

How molecular species trace cores and how to study infall?

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ALMAGAL - MAPPING DIVERSITY IN STAR-FORMATION

Molinari et al. 2025 – Sánchez-Monge et al. 2025 – Coletta et al. 2025 – Wells et al. 2024 – Mininni et al. 2025



PART OF THE INFORMATION IS ONLY REVEALED THROUGH MOLECULAR EMISSION

MOLECULAR EMISSION



AG023.9659-0.1087

HOG METHOD: QUANTIFY THE COMPARISON BETWEEN THE CONTINUUM EMISSION AND THE MOLECULAR EMISSION



astroHOG: Soler, J.D., and the THOR collaboration. A&A, 622 (2019) A166



- HOG method (astroHOG code): intensity independed way to compare morphology
- We normalized V (projected Rayleigh stats.), which is dependent to N number of pixel compared

$$V = \frac{\sum_{k}^{N} w_k \cos 2\phi_k}{\sqrt{\sum_{k}^{N} (w_k)^2 / 2}} \longrightarrow V_{\max} = (2N)^{1/2} \longrightarrow V_{N} = V / V_{\max}$$

THE RESULTS



HOW DO HIGH-MASS STARS GAIN THEIR FINAL MASS ?

WHAT WE KNOW



Coletta et al. 2025

WHAT WE KNOW



Coletta et al. 2025

VERY COMPLEX STRUCTURES

The reservoir for accretion on the cores is not limited to material close to the core, but filamentary/fiber structures and gas flow feeds the cores

(A. Hacar, A. Socci, M. Wells, F. Wyrowski's, P. Andre, and M. Mattern's talks)

BUT CAN WE QUANTIFY THE ACCRETION RATE AT CORES SCALE WITH A GOOD STATISTICS?





in literature so far: Qui et al. 2012, Beltràn et al. 2018, Morii et al. 2025: 9 infall detection in ASHES G337.541

Line for study infall in ALMAGAL

- 1. optically thick line (complemented by thin lines)
- 2. detected in the highest number possible of source

H₂CO 3 (0,3) – 2 (0,2)

~100 (out of 3000) cores with infall detected mass accretion rate ~ $10^{-5} - 10^{-3}$ Msun/yr

preliminary work by Leonardo Berti

OPEN QUESTIONS

- > How the accretion onto cores by infall change for different cores?
- > Does the accretion rate changes due to the position inside a clump?
- > Is all the matter funnelled towards cores accreted?
- \succ Do we have molecular tracer for probing infall at inner layers than HCO⁺, HCN, and H₂CO?
- > How infall accelerate towards the center?