

Regulation of Star Formation in Molecular Gas
Ringberg, June 24-28, 2013



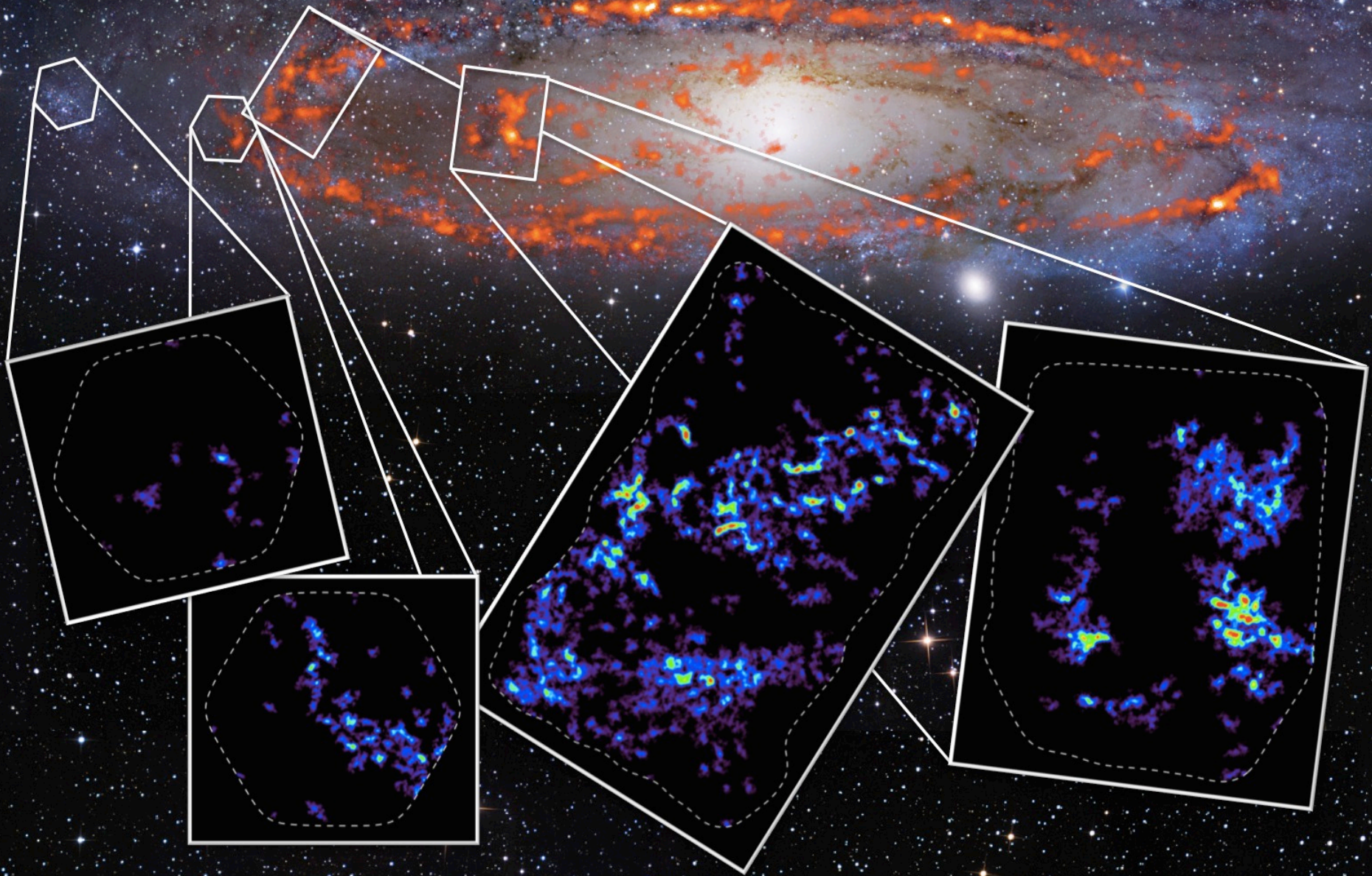
*Molecular Gas and Star Formation
in the Andromeda Galaxy*

Andreas Schruba

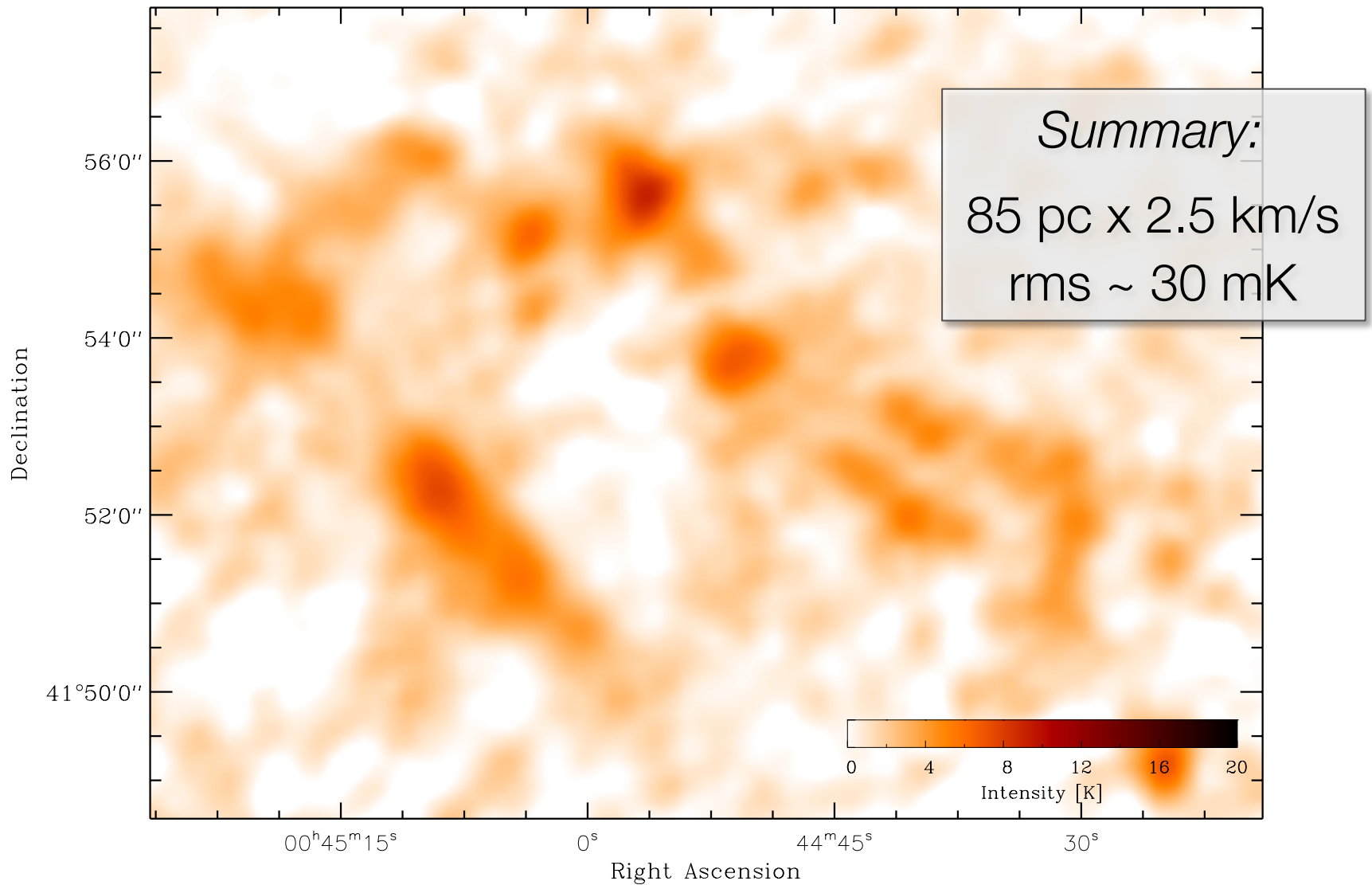
California Institute of Technology

Adam Leroy, Karin Sandstrom, Fabian Walter,
Alberto Bolatto, Nick Scoville, Julianne Dalcanton

