How are star-forming clouds connected to the diffuse ISM?

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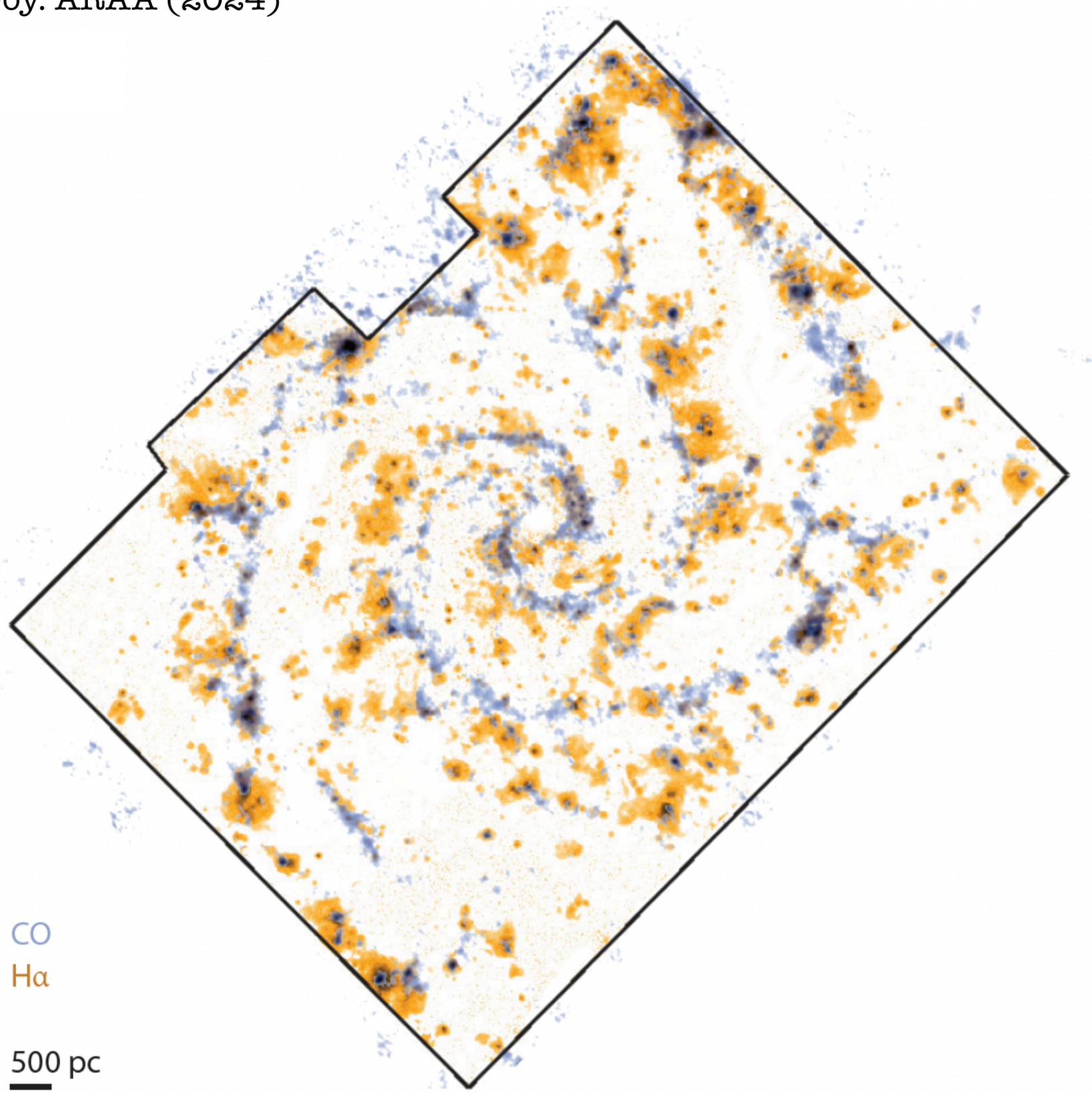
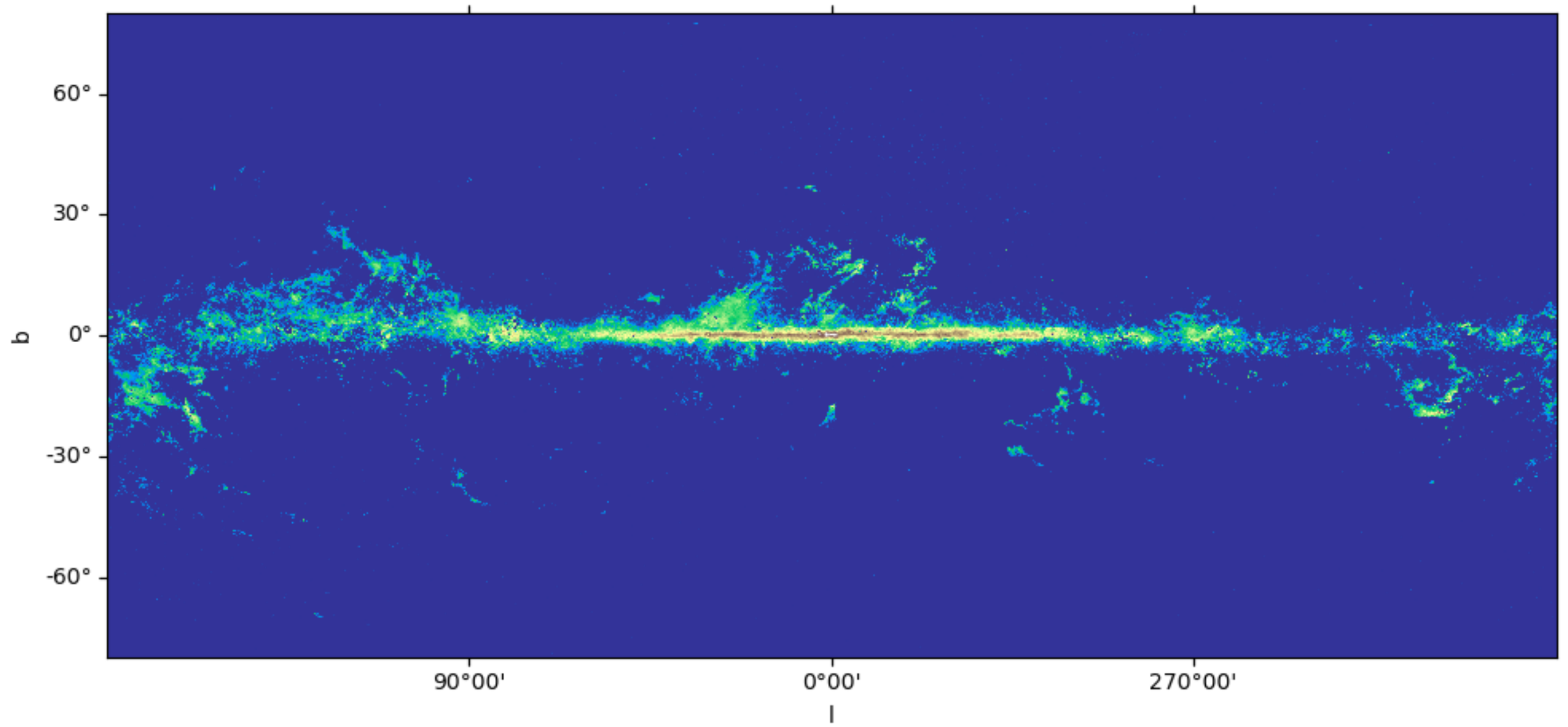
Star formation (Hα) and cold gas (CO)

Schinnerer & Leroy. ARAA (2024)



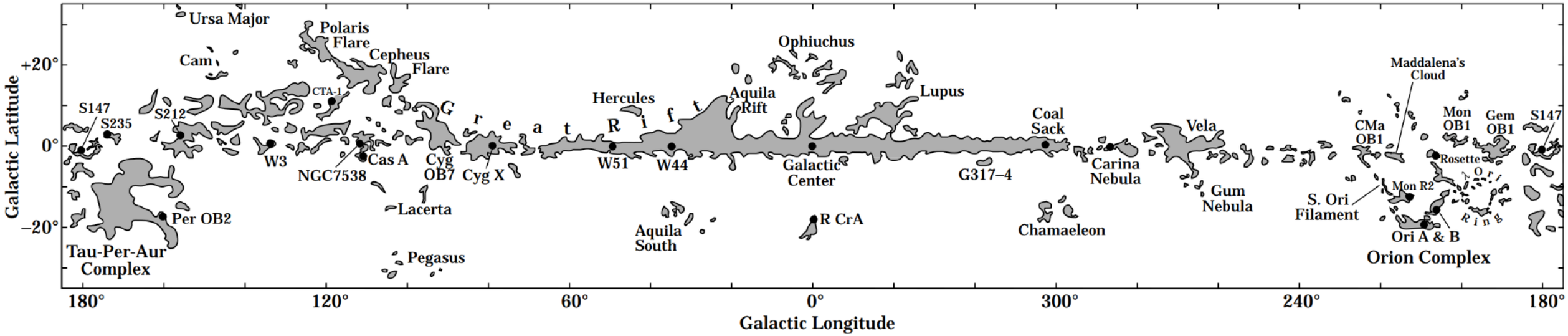
Carbon monoxide (CO) emission

CO(1-0); Planck 2013 results. XIII. A&A (2014)



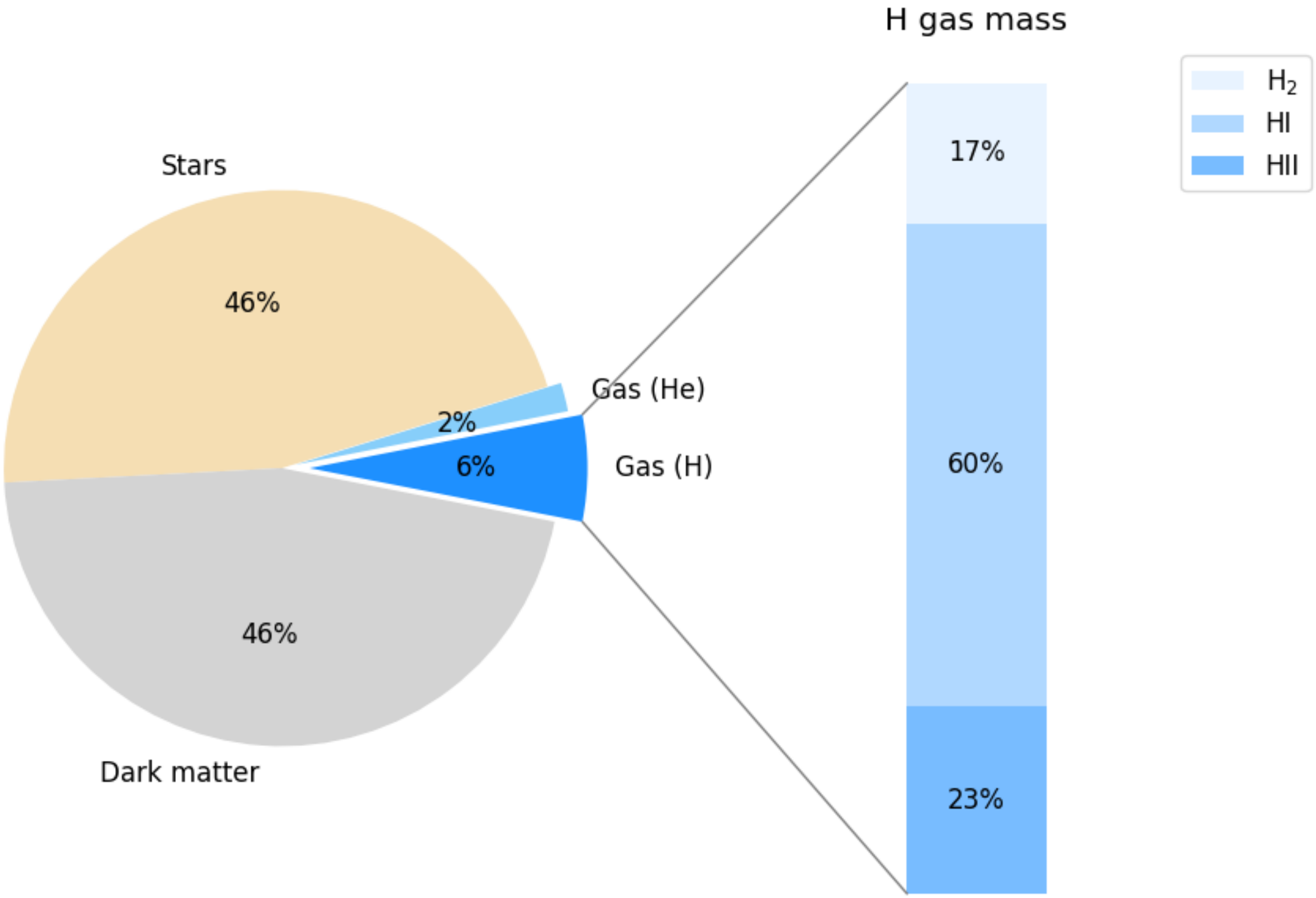
Carbon monoxide (CO) emission

Dame, Hartmann & Thaddeus (2001)



