

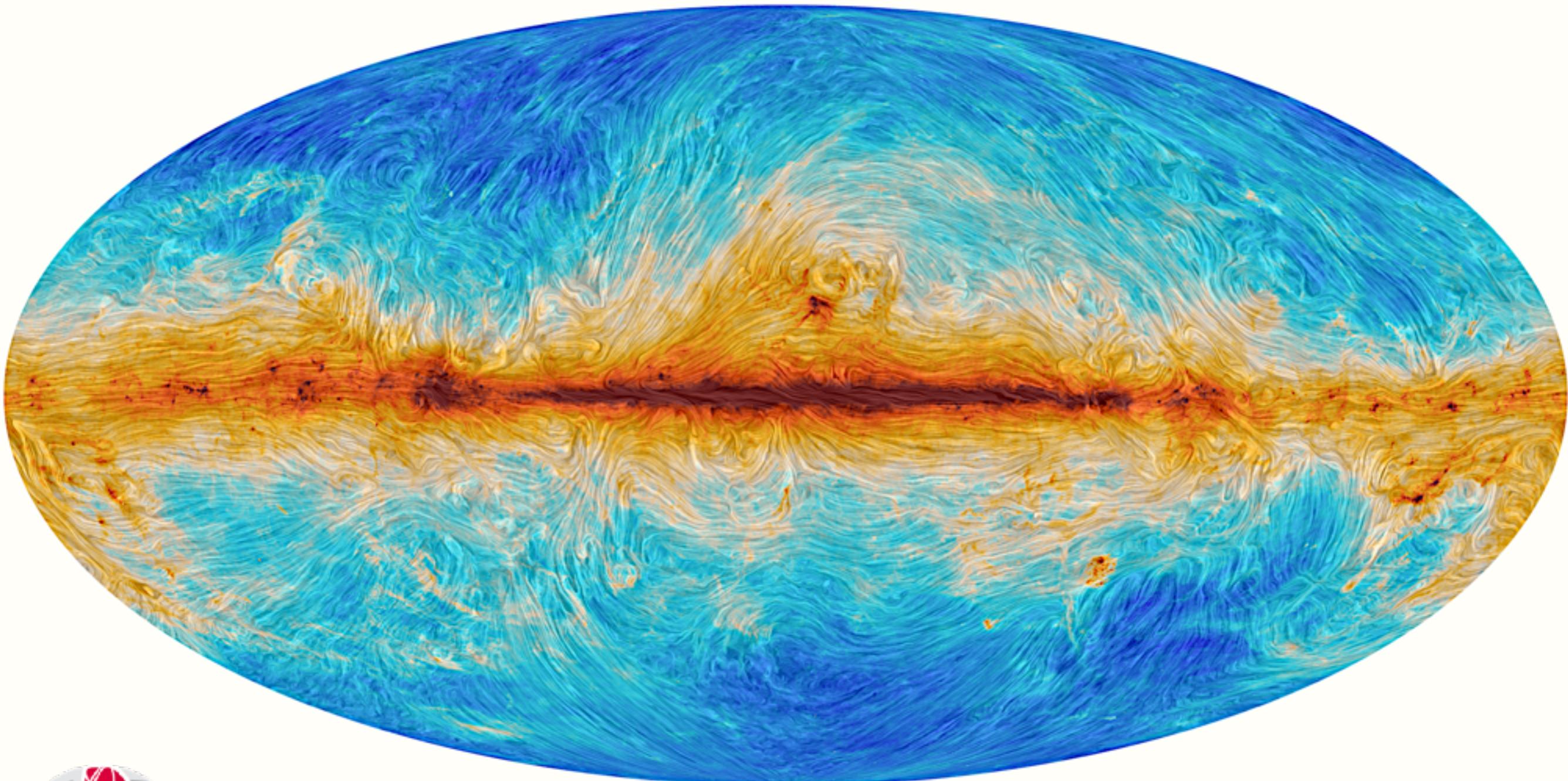
B, v, and n at sub-pc scales

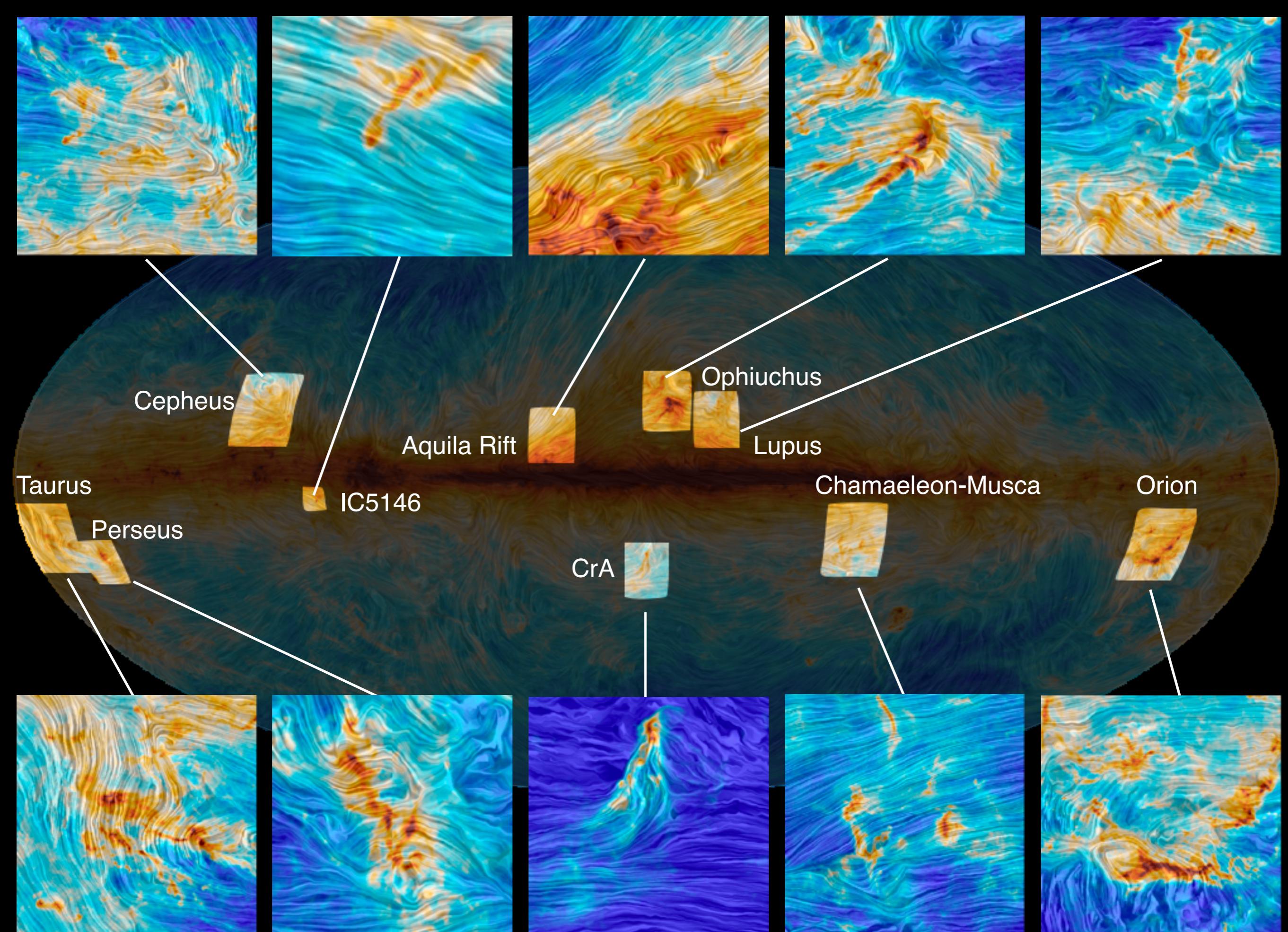
My two cents to Rosetta Stone

Juan Diego Soler

Galactic magnetic field as revealed by Planck

Planck 2015 results I. A&A, 594 (2016), A1

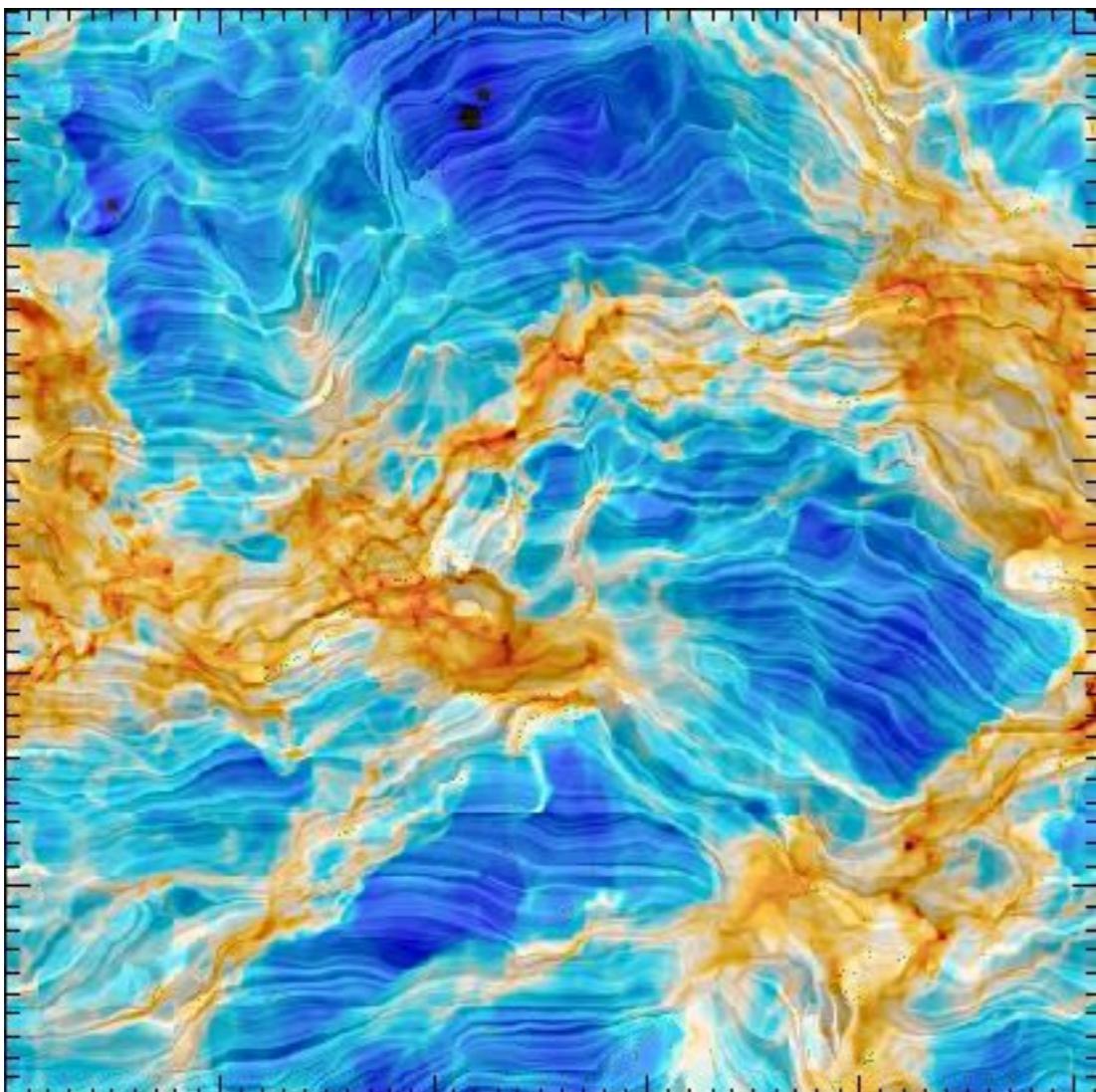




Statistical analysis of dust polarization maps