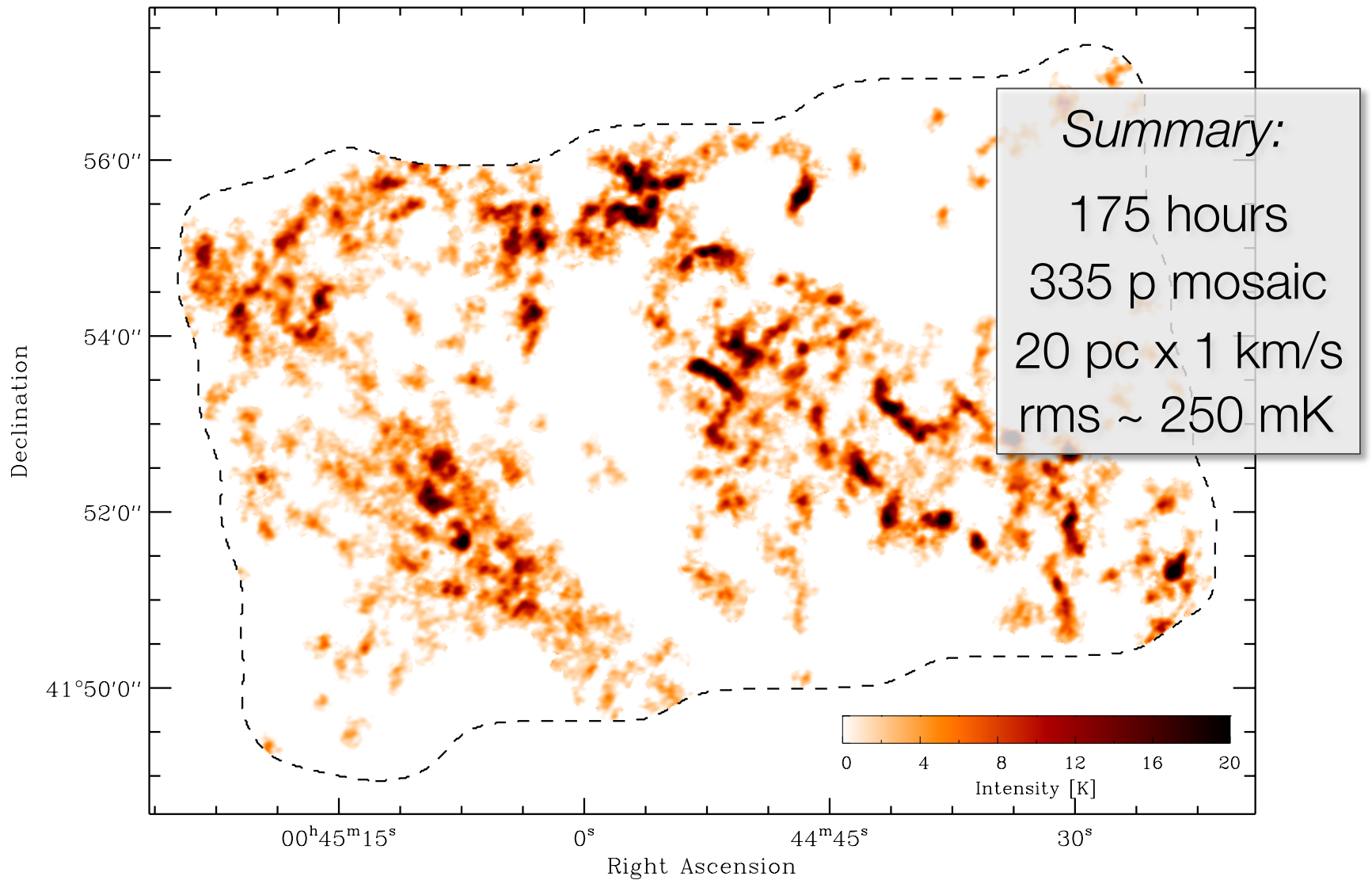
CARMA Survey of Andromeda



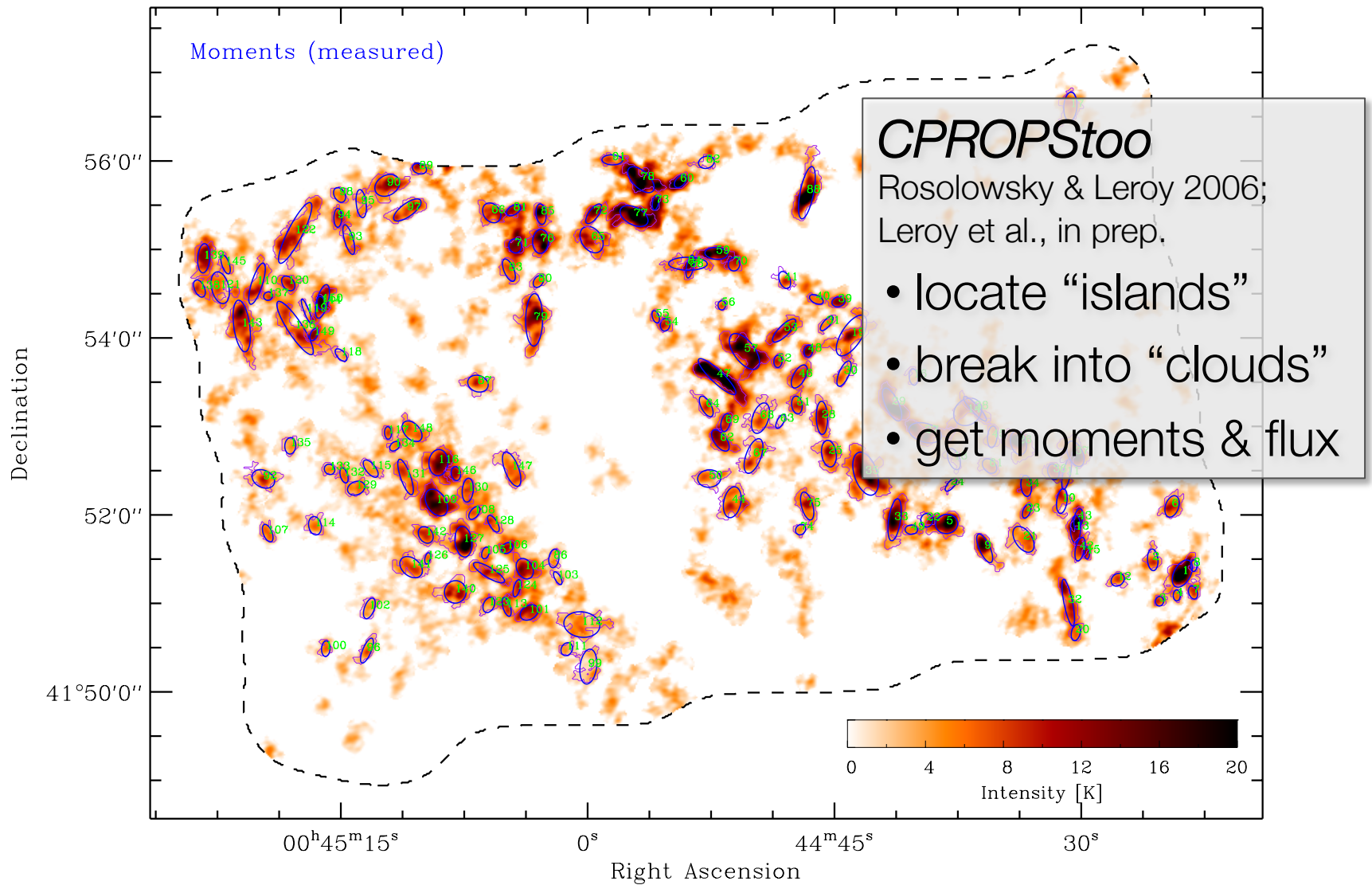
CO Map from IRAM 30m



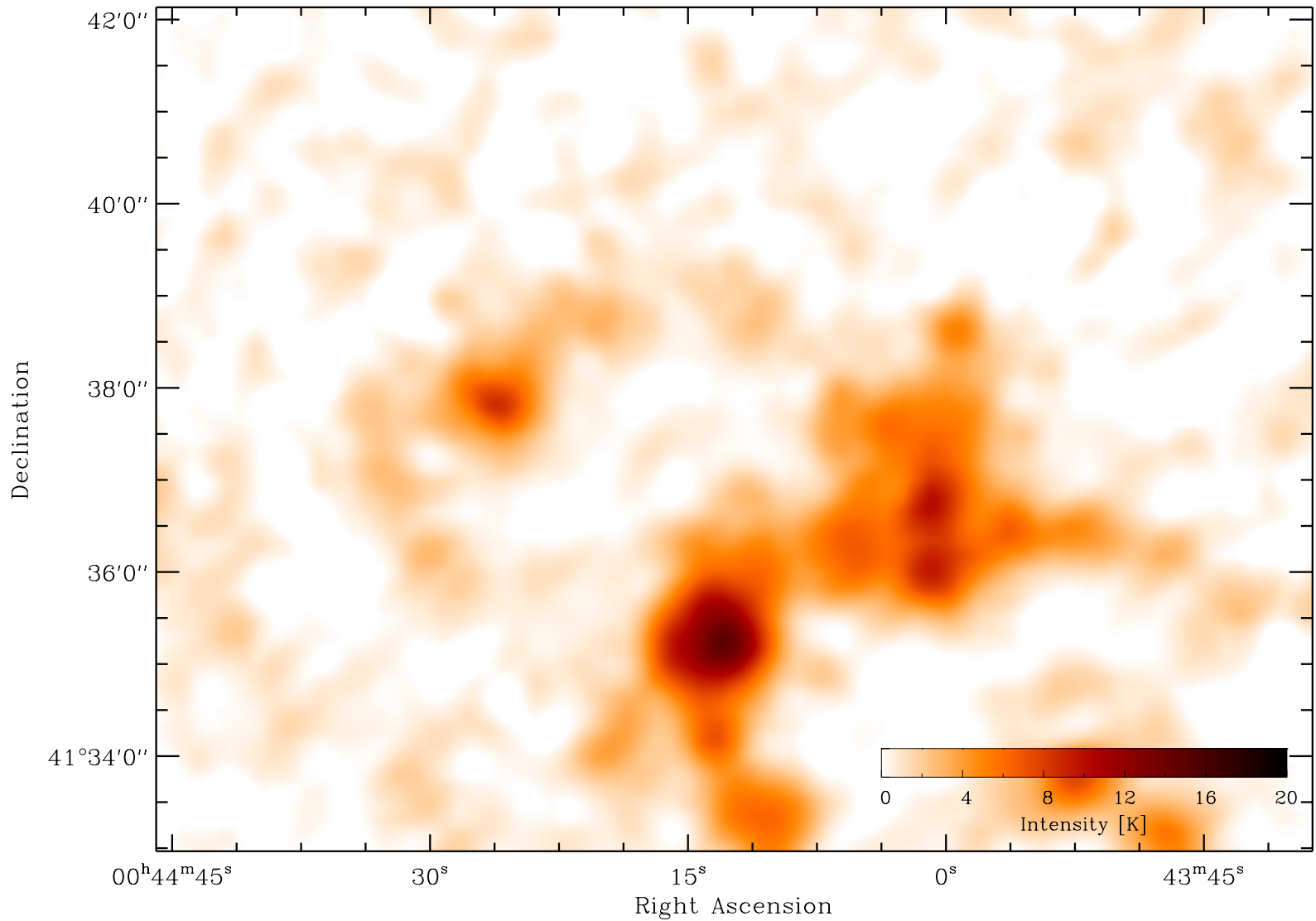
CO Map from CARMA



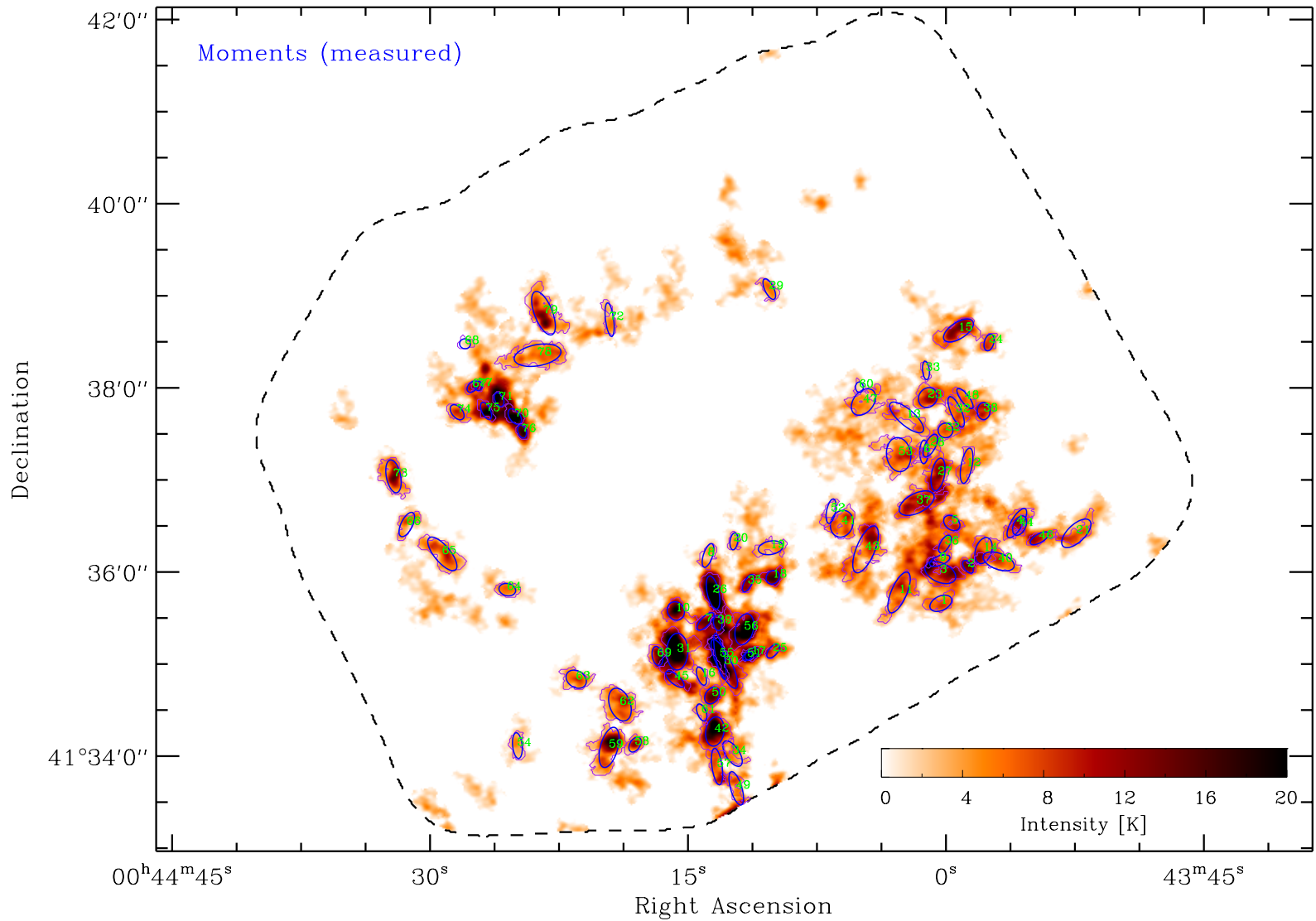
Cloud Decomposition



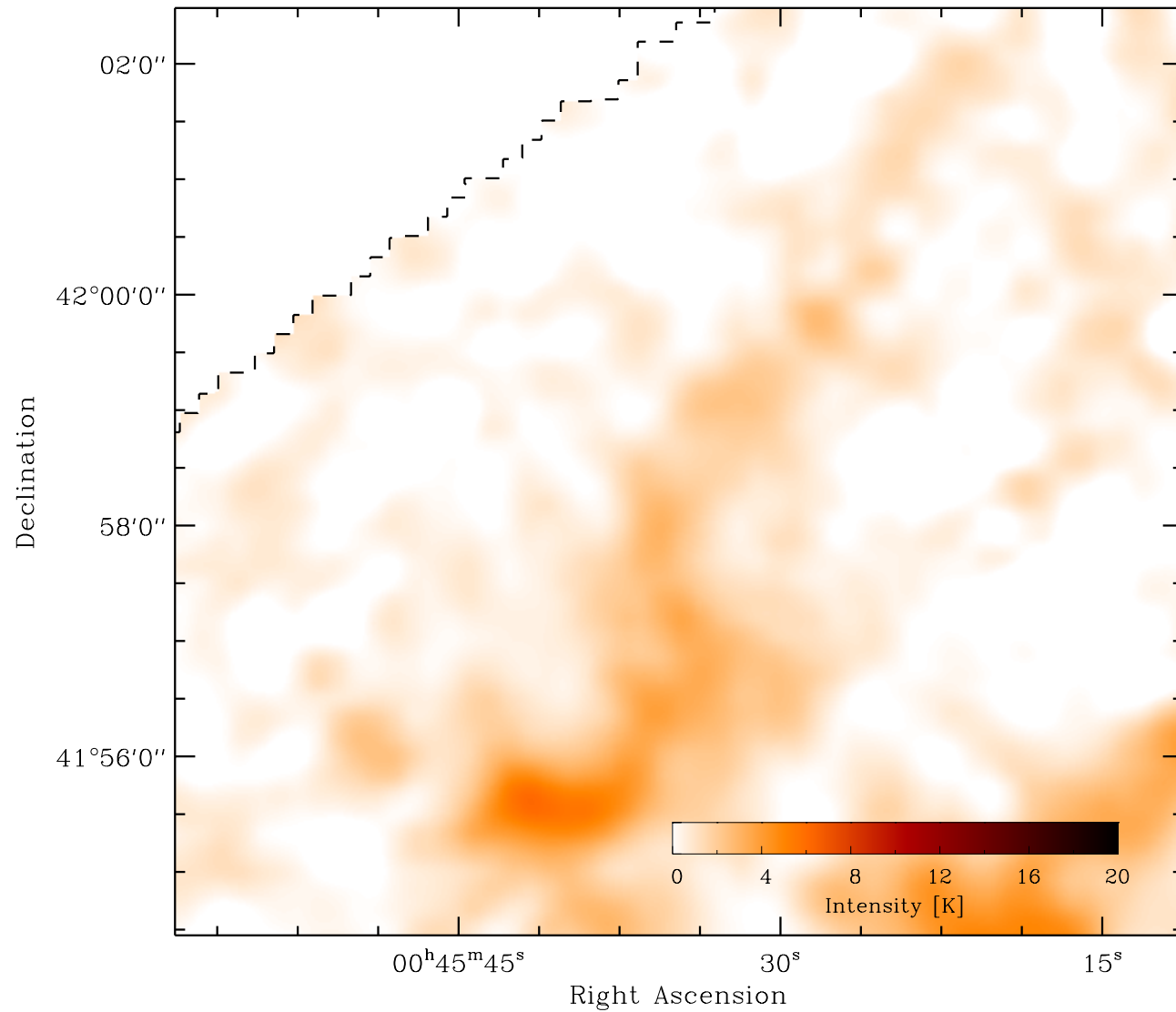
CO Map from IRAM 30m



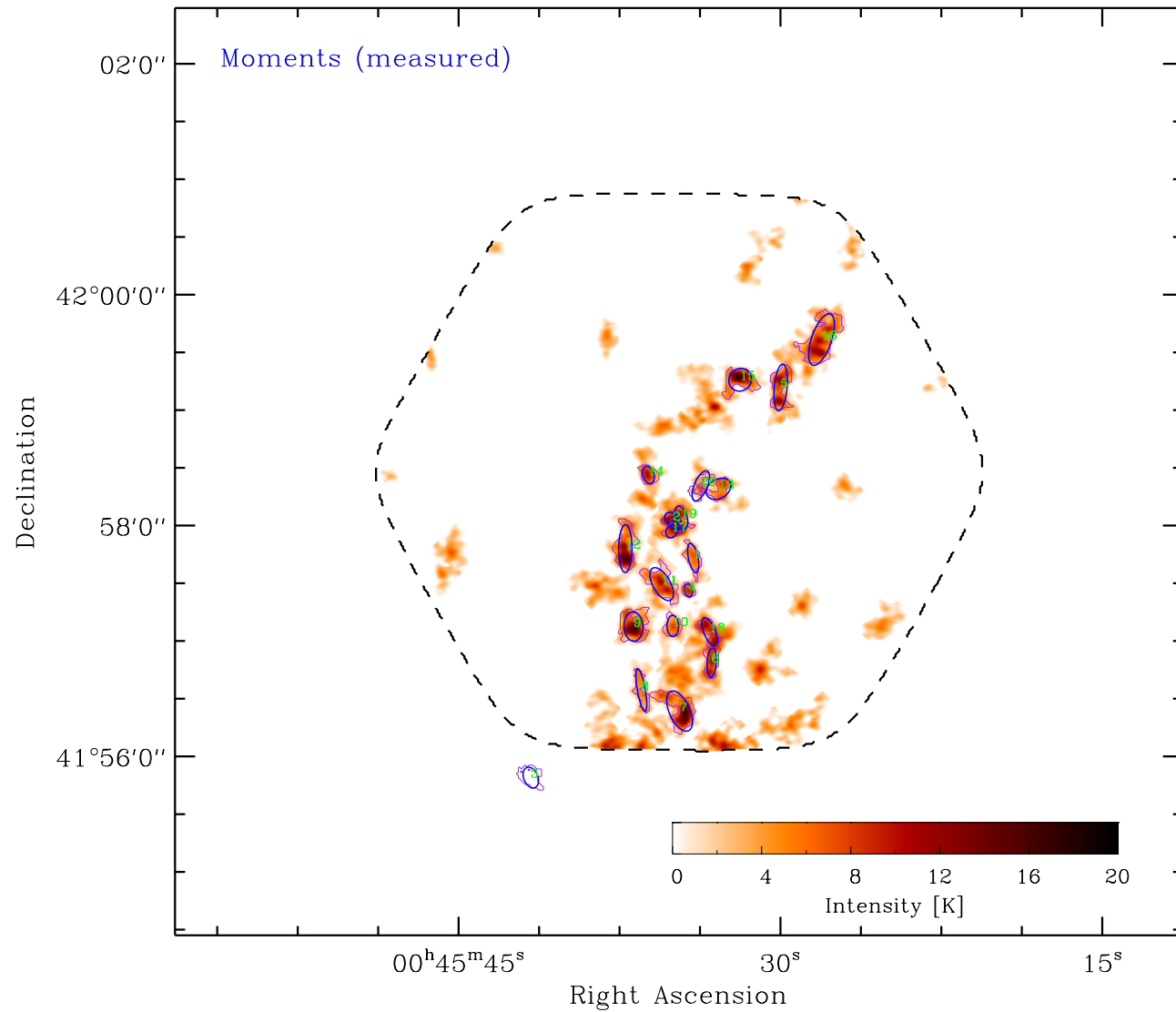