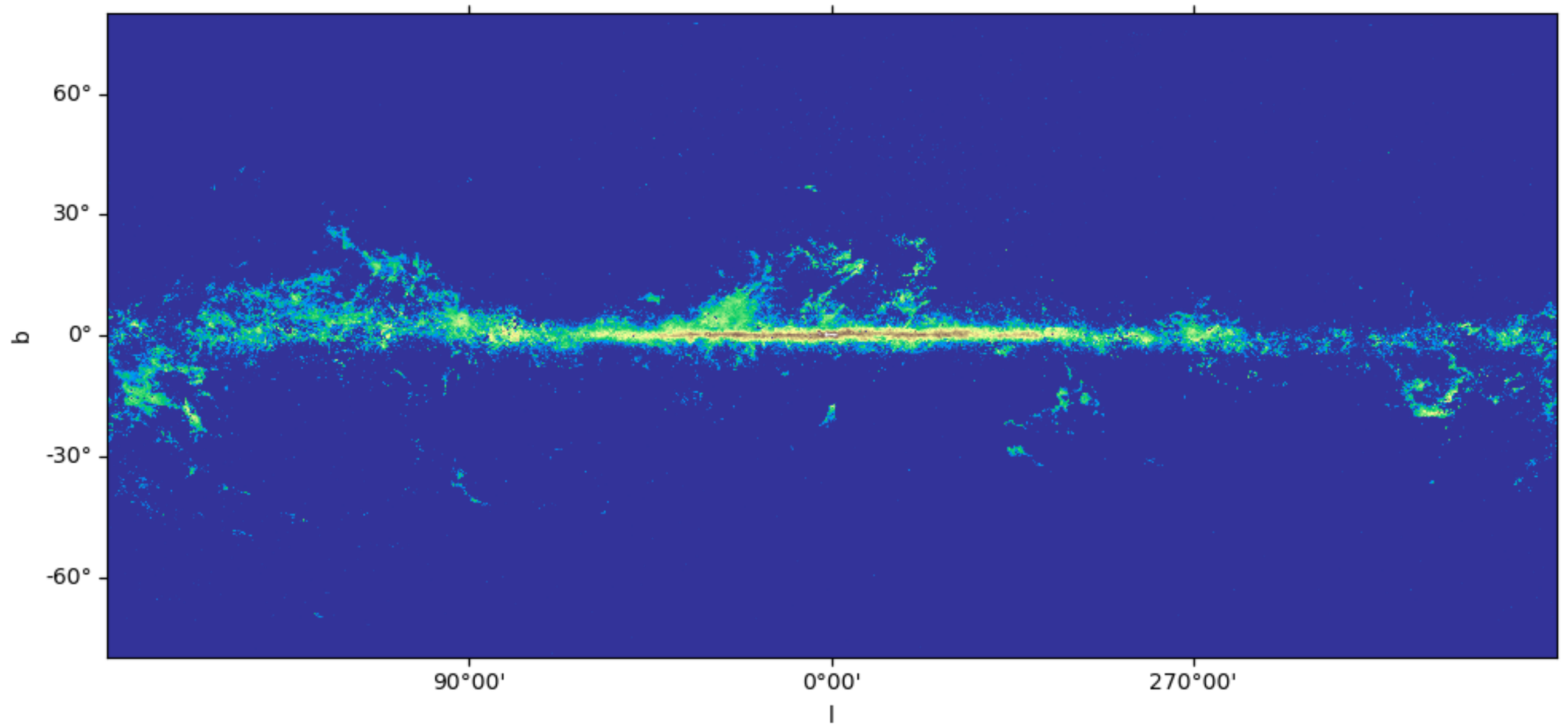
Milky Way's mass budget

Draine, B. T. Physics of the Interstellar and Intergalactic Medium (2011)



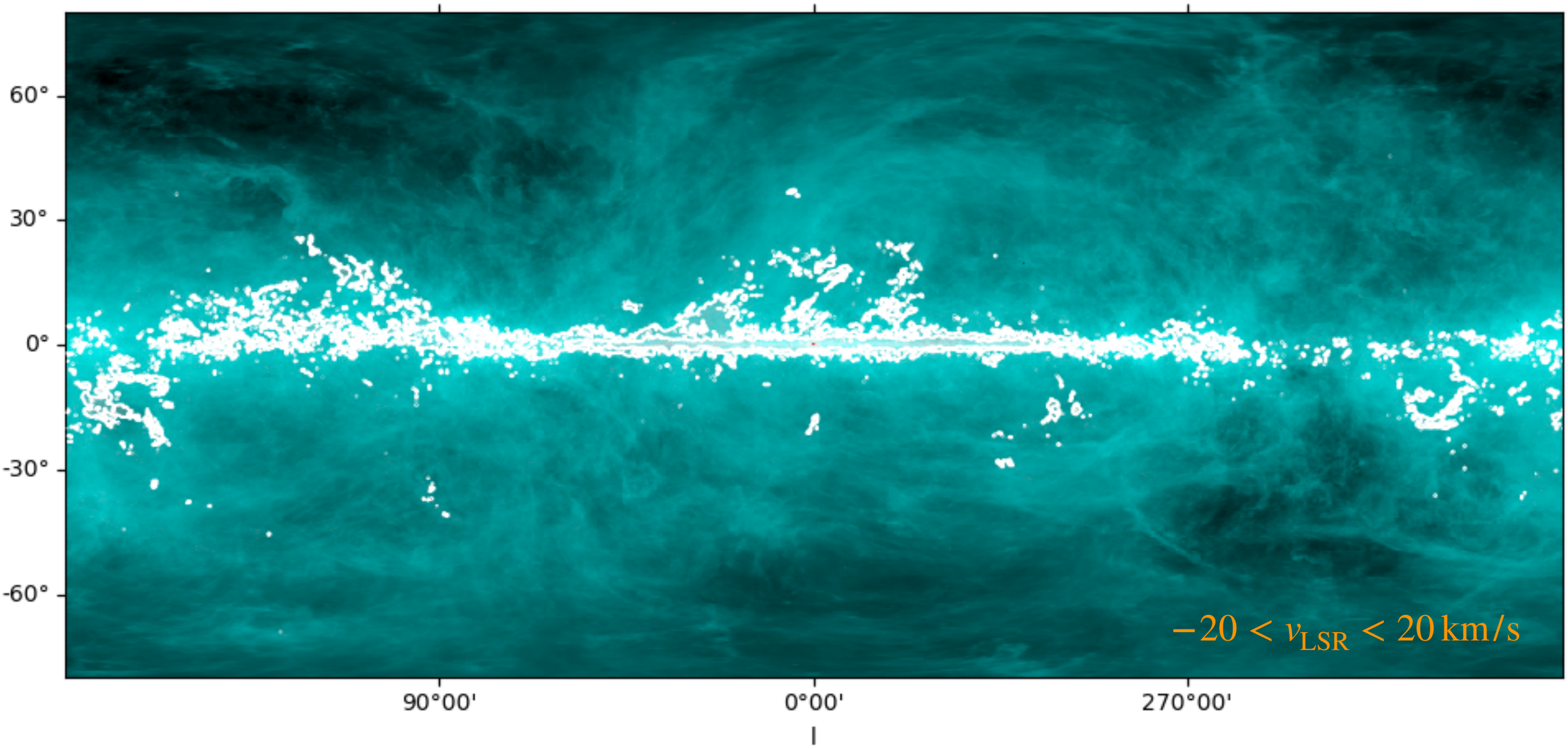
Carbon monoxide (CO) emission

Planck 2013 results. XIII. A&A (2014)



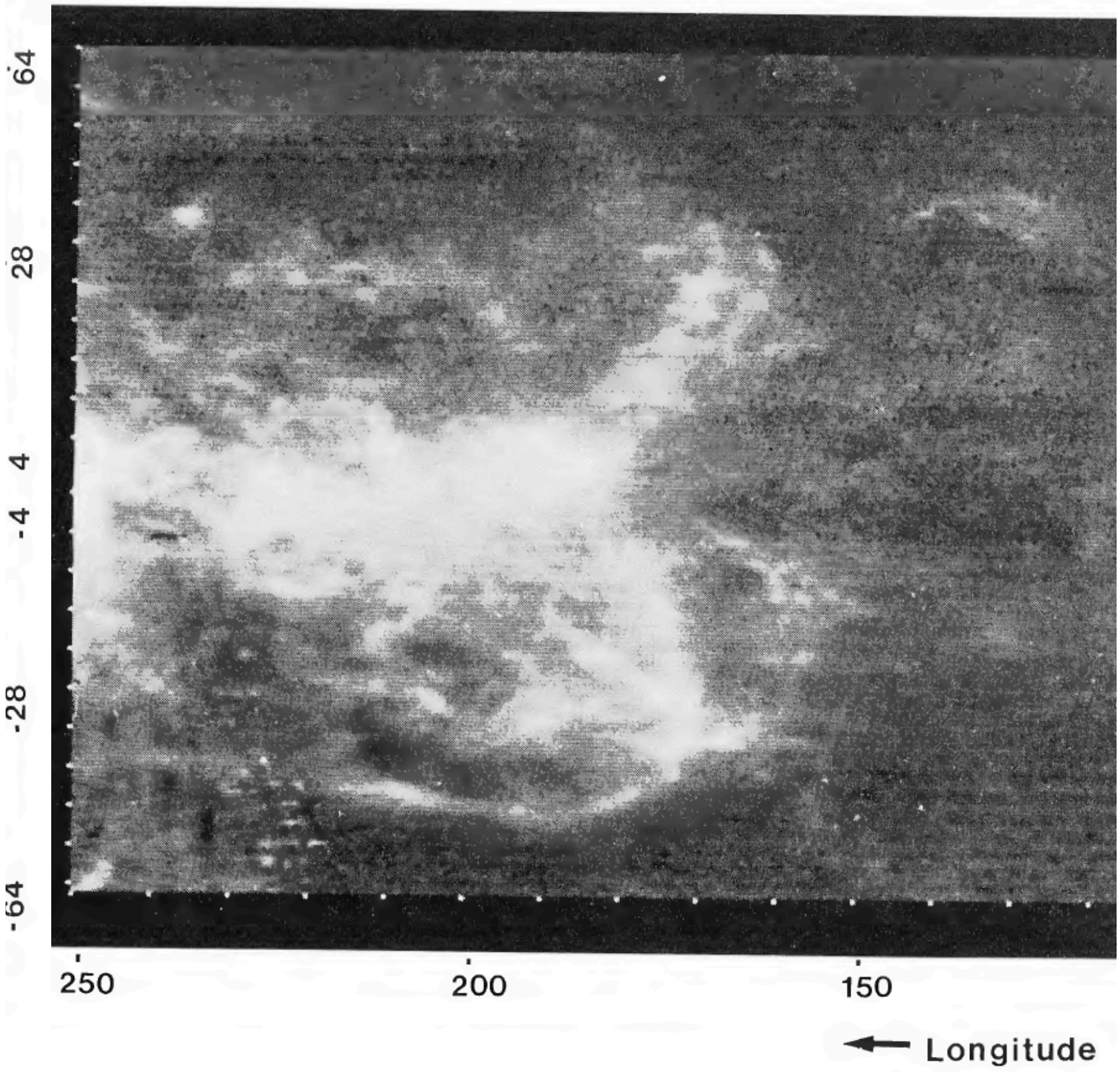
Neutral atomic hydrogen (HI) emission

HI4PI Collaboration. A&A (2016)
McClure-Griffiths, Stanimirović,& Rybarczyk. ARA&A (2023)



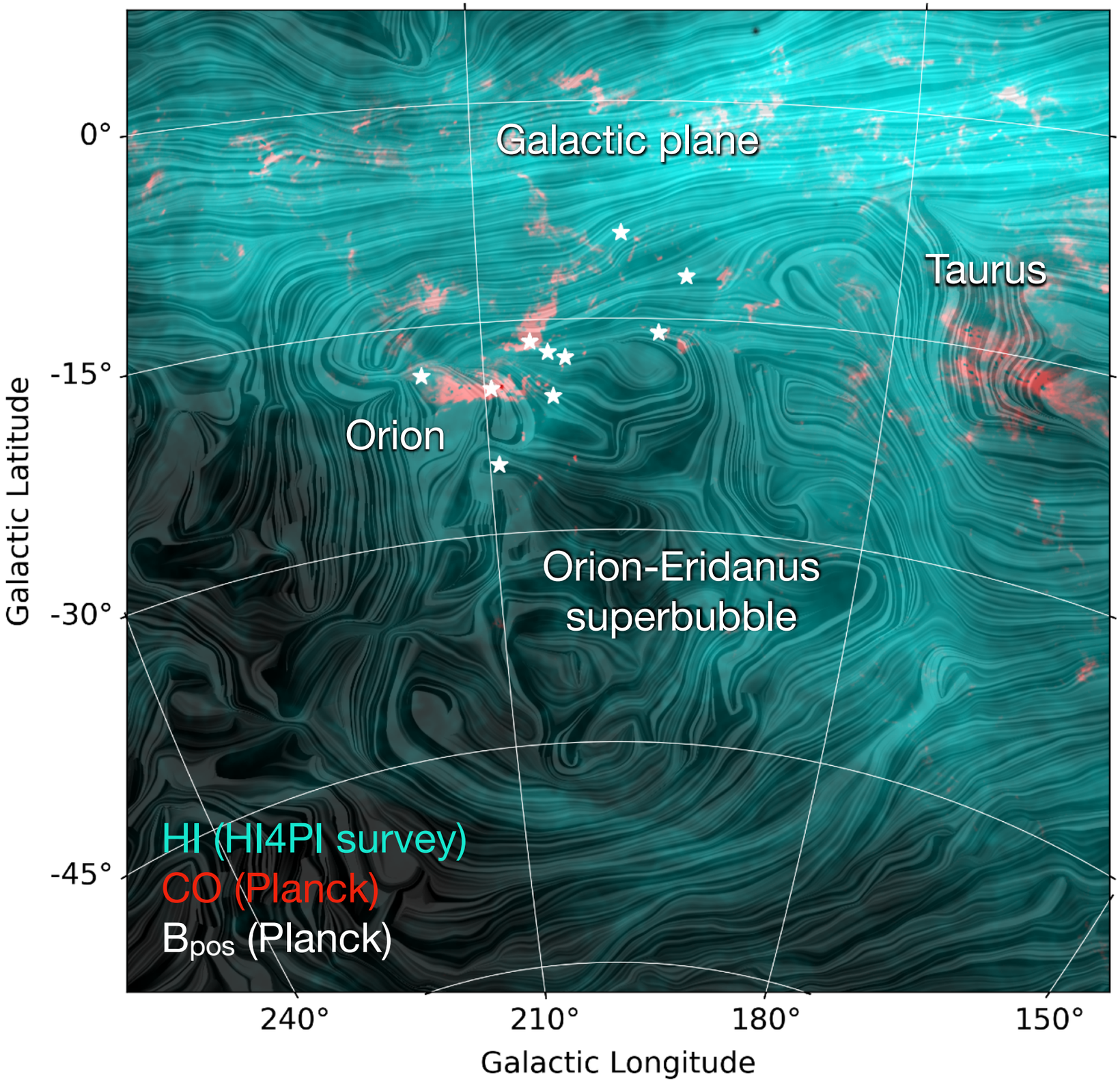
Orion-Eridanus superbubble

Heiles. ApJ (1984); Heiles. ApJS (1997)