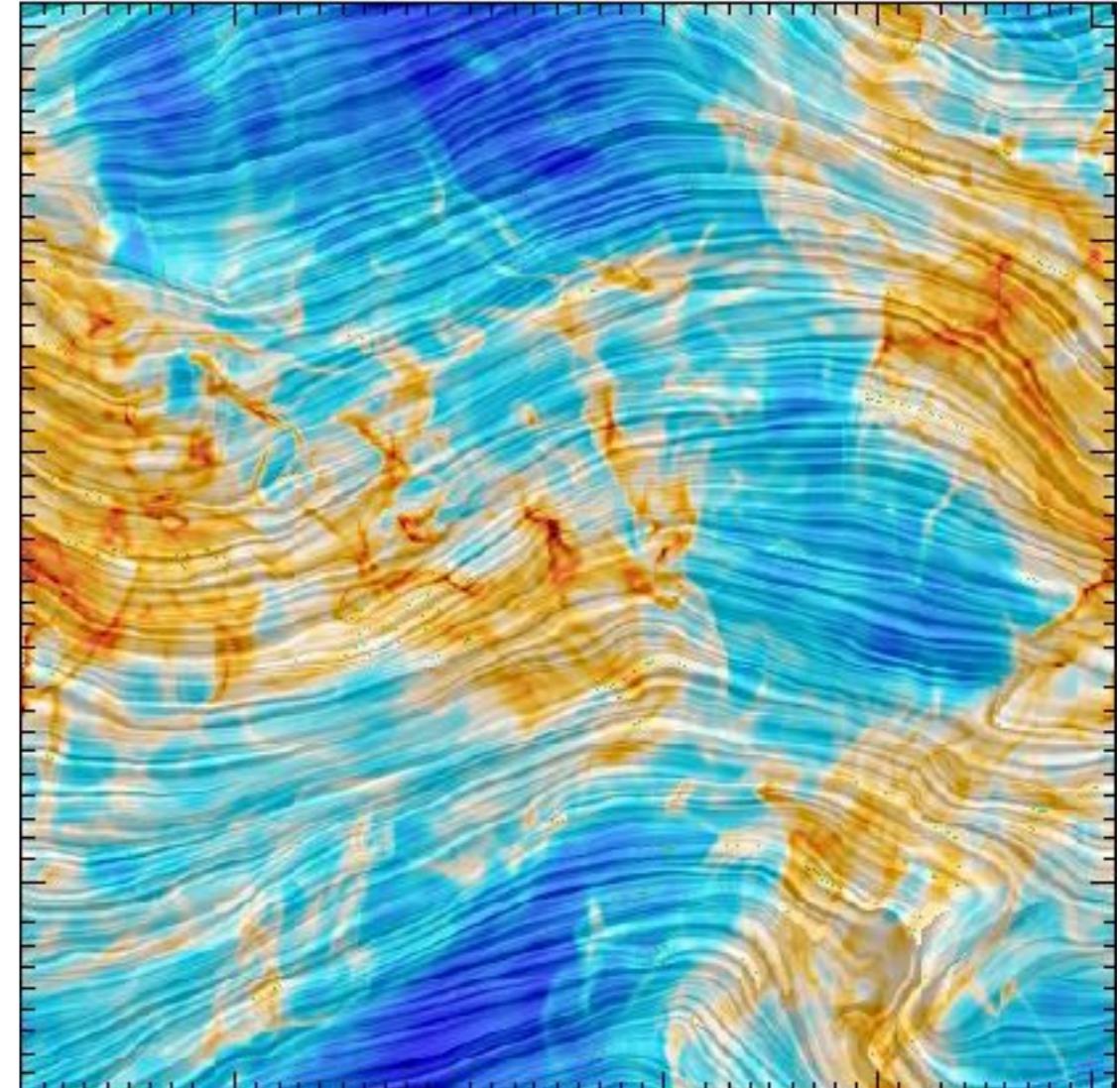
Soler, J.D., Hennebelle, P., Martin, P., et al, ApJ. 774 (2013), 128

Weak magnetic field



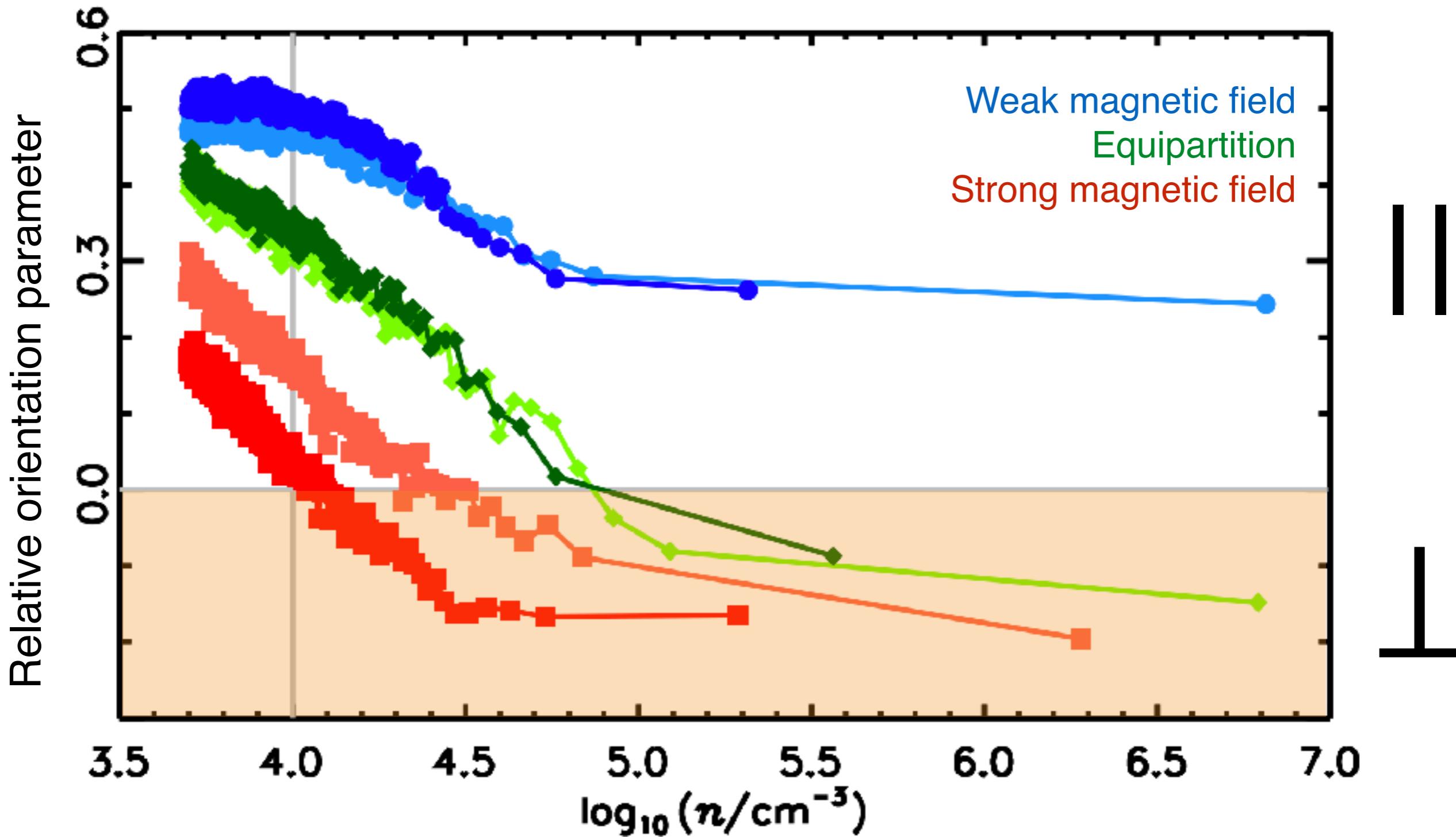
4 pc

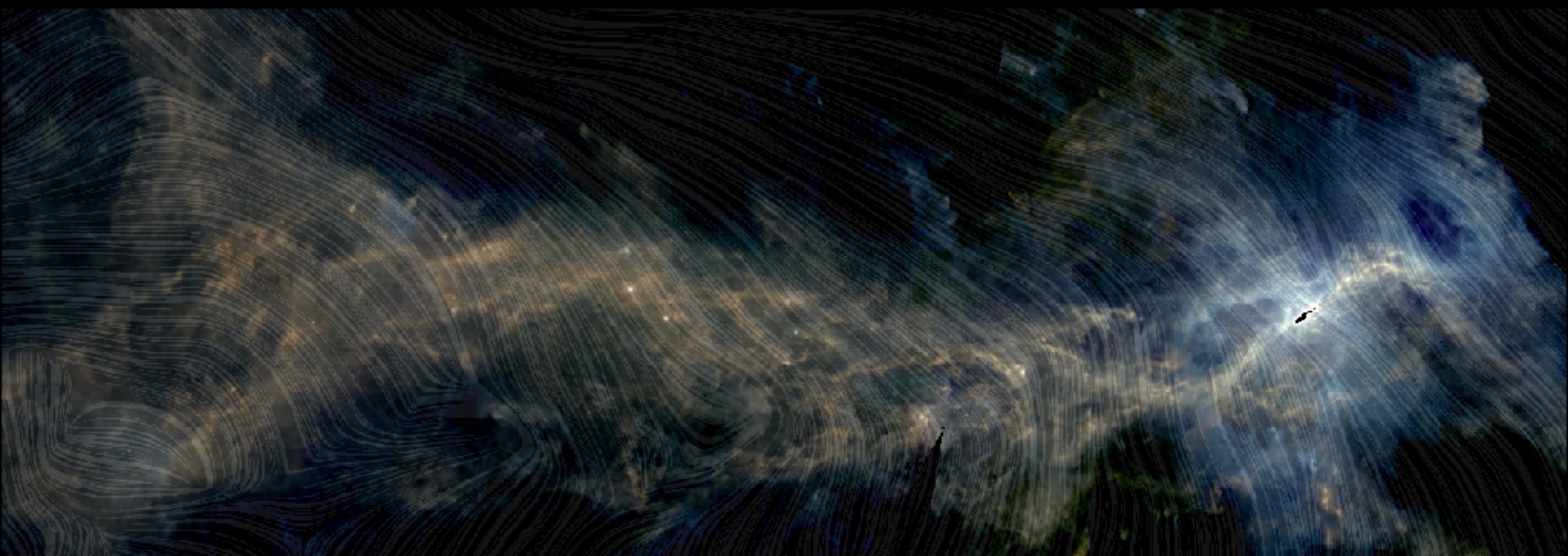
Strong magnetic field



Orientation between density and magnetic fields

Soler, J.D., Hennebelle, P., Martin, P., et al, ApJ. (2013)