Cloud Decomposition



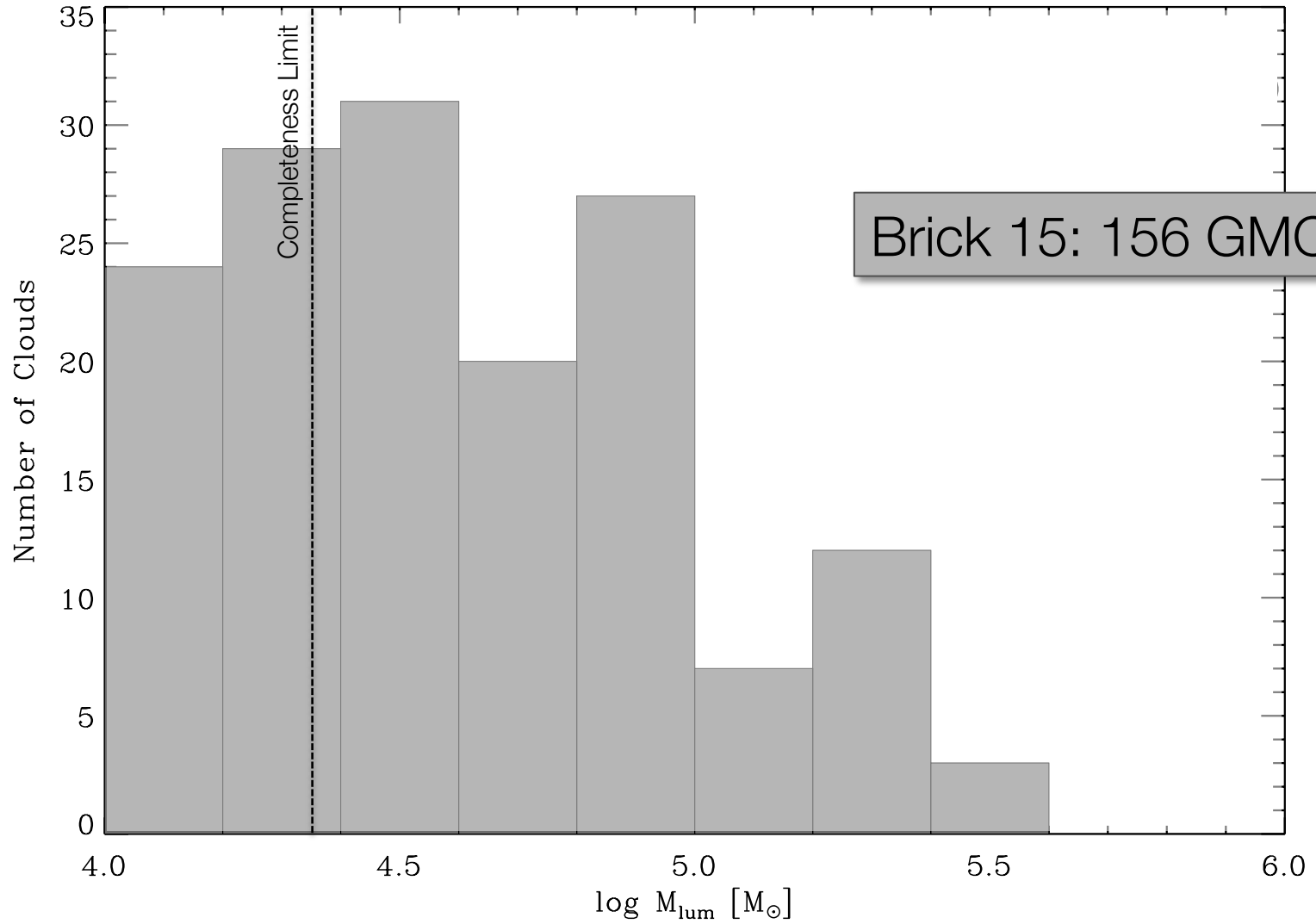
CO Map from IRAM 30m



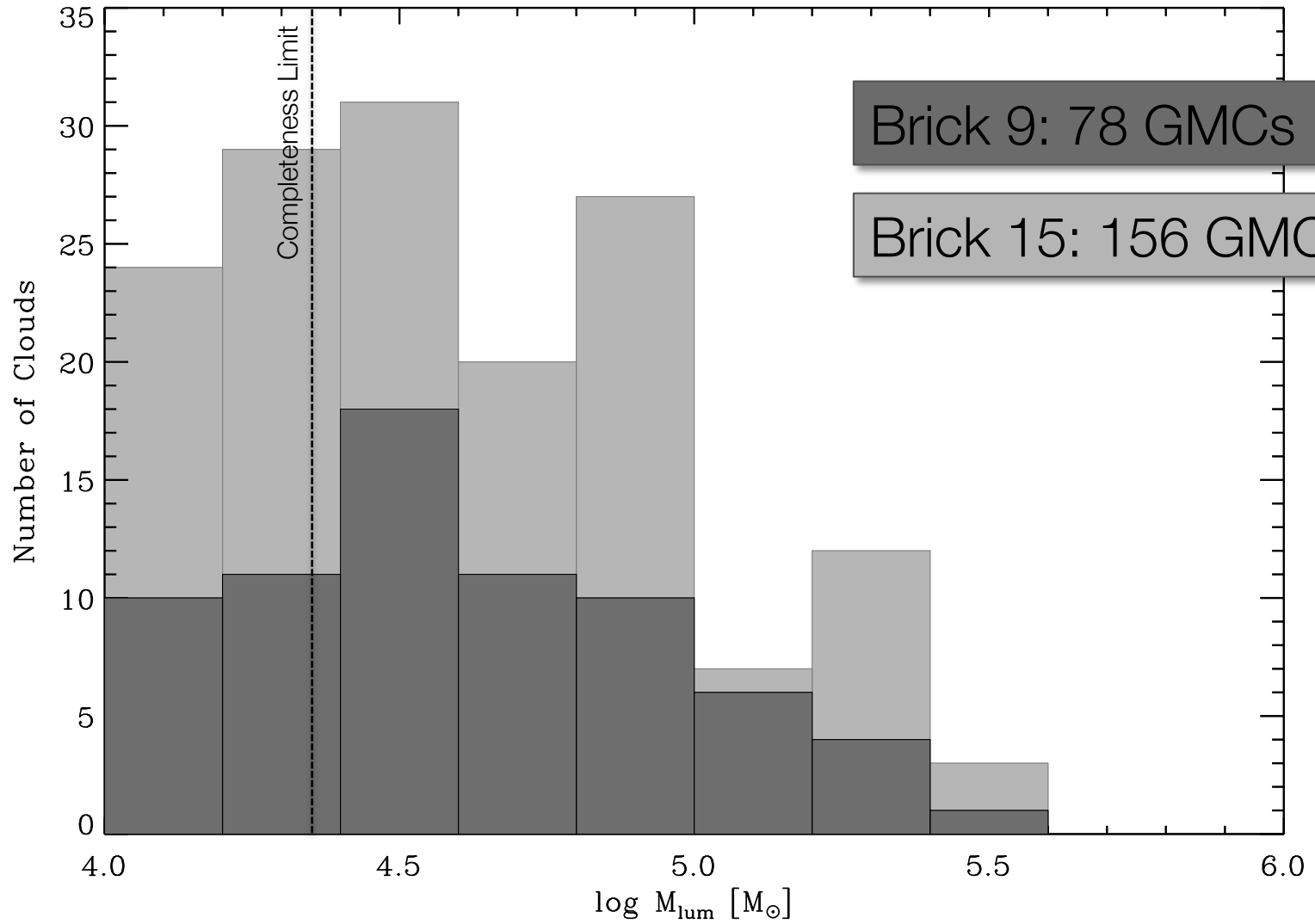
Cloud Decomposition



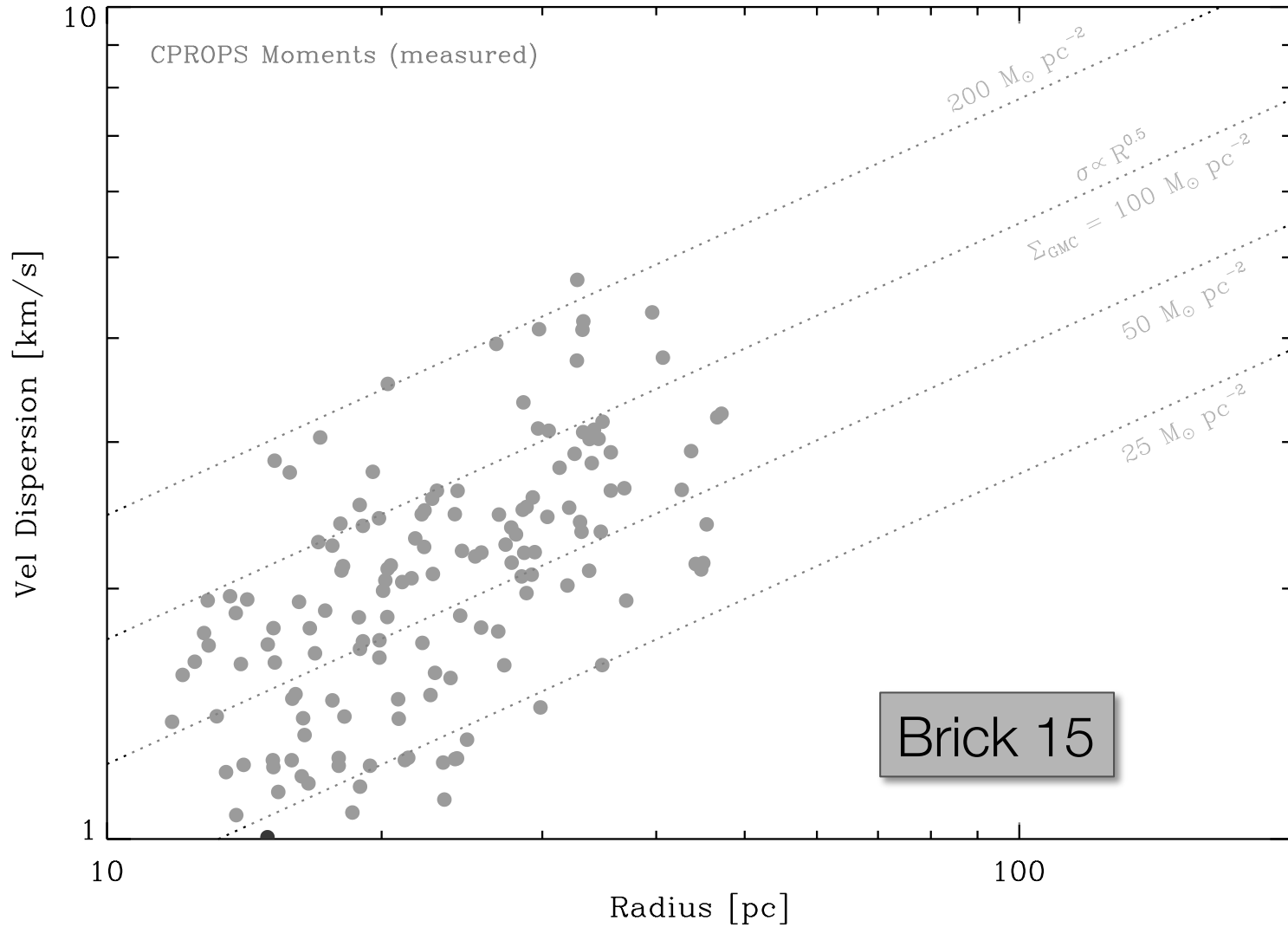
Number of Clouds



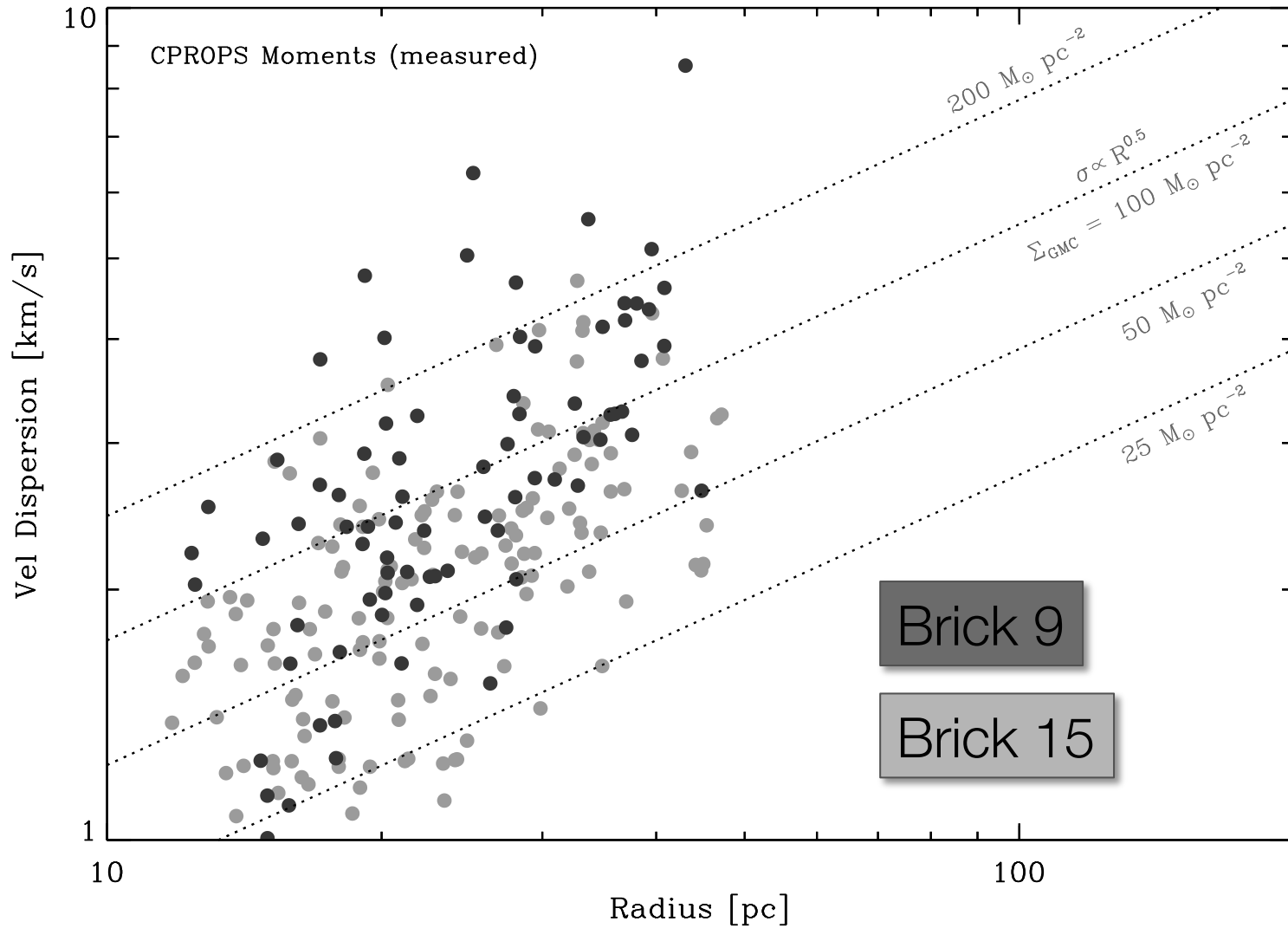
Number of Clouds



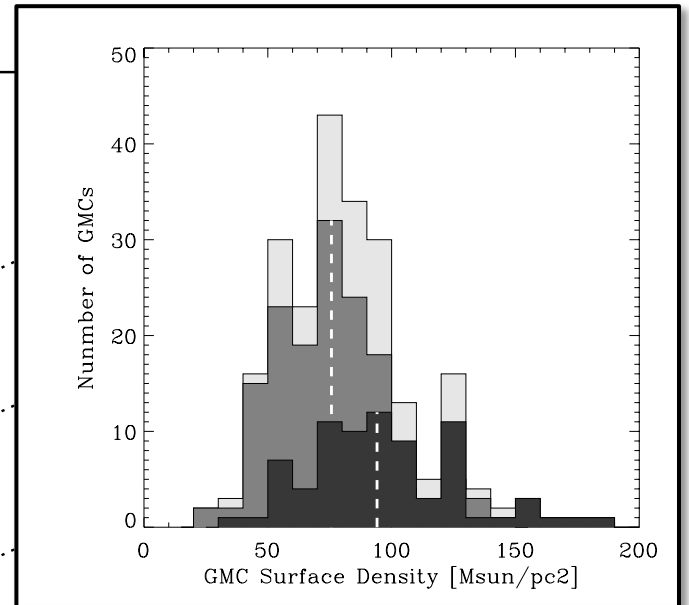
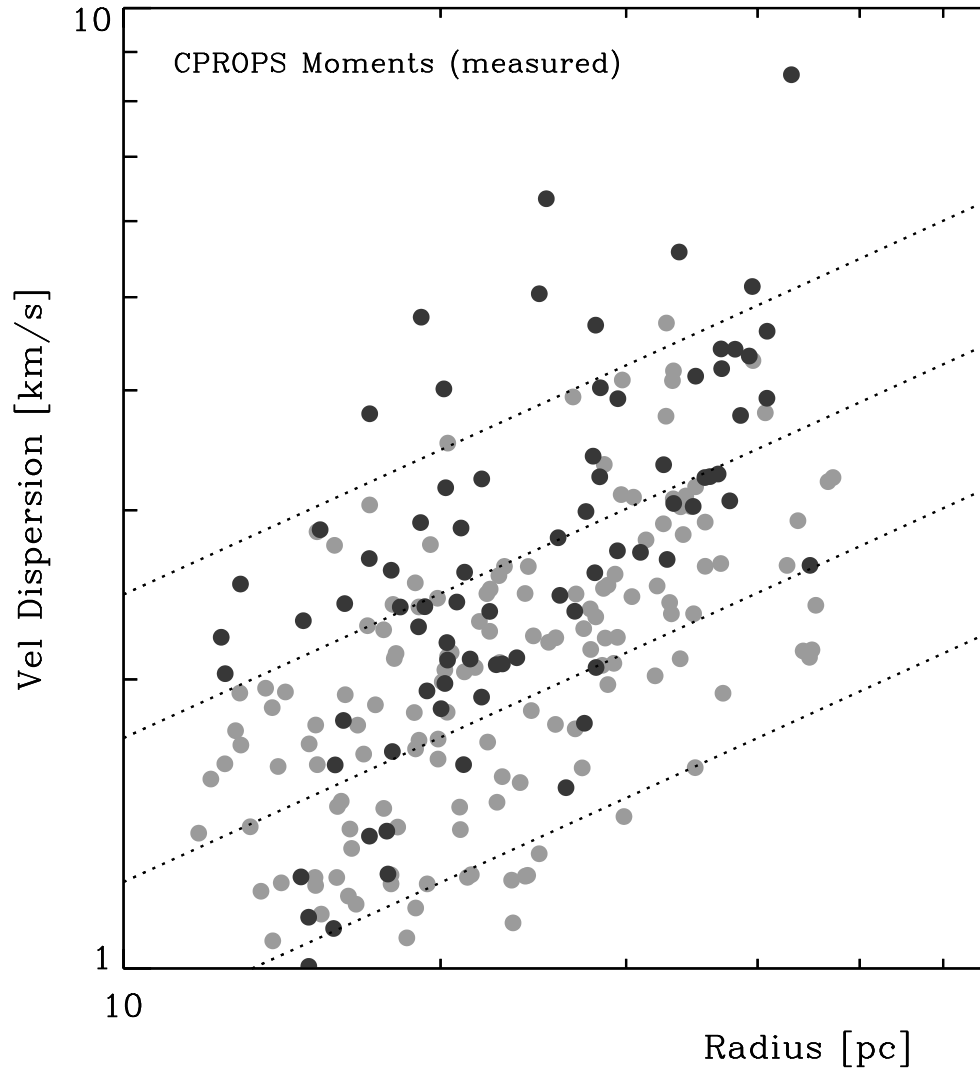
Line Width – Size Relation



