

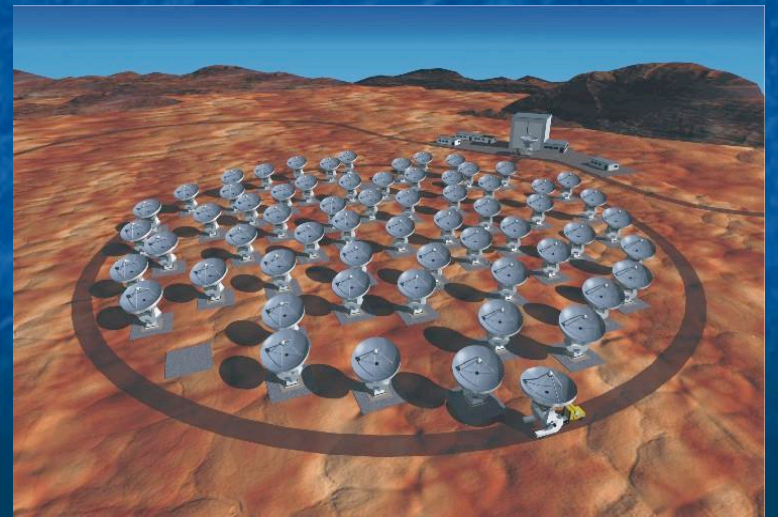
Constant SFR/M in Dense Molecular Gas in the Milky Way

Yancy L. Shirley



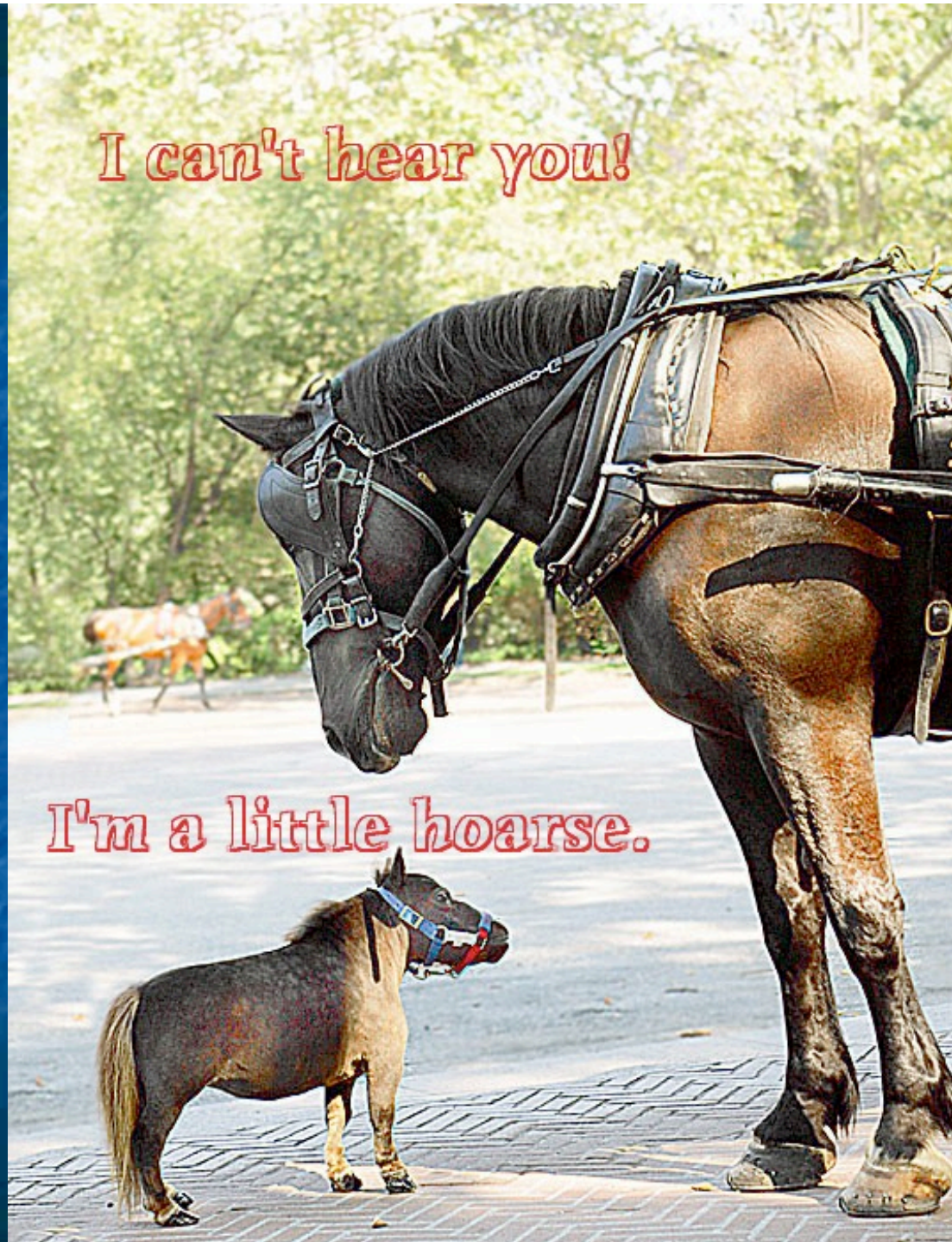
Star Formation and Dust in the Galactic Plane
NASA / JPL-Caltech / S. Carey (SSC)

