

The Interstellar Medium

- = the gas disk
- Includes ionized, neutral, molecular gas (H^+ , H^0 , H_2) = ($H\ II$, $H\ I$, H_2)

Molecular clouds [12.1,12.2]

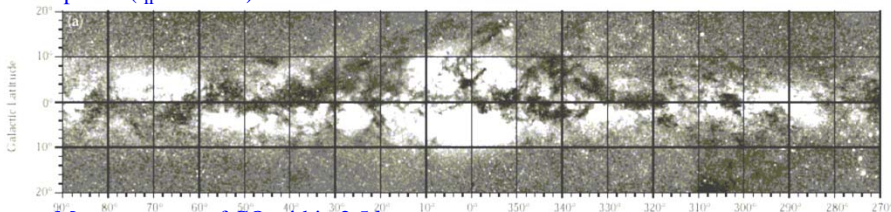
Fraction by mass	
H	73%
He	25%
Metals	2%

- Massive interstellar gas clouds
 - Up to $\sim 10^5 M_\odot$
 - 100's of LY in diameter.
- High density by interstellar medium standards
 - Up to 10^5 atoms per cm^3
- Shielded from UV radiation by dust, so atoms combined into molecules.
 - Mostly H_2 , but not easily detectable
 - Also H_2O , NH_3 , CO etc.
 - form emission lines in observable passbands
 - CO is usual tracer.
 - mm wave observations (\rightarrow low angular resolution)
- All stars form in molecular clouds.

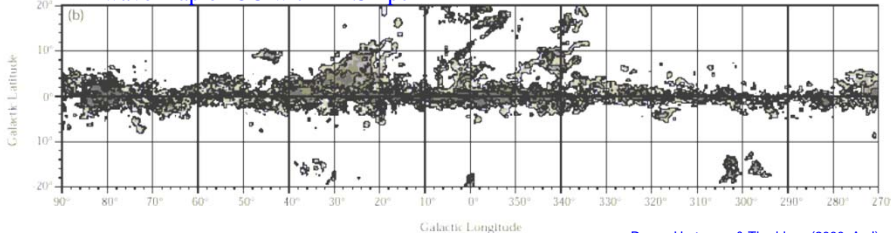
CO map of Milky Way

Molecular clouds are in the disk and are associated with dust.

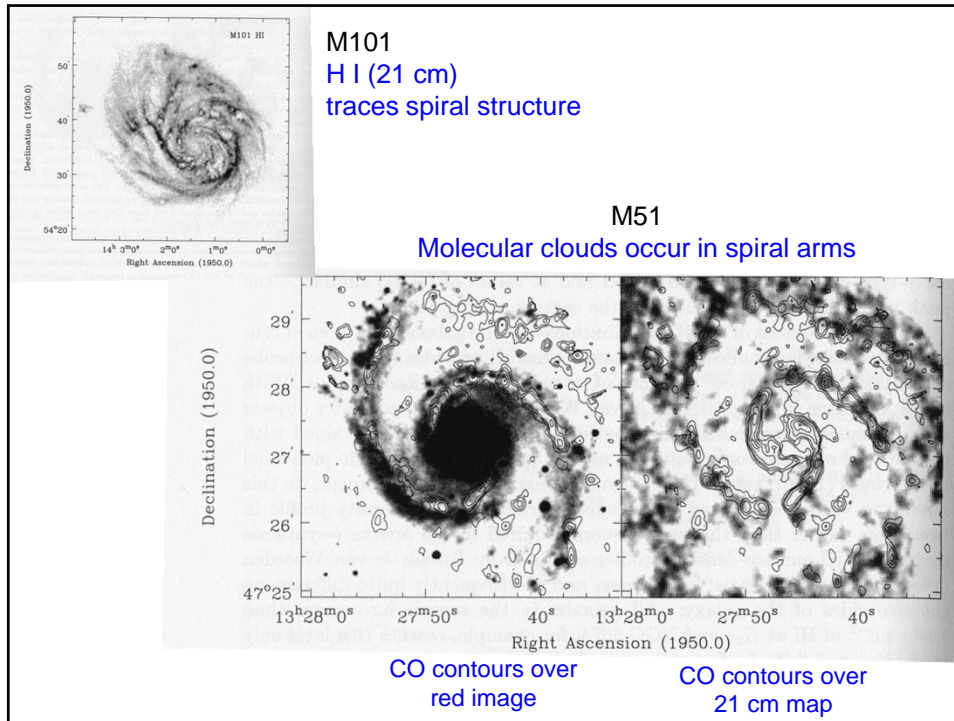
Optical ($I_H = \pm 90^\circ$)



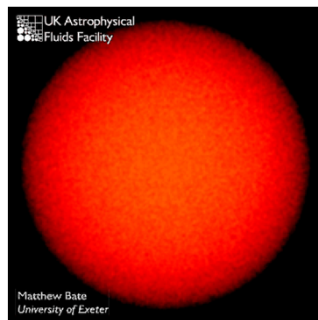
Mm-wave map of CO within 2.5 kpc



Dame, Hartmann & Thaddeus (2000, ApJ)



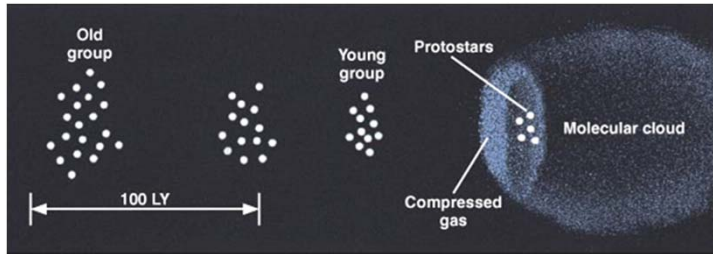
Computer simulation of Star Formation in a Molecular Cloud



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- Collapse and fragmentation of 50 solar-mass cloud.
 - Initially 1 light-year in diameter.

Star formation thought to propagate in wave through dense molecular clouds



- Photons from very luminous O stars heat and blow away surrounding gas.
- So slightly older clusters no longer shrouded by dusty gas
- Compression of gas further inside cloud causes inward wave of star formation (“triggered” star formation).

H II (= H⁺) Regions