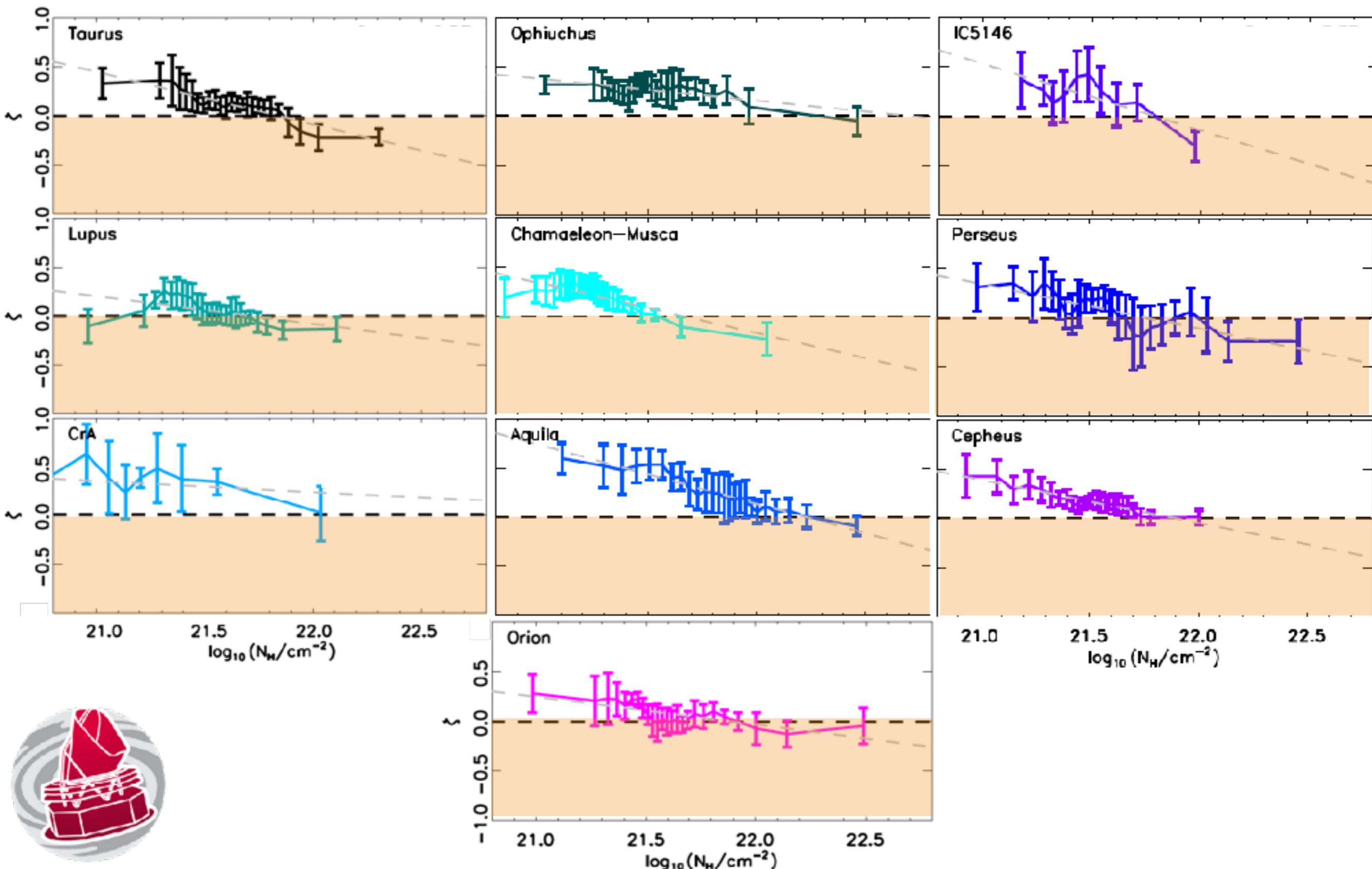




ESA/Herschel/Planck; J. D. Soler, MPIA

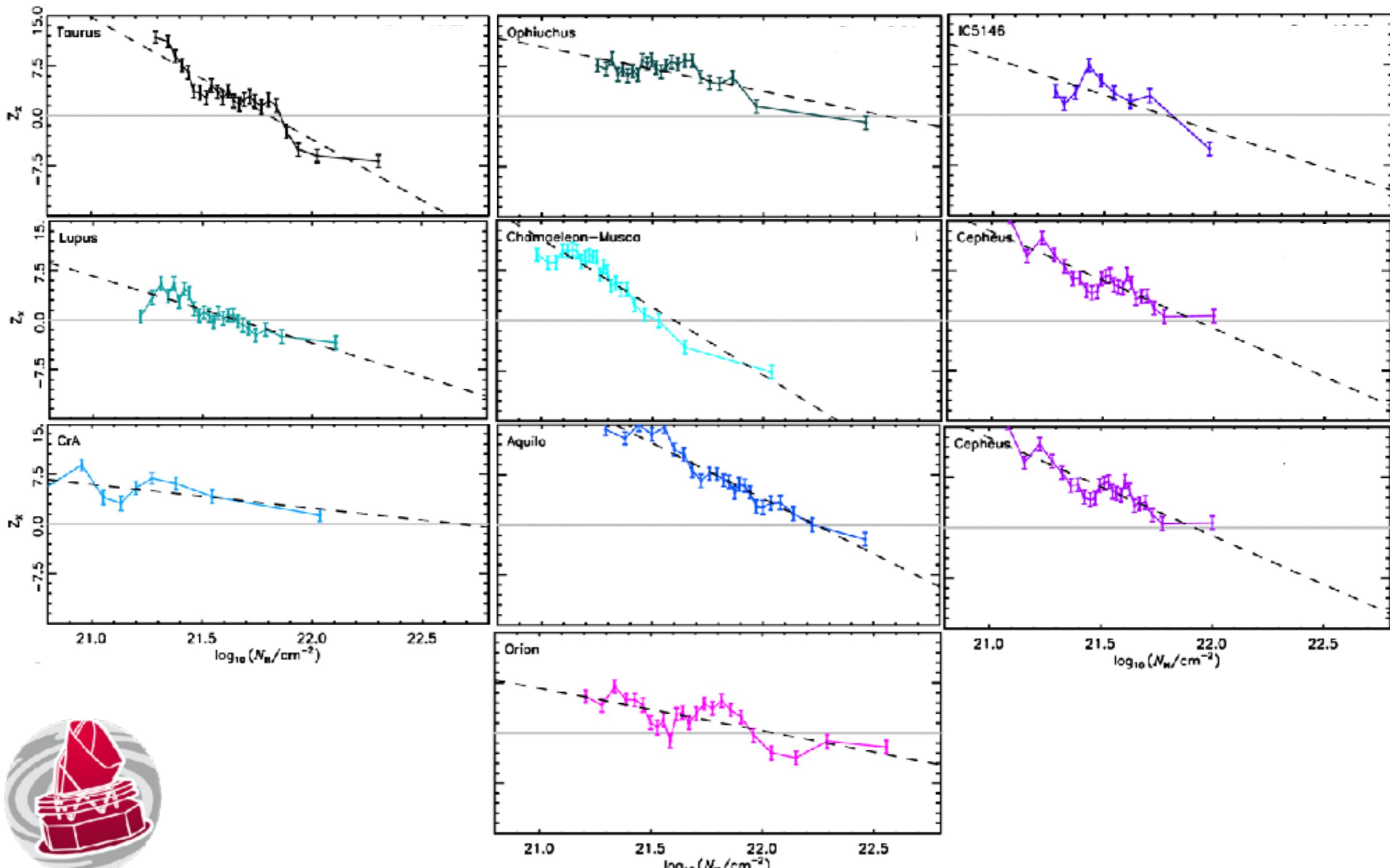
Relative orientation between N_{H} and B_{\perp} (10 MCs @ $d < 500$ pc)

Planck intermediate results. XXXV (corresponding author Soler, J.D.). A&A (2016)



Relative orientation between N_{H} and B_{\perp} (10 MCs @ $d < 500$ pc)

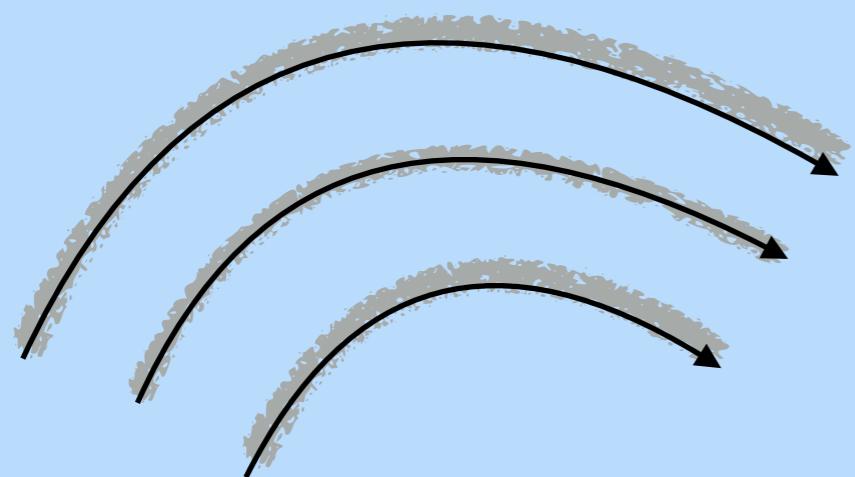
In terms of the projected Rayleigh statistic; Jow et al. A&A (2018)



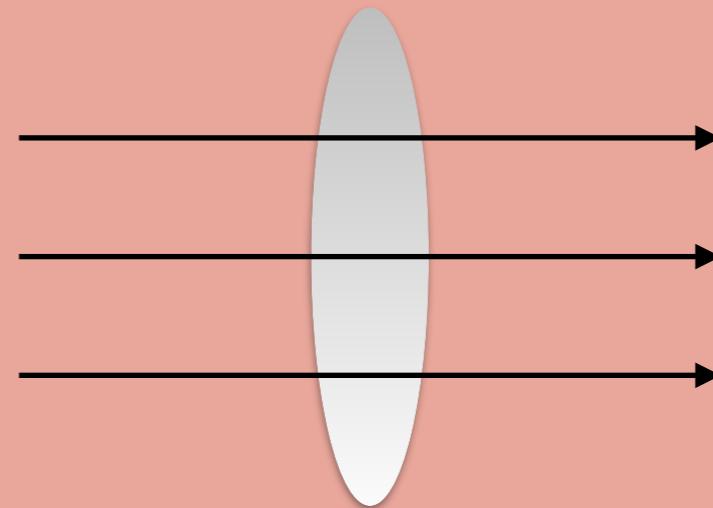
The magnetic field and ISM flows

Soler J.D. & P. Hennebelle, A&A 607A (2017) 2S

Gas stretched
along **B**.



Gas accumulates
perpendicular to **B**.



