Interstellar gas and dust in the Taurus-Perseus-California clouds

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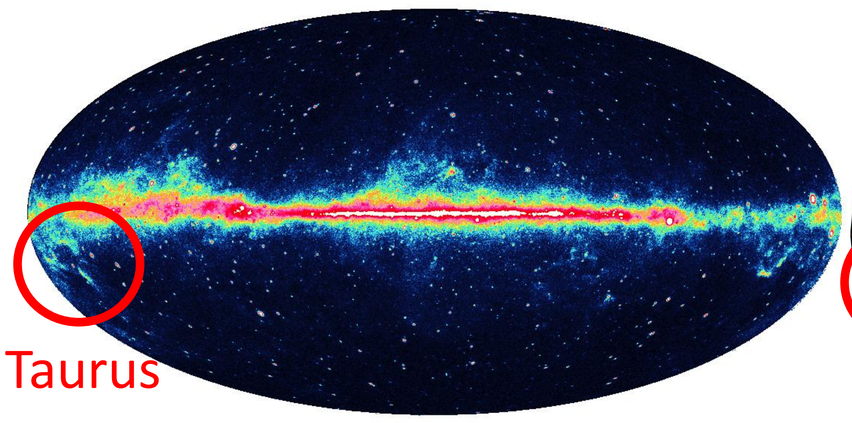
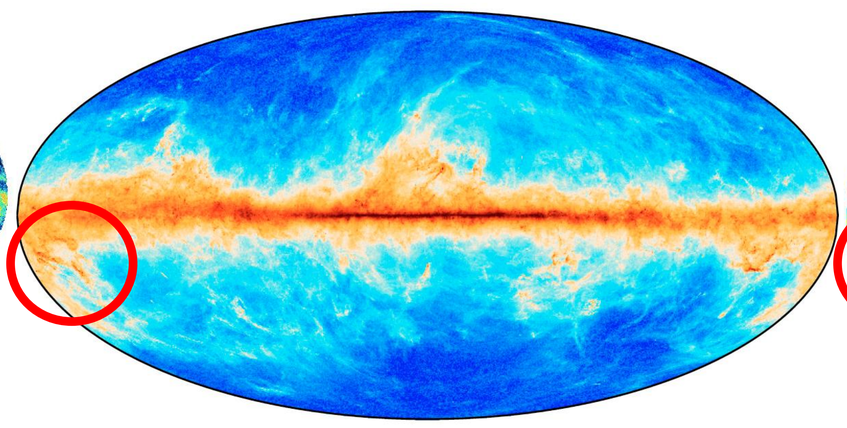
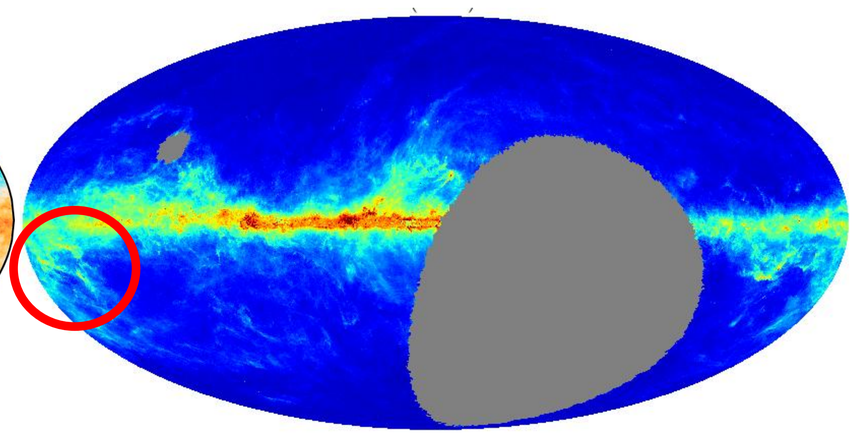
Cosmic-ray interaction with gas : γ-ray (Fermi[1])



