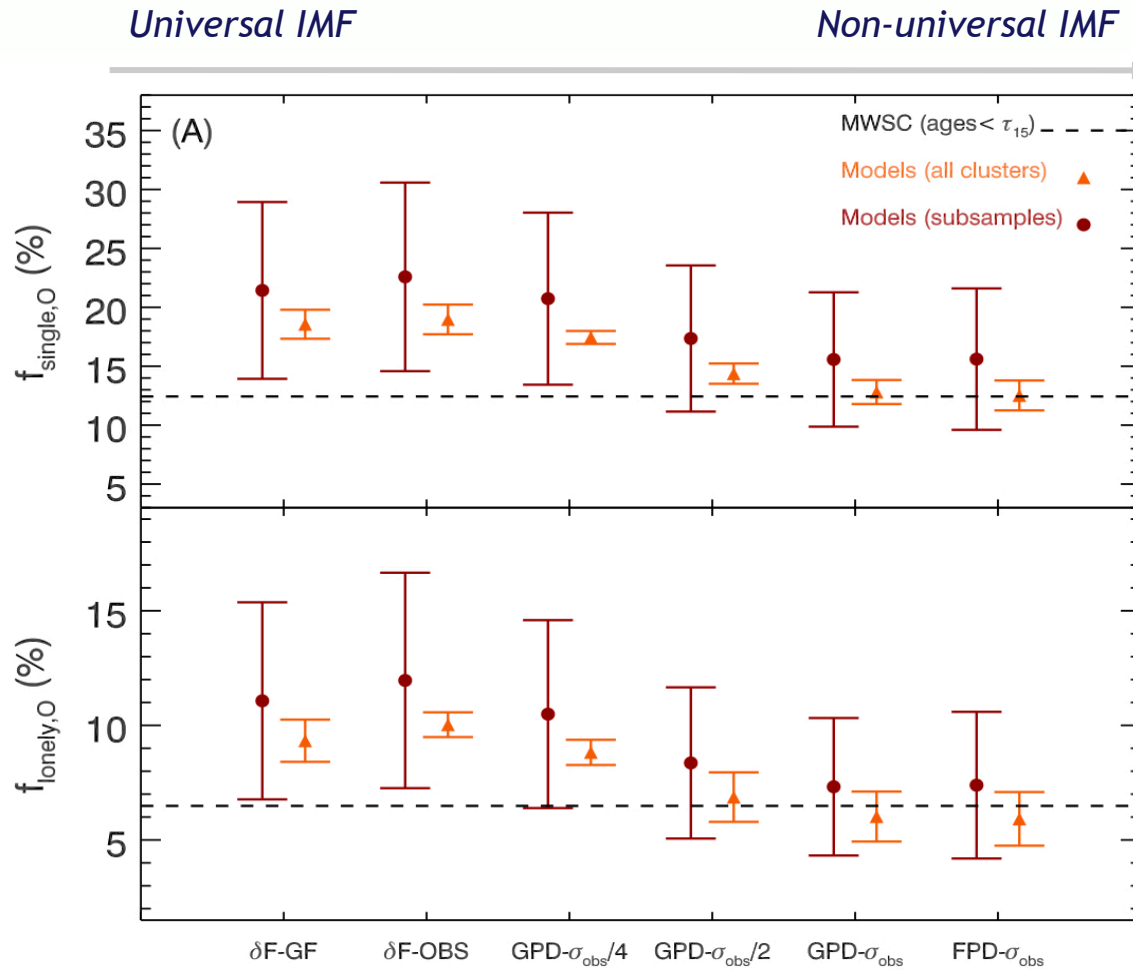
with: Stefan Schmeja & Sacha Hony

MWSC survey: Kharchenko+ (2013)

- **objective**: constrain the distribution function of the IMF parameters

- **method**: constrain the fraction of isolated O stars in young Galactic clusters (observations <=> models)