Relative orientation between N_H and B_\perp

Soler J.D. & P. Hennebelle, A&A 607A (2017) 2S

$$\textcircled{1} \quad \frac{d \log \rho}{dt} = -\partial_j v_j$$

$$\textcircled{2} \quad \frac{dB_i}{dt} = B_j(\partial_j v_i) - B_i(\partial_j v_j)$$

$$\cos \phi = \frac{\nabla \rho \cdot \mathbf{B}}{|\nabla \rho| |\mathbf{B}|}$$

Relative orientation between N_H and B_\perp

Soler J.D. & P. Hennebelle, A&A 607A (2017) 2S

$$r_i \equiv \frac{R_i}{(R_k R_k)^{1/2}} \quad R_i \equiv \partial_i \log \rho$$

$$\frac{d(\cos \phi)}{dt} = \frac{\partial_i(\partial_j v_j)}{(R_k R_k)^{1/2}} [-\cancel{b_i} + \cancel{r_i} \cos \phi] + \partial_i v_j [r_i r_j - b_i b_j] \cos \phi.$$

$$b_i \equiv \frac{B_i}{(B_k B_k)^{1/2}}$$

Relative orientation between N_H and B_\perp

Soler J.D. & P. Hennebelle, A&A 607A (2017) 2S

$$\frac{d(\cos \phi)}{dt} = \frac{\partial_i(\partial_j v_j)}{(R_k R_k)^{1/2}} [-b_i + r_i \cos \phi] + \partial_i v_j [r_i r_j - b_i b_j] \cos \phi.$$

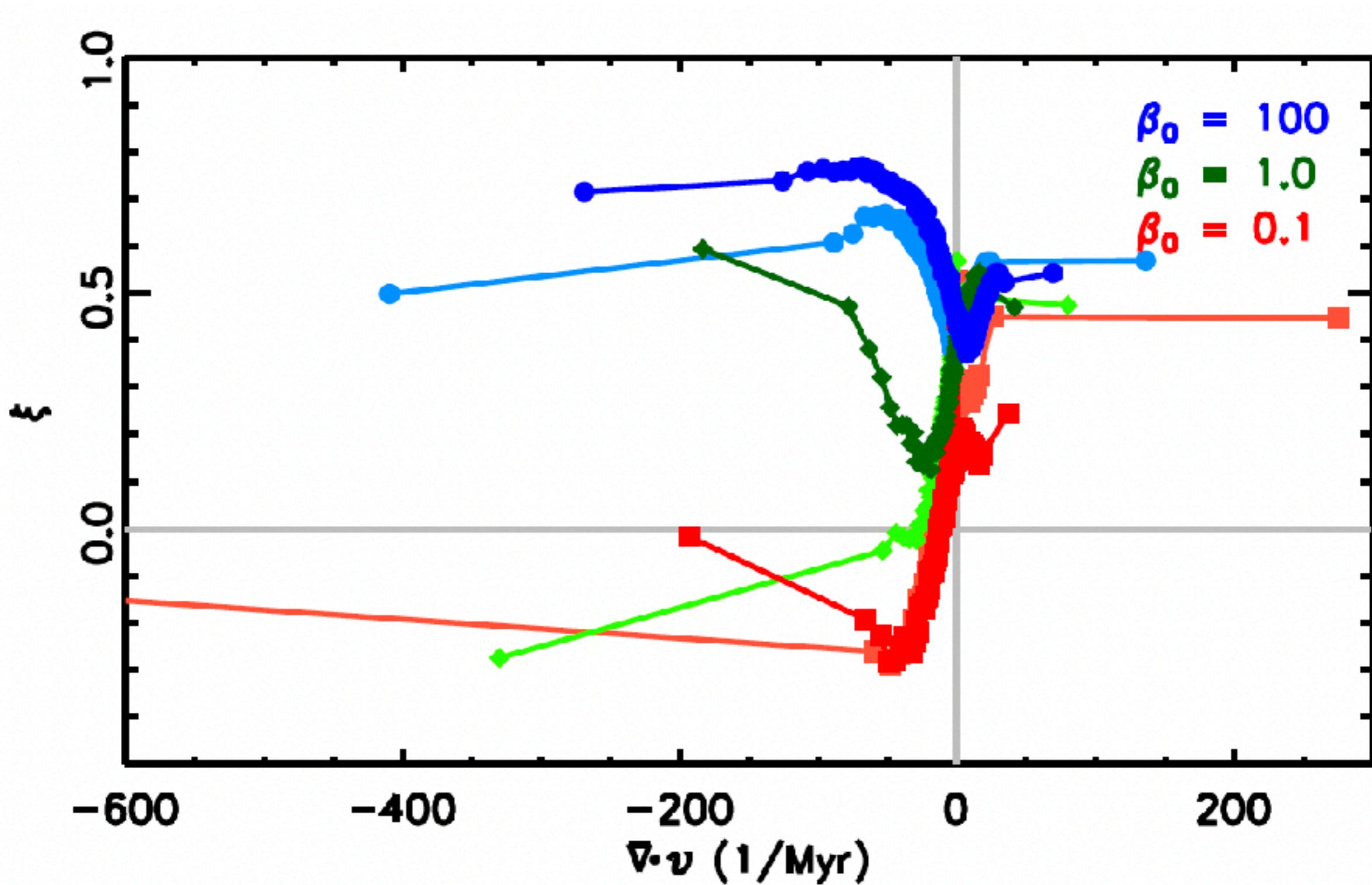


$$\cos \phi = \pm 1$$

$$\cos \phi = 0$$

Relative orientation between N_H and B_\perp

Soler J.D. & P. Hennebelle, A&A 607A (2017) 2S



Relative orientation between v and B_\perp

Soler J.D. & P. Hennebelle, A&A 607A (2017) 2S

$$\frac{d \cos \theta}{dt} = \left[-\frac{\partial_i P}{\rho v} + \left(\frac{B_j \partial_j B_i - B_j \partial_i B_j}{\rho v} \right) + \partial_i v \right] (b_i - u_i \cos \theta) + \frac{1}{2} (\partial_j v_i + \partial_i v_j) [u_i u_j - b_i b_j] \cos \theta,$$

$b_i \equiv \frac{B_i}{(B_k B_k)^{1/2}}$

$u_i \equiv \frac{v_i}{(v_k v_k)^{1/2}}$

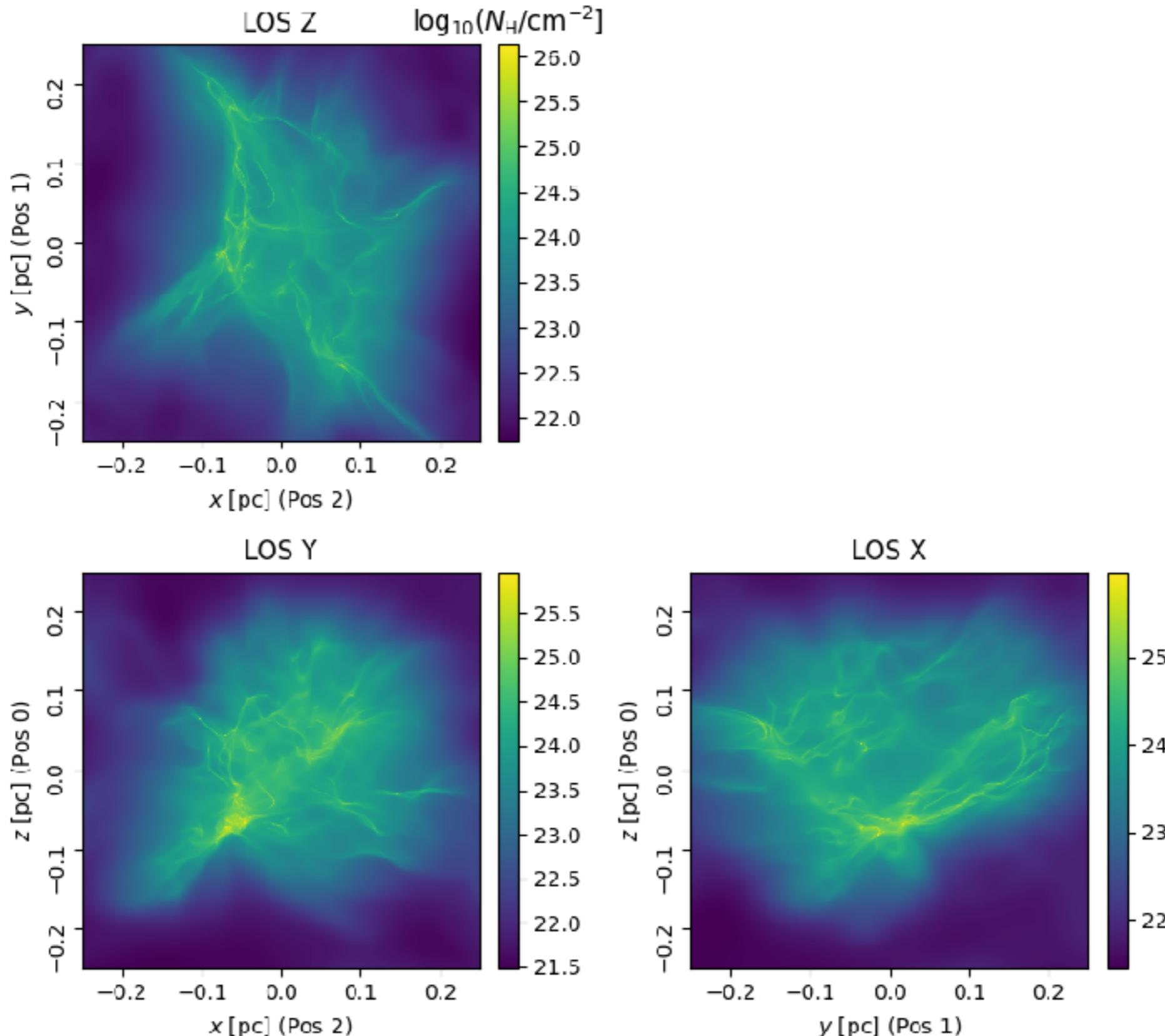
Relative orientation between v and B_\perp