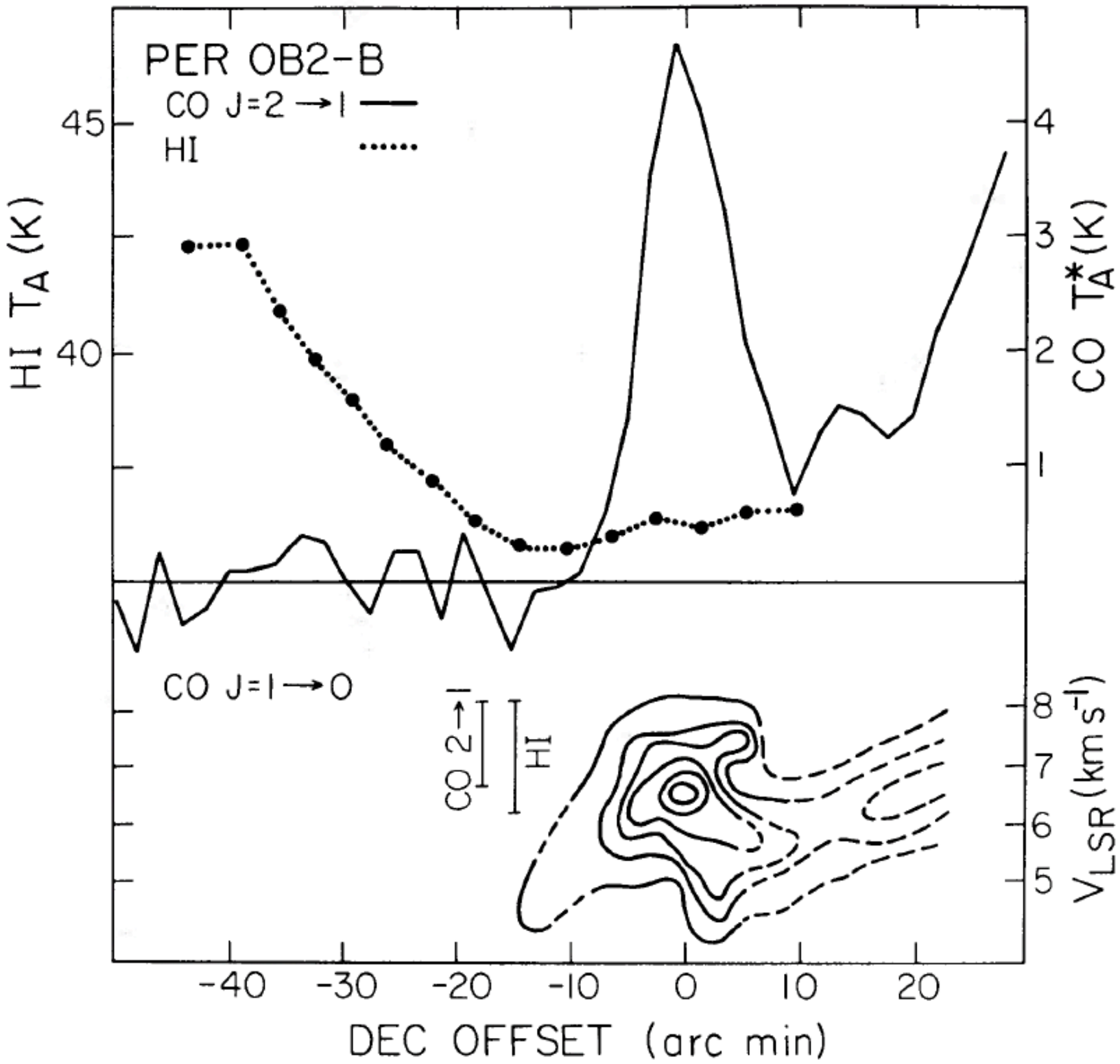
Orion-Eridanus superbubble

Soler, Bracco & Pon. ApJ (2018)



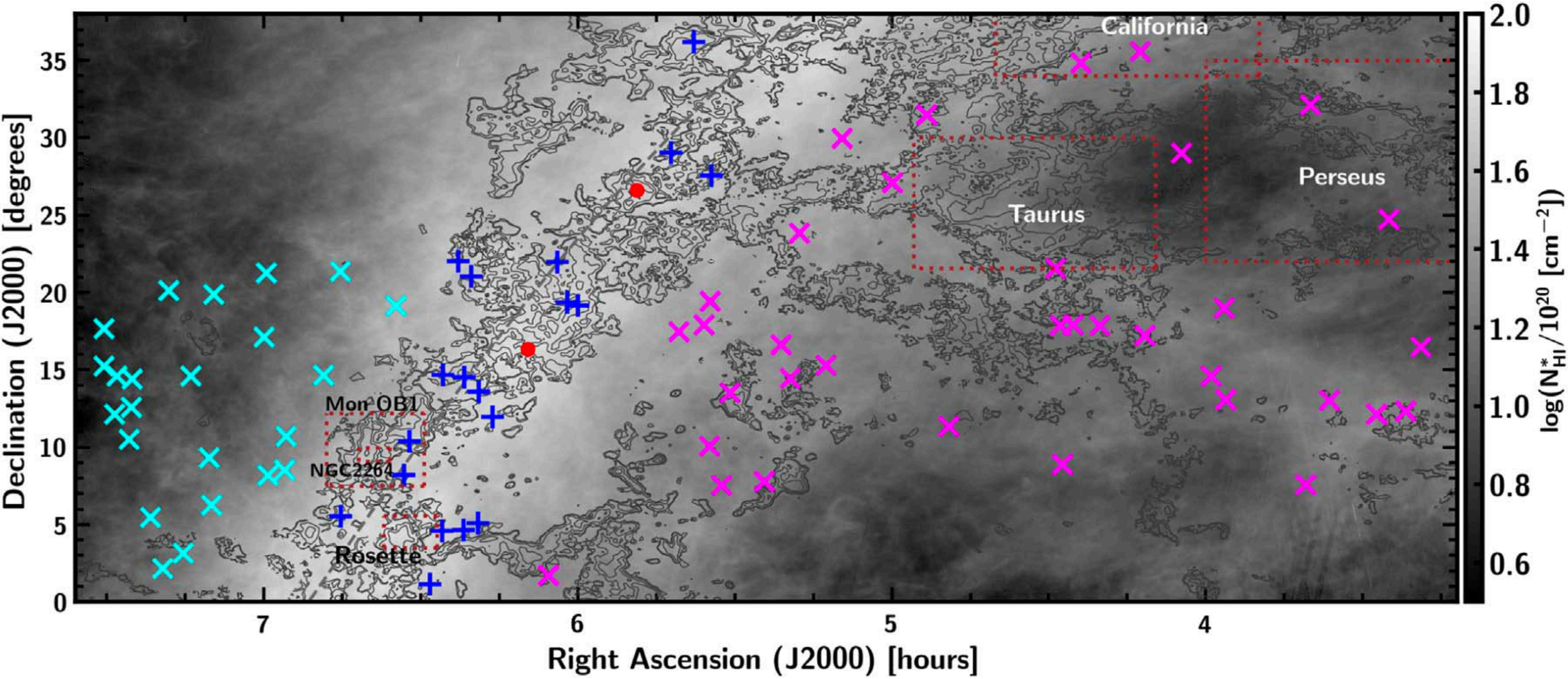
Warm neutral halos around molecular clouds

Wannier, Morris & Lichten (1983)



Atomic Hydrogen in the Taurus and Gemini Regions

Nguyen et al. (2019)



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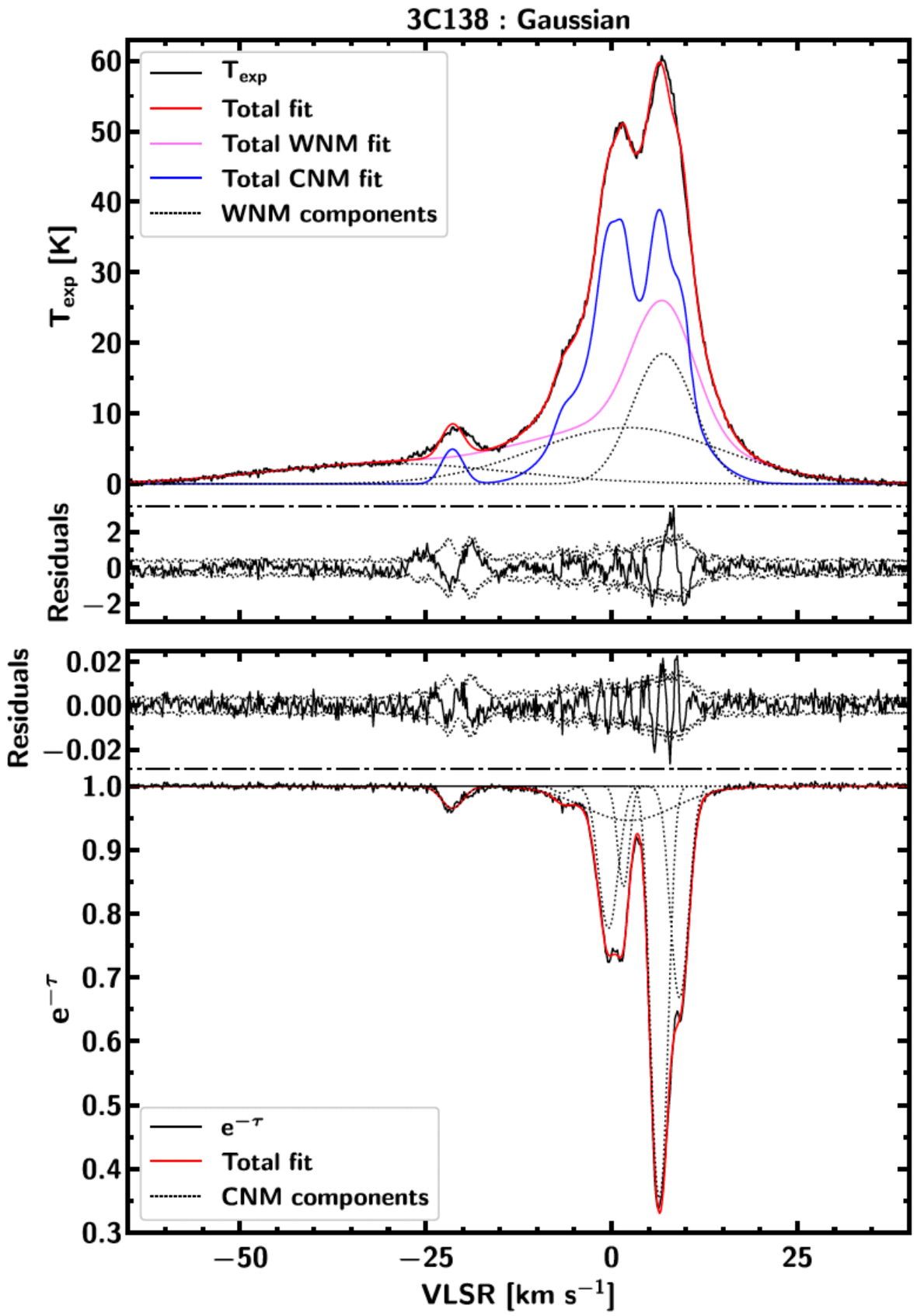
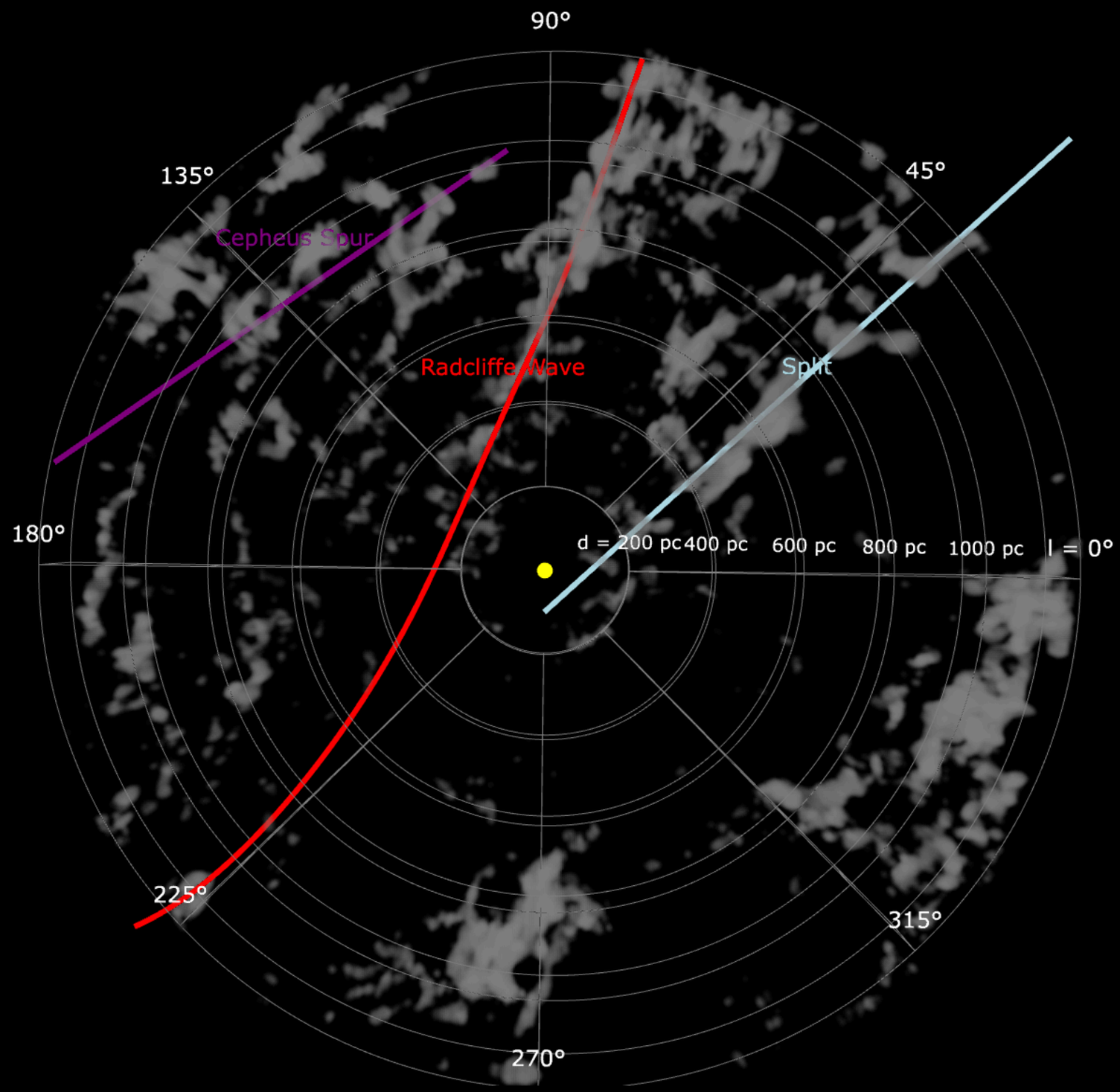