- **obs. data**: MWSC survey; 342 clusters with ages < 12 Myrs

- **models**: synthetic Monte-Carlo generated clusters

observations ⇔ matching

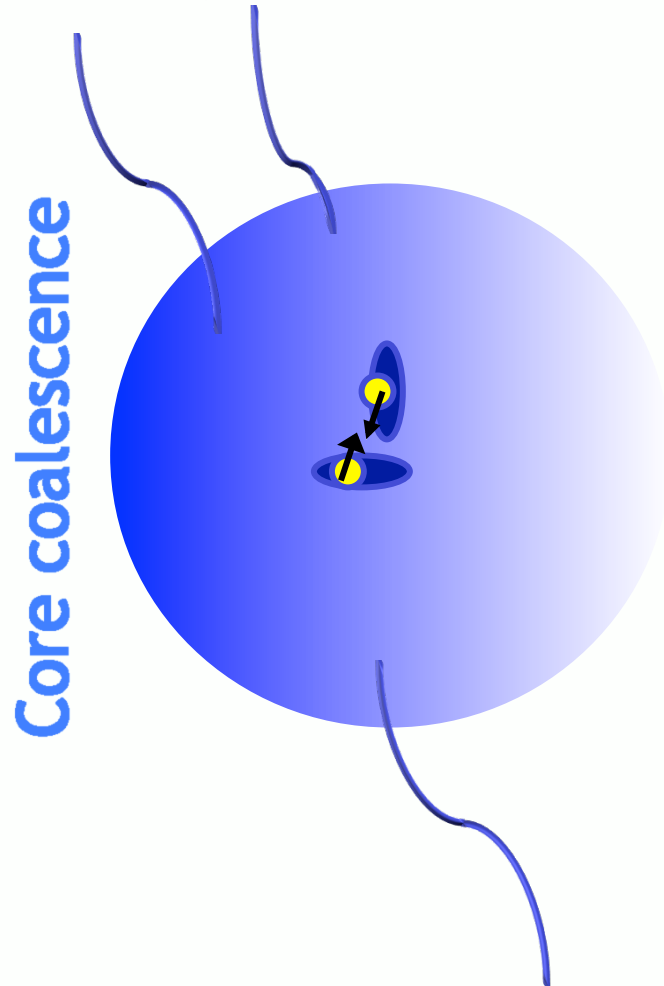Dib, Schmeja & Hony (2017) $\sigma_\Gamma = 0.6$ $\sigma_\gamma = 0.25$ $\sigma_{M_{ch}} = 0.3 M_{sol}$