Soler J.D. & P. Hennebelle, A&A 607A (2017) 2S

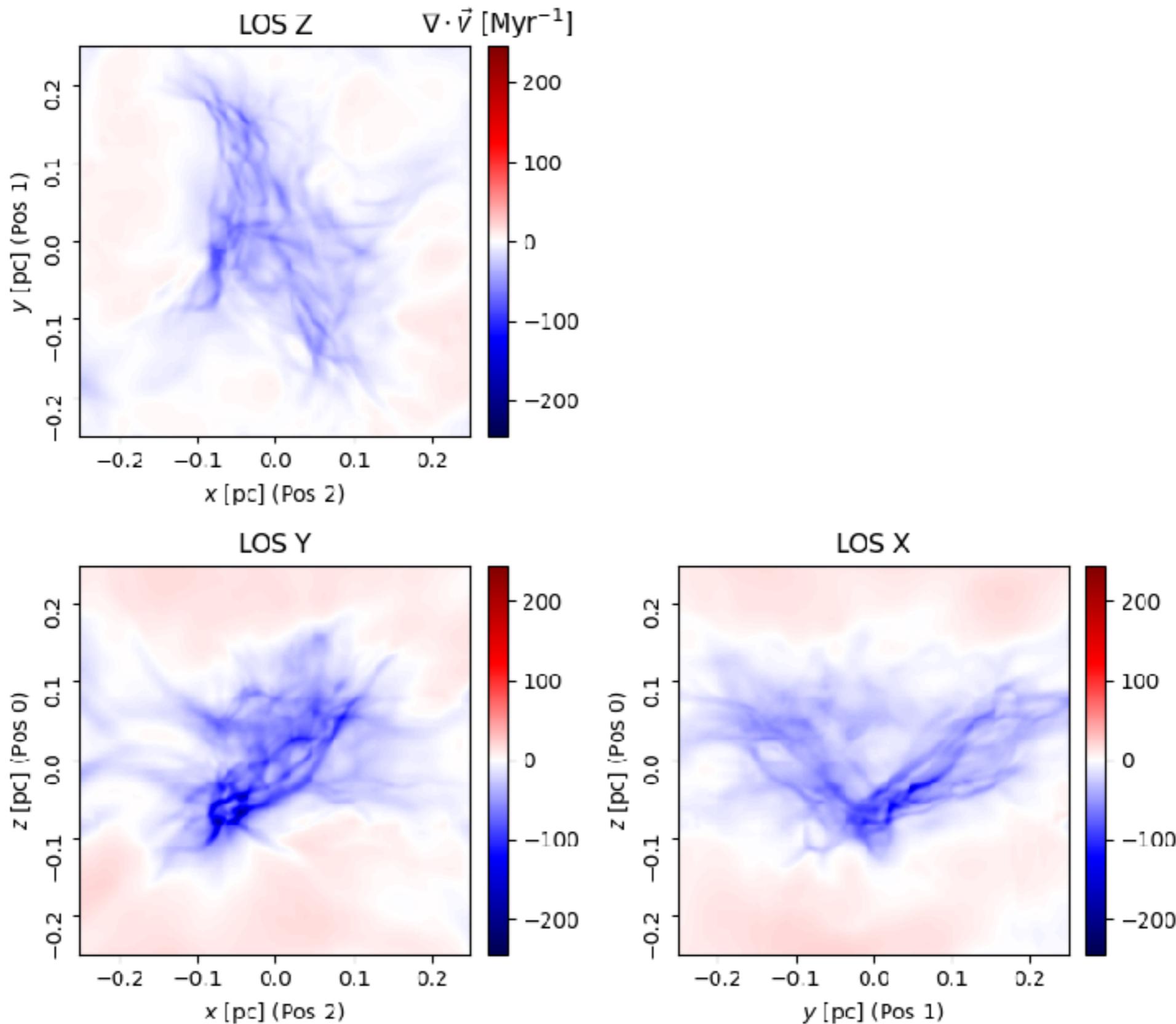
$$\begin{aligned} \frac{d \cos \theta}{dt} = & \left[-\frac{\partial_i P}{\rho v} + \left(\frac{B_j \partial_j B_i - B_j \partial_i B_j}{\rho v} \right) + \partial_i v \right] (b_i - u_i \cos \theta) \\ & + \frac{1}{2} (\partial_j v_i + \partial_i v_j) [u_i u_j - b_i b_j] \cos \theta, \end{aligned}$$

Protoplanetary Disk Birth in Massive Star-forming Clumps

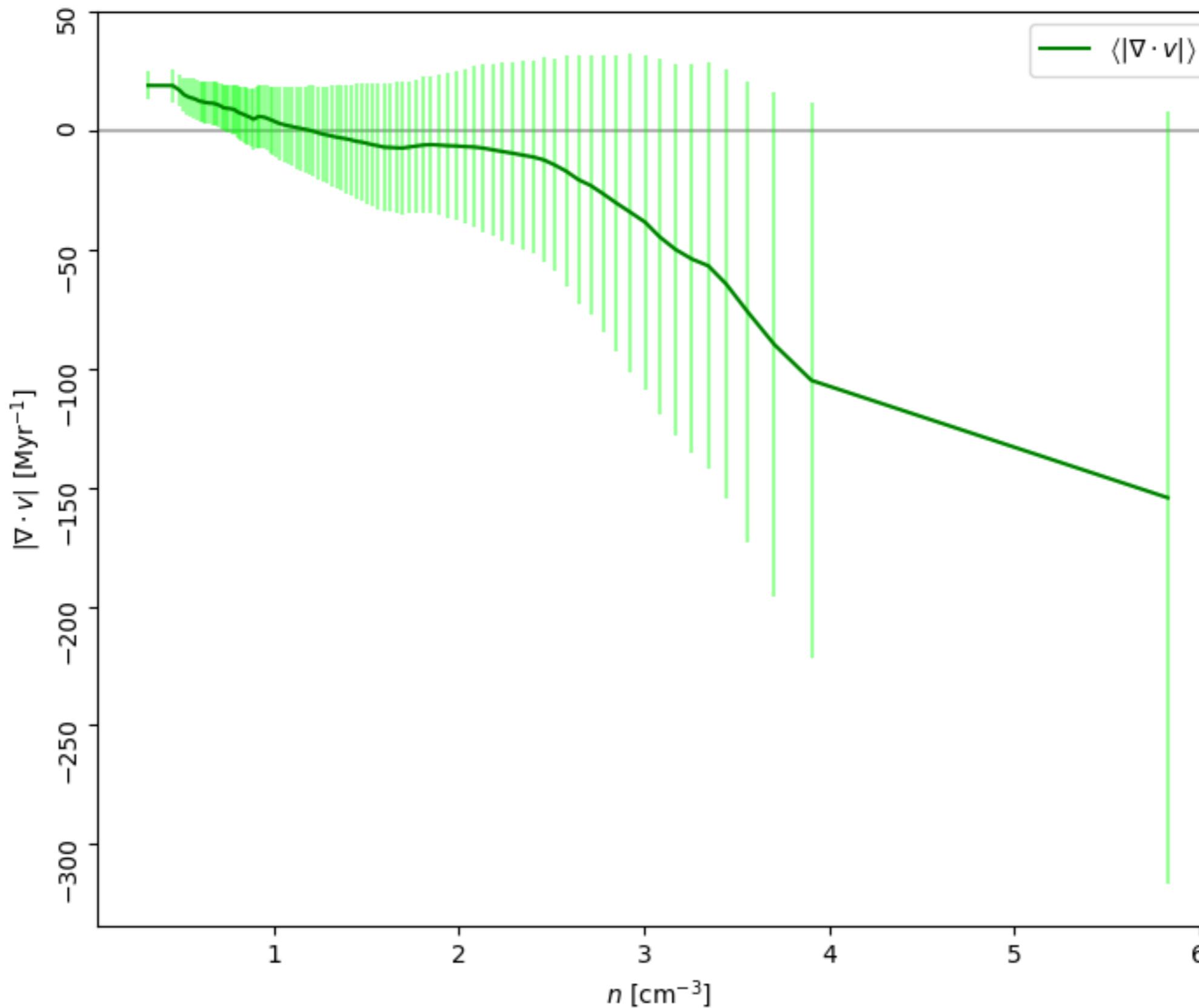
Lebreuilly, Hennebelle, et al. ApJL (2021)



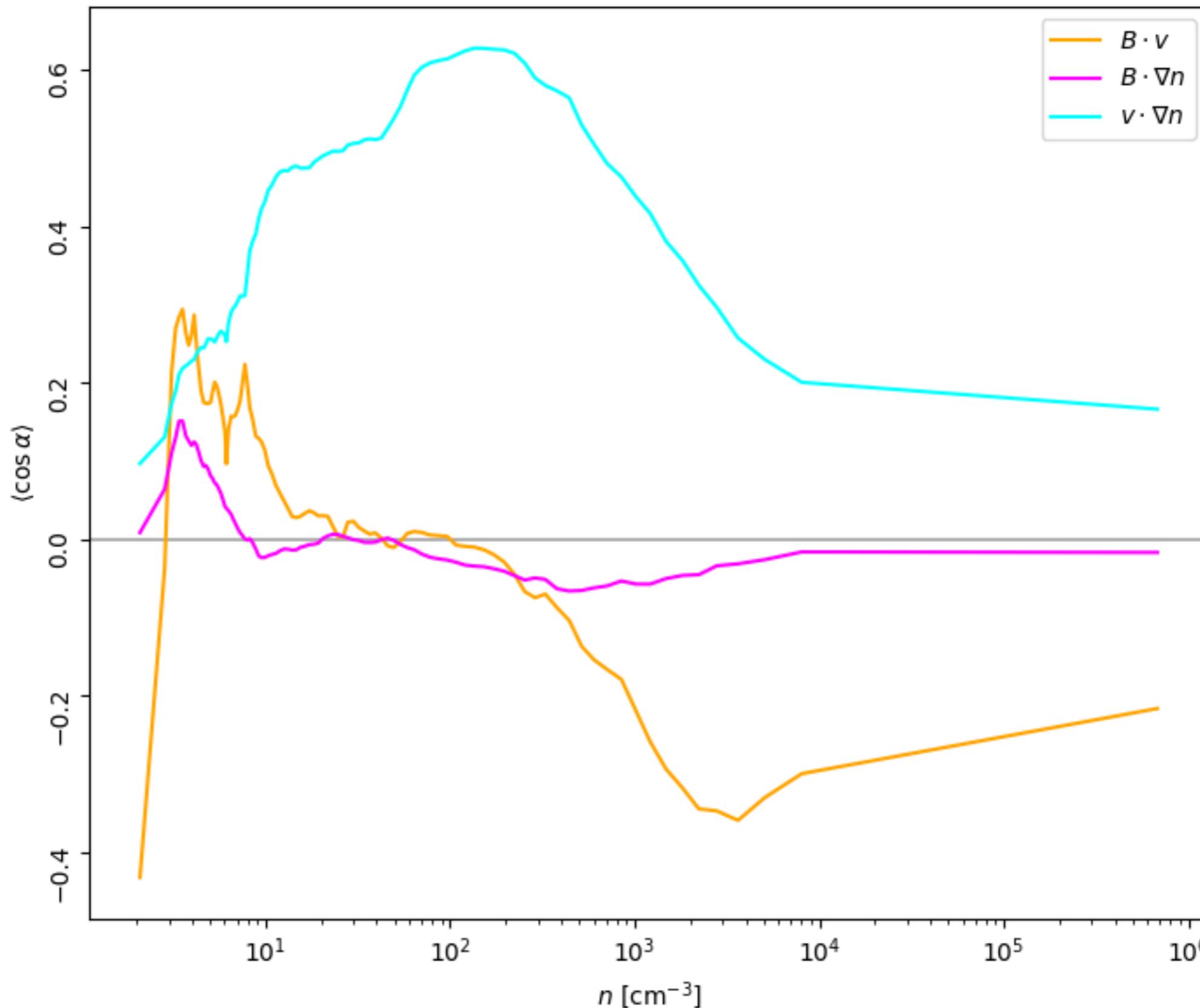
Protoplanetary Disk Birth in Massive Star-forming Clumps