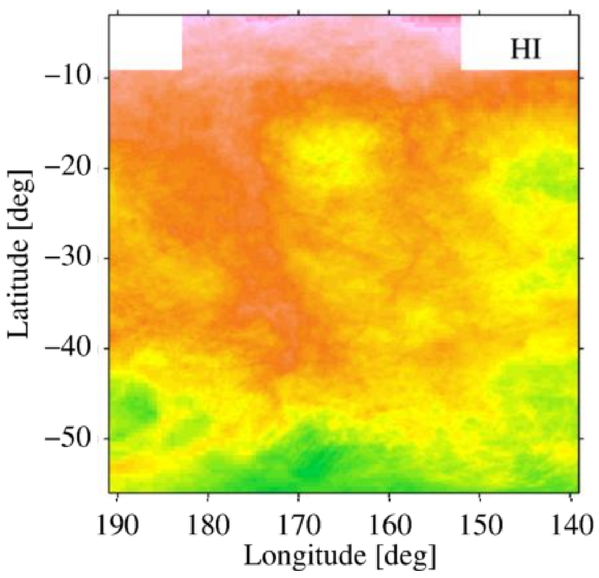
Dust optical depth at 353 GHz : τ_{353} (Planck [2])



Dust reddening : E(B-V) (Pan-STARRS1[3])



Tracing interstellar gas : γ-ray, τ_{353}, E(B-V) =



Atomic gas : HI
≈ 68% M_{tot}

Dominant form of gas in the ISM. Most likely HI spin temperature in Taurus cloud 400K

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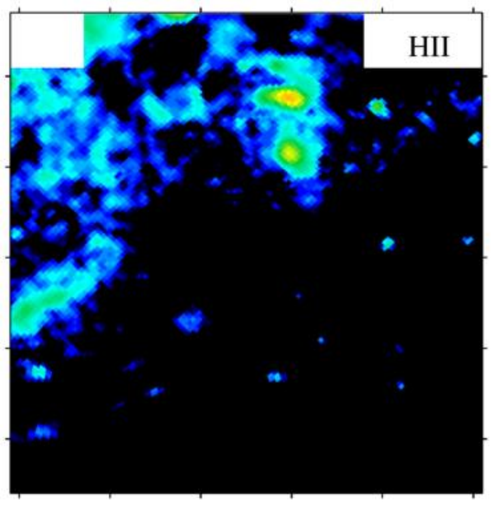
Ionized gas : HII
≈ 2% M_{tot}



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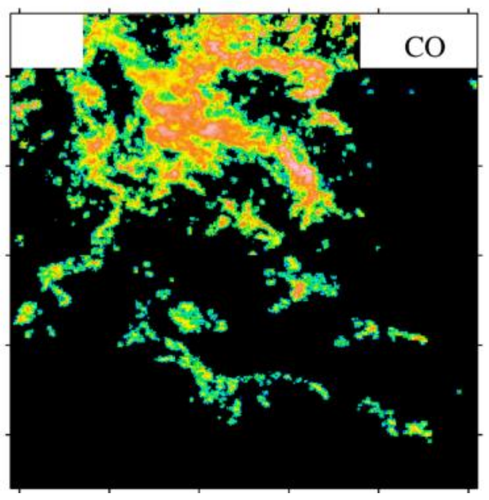
Molecular gas traced by ^{12}CO
≈ 12% M_{tot}

Conversion factor of CO-to-H_2 : X_{CO} = NH2/WCO evidence of decrease from diffuse to more compact clouds



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19.5 20 20.5 21 21.5 22

log(N_H) [cm^{-2}]

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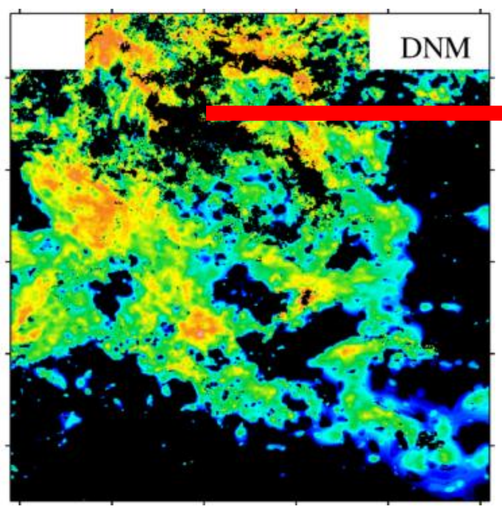
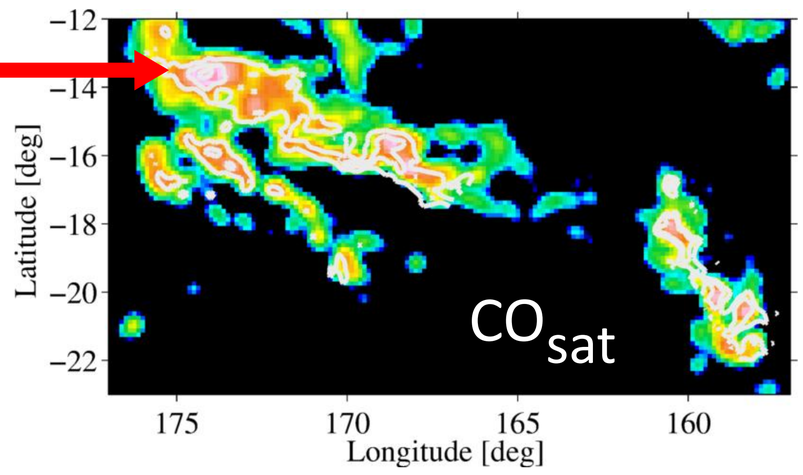
Dark Neutral Medium (DNM)
≈ 15% M_{tot}