Origin of CMF/IMF variations

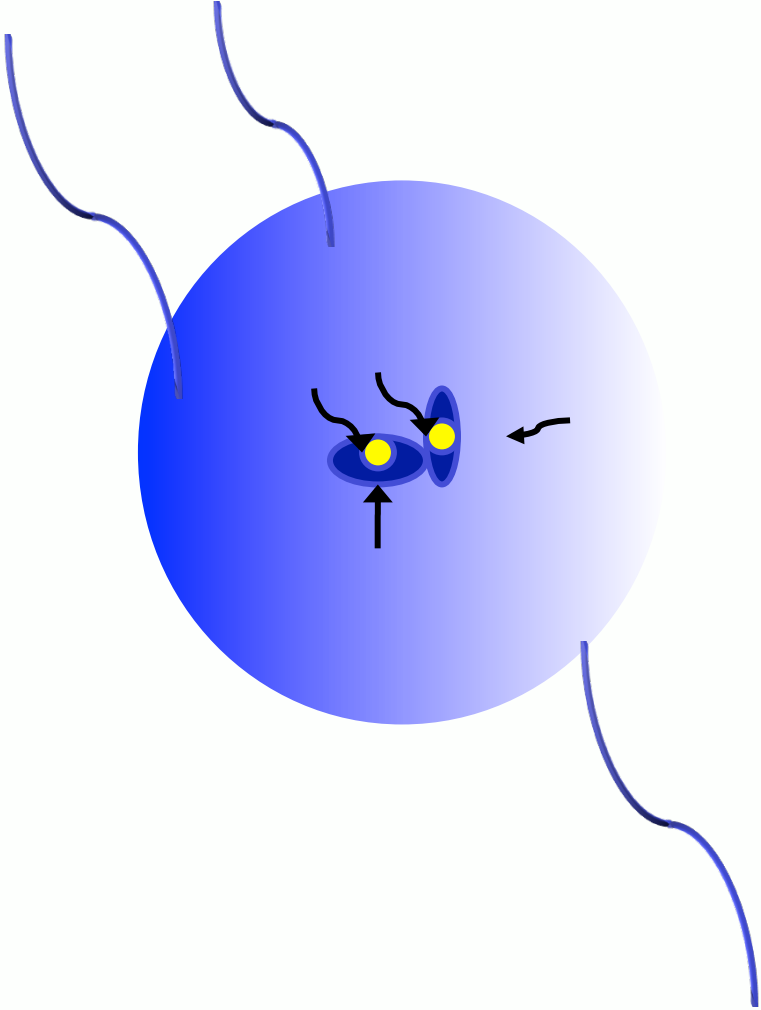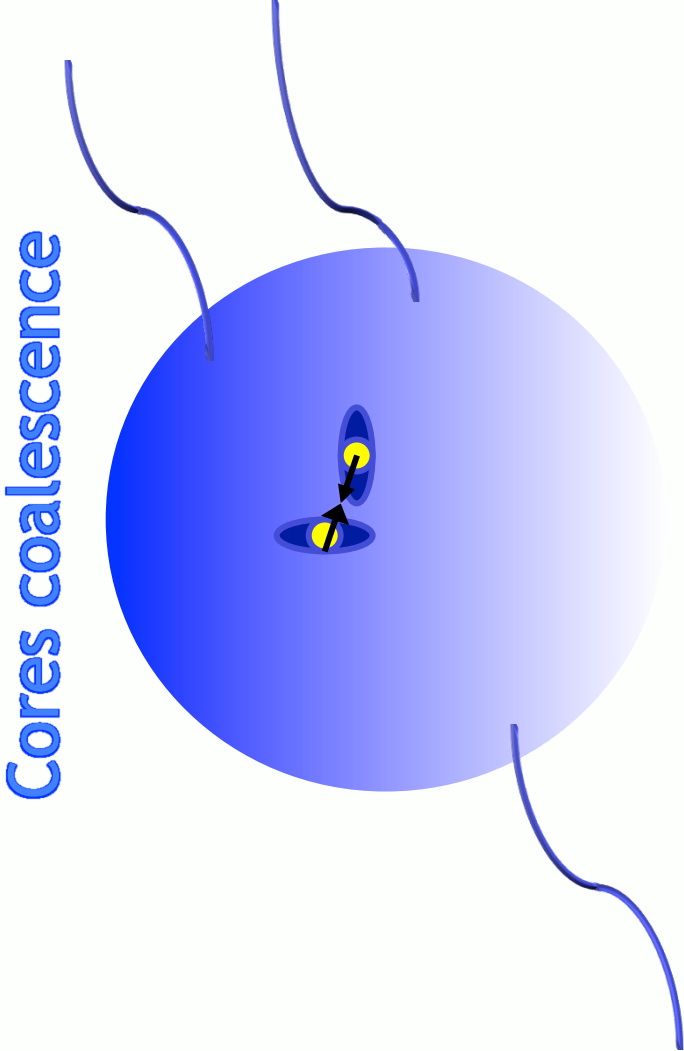Turbulence fragmentation is may be able to explain these variations…
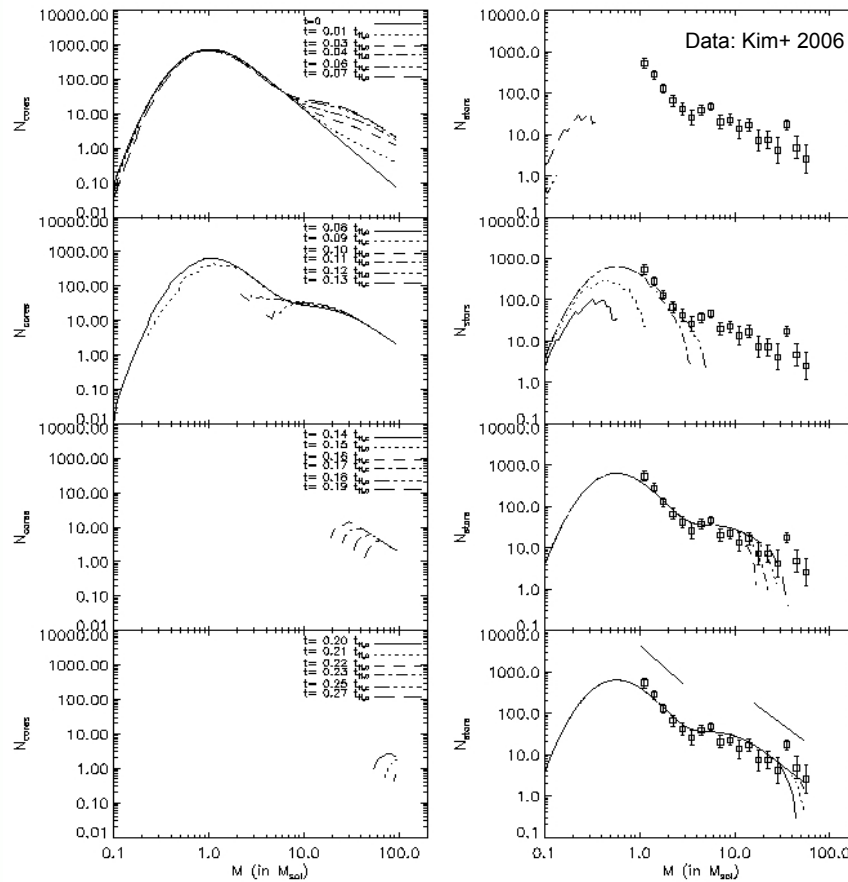and maybe not.