Galactic 3D dust map out to 1.25 kpc from the Sun

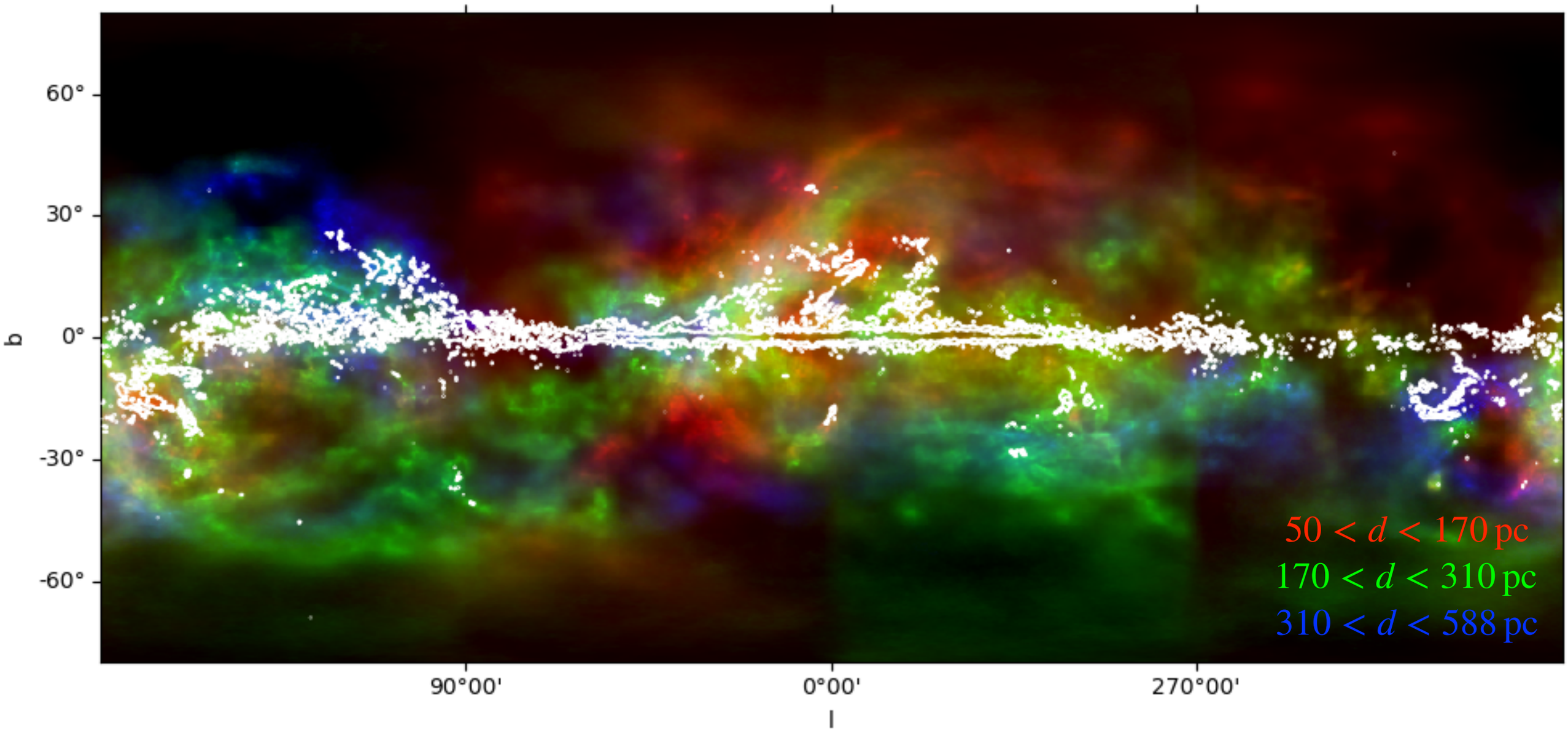
Edenhofer et al. (2024)



Juan D. Soler

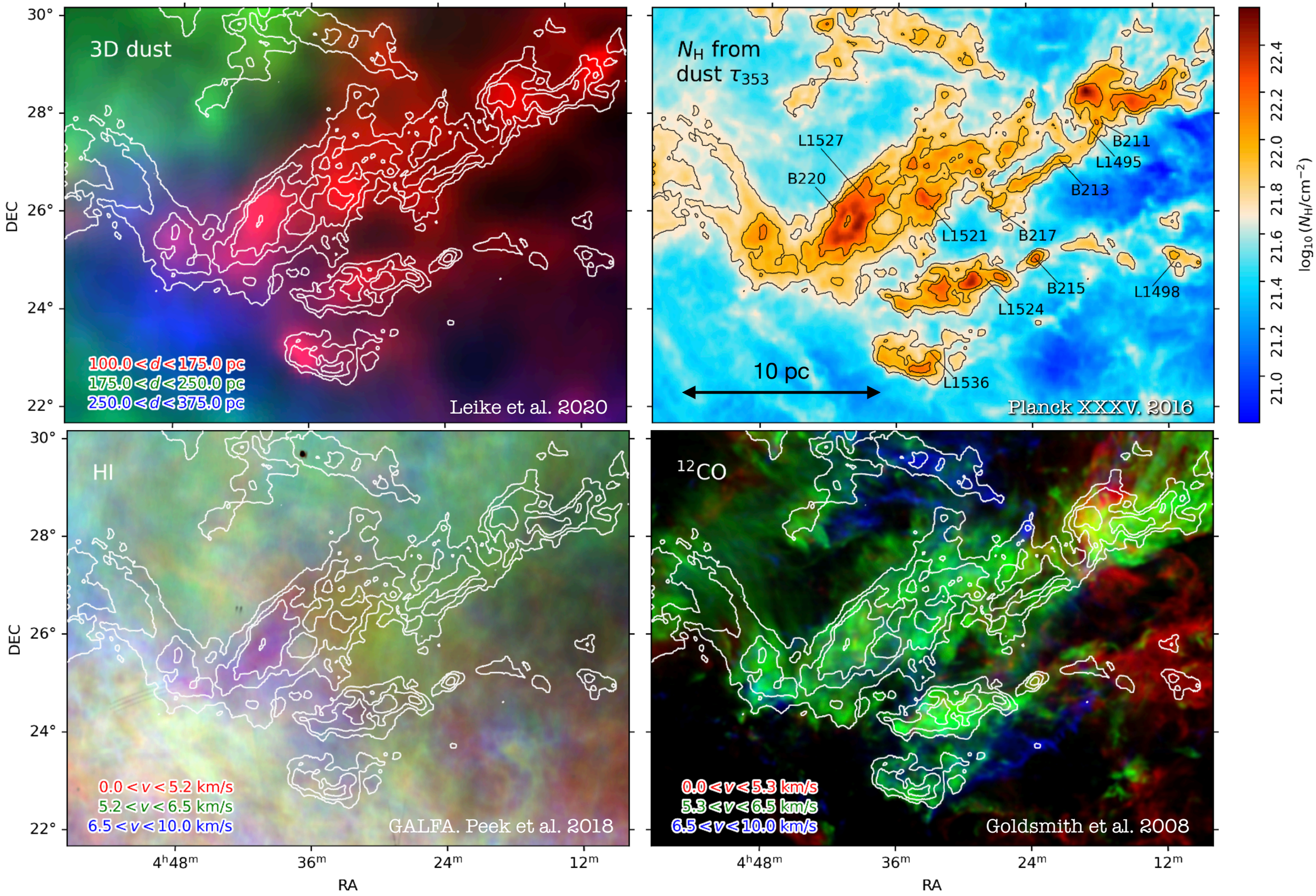
Local 3D dust density reconstruction

Leike et al. A&A (2020); Leike et al. A&A (2019);

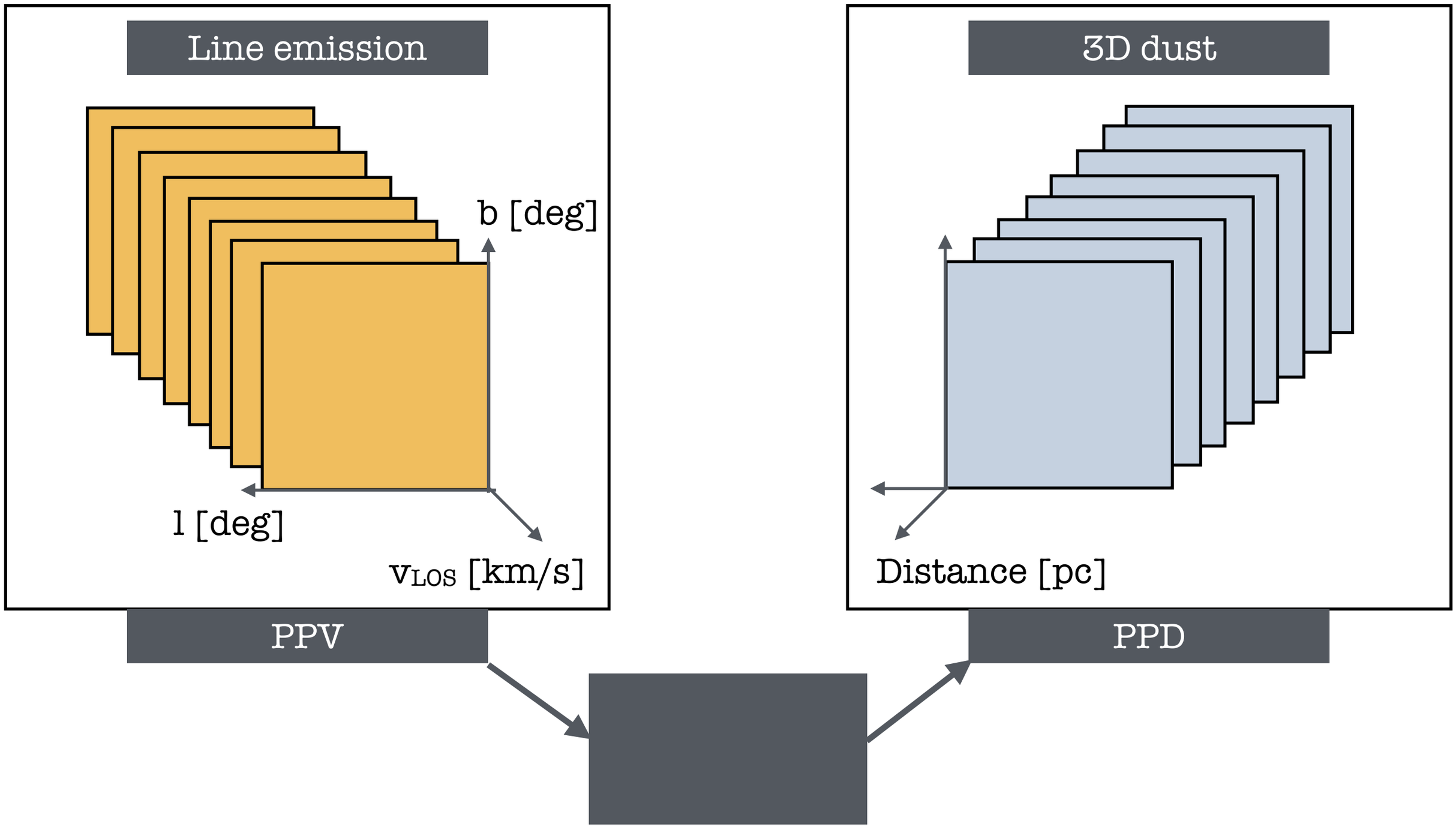


Pilot study: dynamics of the Taurus molecular cloud

Soler, Zucker, et al. A&A (2023)