Protoplanetary Disk Birth in Massive Star-forming Clumps

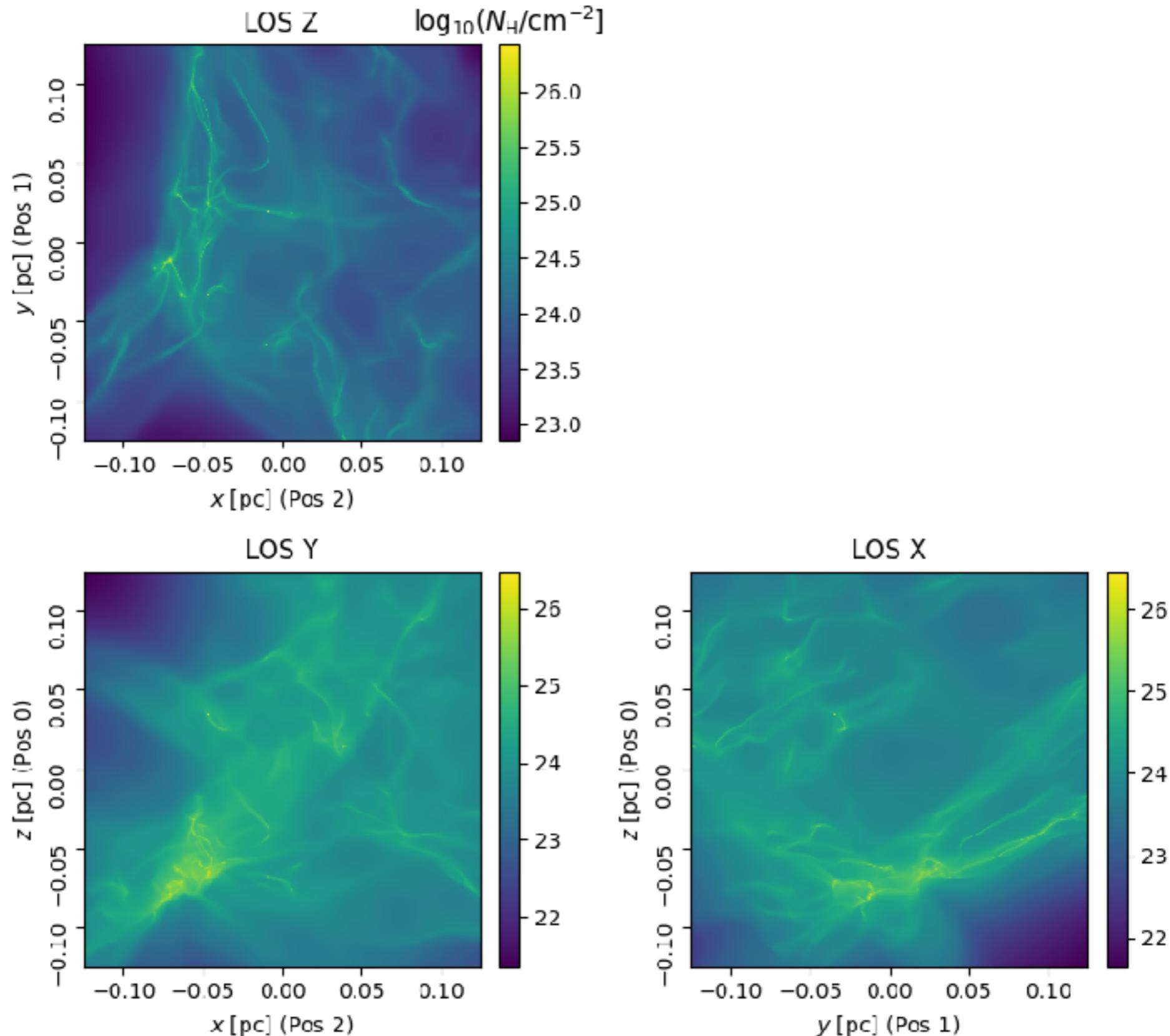


Protoplanetary Disk Birth in Massive Star-forming Clumps



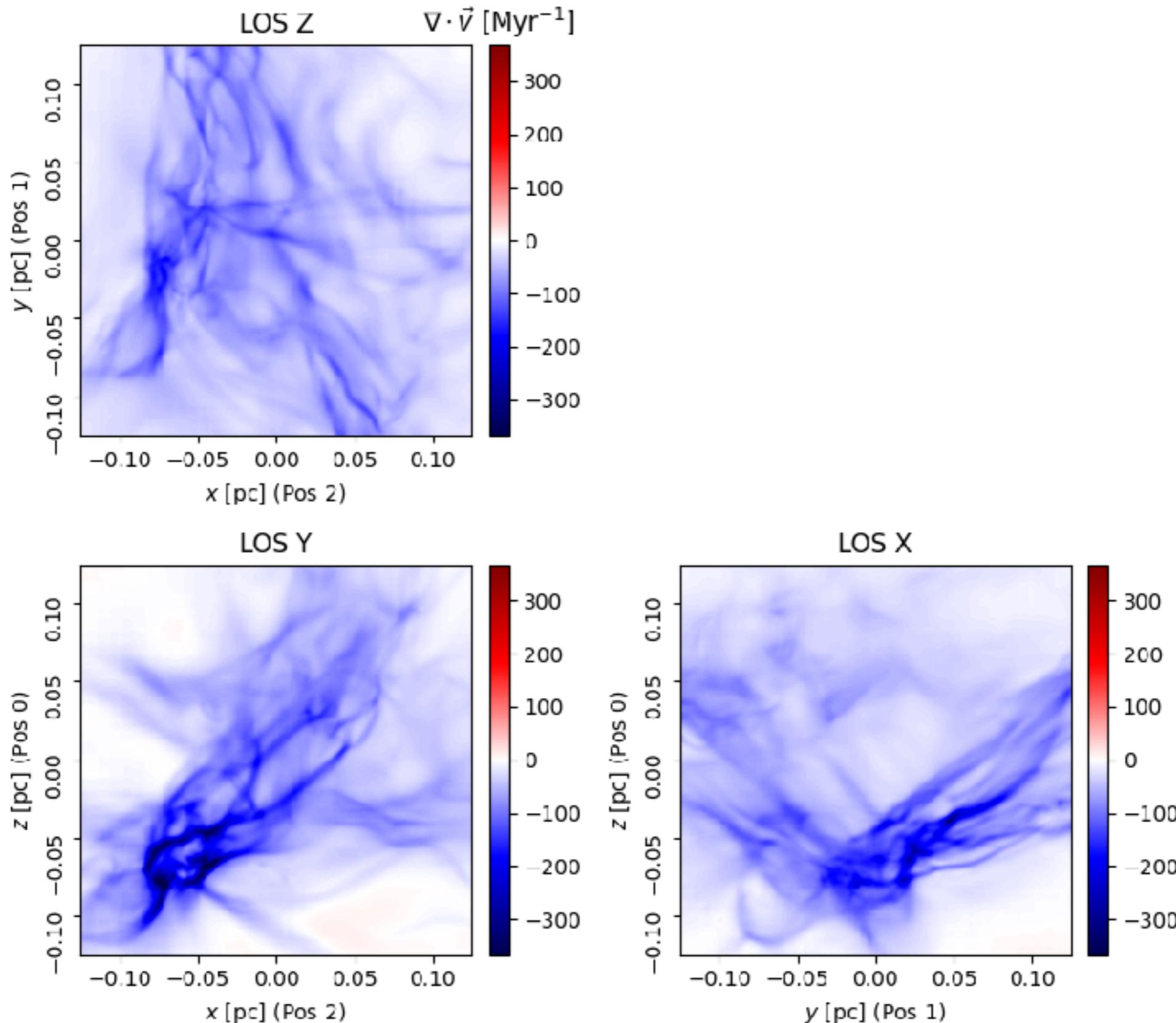
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Lebreuilly, Hennebelle, et al. ApJL (2021)