Line Width – Size Relation



Line Width – Size Relation

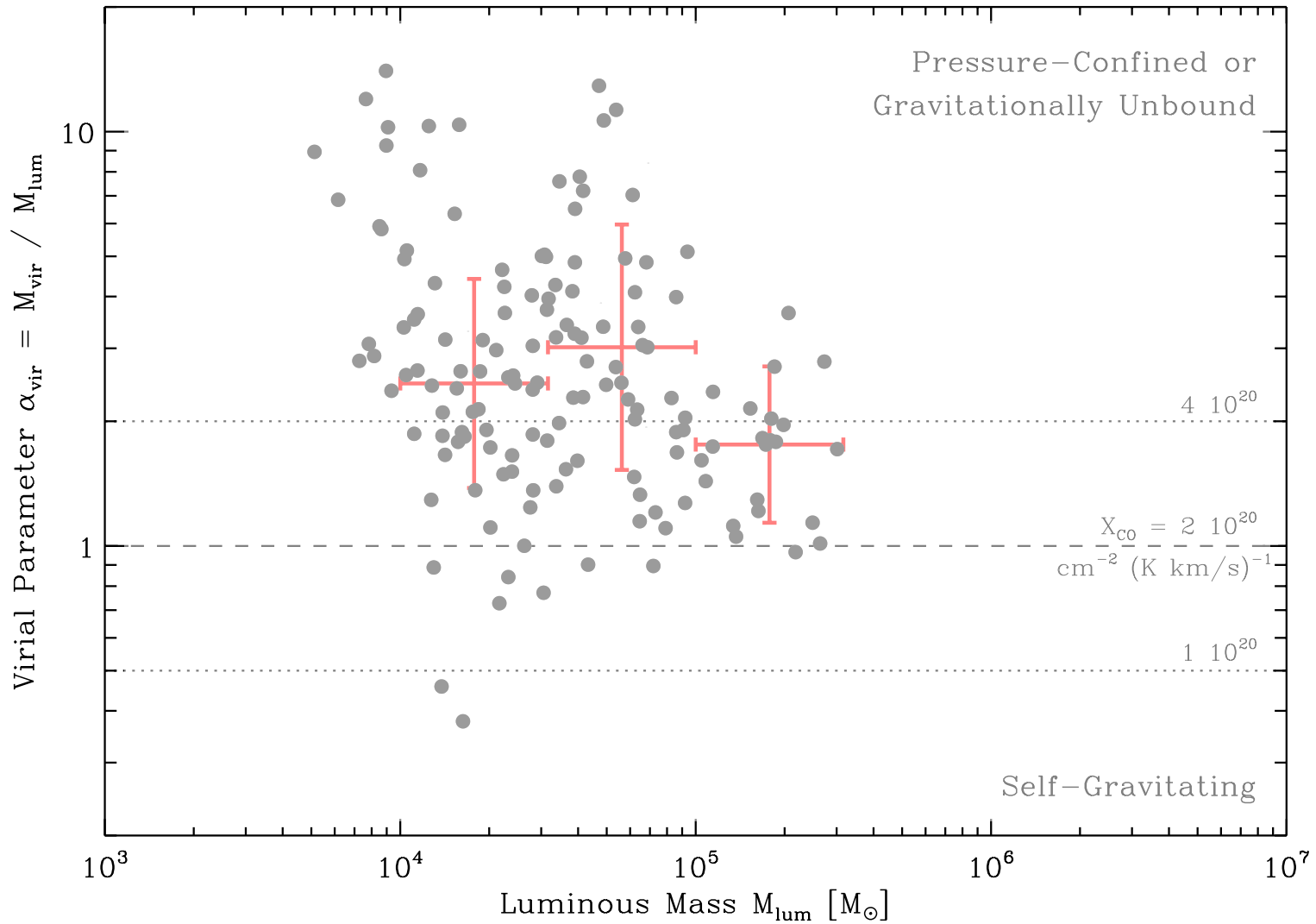


Surface Density

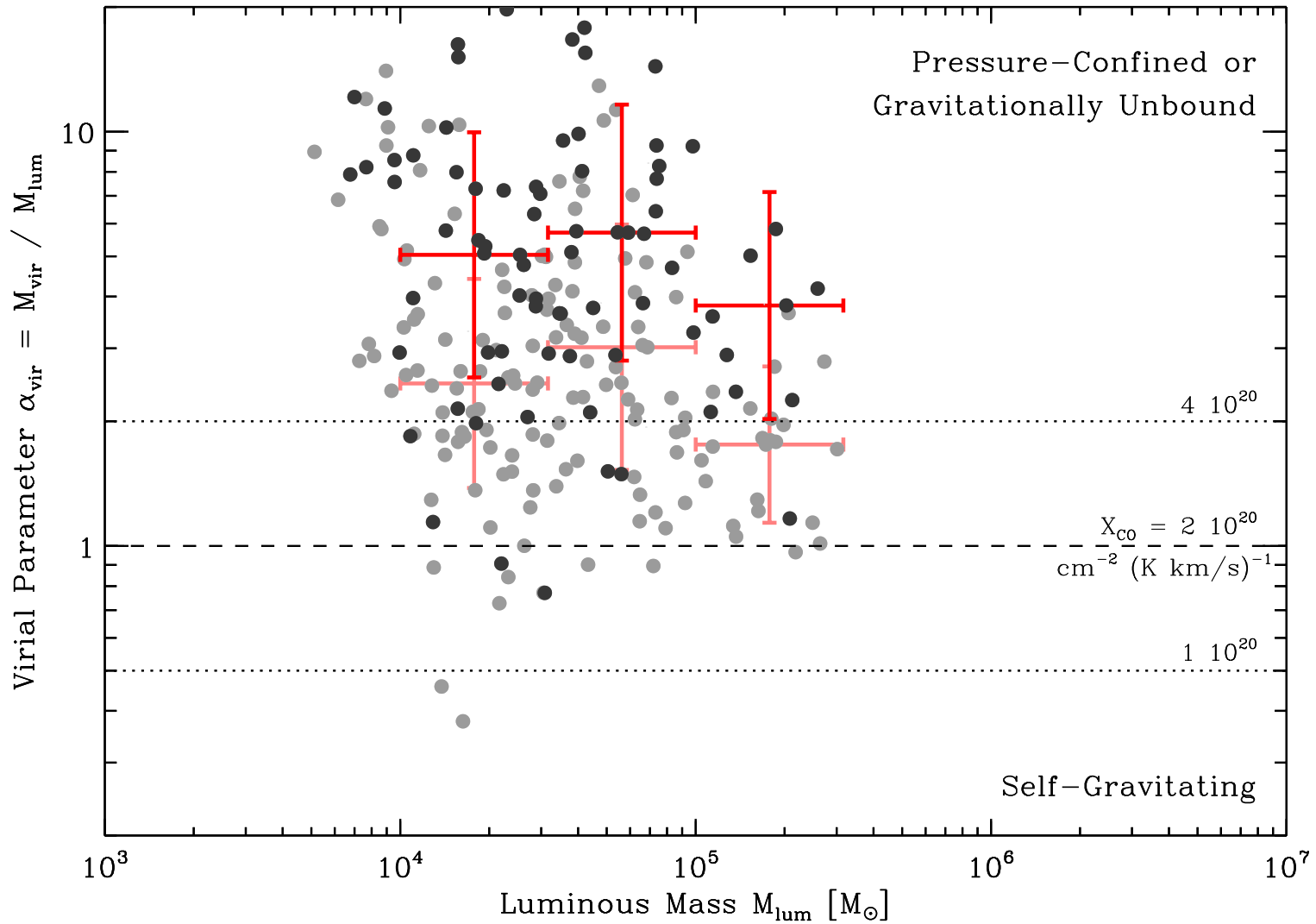
Brick 9: $94 M_{\odot} pc^{-2}$

Brick 15: $76 M_{\odot} pc^{-2}$

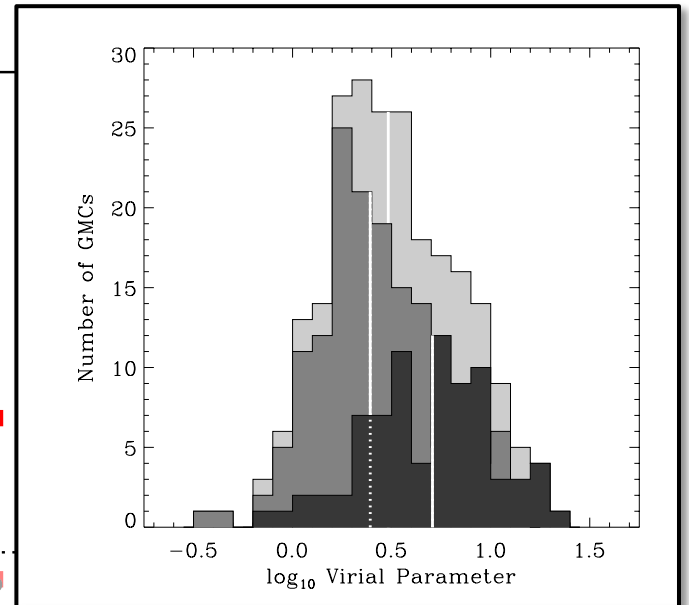
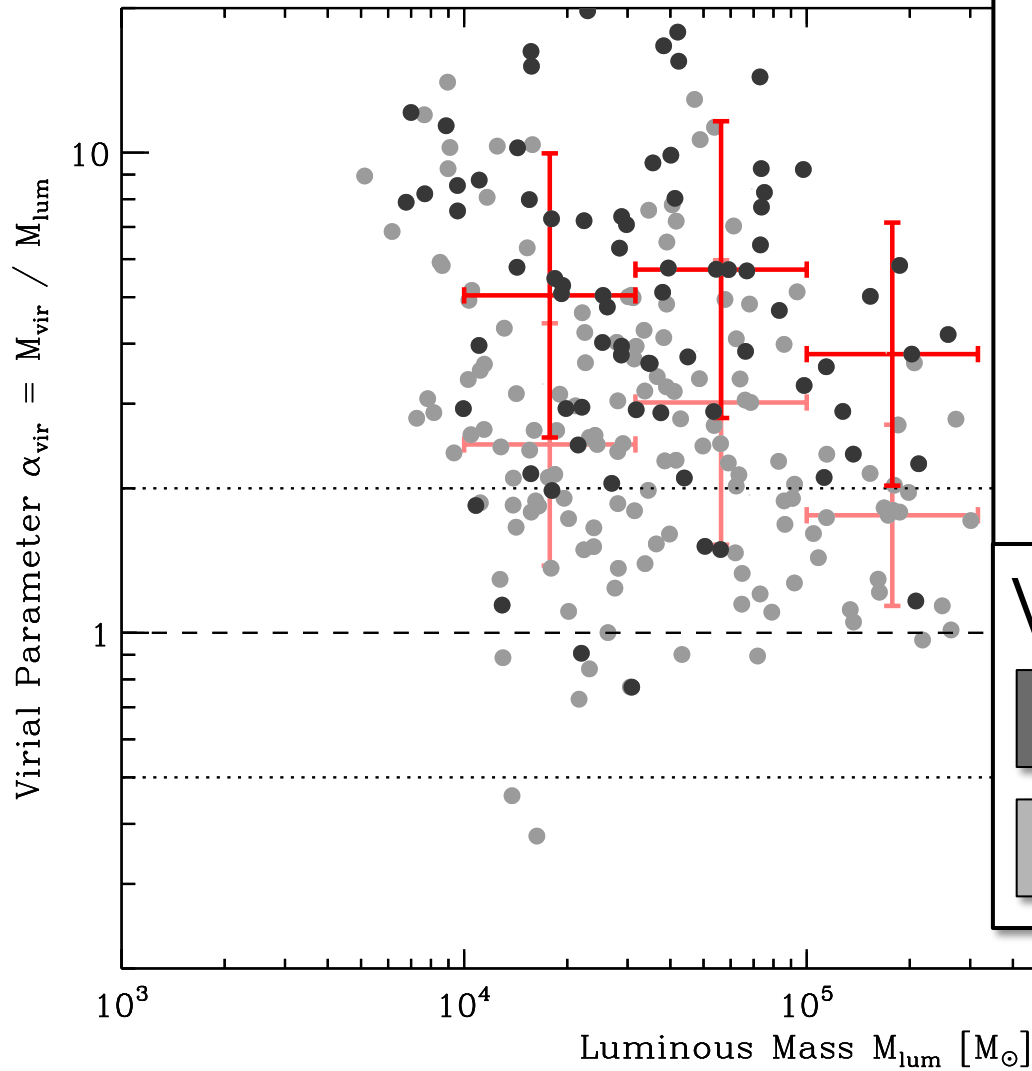
Virial Parameter