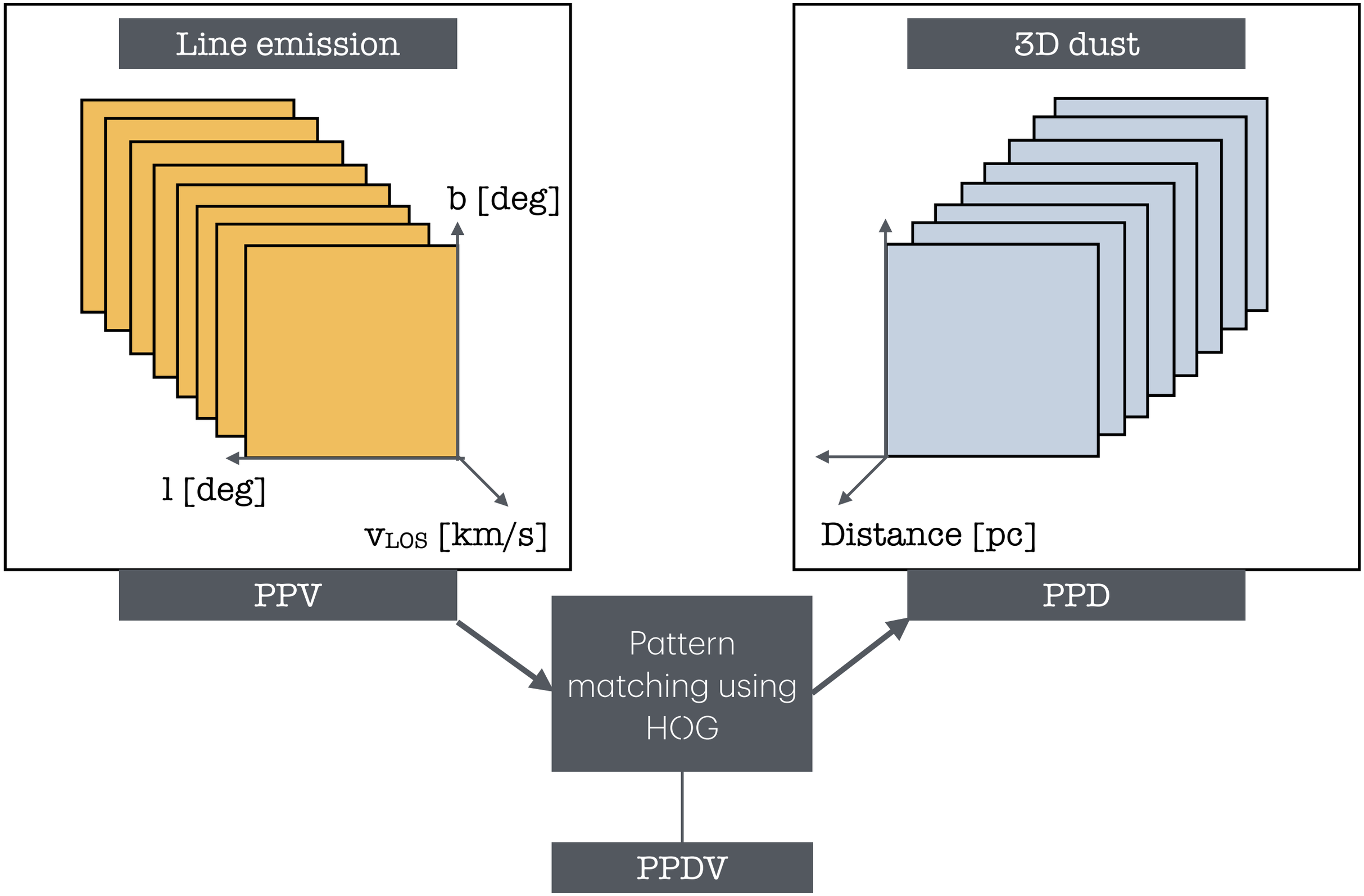


Knitting together line emission and 3D dust



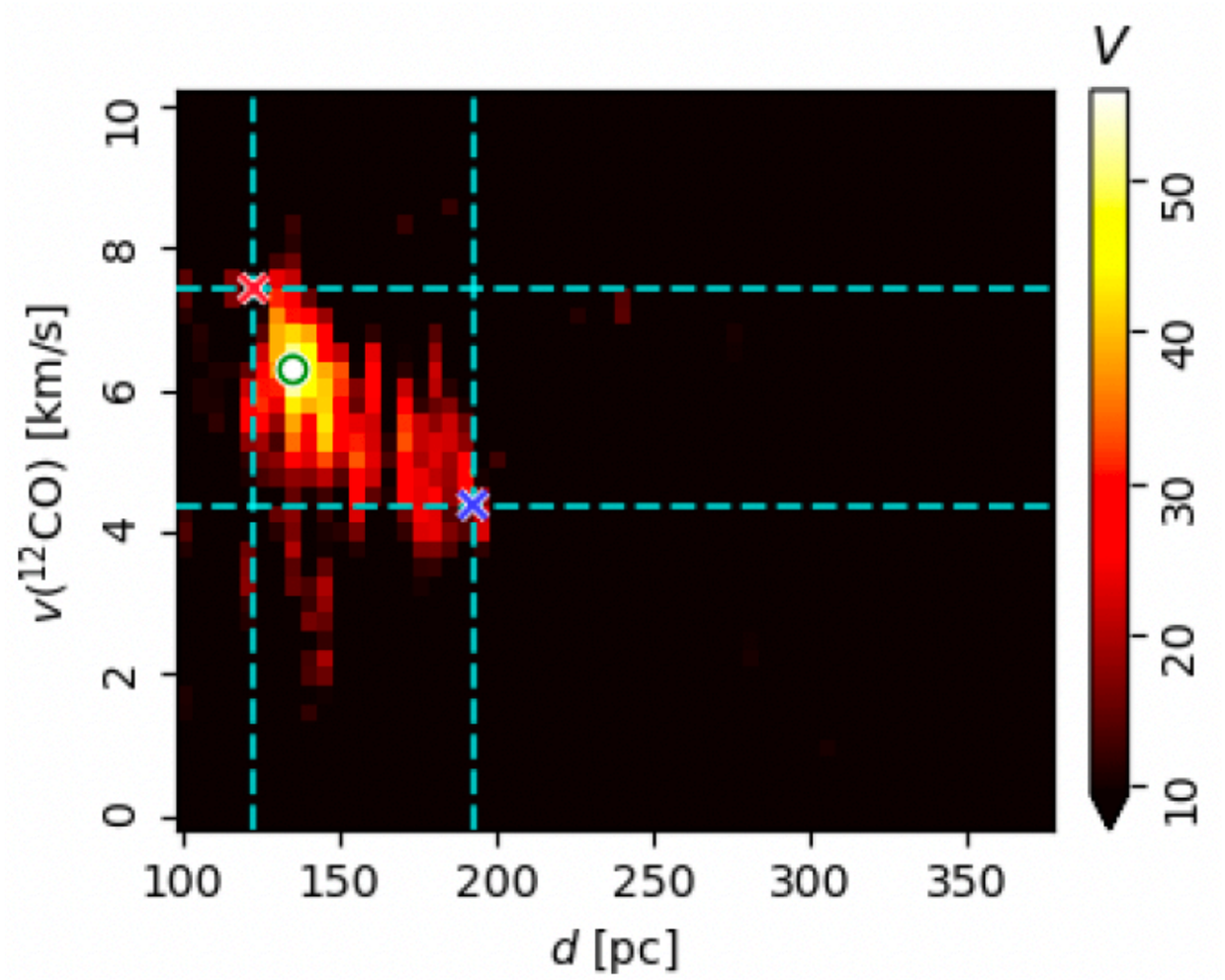
Knitting together 3D dust and line emission

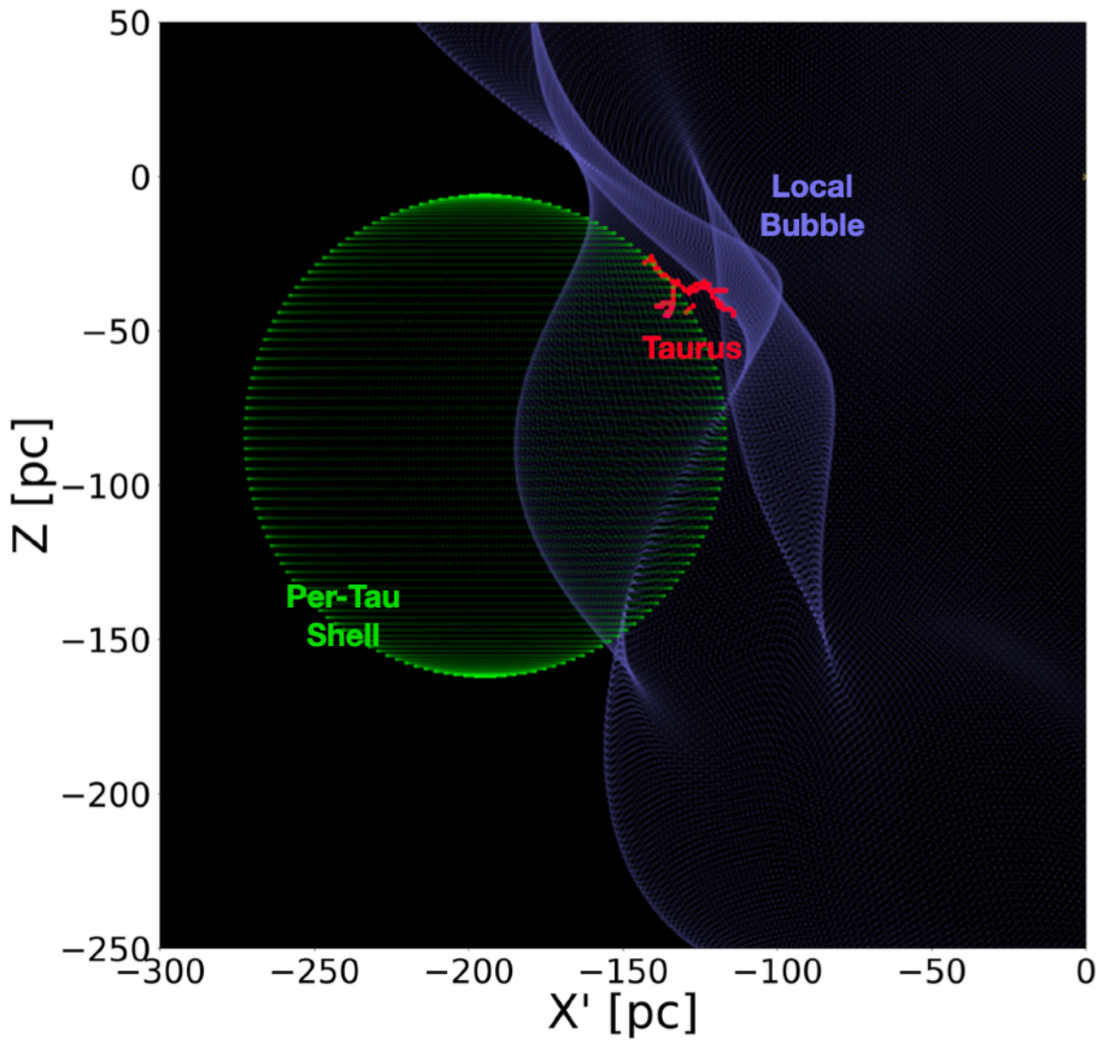
Histogram of oriented gradients (HOG; Soler et al. 2019)