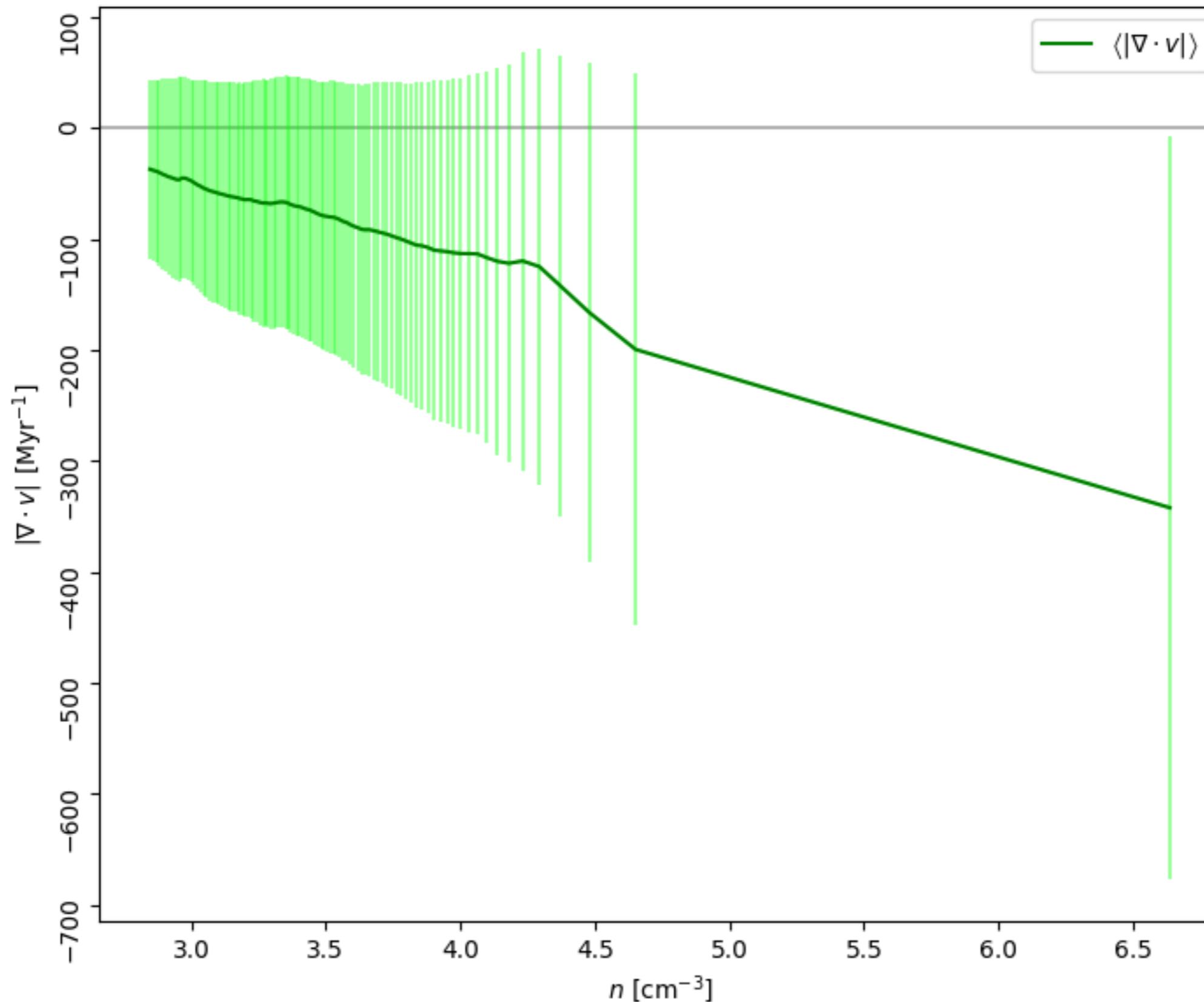


Protoplanetary Disk Birth in Massive Star-forming Clumps

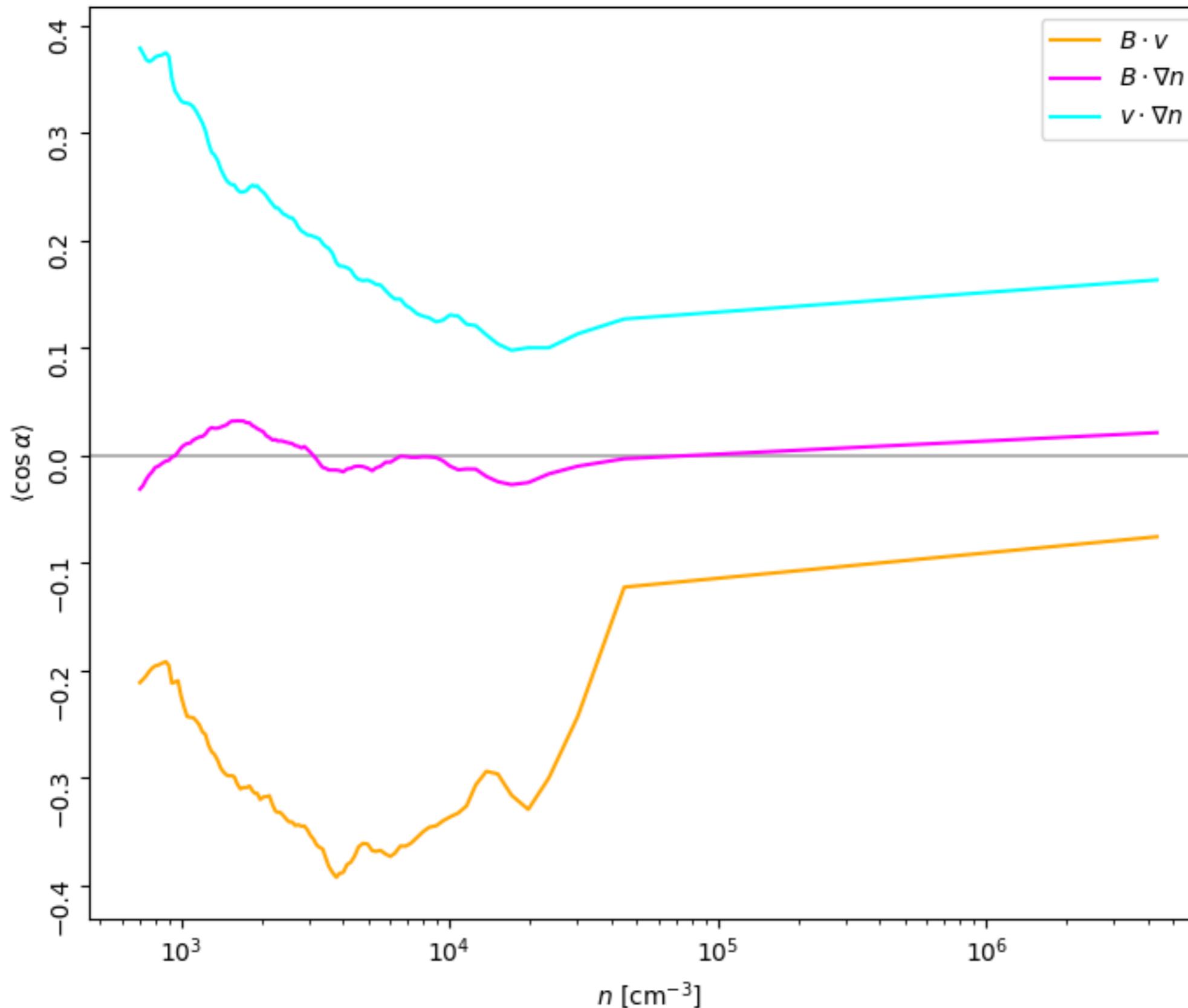
Lebreuilly, Hennebelle, et al. ApJL (2021)



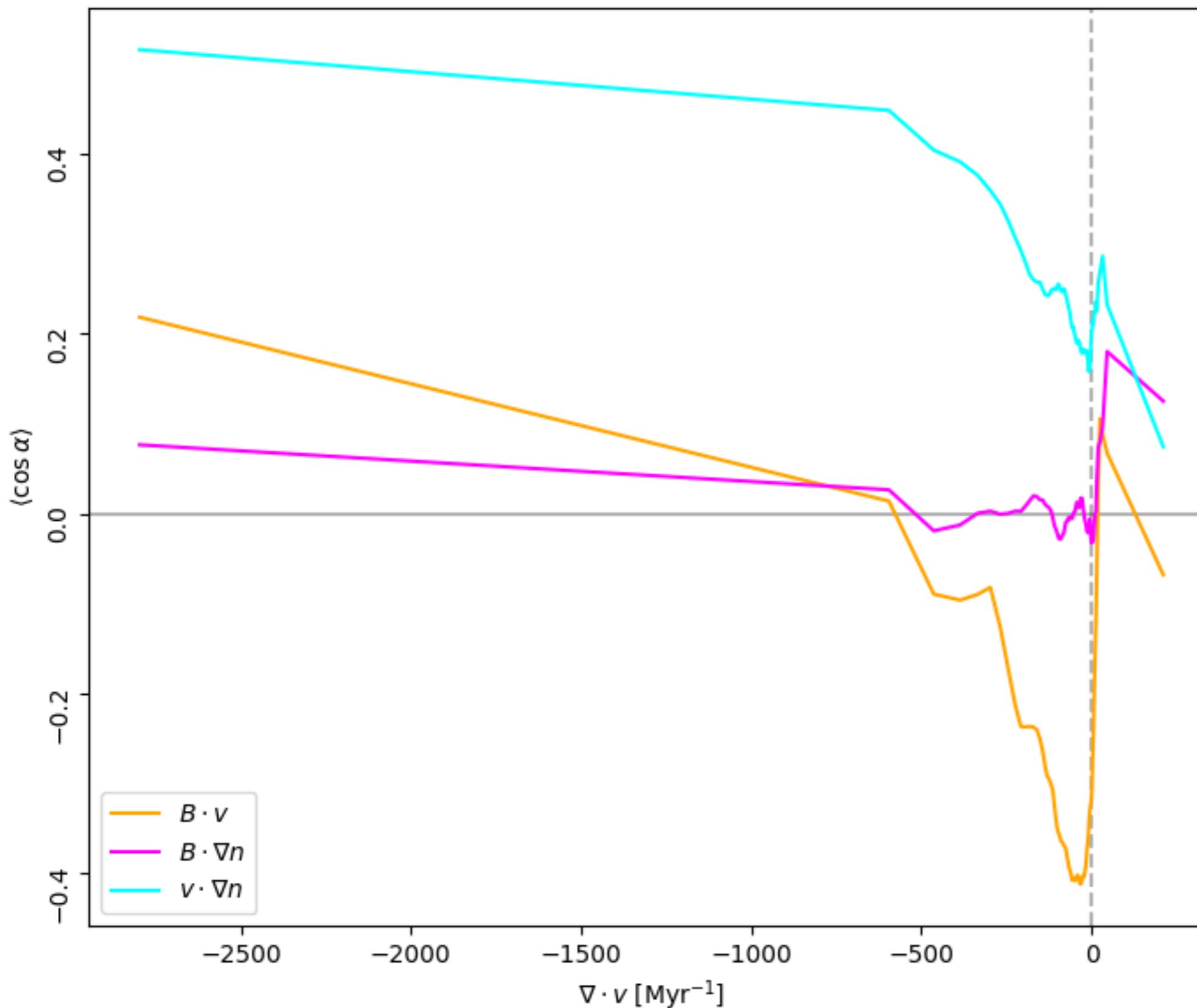
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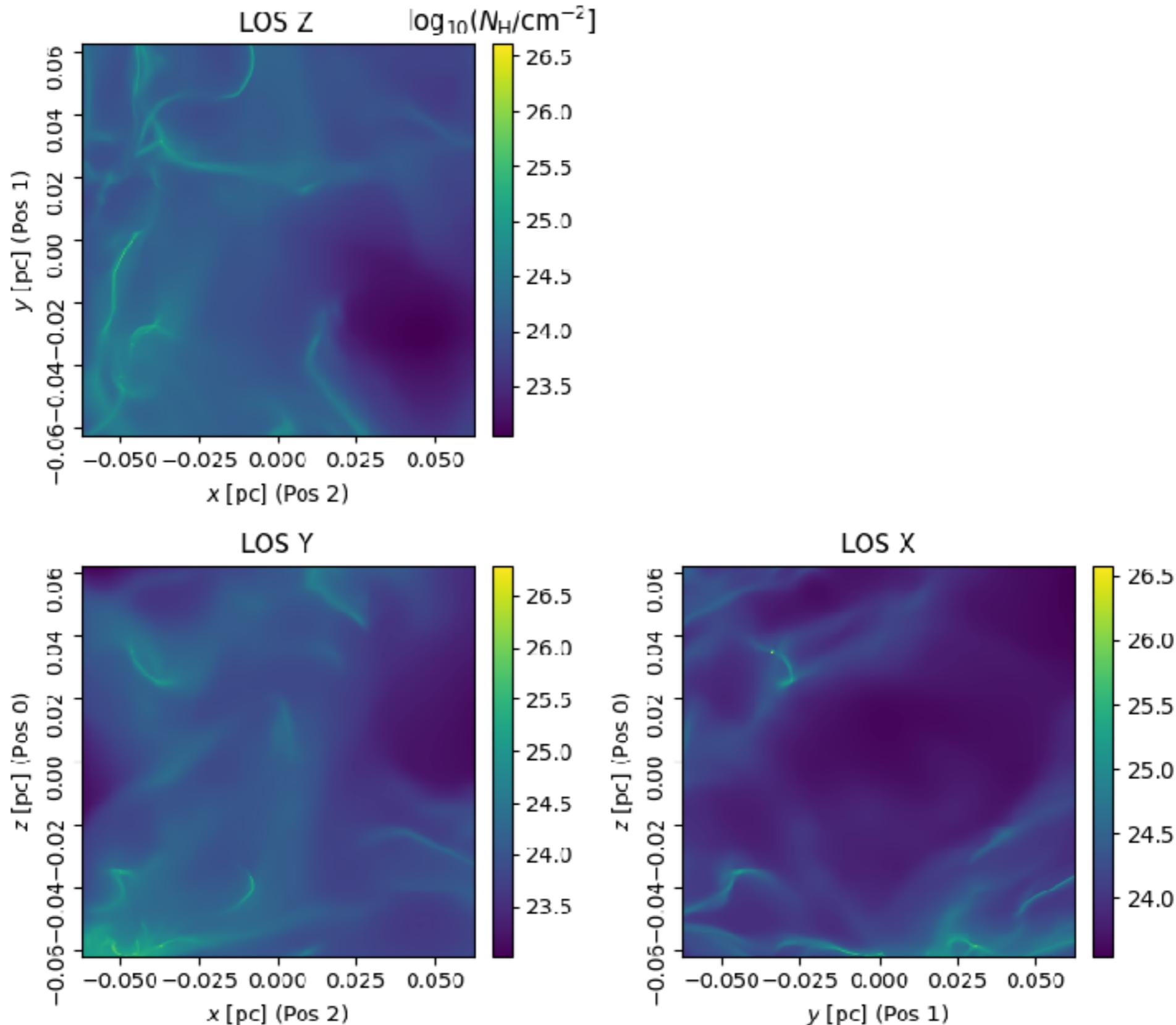


