THE CMF OF MASSIVE STAR-FORMING REGIONS

Javier A. Rodón
ESO/ALMA Fellow - Santiago ➔ Garching

Henrik Beuther (MPIA)
Qizhou Zhang(CfA)
A link between the CMF and the IMF

→ Key on understanding the origin of the IMF

Mainly 2 theories:
A link between the CMF and the IMF

→ Key on understanding the origin of the IMF

Mainly 2 theories:

1. The IMF is linked to the CMF

SFR constant for all masses

- The IMF is linked to the CMF

\[ \frac{\Delta N}{\Delta M} \]

\[ \Delta M \]

\[ \Delta N \]

\[ M \]

\[ \text{Mass} \]

A link between the CMF and the IMF

→ Key on understanding the origin of the IMF

Mainly 2 theories:

2 - The IMF is independent of the CMF

e.g., Bonnell et al. 2001; Bate et al. 2003; Clark et al. 2007
The CMF of low-mass star-forming regions

→ Observed to be similar to the IMF

Though shifted to higher masses

Aquila
(André et al. 2010)
The CMF of high-mass star-forming regions → More rarely observed
Not always resembles the IMF

OMC (Li et al. 2007)
Observations seem to agree with theory

→ The shape of the IMF comes from the CMF (or

Keep testing this

→ Increasing the sample of high-mass CMFs
Observations of high-mass star-forming regions

Continuum maps

IRAS 19410+2336

→ PdBI data

→ Two subregions

→ ~ 0.01 pc resolution

→ Size ~ 0.1 pc

Rodón et al. 2012
Observations of high-mass star-forming regions

→ Continuum maps

IRAS 06058+2138
→ SMA data
→ ~ 0.01 pc resolution
→ Size ~ 0.05 pc

Rodón et al. 2015 (in prep)
Observations of high-mass star-forming regions

→ Continuum maps

IRAS 06056+2131
→ SMA data
→ Two subregions
→ ~ 0.01 pc resolution
→ Size ~ 0.15 - 0.25 pc

Rodón et al. 2015 (in prep)
Core Mass Functions with different slopes

IRAS 19410+2336

CMF slope similar to Salpeter IMF

\[ \beta = -2.2 \pm 0.1 \]

\[ N(M) \propto \frac{1}{1+\beta} M^{1+\beta} \]

Rodón et al. 2012
Core Mass Functions with different slopes

IRAS 19410+2336
IRAS 06058+2138
IRAS 06056+2131

CMF slope similar to Salpeter IMF

$$\beta = -2.2 \pm 0.1$$

Slopes flatter than Salpeter’s IMF

$$\beta = -1.6 \pm 0.2 \quad \beta = -1.7 \pm 0.2$$

Rodón et al. 2012

Rodón et al. 2015 (in prep)
Why are the slopes different?

→ Completeness / confusion
   Possible: Faint cores undetected
   Better sensitivity / longer baselines
Why are the slopes different?

- Completeness / confusion
  Possible: Faint cores undetected
  Better sensitivity / longer baselines

- Further fragmentation
  Possible: The brightest cores are fragmenting
  Better resolution
Why are the slopes different?

→ Completeness / confusion
   Possible: Faint cores undetected
   Better sensitivity / longer baselines

→ Further fragmentation
   Possible: The brightest cores are fragmenting
   Better resolution

→ Different star-forming processes at play
   Most likely:
   Processes favoring formation of massive cores
   Too early for low-mass cores
   Processes preventing fragmentation
      Kinematics
      Polarization
      Chemistry
Thanks!

Questions?