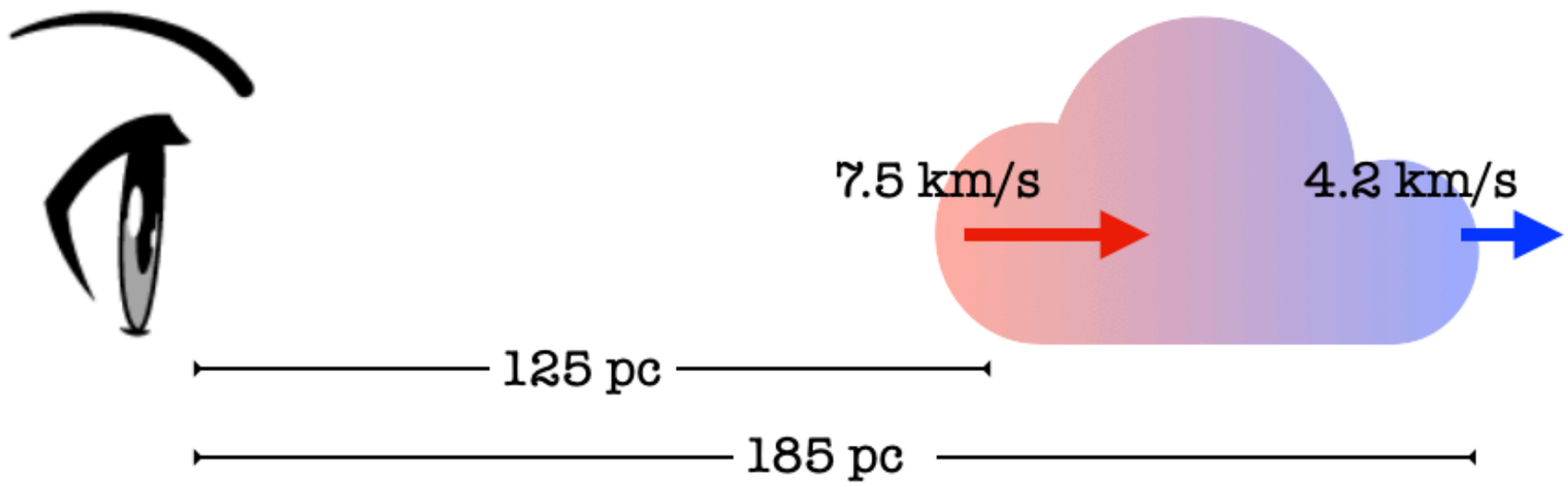


Pilot study: dynamics of the Taurus molecular cloud

Soler, Zucker, et al. A&A (2023)

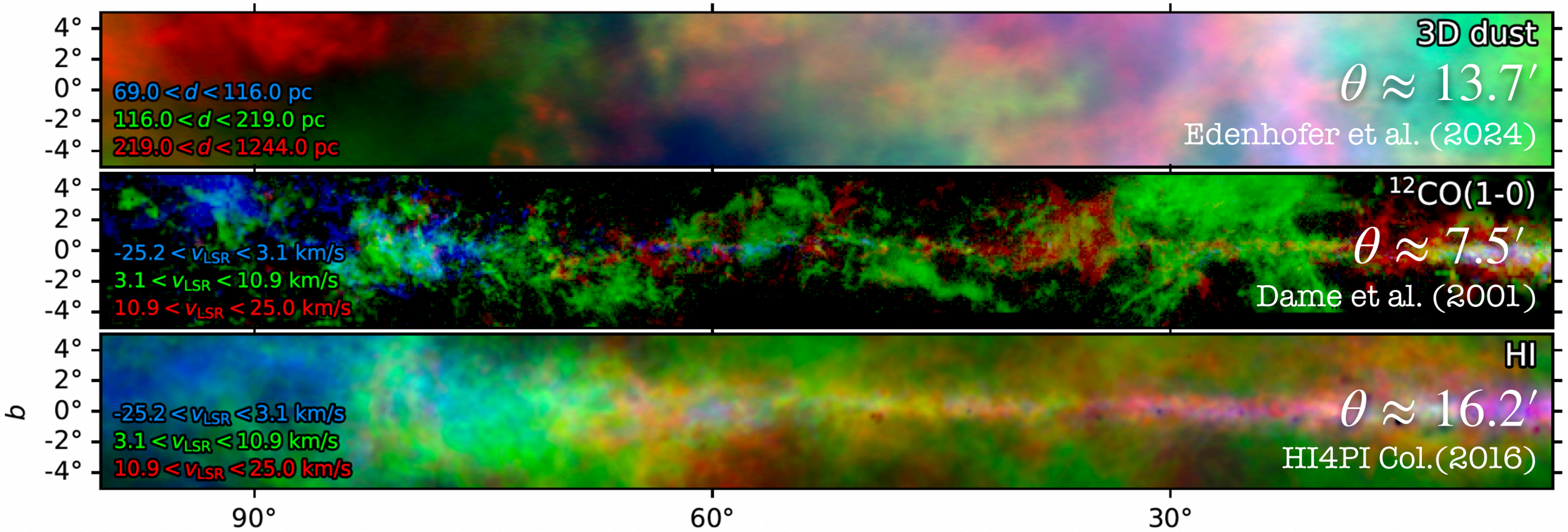






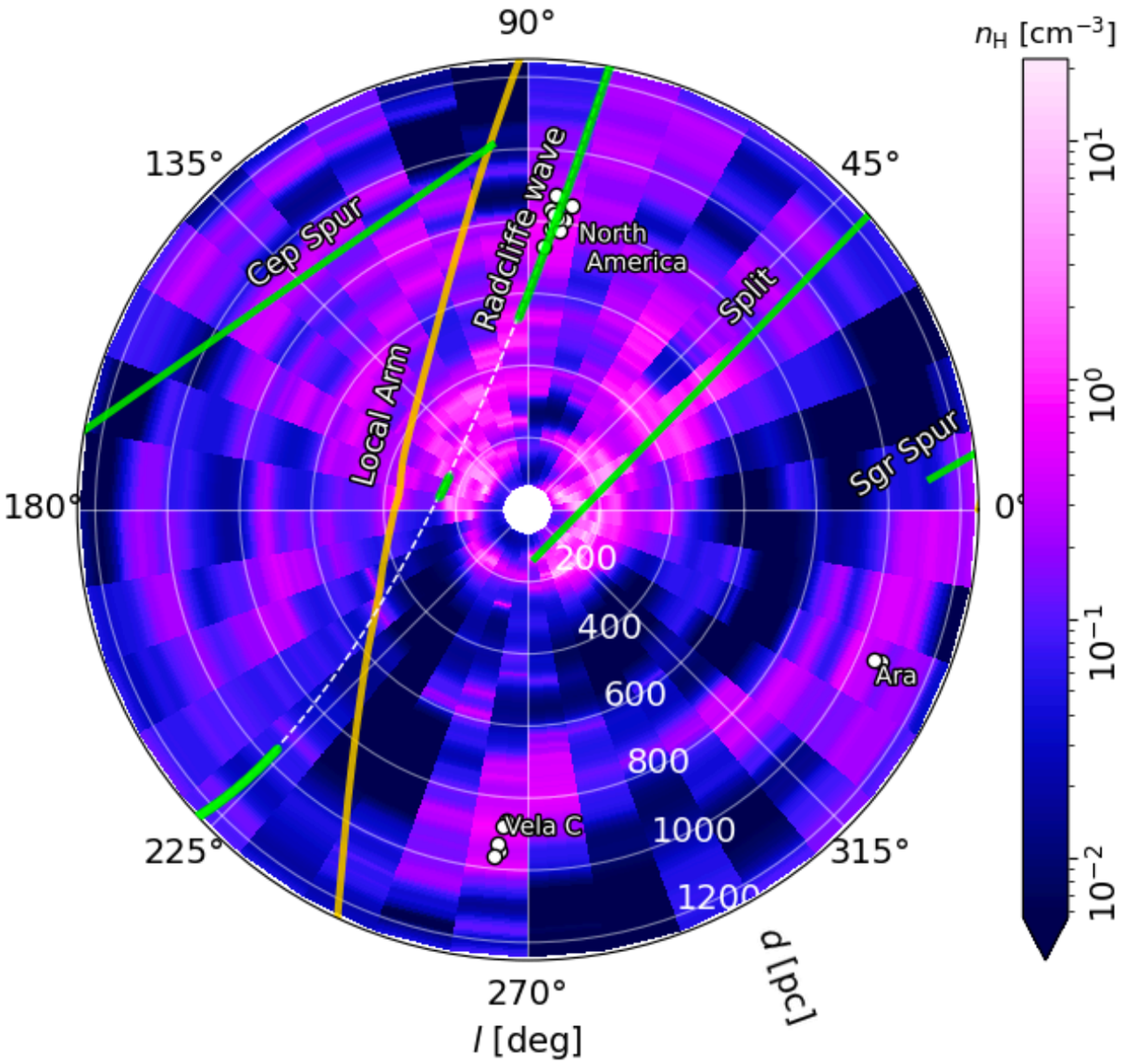
3D dust and line emission toward the Galactic plane

Soler, Molinari et al. A&A (2025)



Distribution of LOS motions in the local ISM

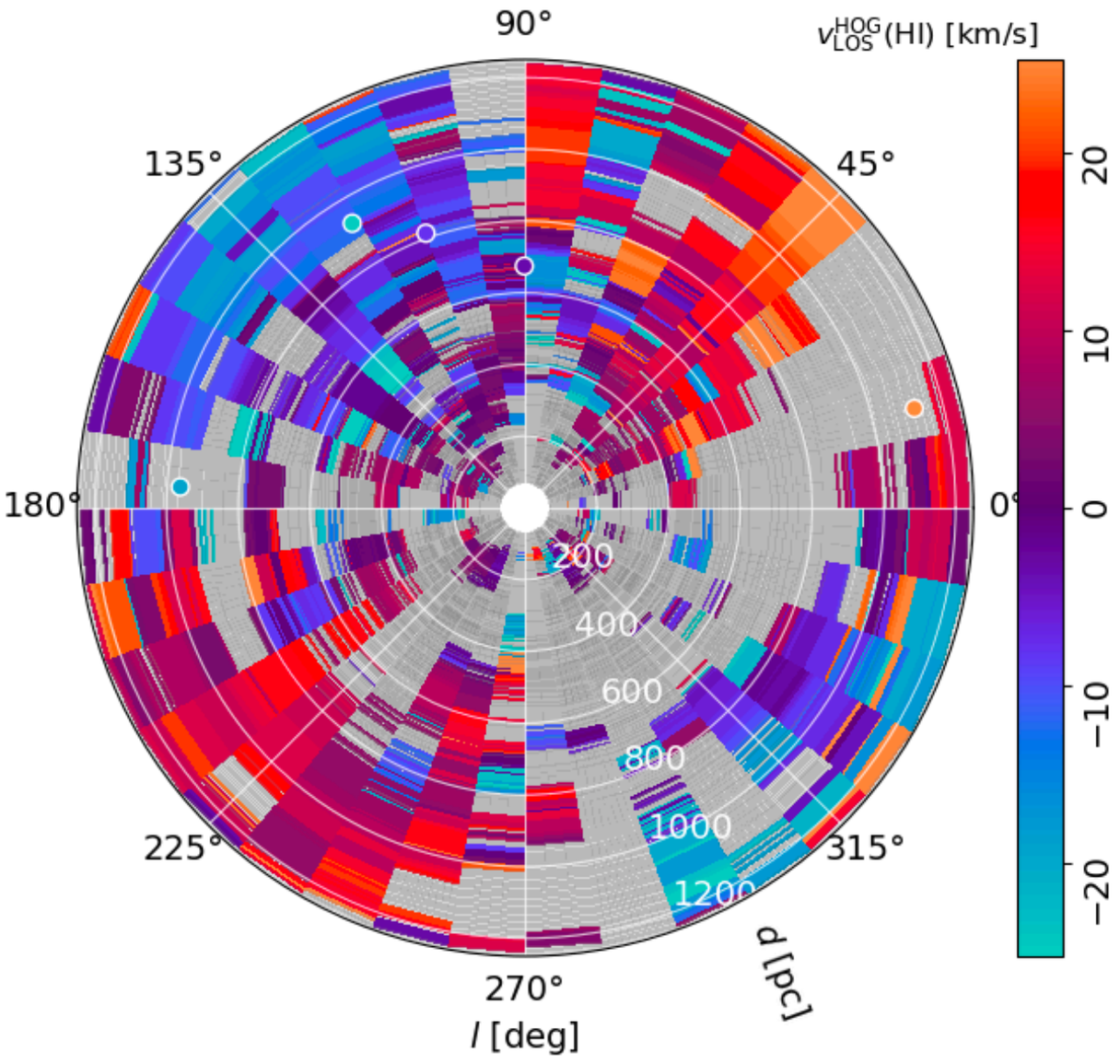
Soler, Molinari et al. A&A (2025)