Virial Parameter



Virial Parameter

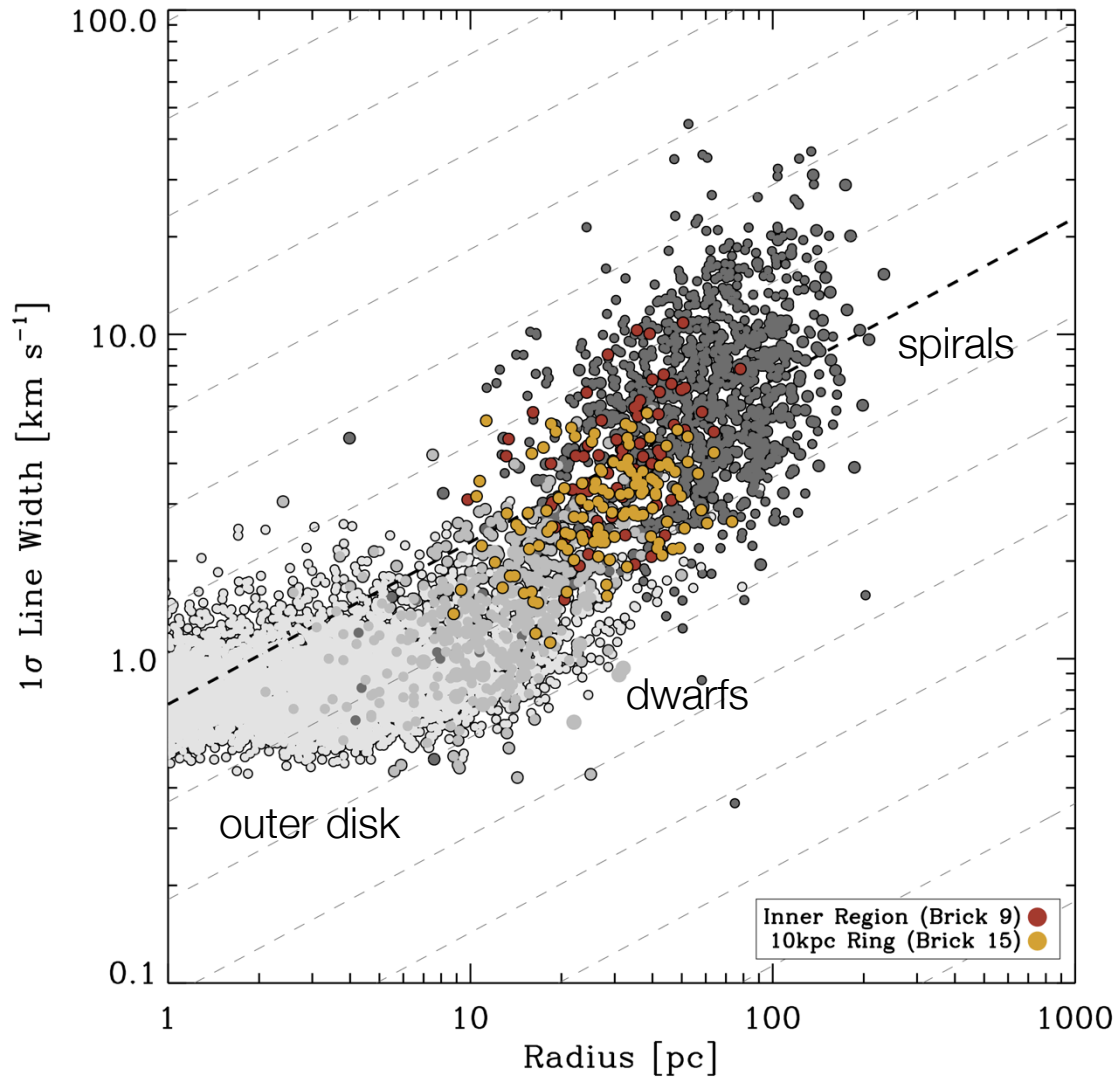


Virial Parameter

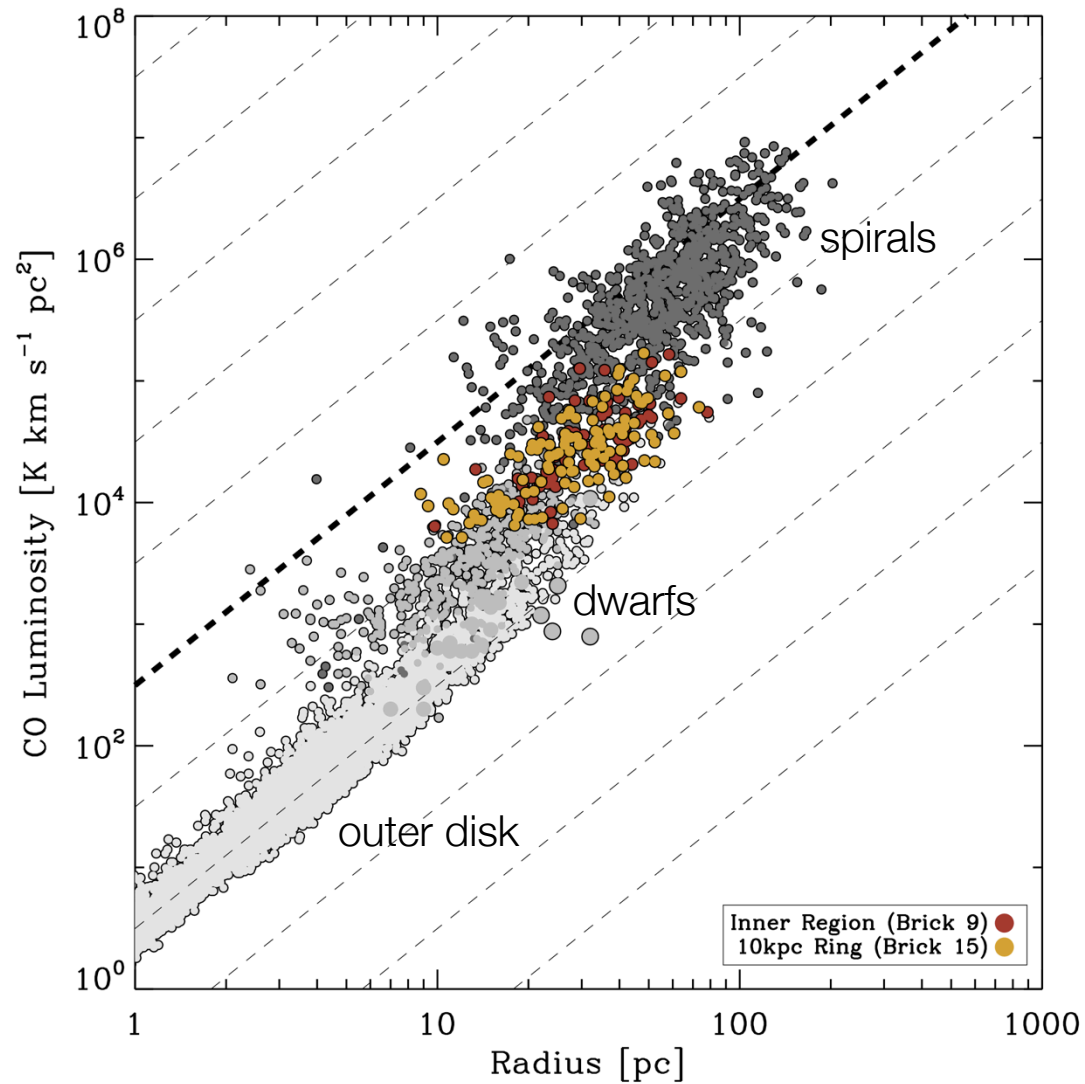
Brick 9: 5.2

Brick 15: 3.0

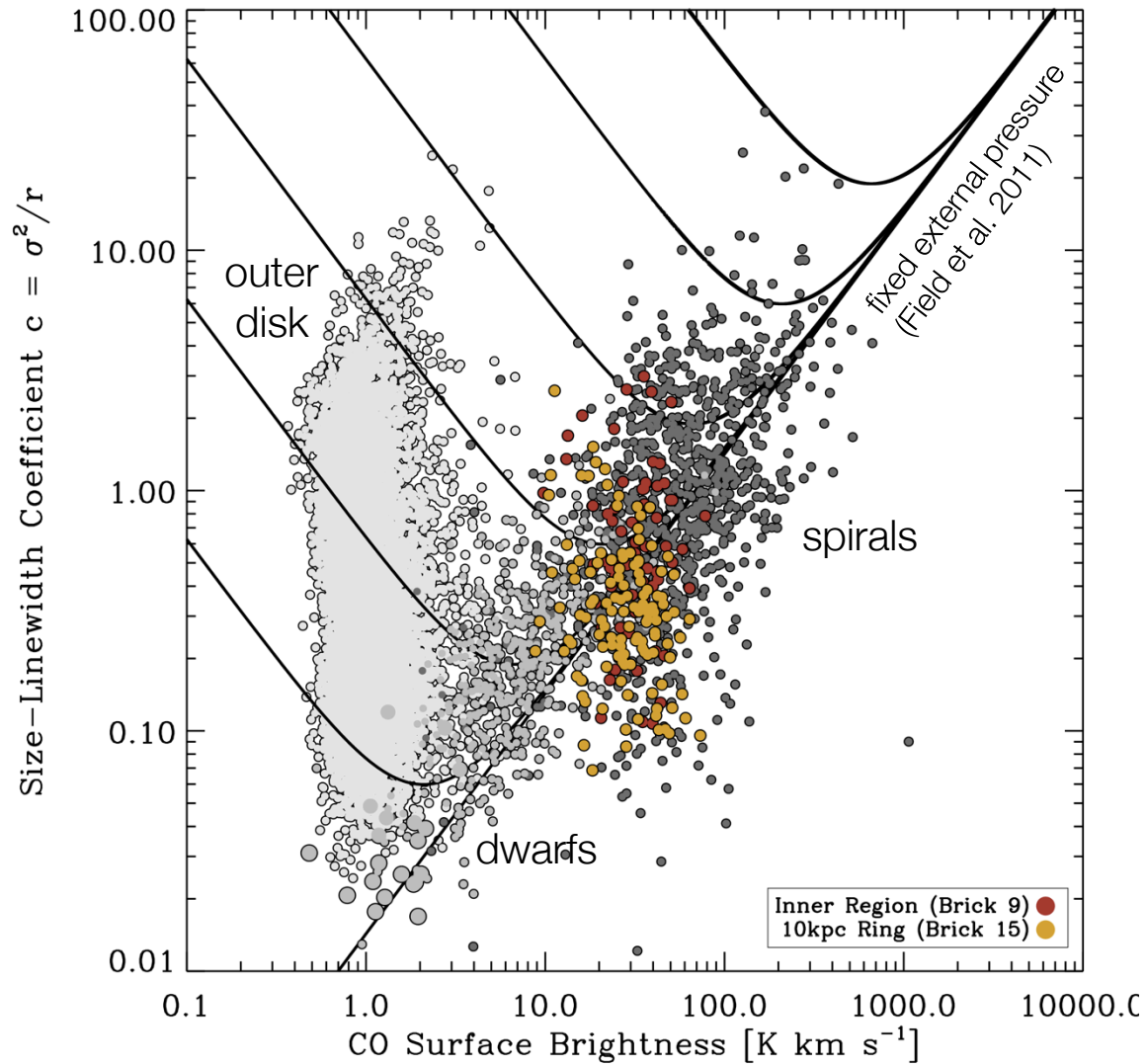
Larson's "Law"