Transition between the atomic and molecular phases : Optically thick HI and/or H2 not detected in CO

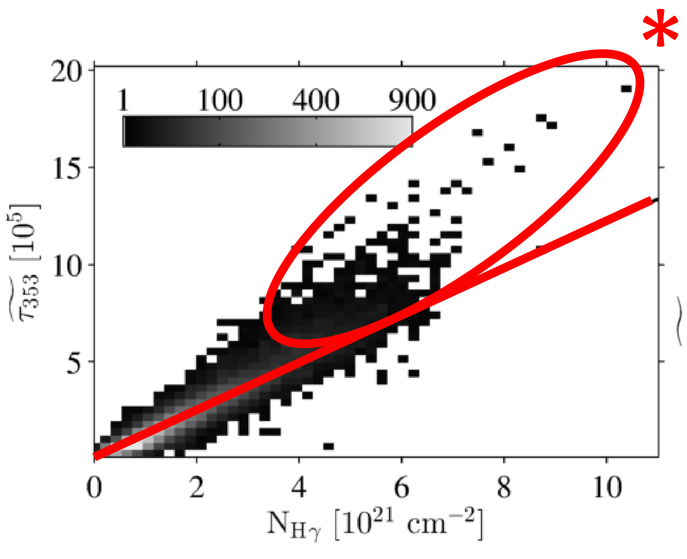


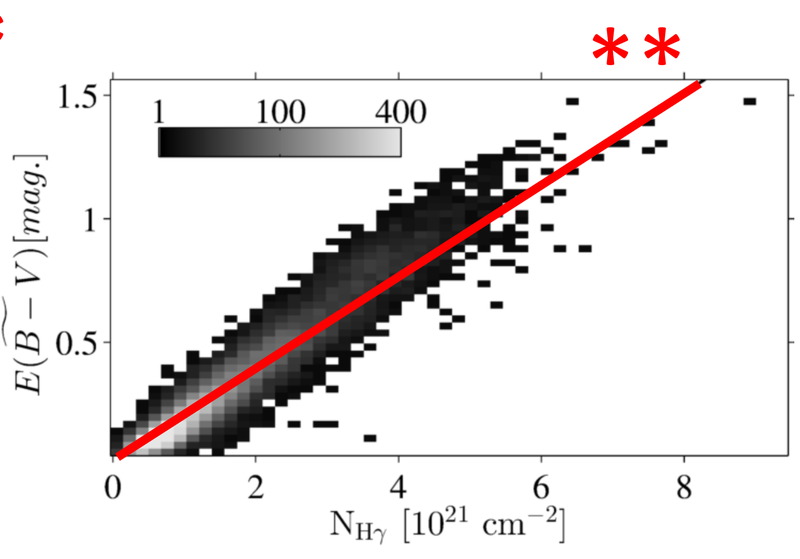


Saturated CO (CO_{sat}) :
≈ 3% M_{tot}

Molecular gas not traced by ^{12}CO (optical thickness of dense molecular gas)

Dust emission and extinction VS hydrogen column density derived from γ-ray :





* Evidence of changes in dust emission properties in dense clouds

** Better correlation of dust extinction with γ-rays

References

[1] fermi.gsfc.nasa.gov/ssc

[2] Planck Collaboration XI, 2014, A&A, 571, AA11

[3] Green G.M., Schlafly E.F., et al, 2015, ApJ , 810, 1

Contact

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