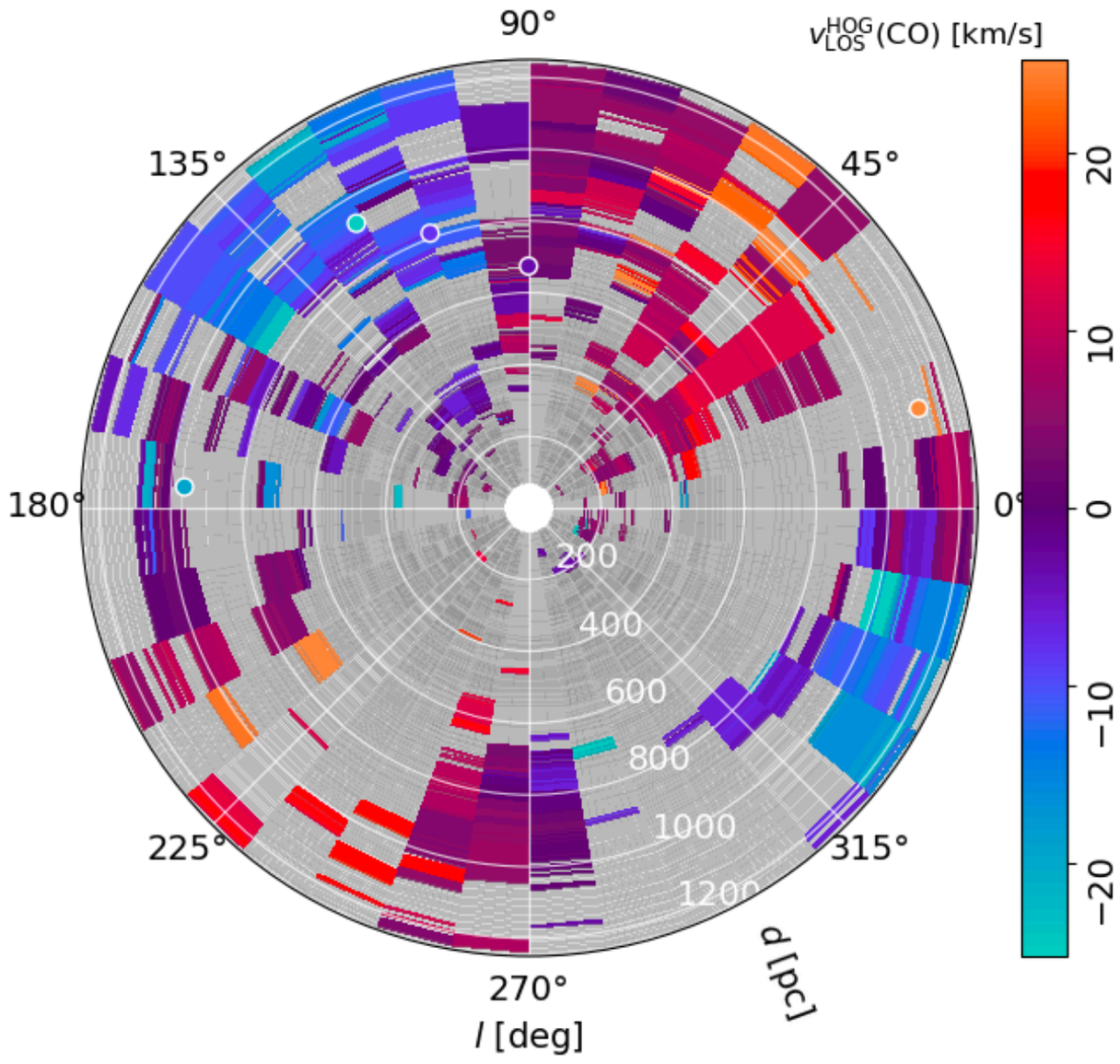
Nucleon density
derived from the Edenhofer et al. 2024
3D dust extinction models

Distribution of LOS motions in the local ISM

Soler, Molinari et al. A&A (2025)



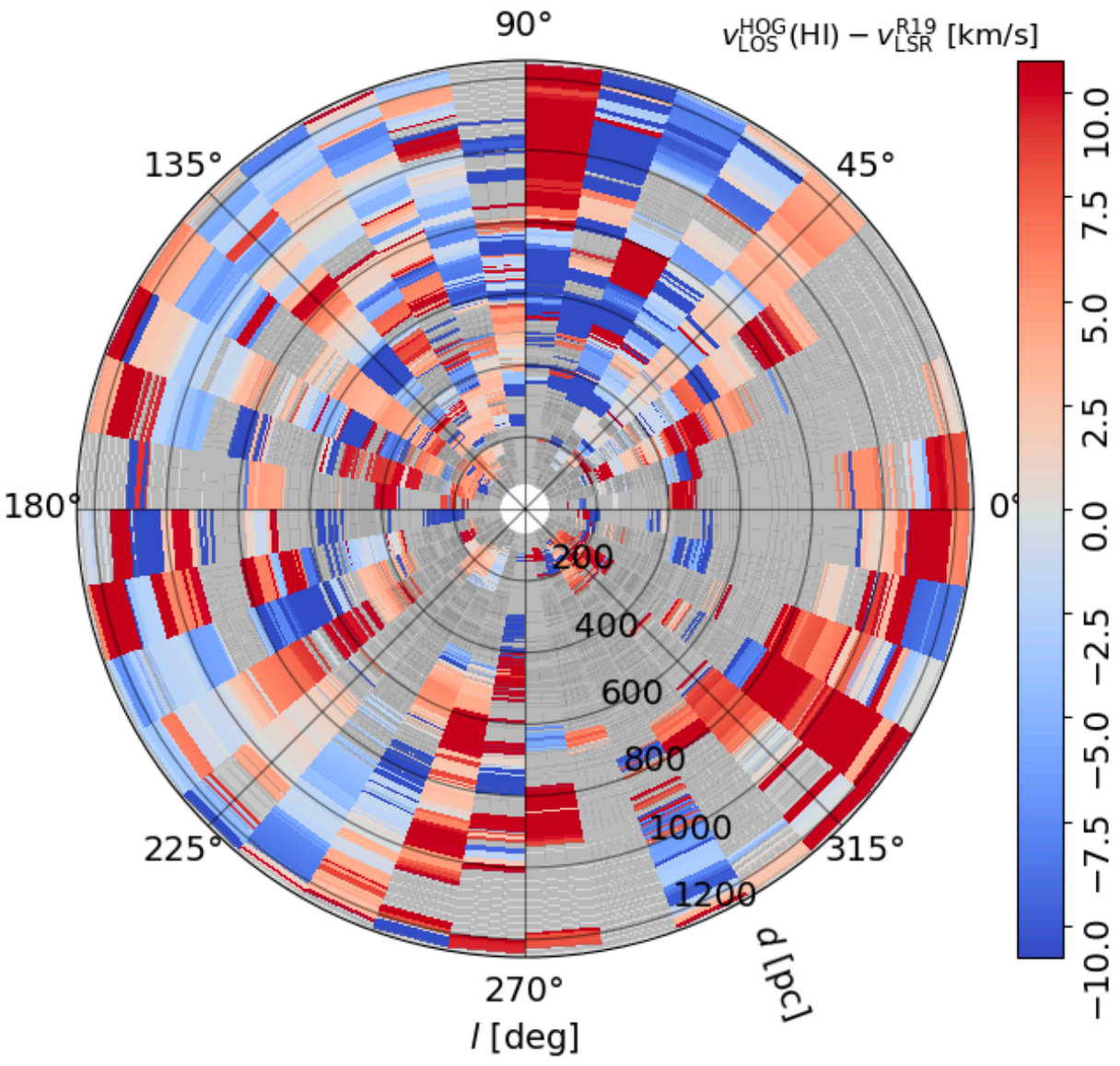
HI line-of-sight velocity
computed using the HI4PI survey,
3D dust and the HOG method



CO line-of-sight velocity
computed using the Dame et al. 2001 CO survey,
3D dust and the HOG method

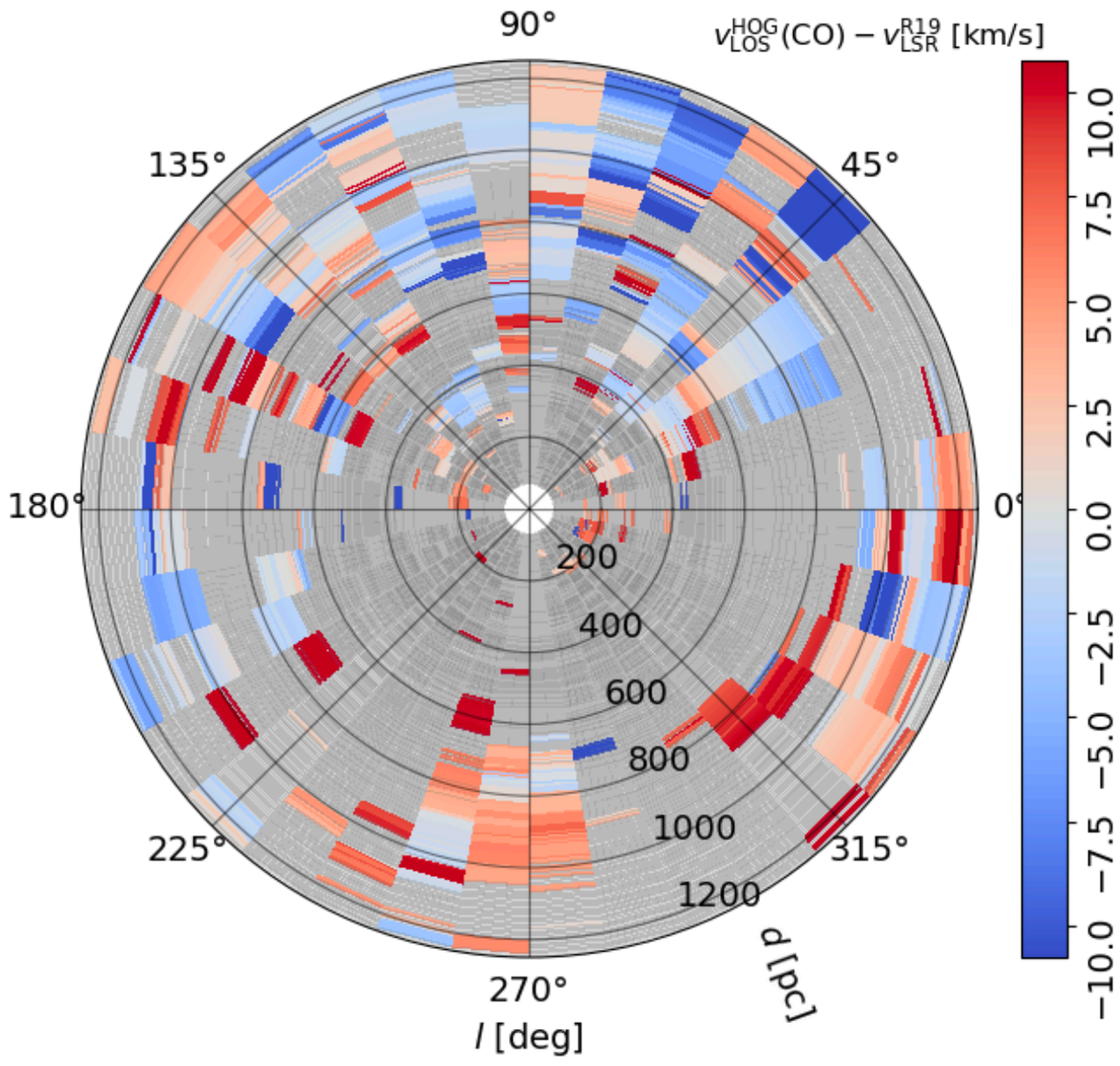
Departures from Galactic rotation in the local ISM

Soler, Molinari et al. A&A (2025)