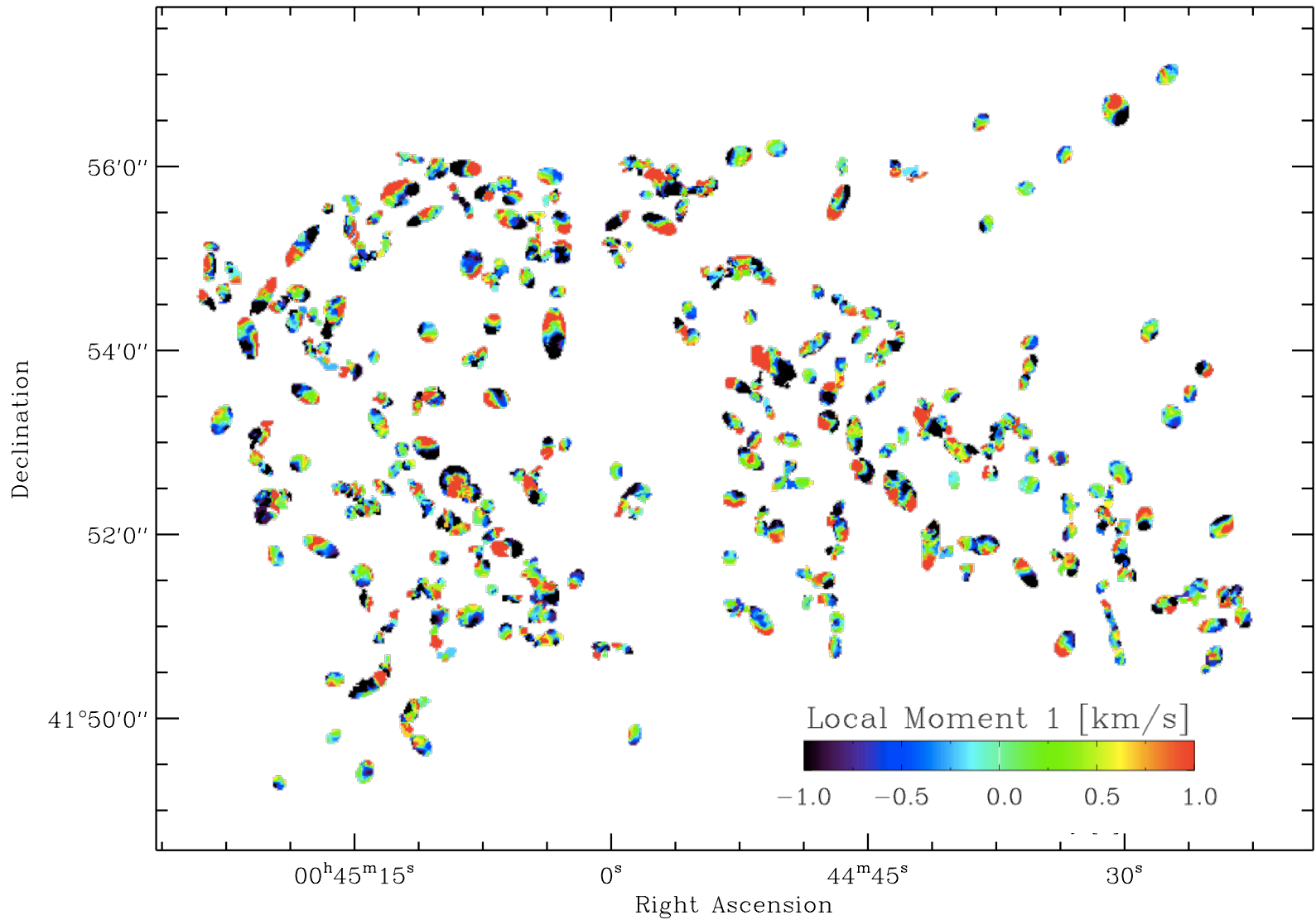
Luminosity – Radius Relation



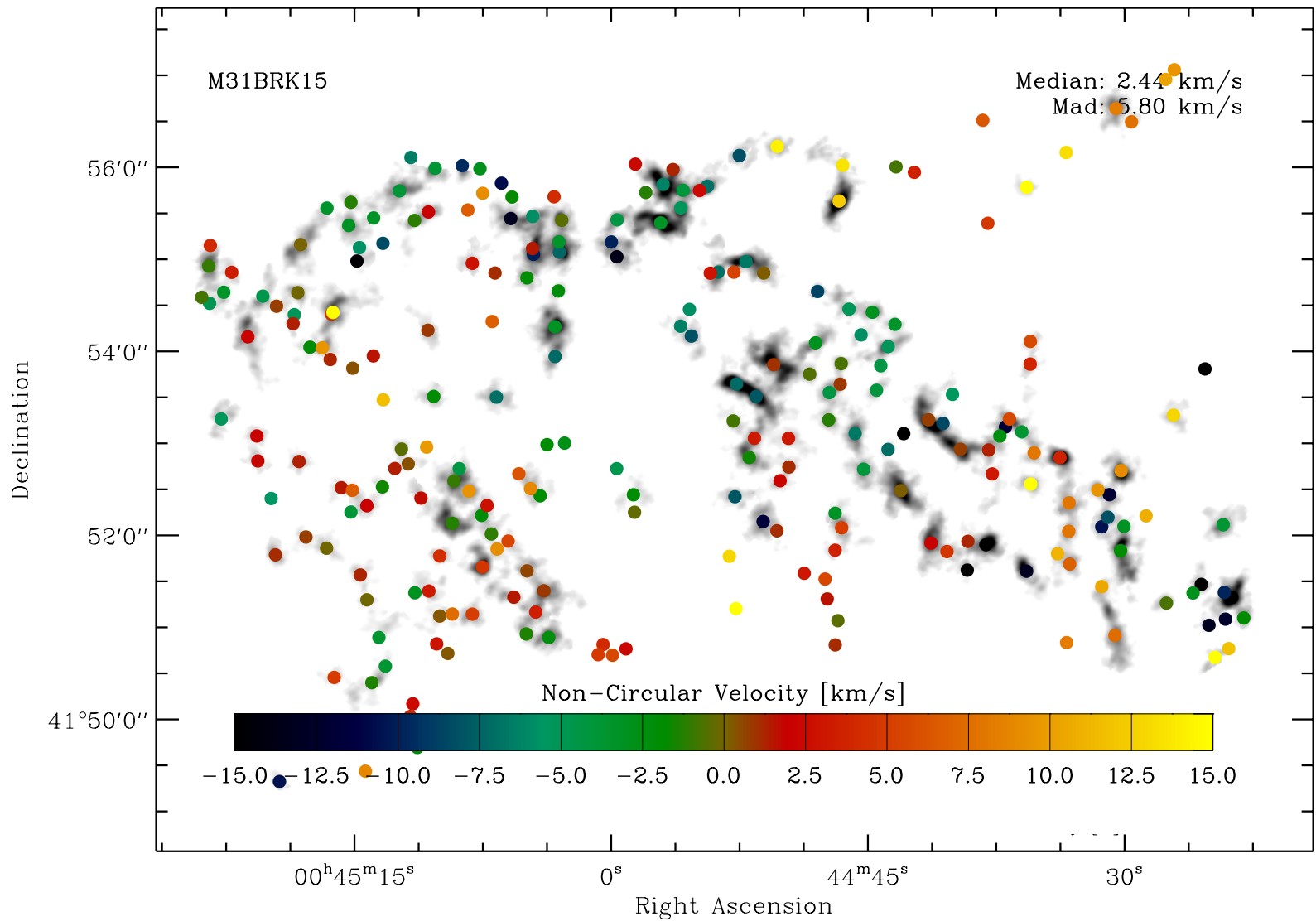
Larson's "Law" Offsets



Cloud Dynamics

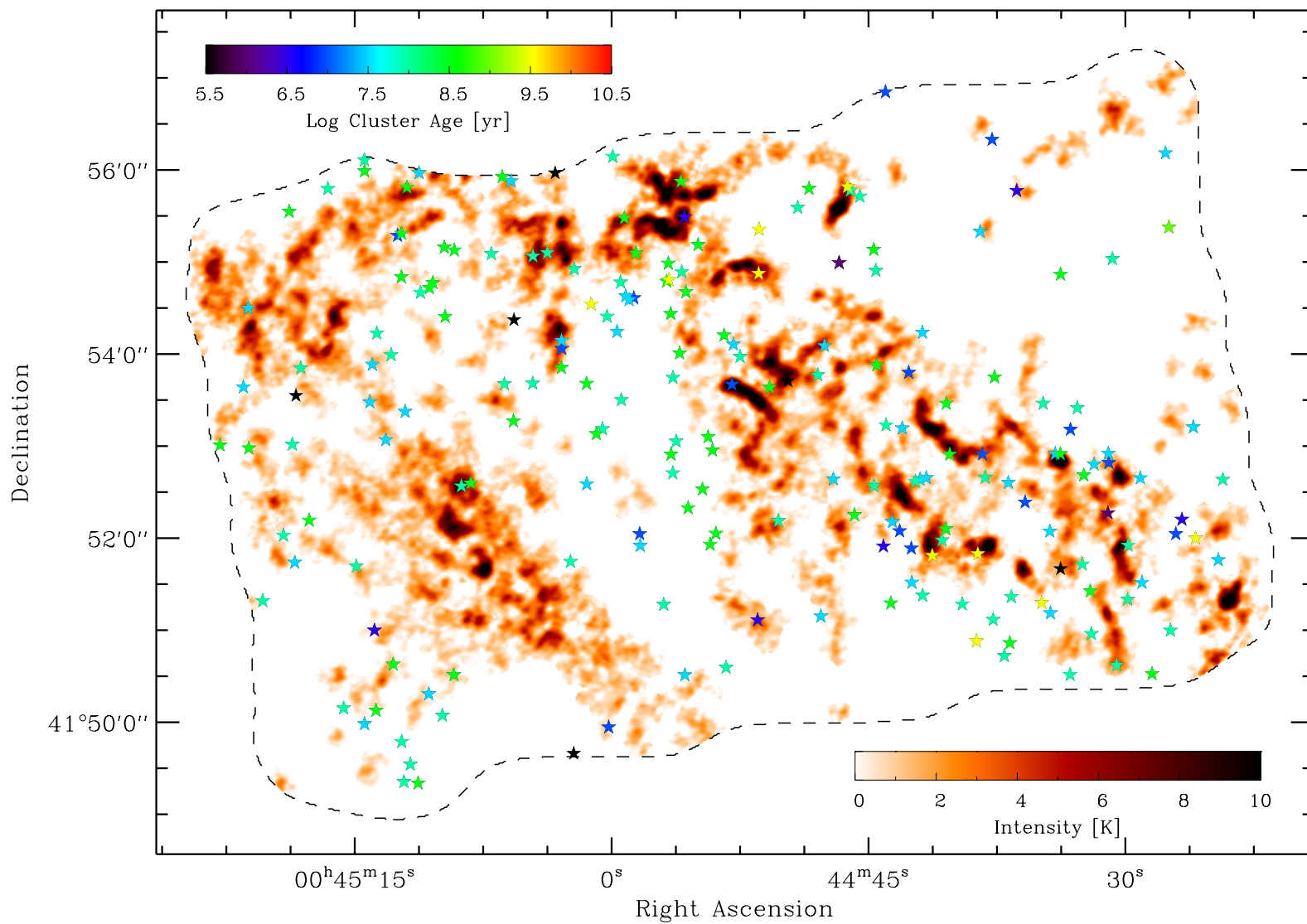


Cloud Dynamics

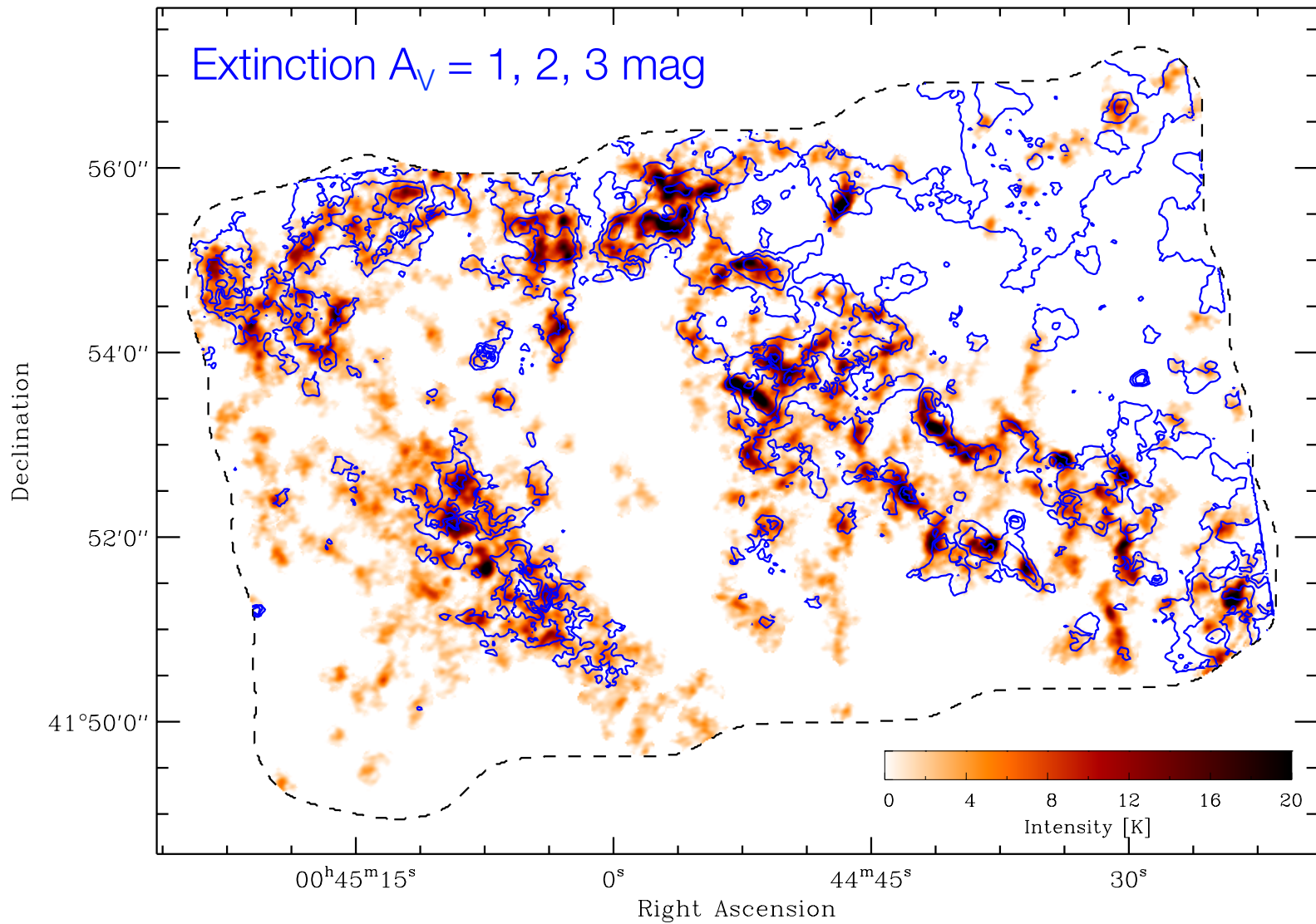


PHAT Cluster Catalog

Grad: Lori Beerman
(U Washington)

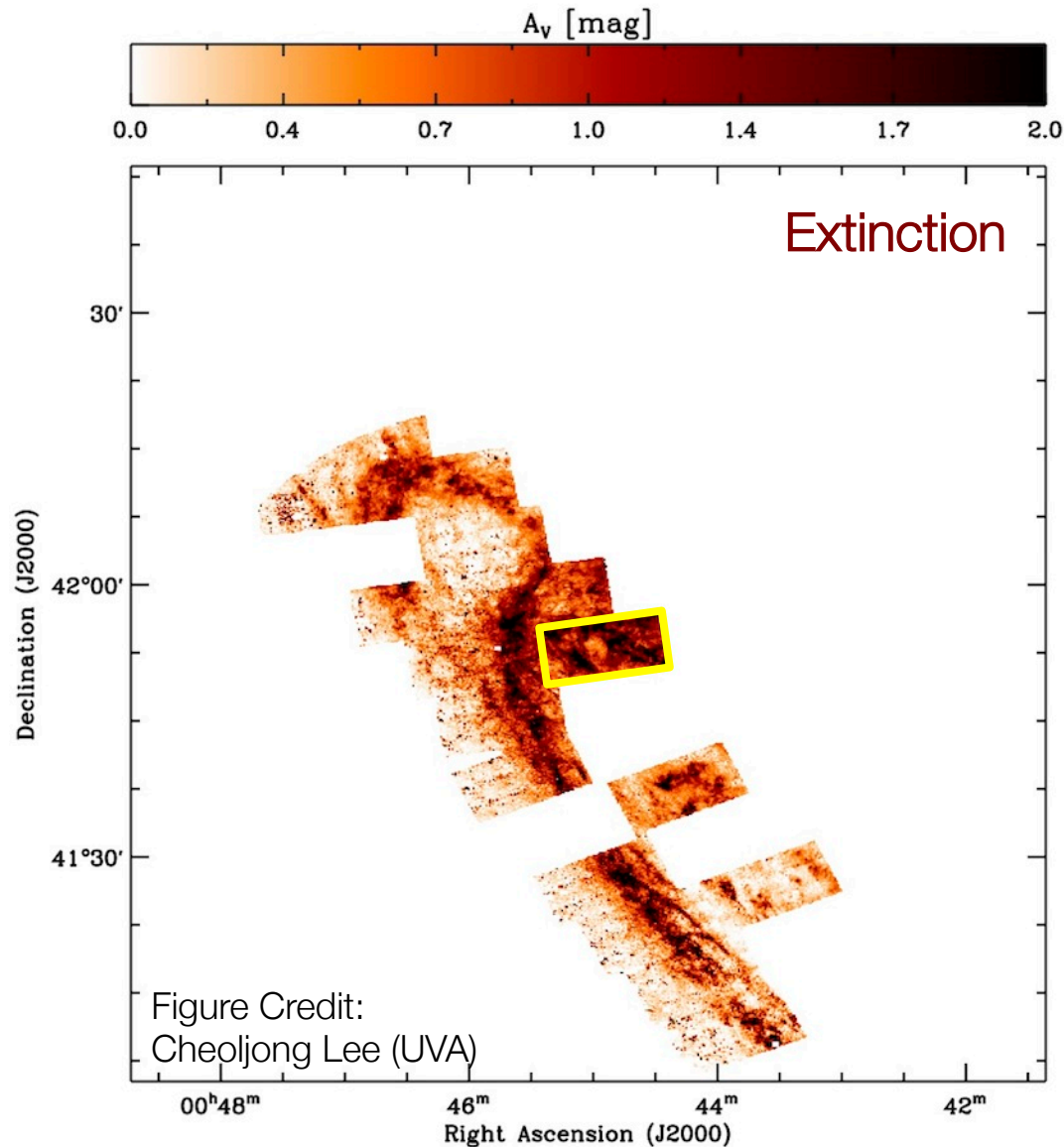


PHAT Extinction Map

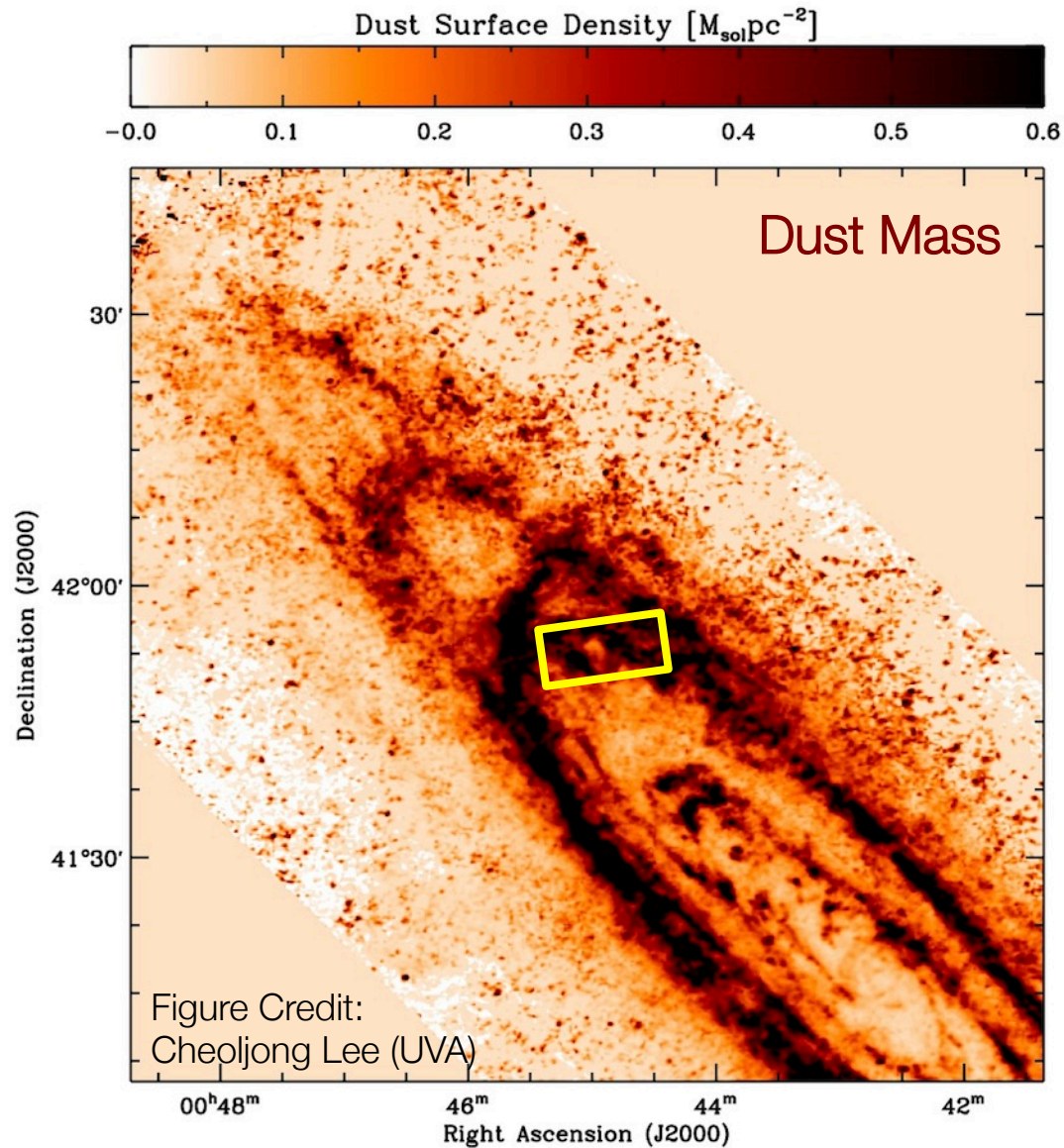


PHAT Extinction Map

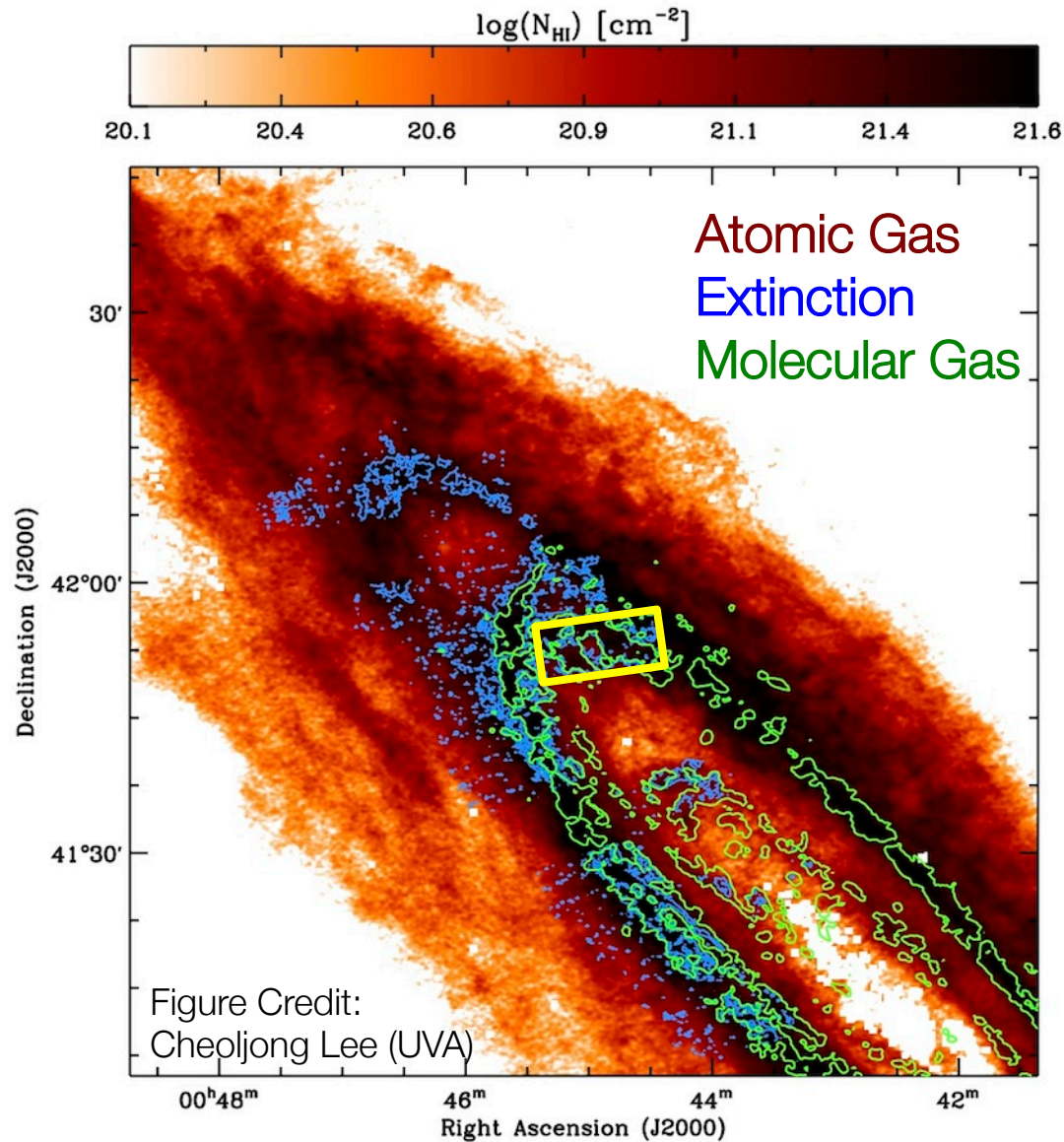
Julianne Dalcanton
(U Washington)