Spitzer Space Telescope • IRAC • MIPS
ssc2006-20a



I can't hear you!

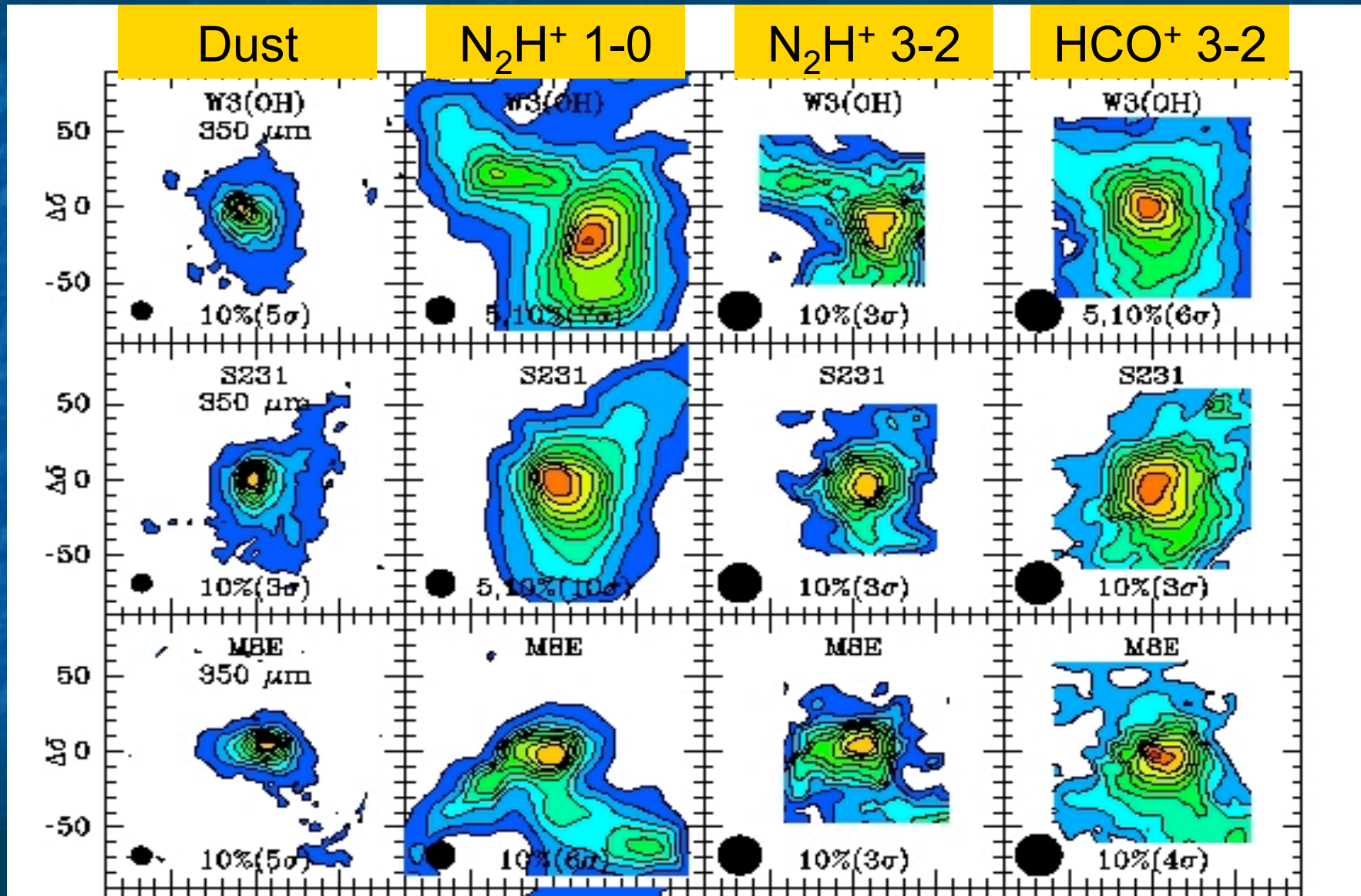
I'm a little hoarse.