HI drift motions
subtracting the Reid et al. 2019
Galactic rotation model

$$\sigma_{v_{\mathrm{LOS}}}^{\mathrm{HI}} = 10.8\,\mathrm{km\,s^{-1}}$$

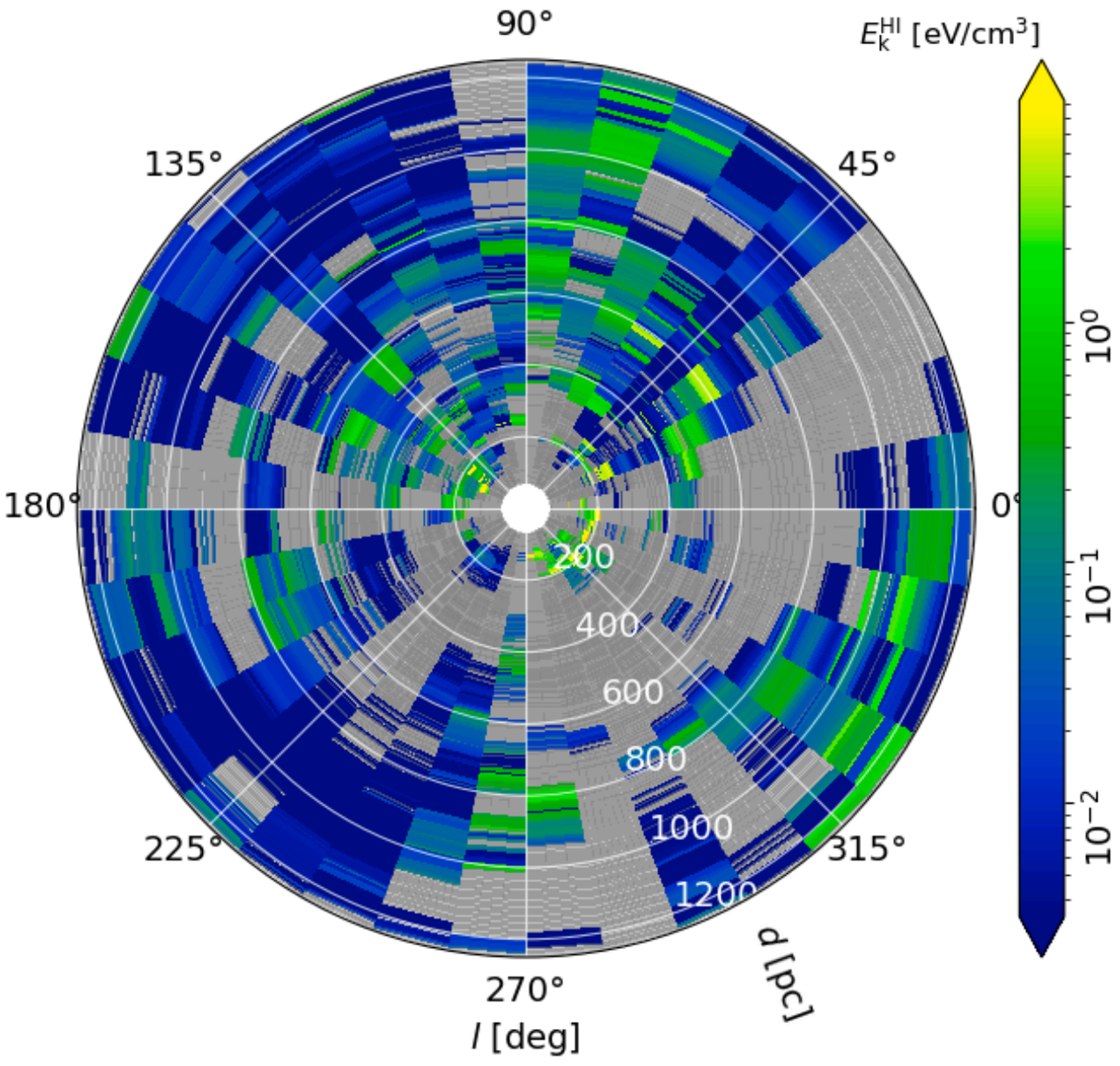


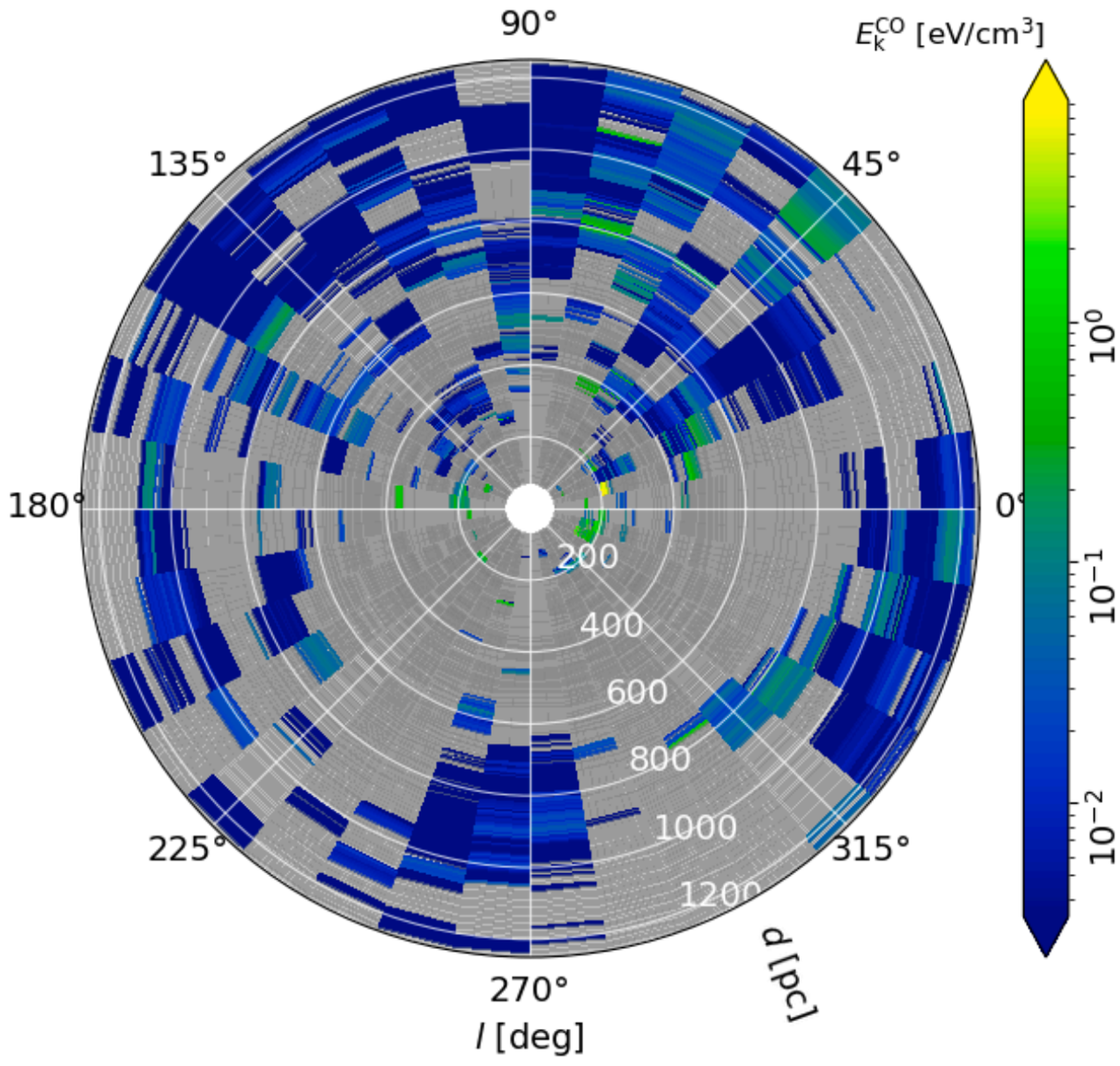
CO drift motions
subtracting the Reid et al. 2019
Galactic rotation model

$$\sigma_{v_{\mathrm{LOS}}}^{\mathrm{CO}} = 6.6\,\mathrm{km\,s^{-1}}$$

Kinetic energy density in the local ISM

Soler, Molinari et al. A&A (2025)



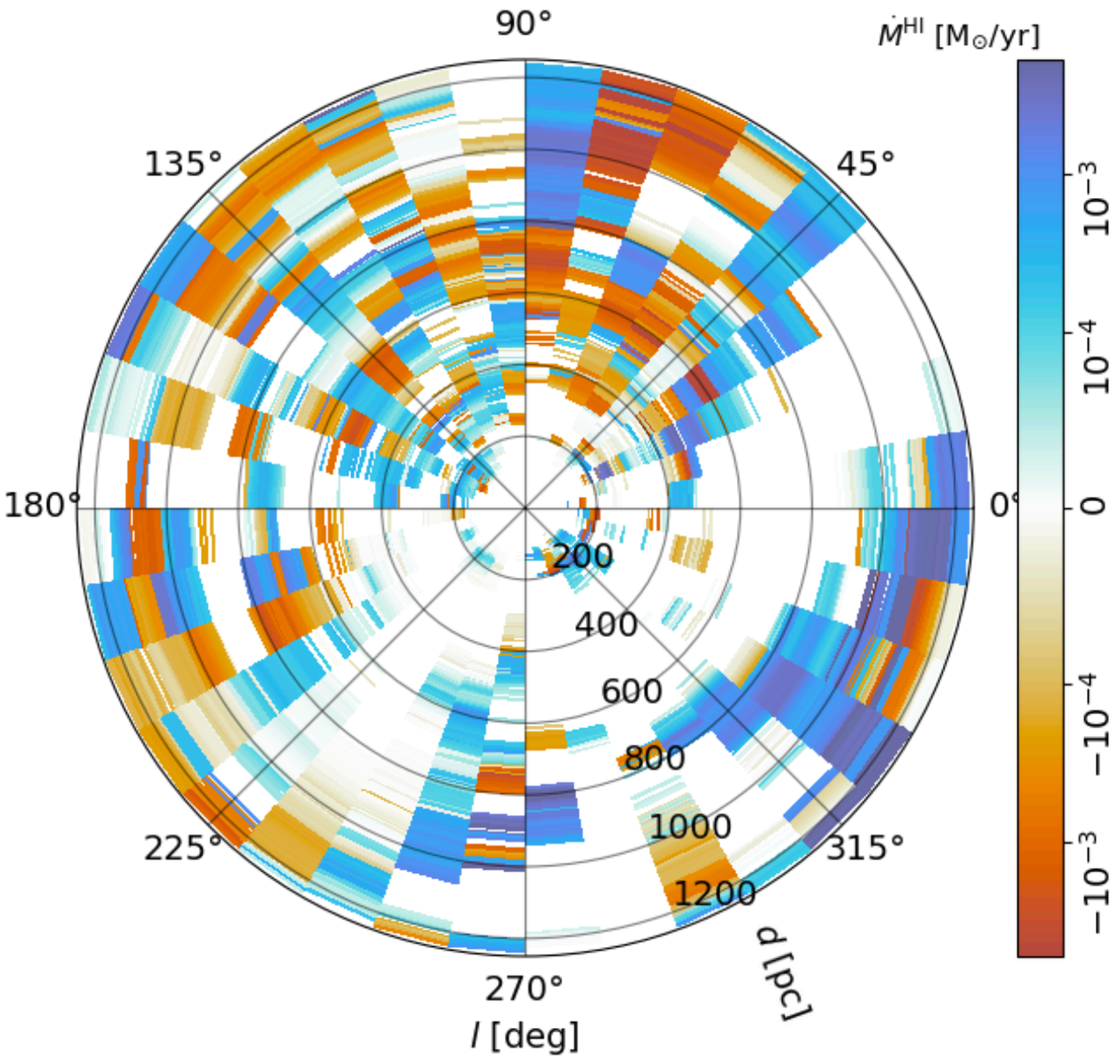


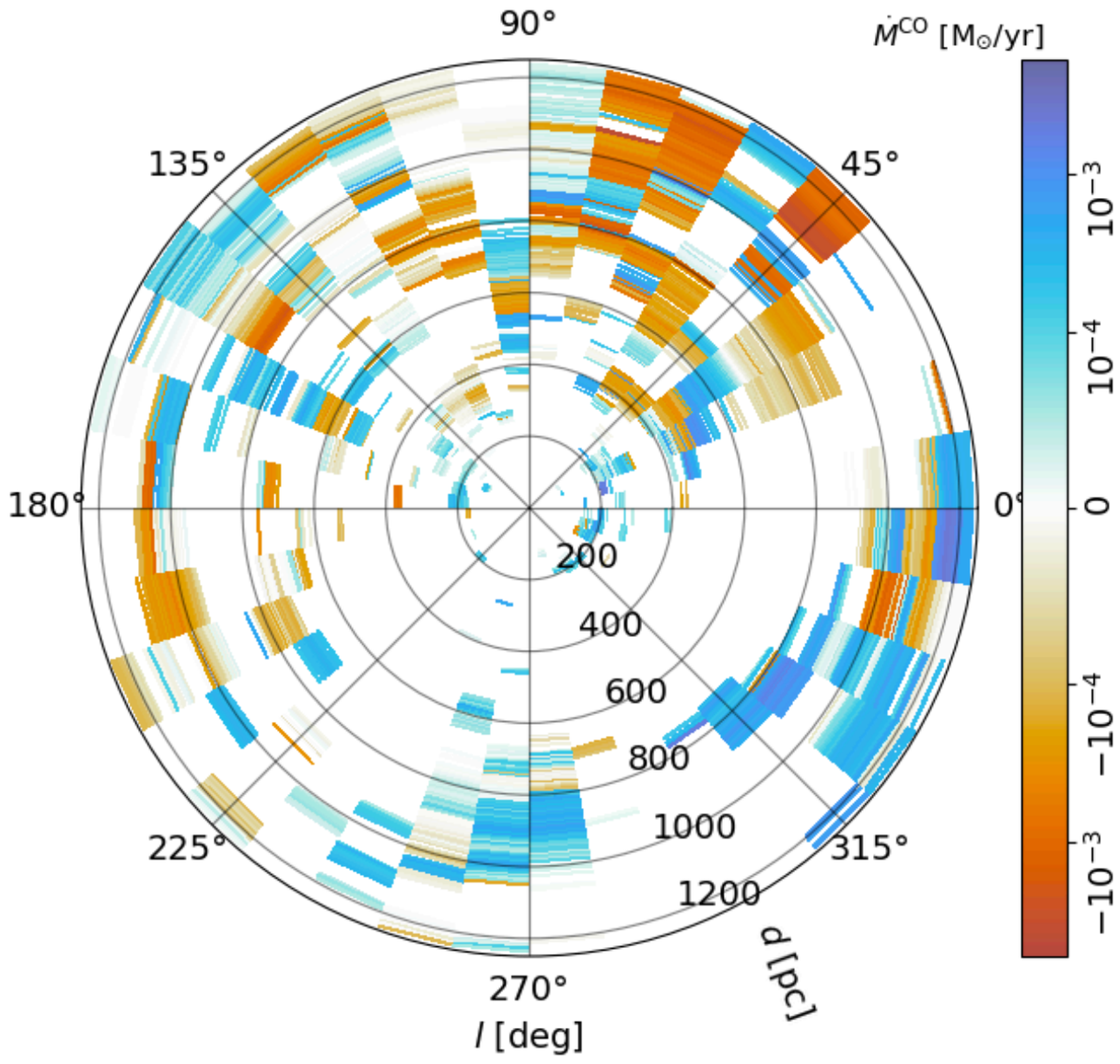
$\langle E_k \rangle (\mathrm{HI}) = 0.11\,\mathrm{eV\,cm^{-3}}$

$\langle E_k \rangle (\mathrm{CO}) = 0.04\,\mathrm{eV\,cm^{-3}}$

LOS mass flow rates in the local ISM

Soler, Molinari et al. A&A (2025)





$\sigma_{\dot{M}}(\mathrm{HI}) = 1.1 \times 10^{-3}\,\mathrm{M}_\odot\,\mathrm{yr}^{-1}$

$\sigma_{\dot{M}}(\mathrm{CO}) = 0.4 \times 10^{-3}\,\mathrm{M}_\odot\,\mathrm{yr}^{-1}$

How are star-forming clouds connected to the diffuse ISM?

- Are MC properties and star formation affected by:
  - density concentration (e.g., Zucker et al. 2023),
  - kinetic energy distribution (e.g. Soler et al. 2025),
  - or magnetic fields structure (e.g. Planck XXXV. 2016),

on scales of tens and hundreds of parsecs?