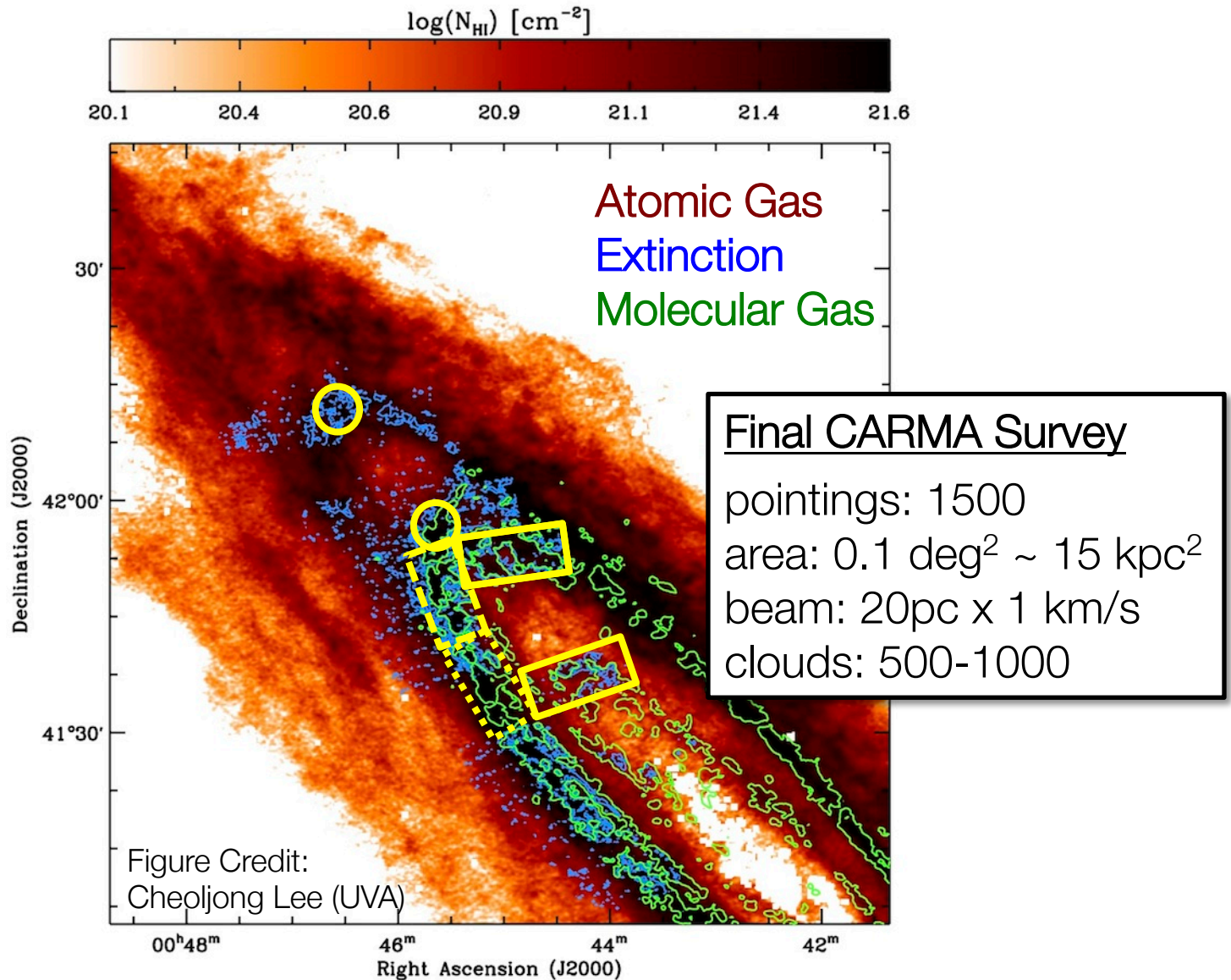
PHAT Extinction Map



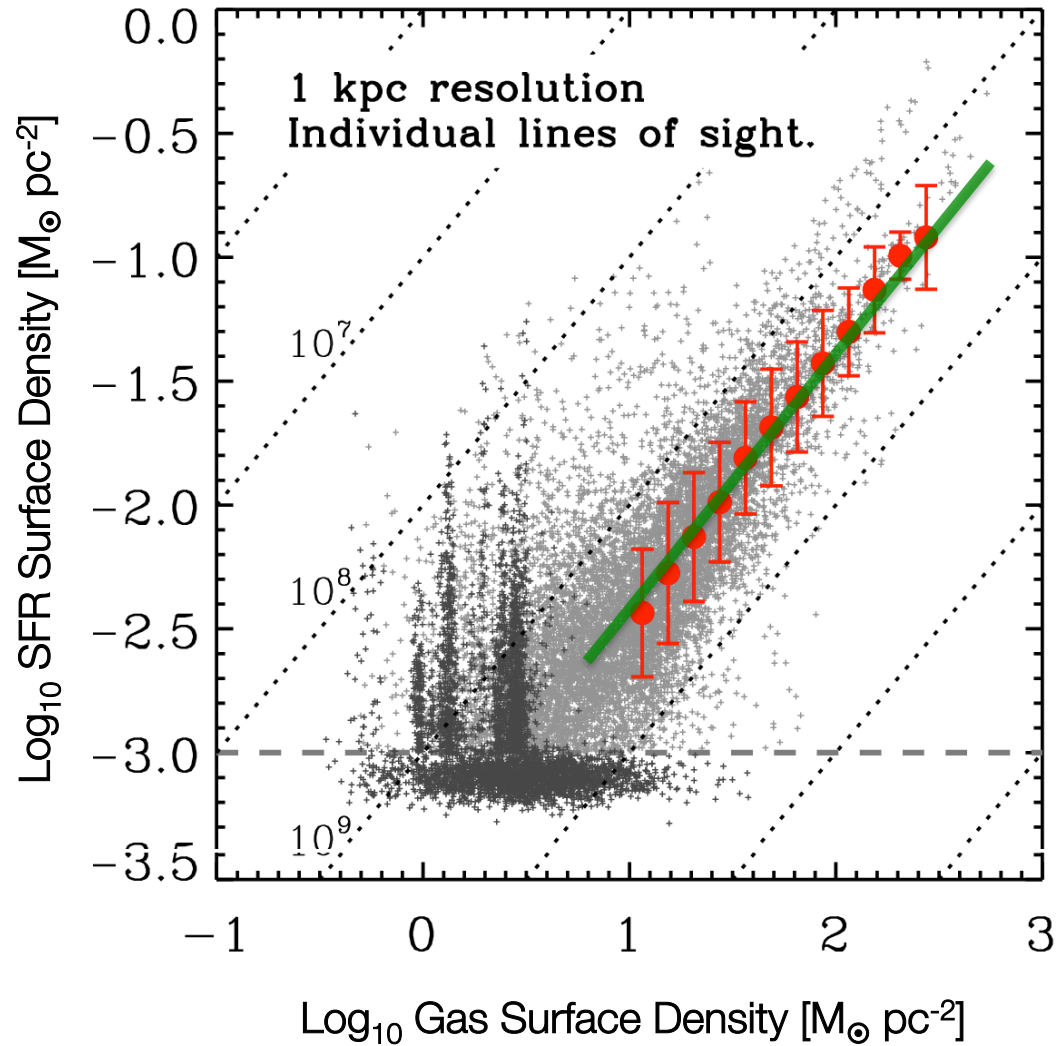
PHAT Extinction Map



PHAT Extinction Map



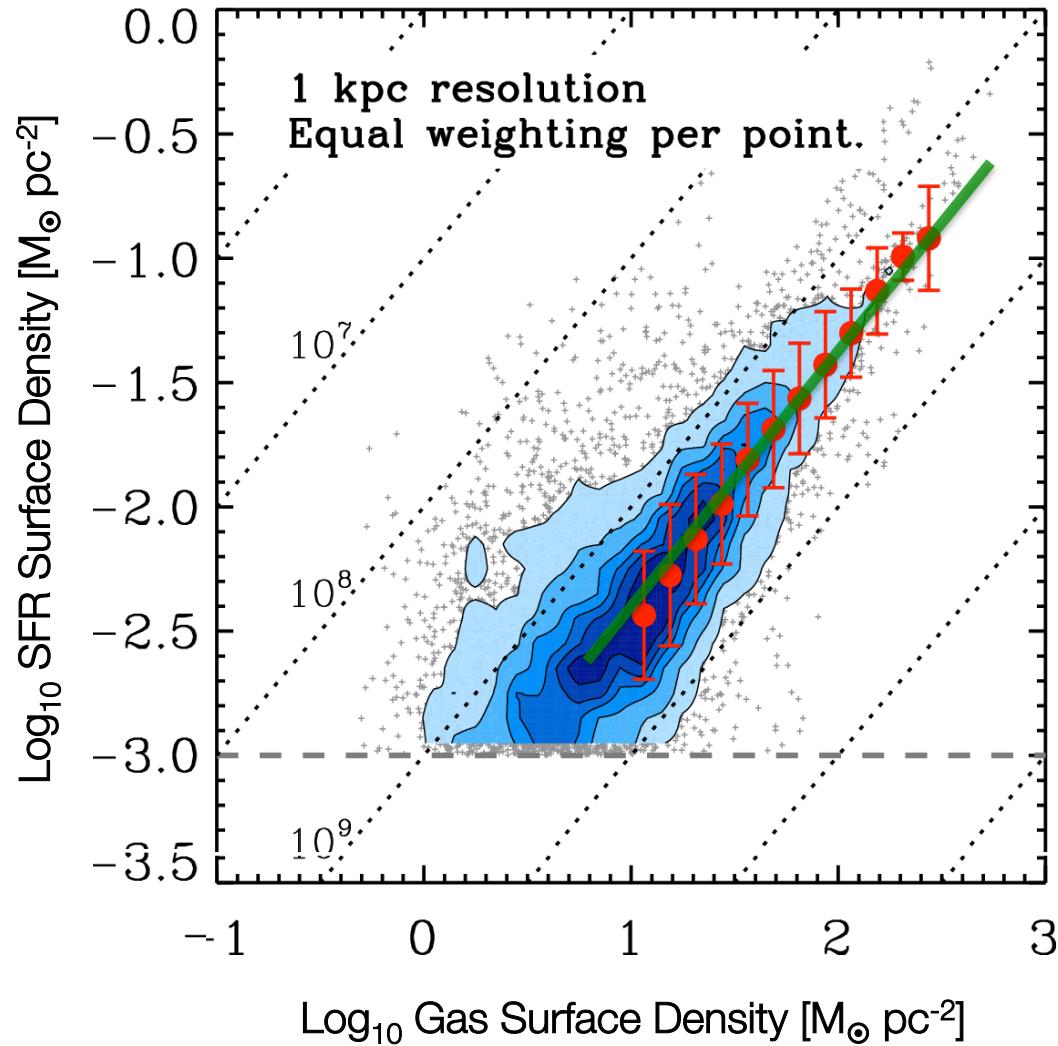
Star Formation Relation



Each Point: 1 kpc pixel, 30 galaxies

Leroy, Schruba et al. 2013

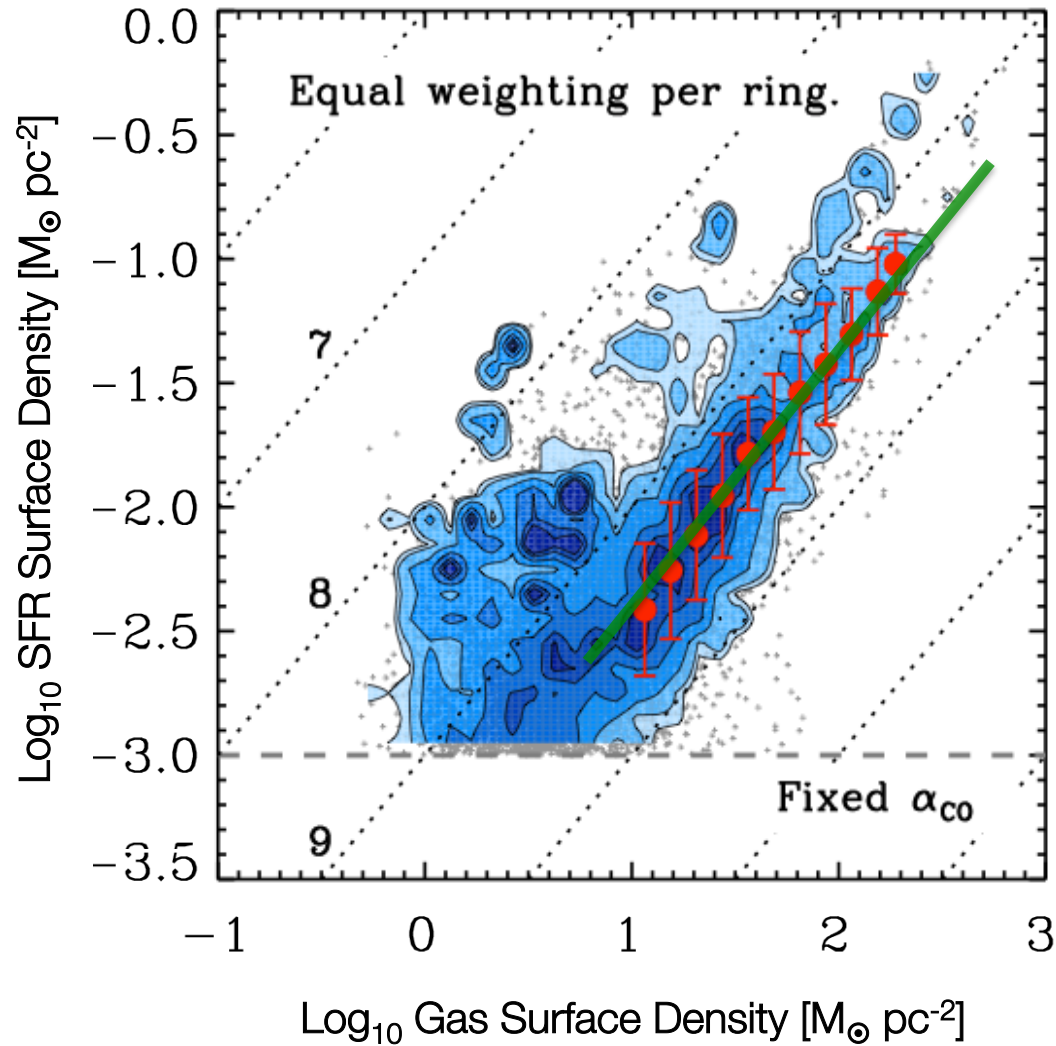
Star Formation Relation



Each Point: 1 kpc pixel, 30 galaxies

Leroy, Schruba et al. 2013

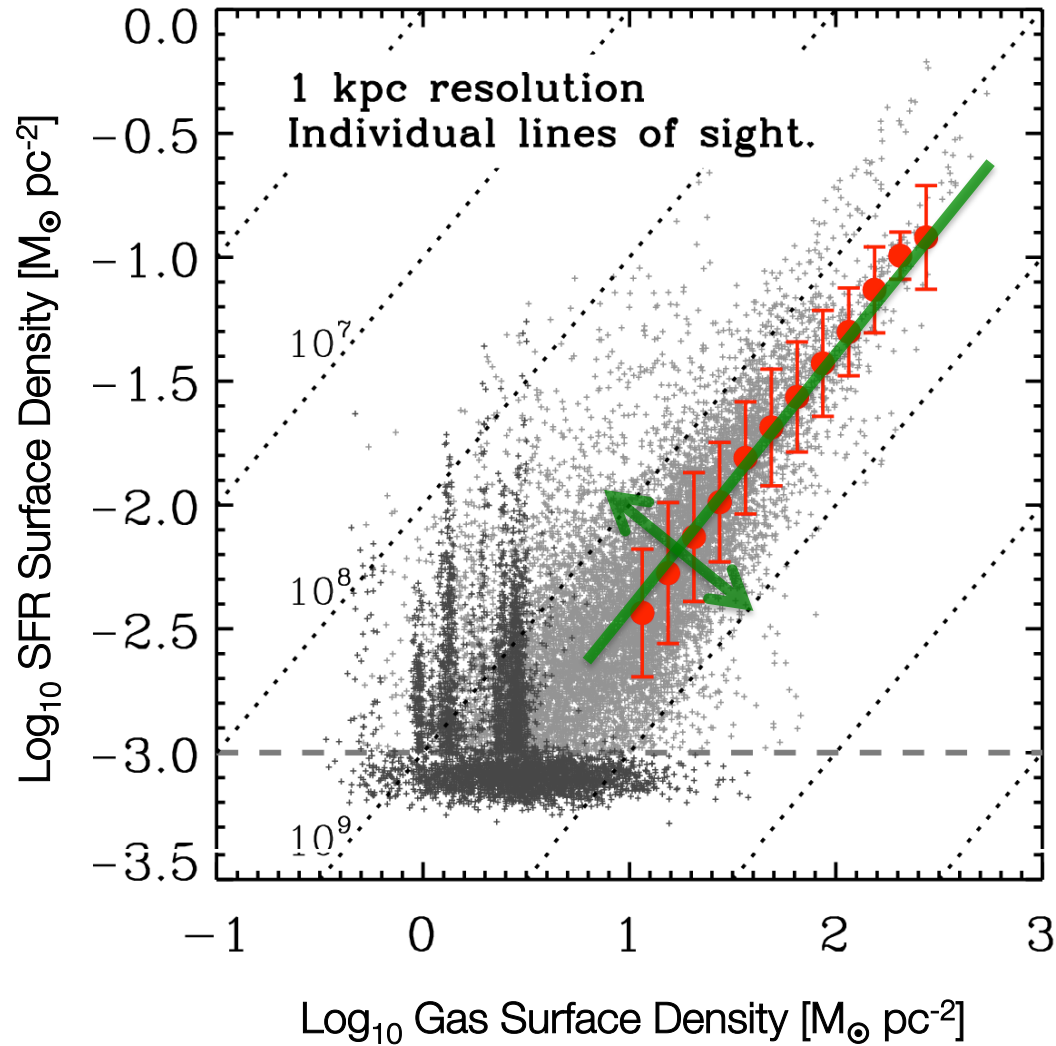
Star Formation Relation