Galactic SFR/M

- Star formation in the Milky Way is resolved but incompletely observed
- Single dish observations indicate that L/M is \sim constant for massive clumps
- This may indicate that SFR/M in dense molecular gas is also constant
- Critically analyze the observational evidence for constant SFR/M

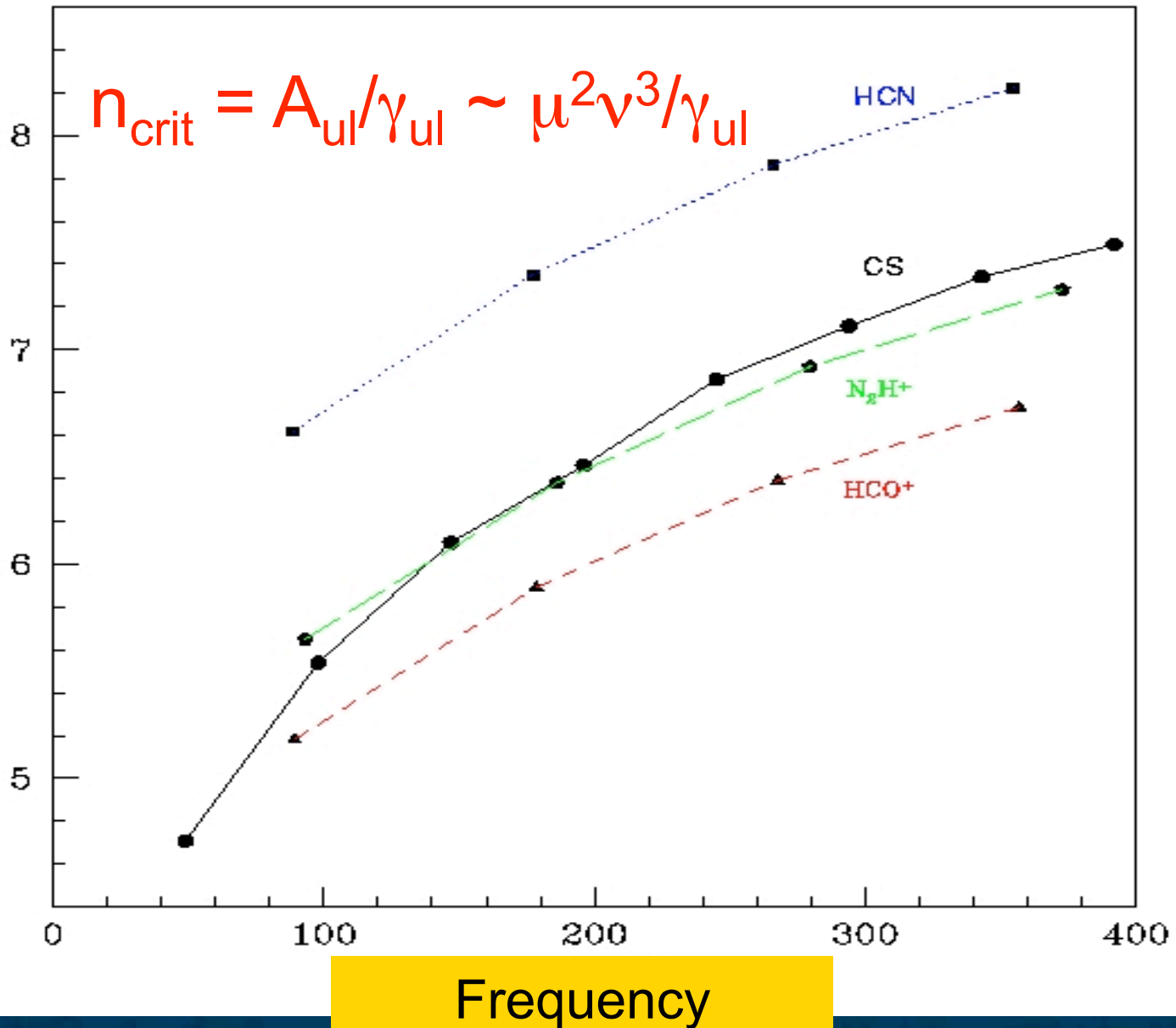
Galactic Surveys: High Mass Clumps



Reiter, Shirley, Brogan, Wootten, & Tatematsu, in prep.