Core coalescence

Origin of CMF/IMF variations

Core coalescence (Dib+ 2007)

$$\frac{dN(r,M,t)_{coal}}{dt} = \frac{1}{2}\eta(r)\int_{M_{min}}^{M-M_{min}} N(r,m,t)N(r,M-m,t)\sigma(m,M-m,r,t)v(r)dm$$

$$-\eta(r)N(r,M,t)\int_{M_{min}}^{M_{max}} N(r,m,t)\sigma(m,M-m,r,t)v(r)dm$$

Accretion onto cores (Dib+ 2010)

$$\frac{dN(r,M,t)_{acc}}{dt} = \left(-\frac{\partial N}{\partial M}\dot{M} - \frac{\partial \dot{M}}{\partial M}N \right)(r,M,t)$$
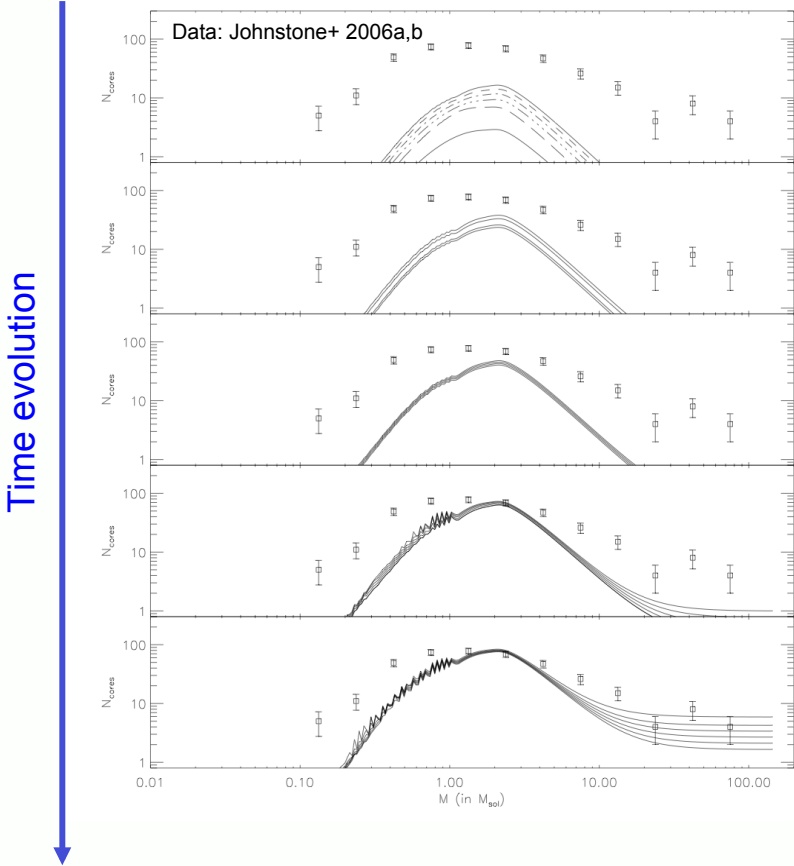
Accretion onto cores (Dib+ 2010)

$$\frac{dN(r,M,t)_{acc}}{dt} = \left(-\frac{\partial N}{\partial M}\dot{M} - \frac{\partial \dot{M}}{\partial M}N \right)(r,M,t)$$