Protoplanetary Disk Birth in Massive Star-forming Clumps



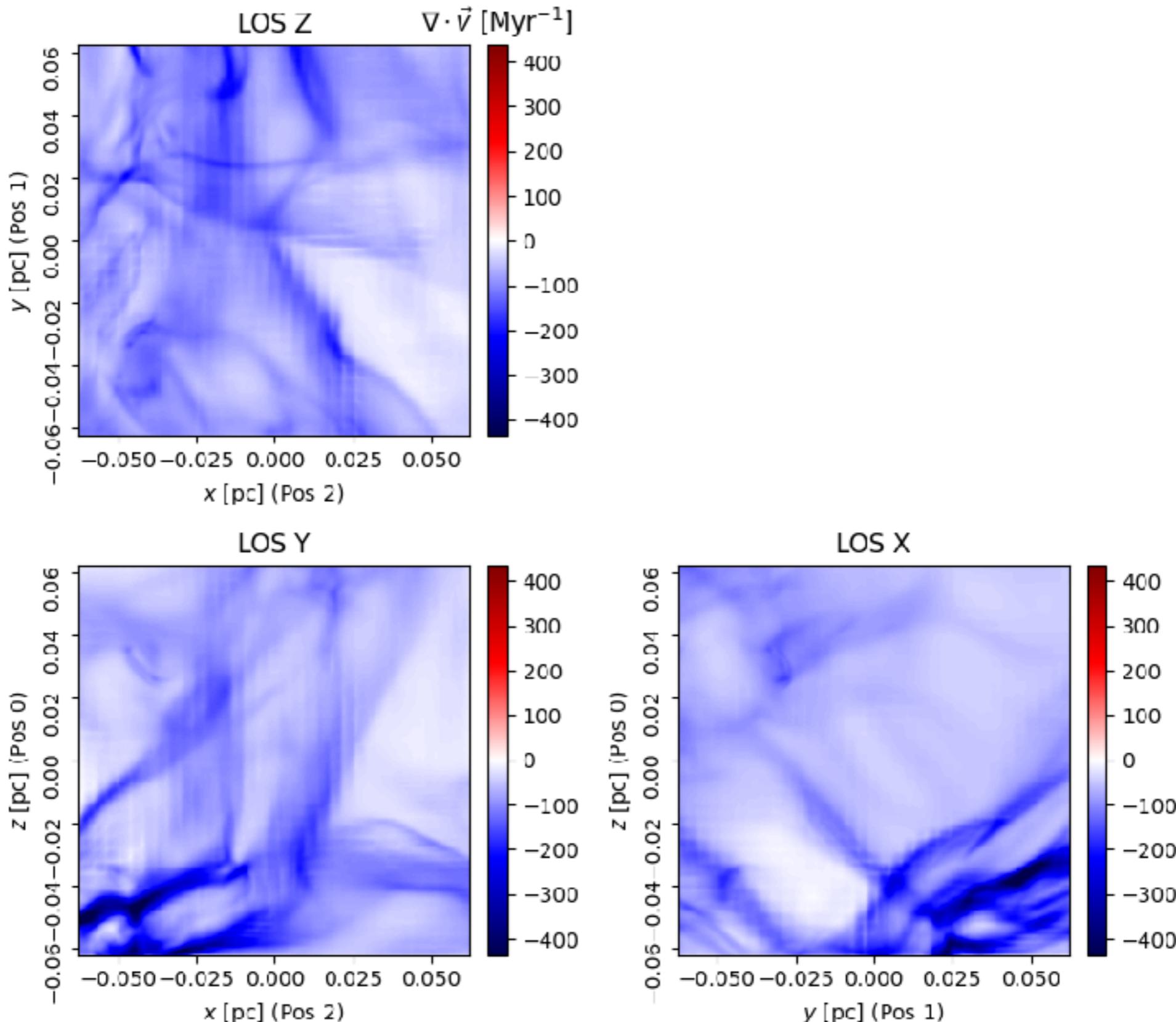
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Lebreuilly, Hennebelle, et al. ApJL (2021)

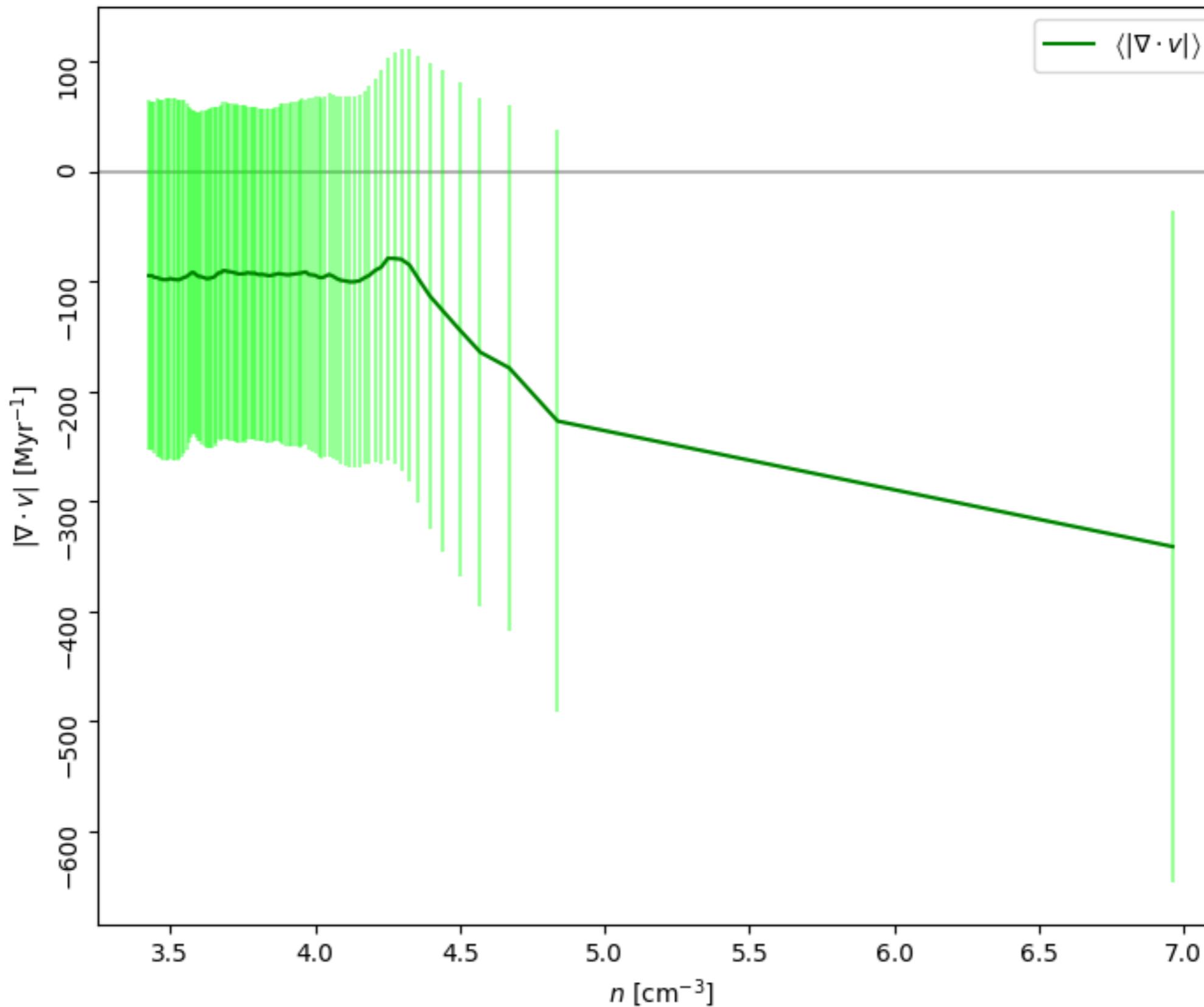


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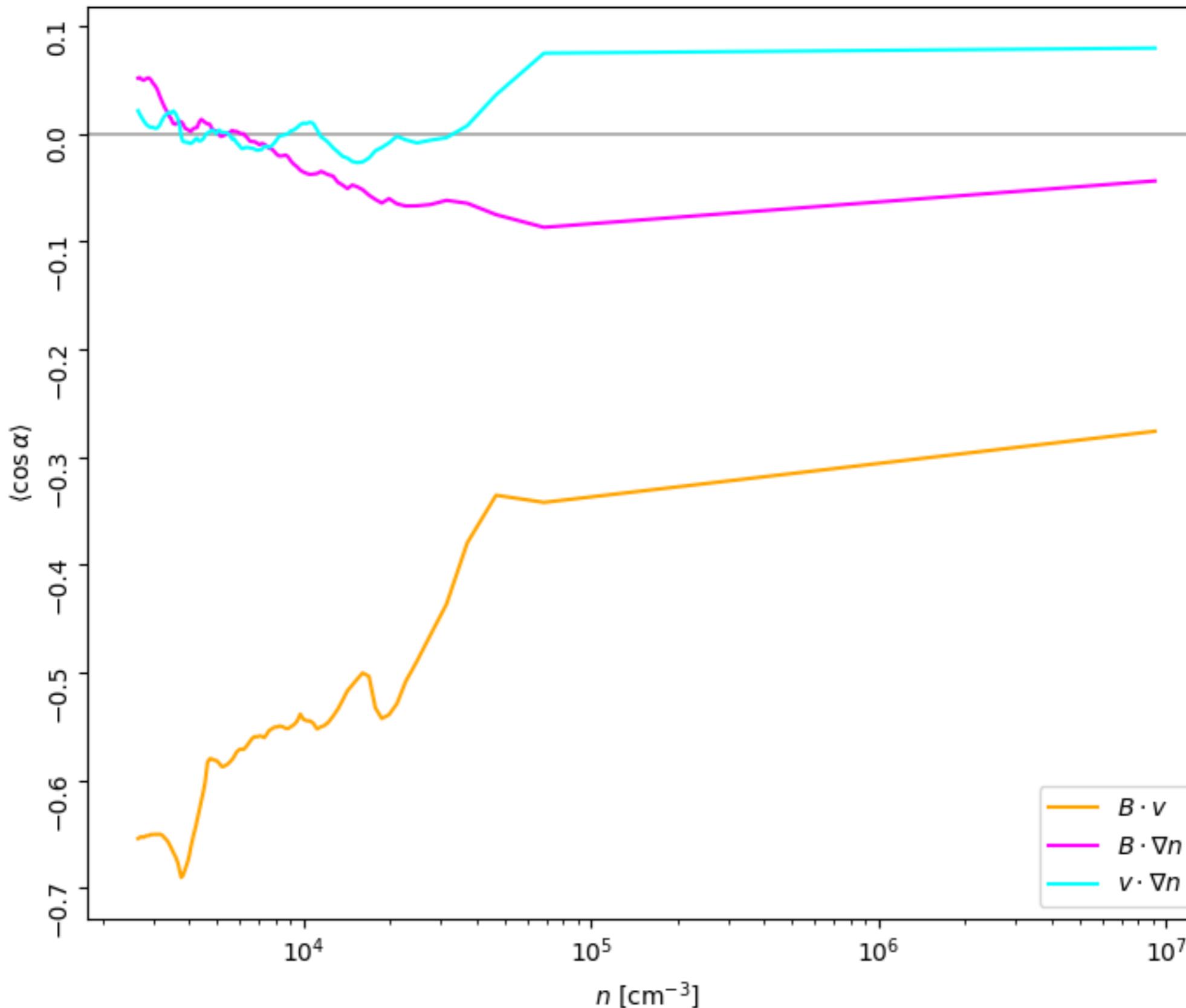
Lebreuilly, Hennebelle, et al. ApJL (2021)



Protoplanetary Disk Birth in Massive Star-forming Clumps



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