Critical Density

Critical Density



Virial Mass

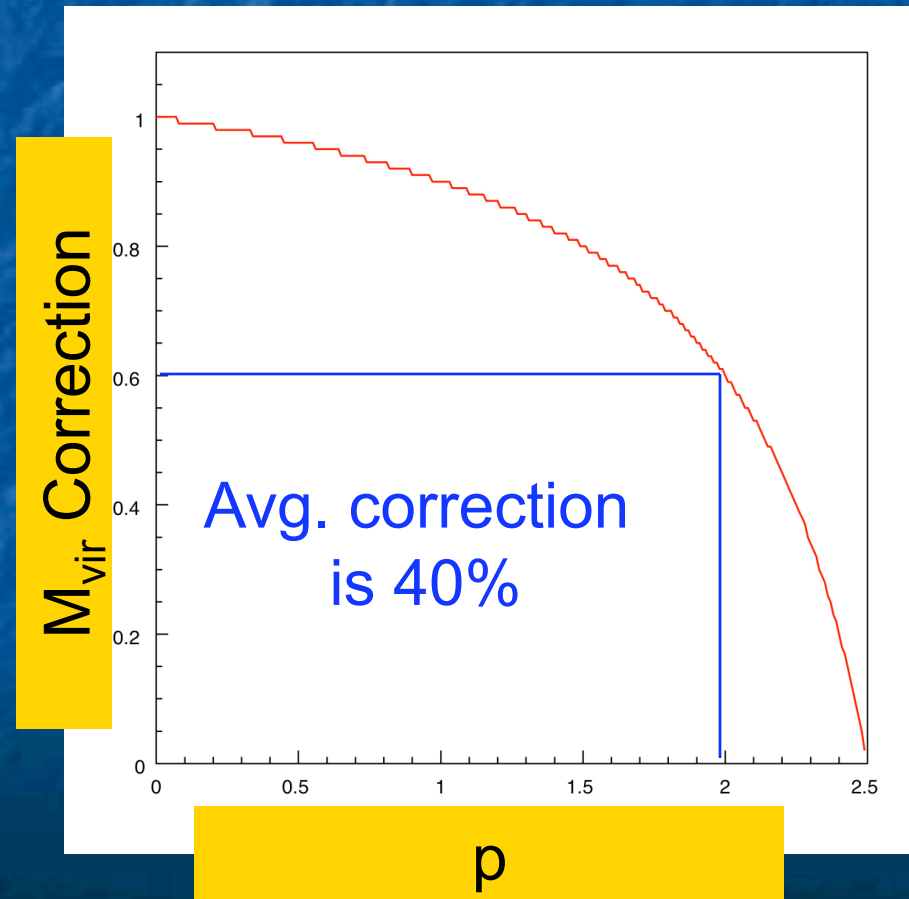
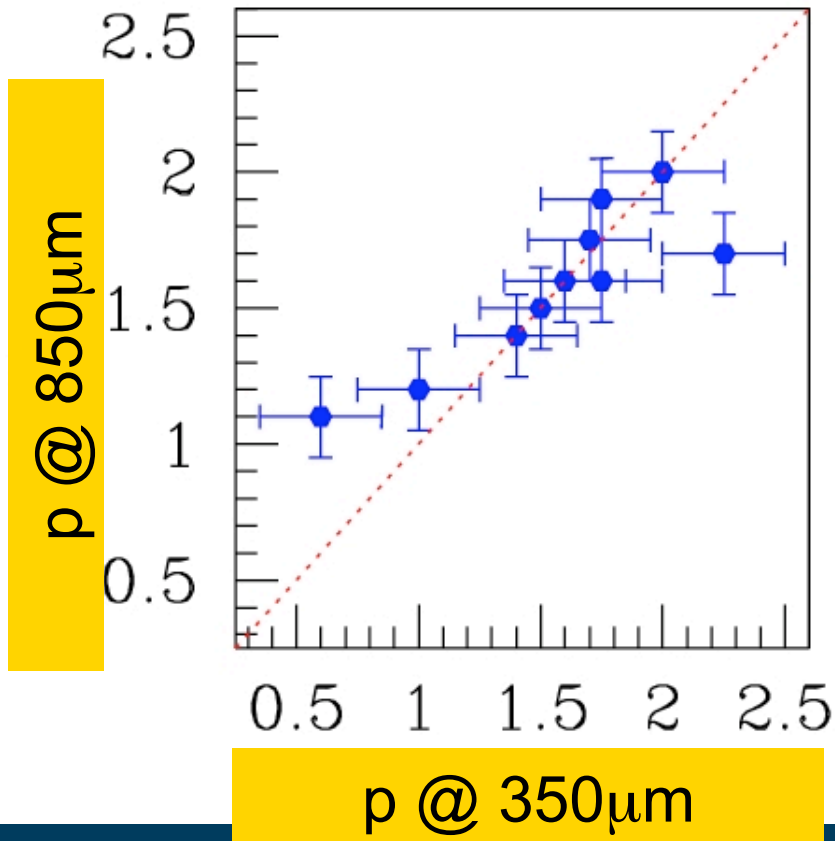
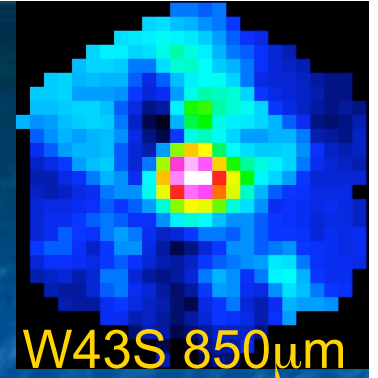
$$M_{\text{vir}} = \frac{5R}{G} \frac{\Delta v^2}{8 \ln 2} \frac{a_{\text{density}}}{a_{\text{shape}}}$$