Time evolution

Data: Johnstone+ 2006a,b

M (in M_{sol})

Accretion onto cores (Dib+ 2010)

$$\frac{dN(r,M,t)_{acc}}{dt} = \left(\boxed{-\frac{\partial N}{\partial M}\dot{M}} - \frac{\partial \dot{M}}{\partial M}N \right)(r,M,t)$$
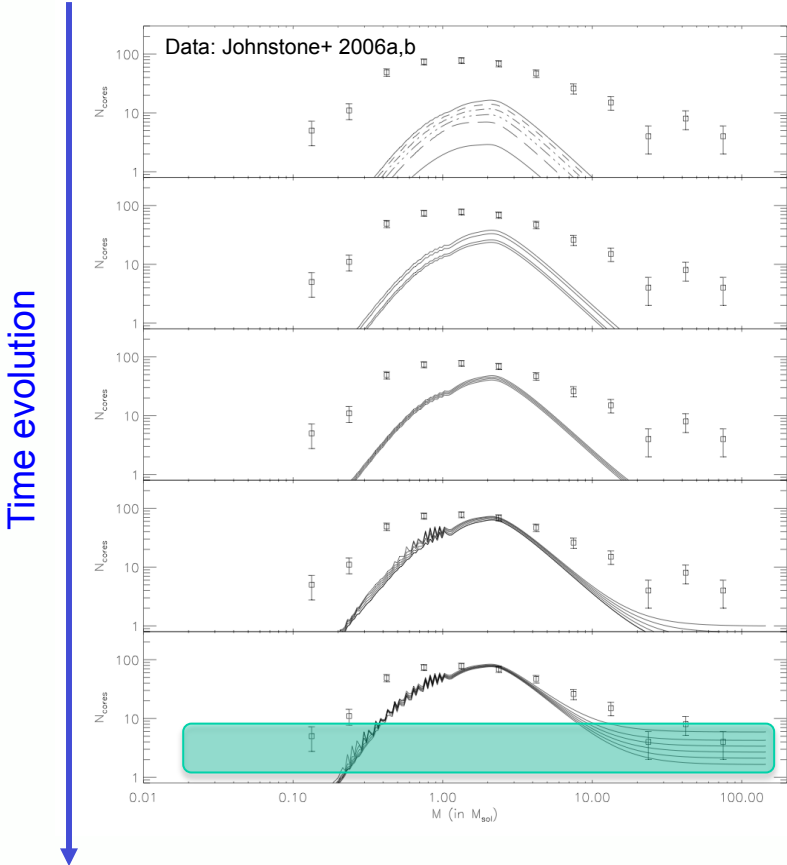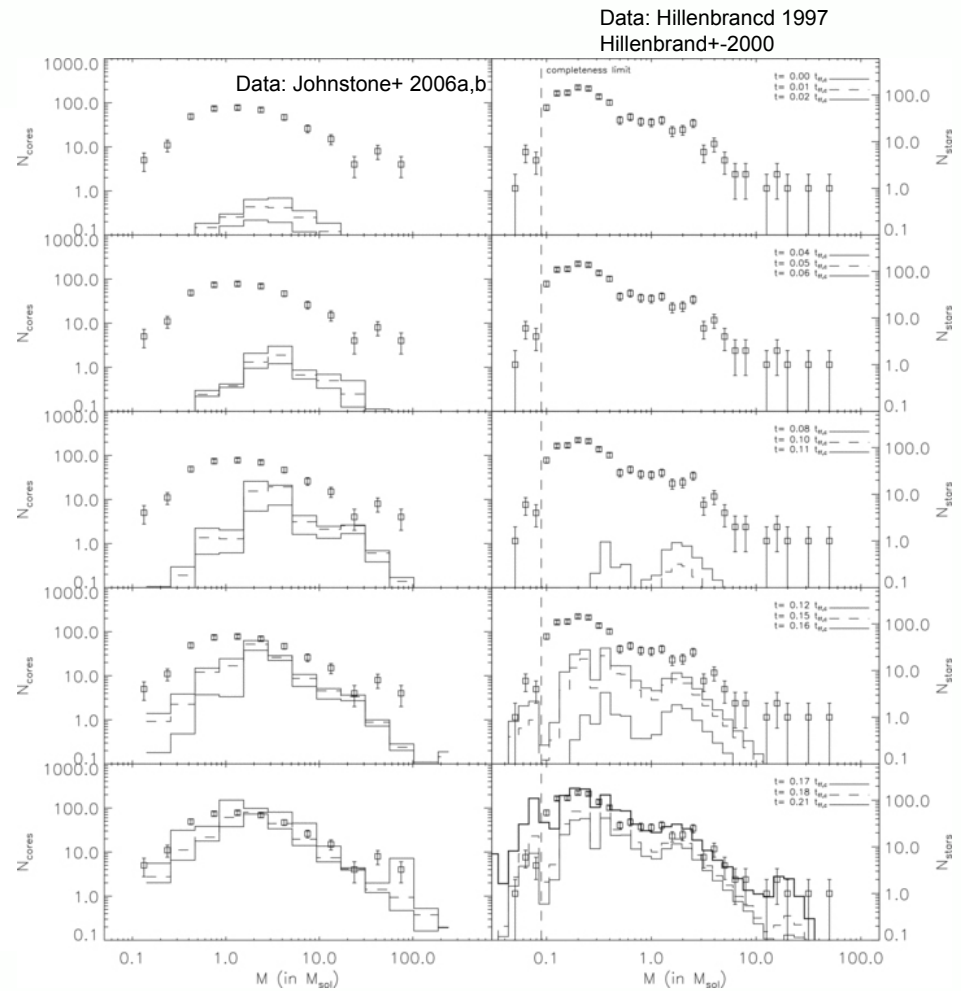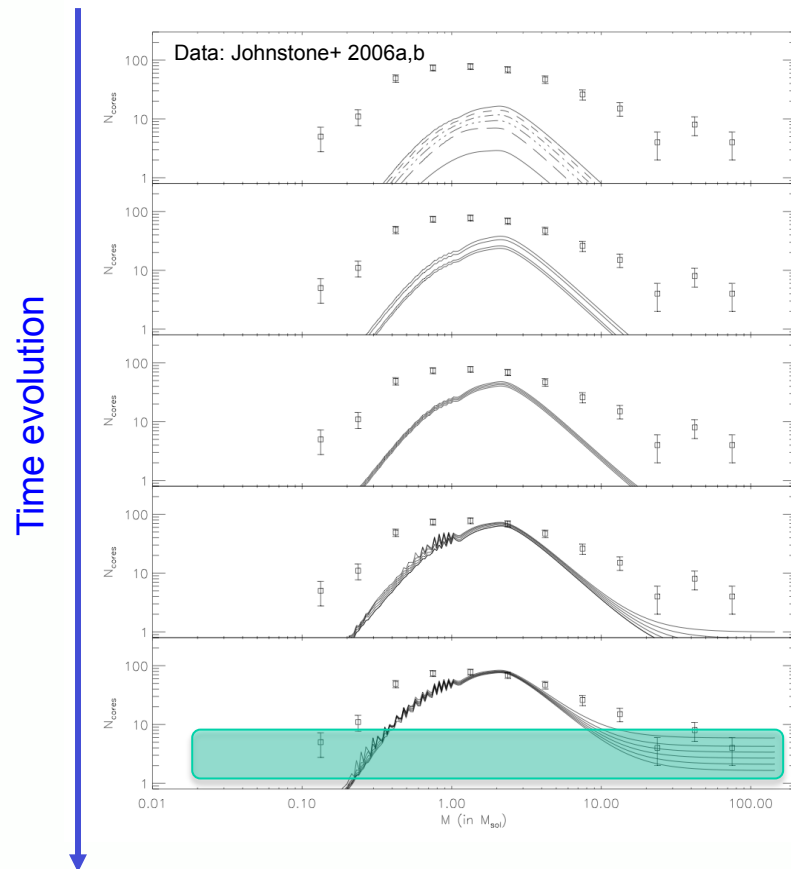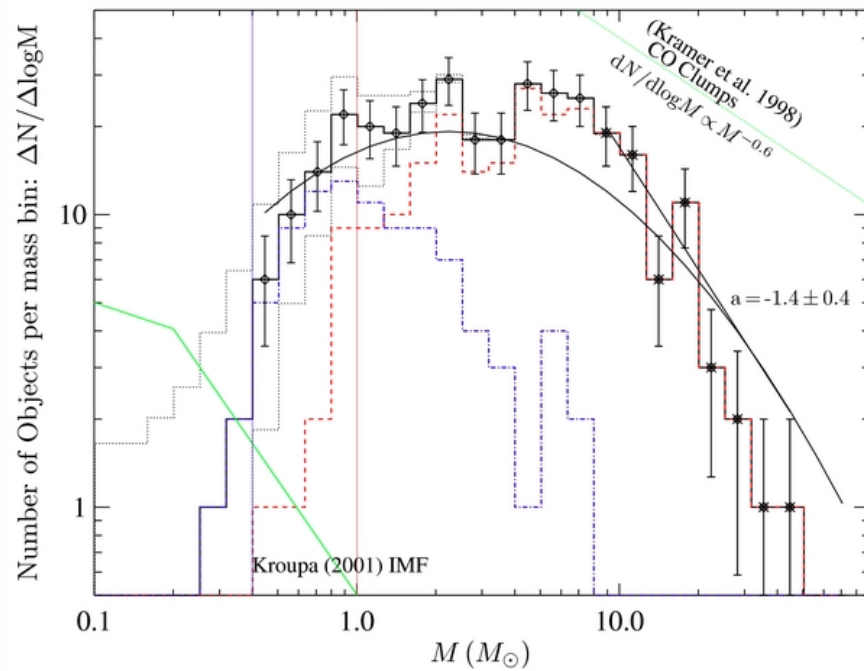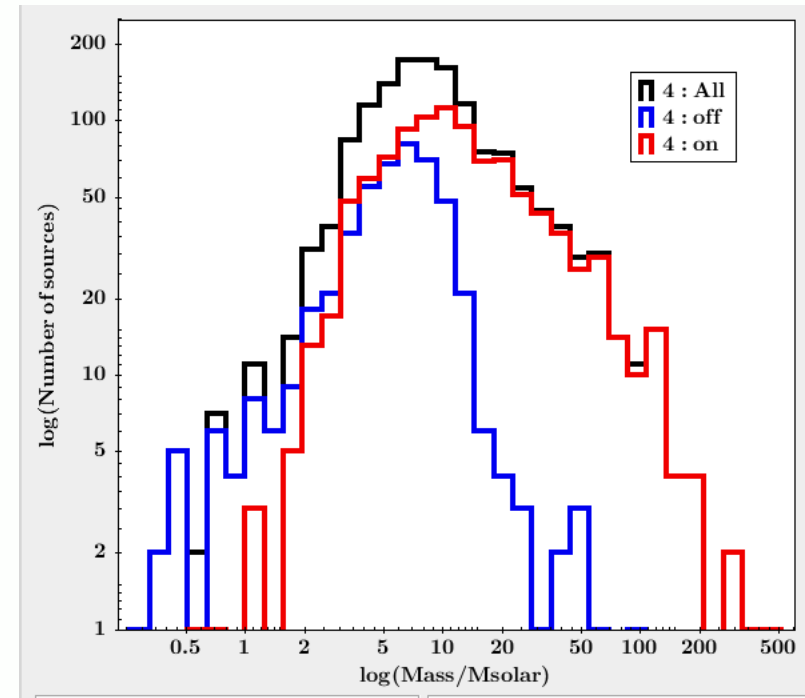

Time evolution

Accretion onto cores (Dib+ 2010)

$$\frac{dN(r,M,t)_{acc}}{dt} = \left(-\frac{\partial N}{\partial M}\dot{M} - \frac{\partial \dot{M}}{\partial M}N\right)(r,M,t)$$

Data: Hillenbrancd 1997
Hillenbrand+-2000

Data: Johnstone+ 2006a,b

Time evolution

Evidence for variations in the CMF- cores on/off filaments

Polychroni+ 13

Polychroni+ in prep