Bertoldi & McKee 1992

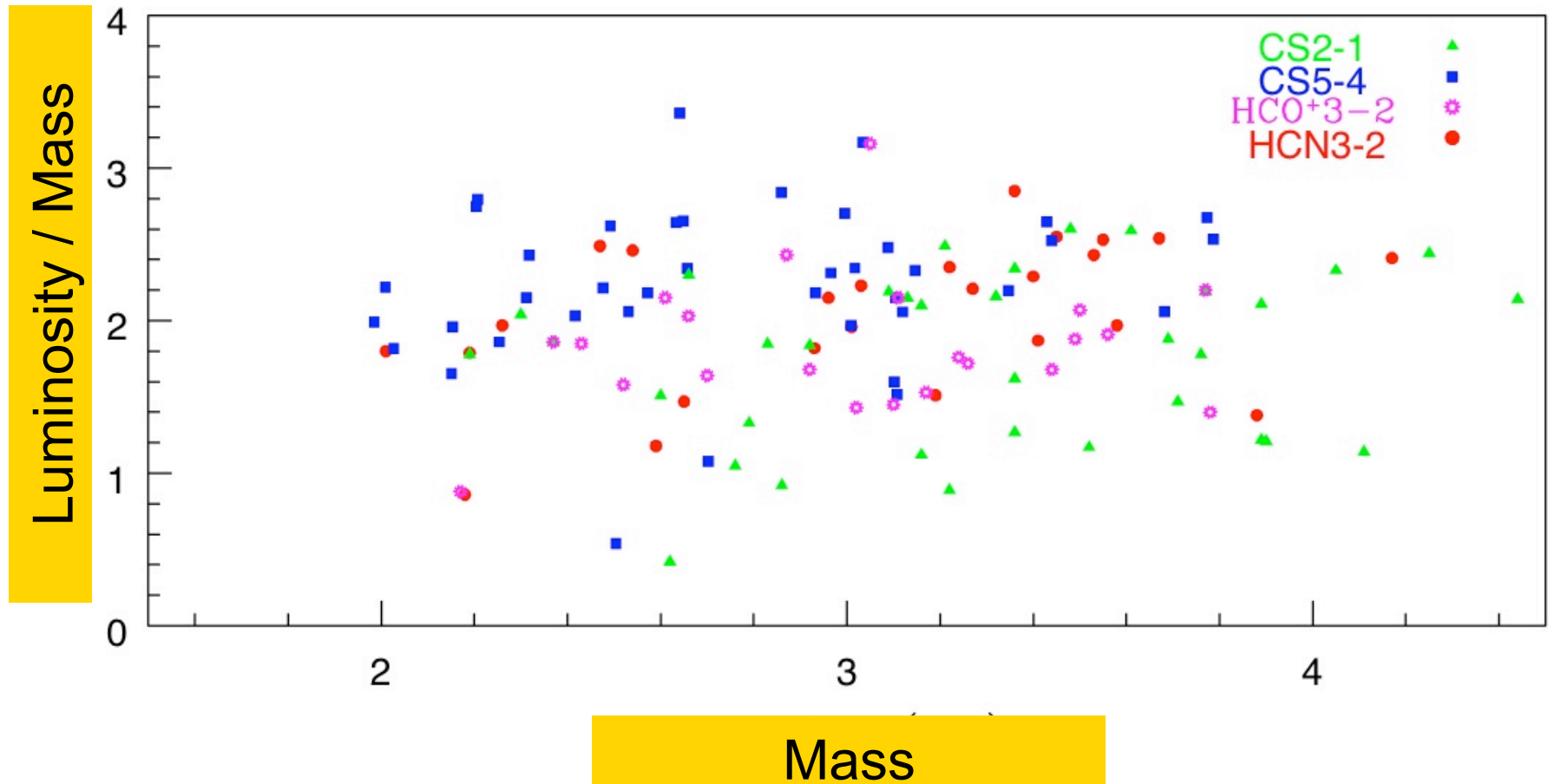
- Define a R (e.g. FWHM size)
- Δv determined from optically thin isotopomer
- a_{density} from dust continuum radiative transfer
- a_{shape} negligible for aspect ratios < 2

Density Correction

$$n \sim r^{-p}$$

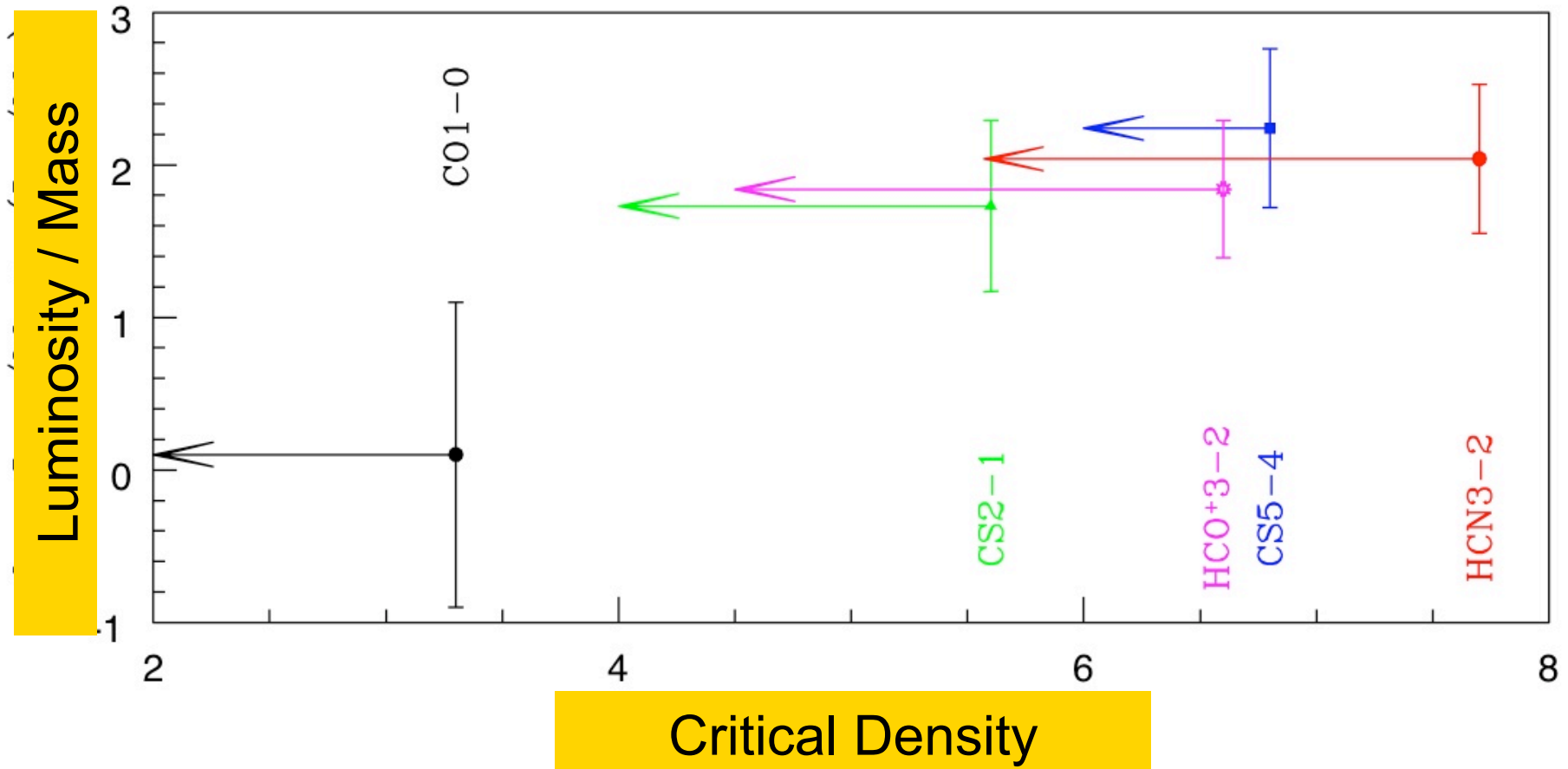


Milky Way SFR/M



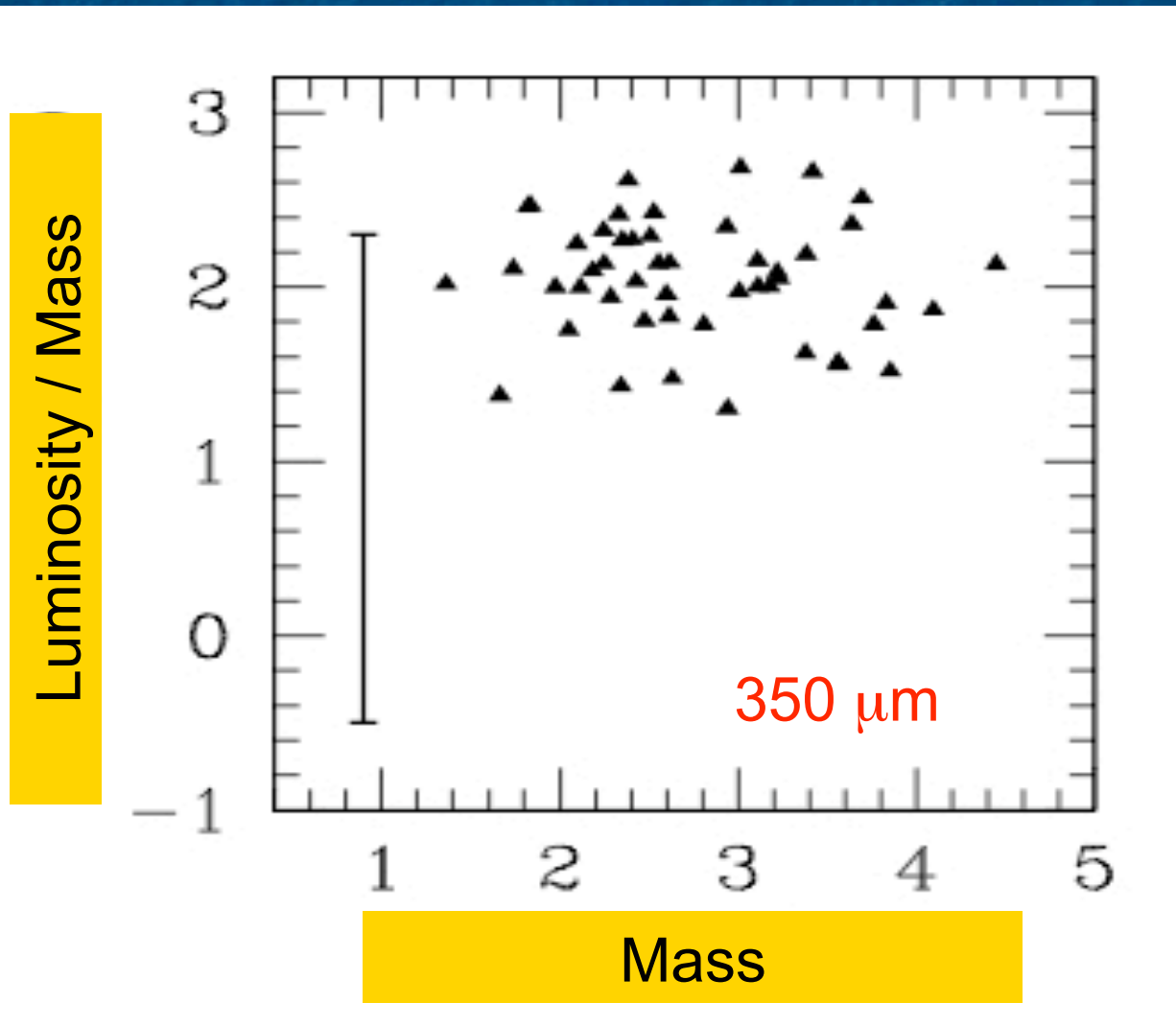
Shirley et al. 2008

Milky Way SFR/M



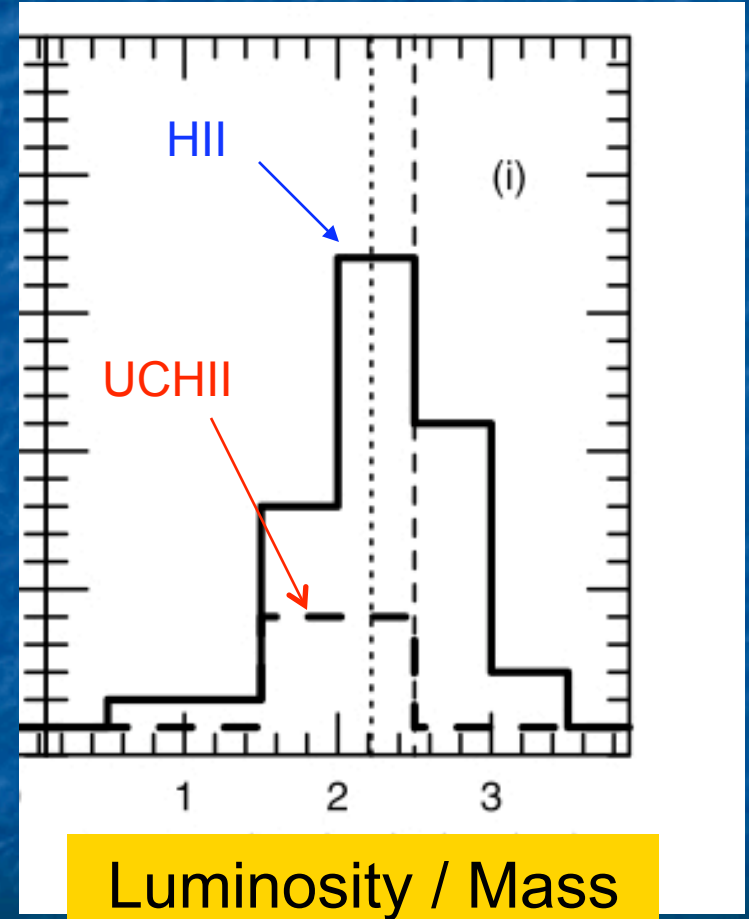
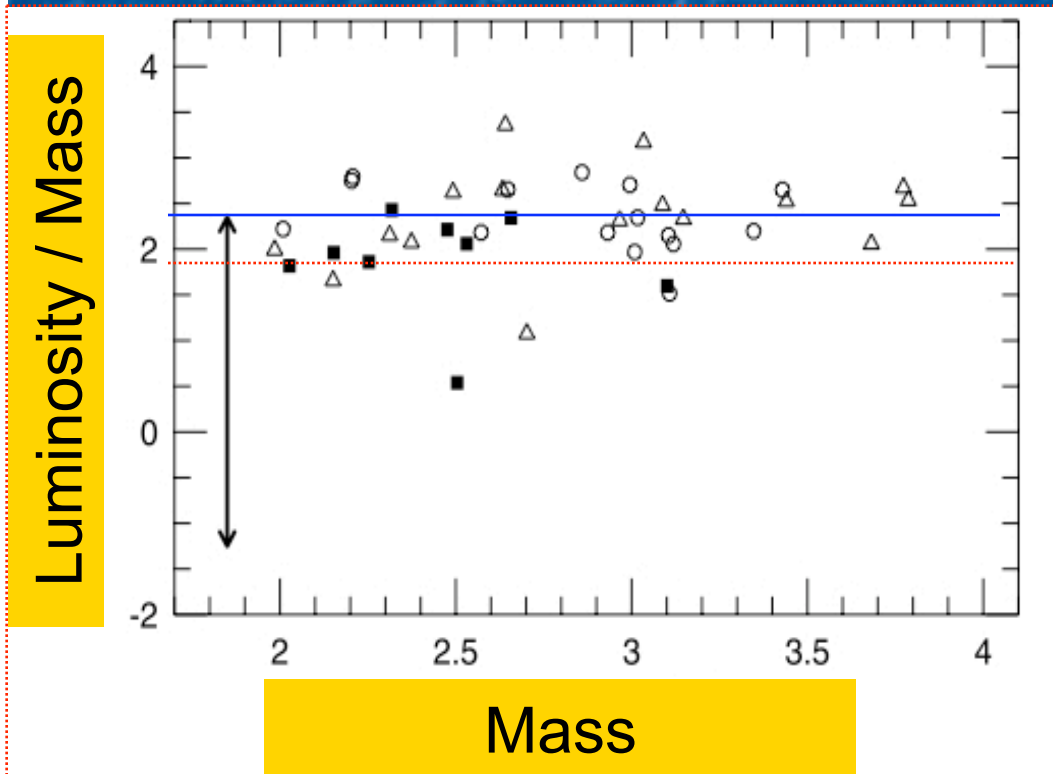
Shirley et al. 2008

Dust Emission



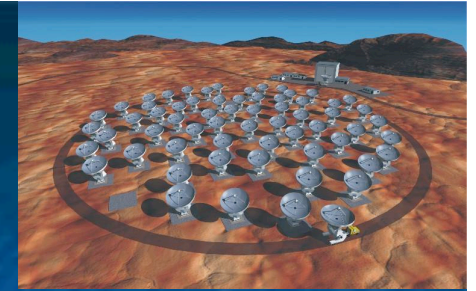
Mueller et al. 2002

L/M Evolution



Data from Shirley et al. 2003

Conclusion



- Observational evidence in dense molecular gas tracers for a constant SFR/M in Galactic clumps
 - Calc L/M for all new Galactic mapping surveys
 - Does this interpretation extend to other galaxies?
- ALMA: does this result extend to the scales of individual high-mass cores ?
- Theoretical explanation: mitigation of SFR via feedback

“Never put off till
tomorrow what
you can do today...
Calculate L/M.”