Each Point: 1 kpc pixel, 30 galaxies

Leroy, Schruba et al. 2013

Star Formation Relation

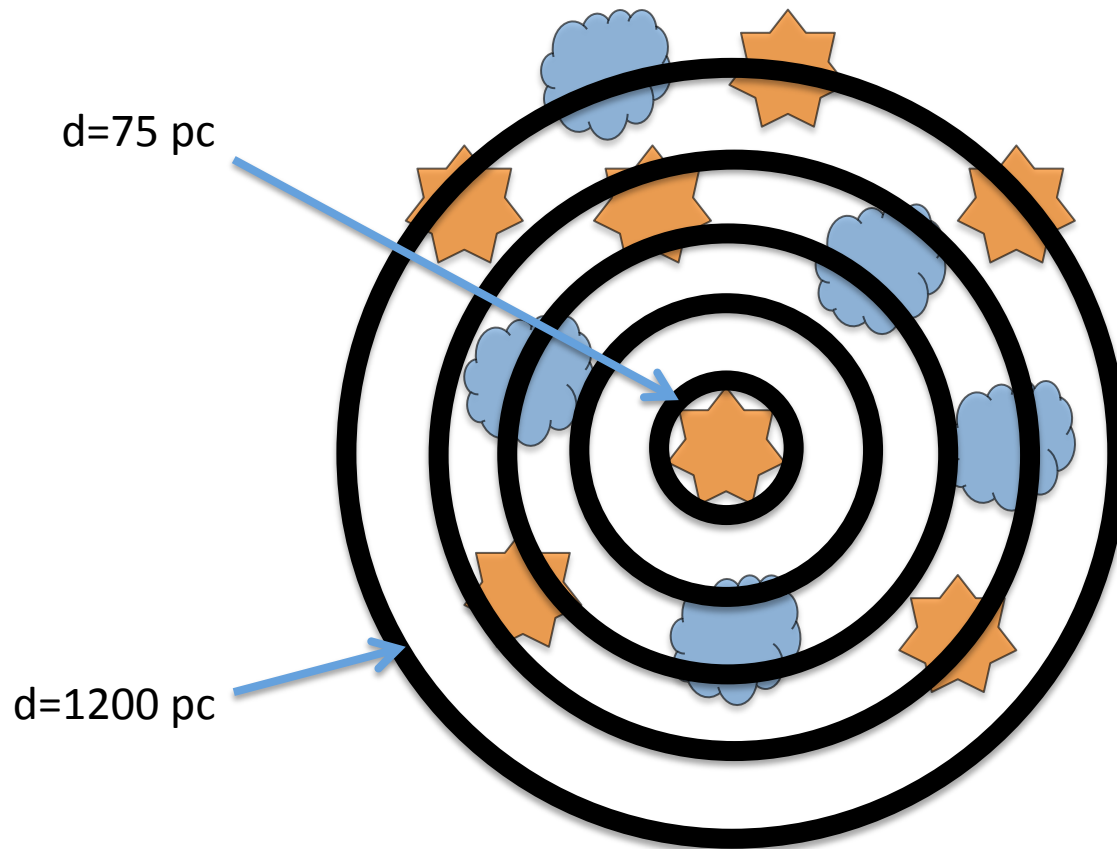


Each Point: 1 kpc pixel, 30 galaxies

Leroy, Schruba et al. 2013

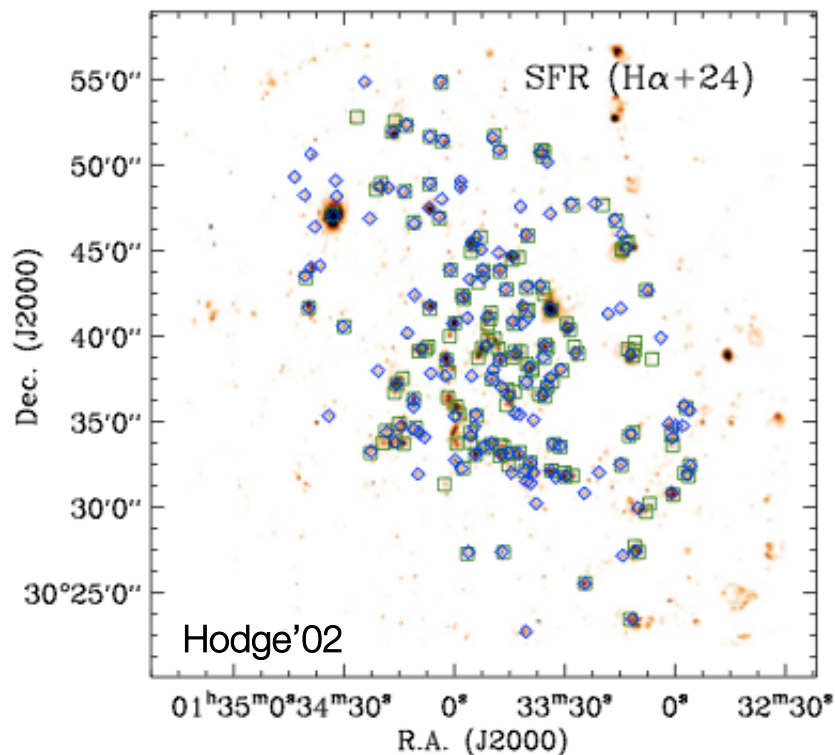
Star Formation Relation

Aperture Size Matters

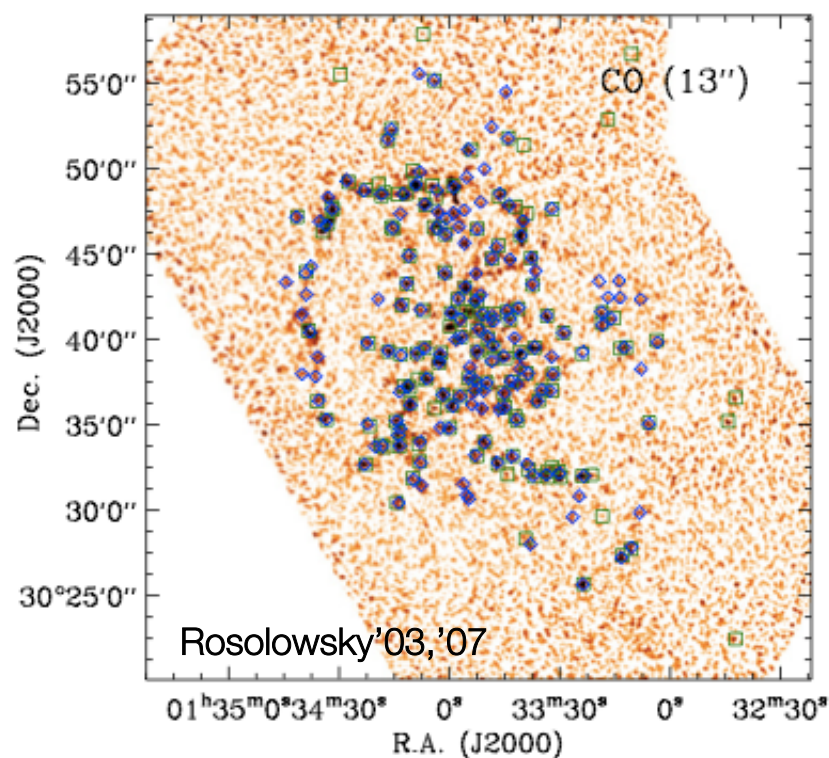


Local Example: M33

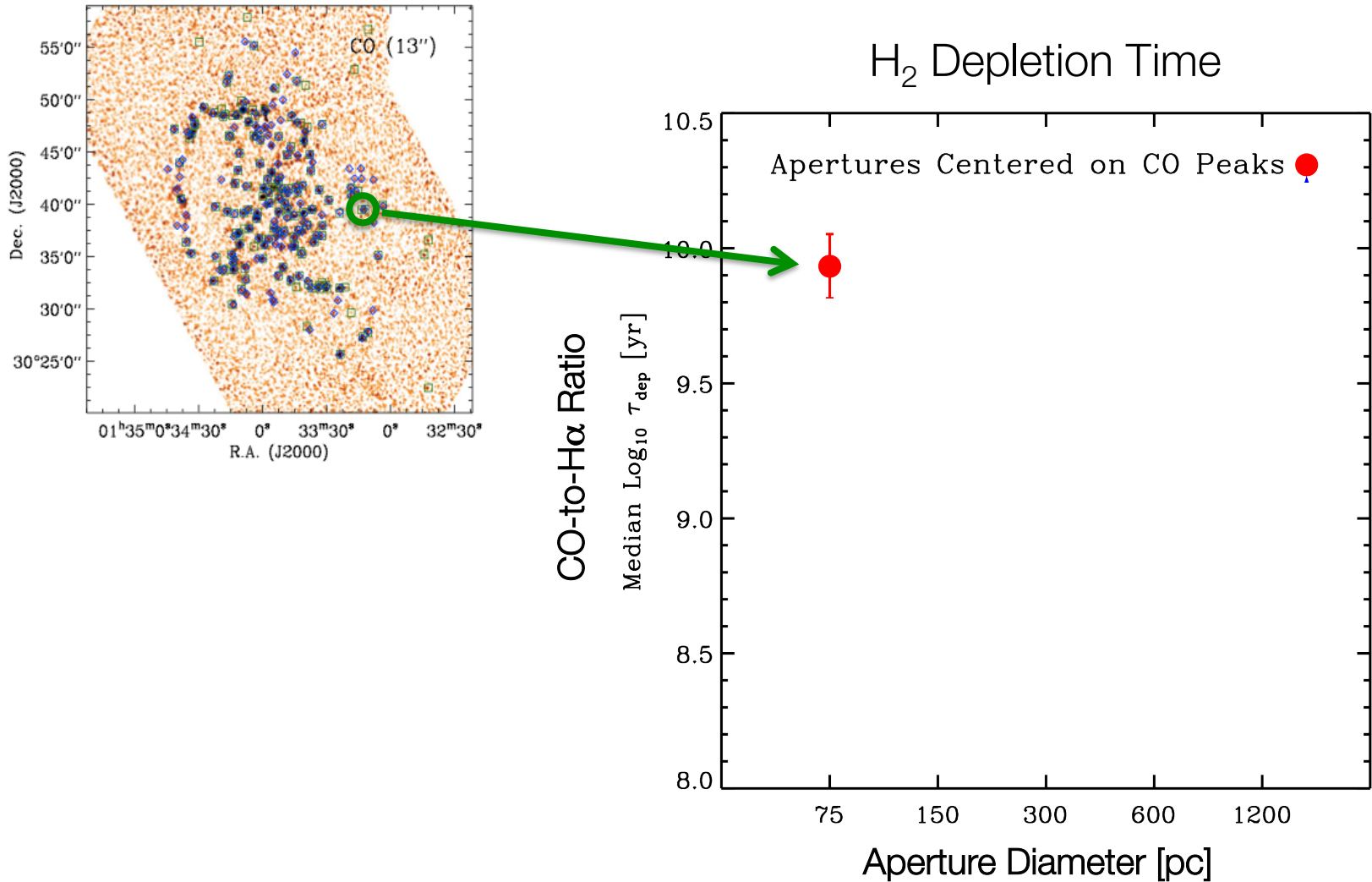
Star Formation Rate Map



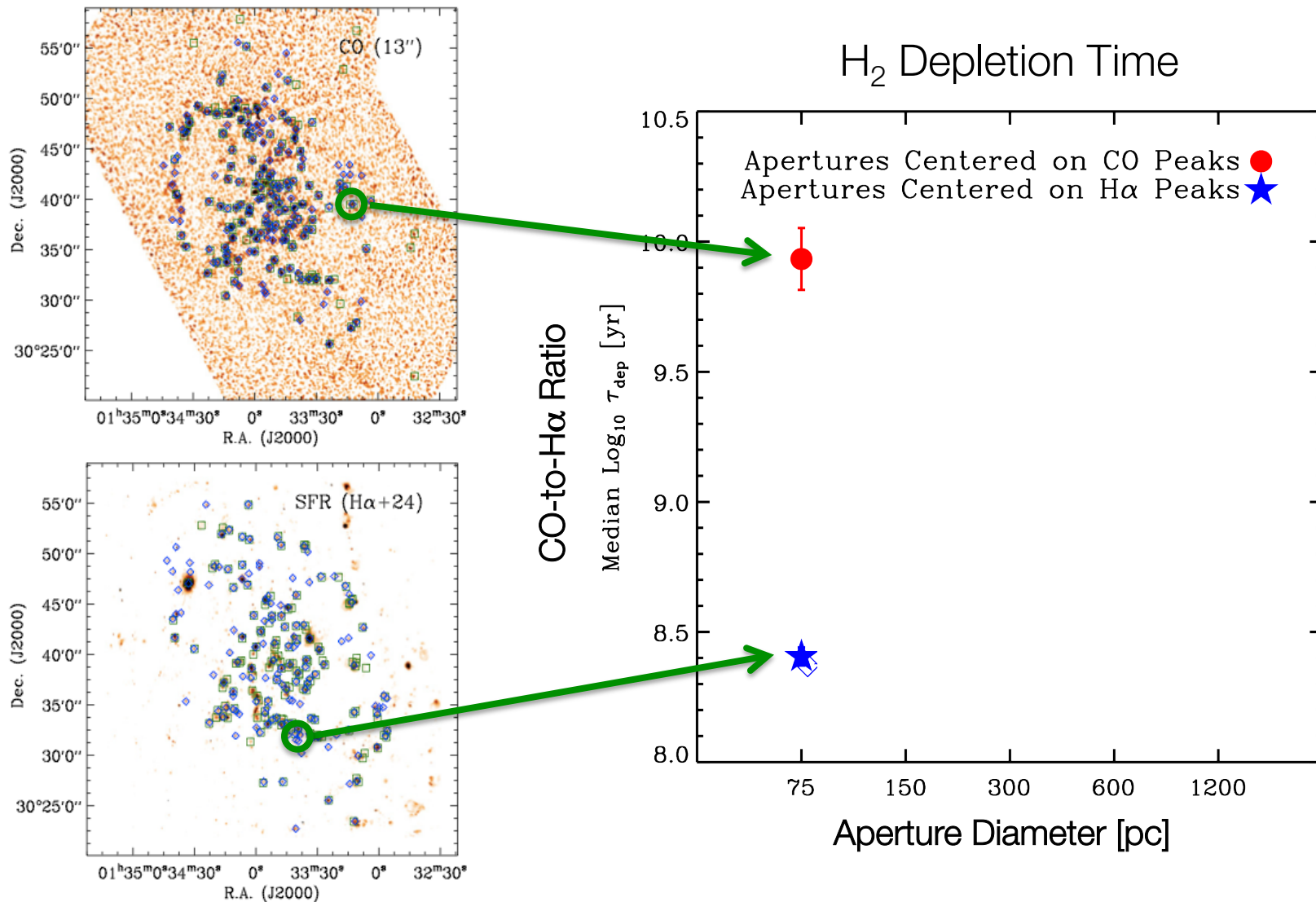
Molecular Gas Map



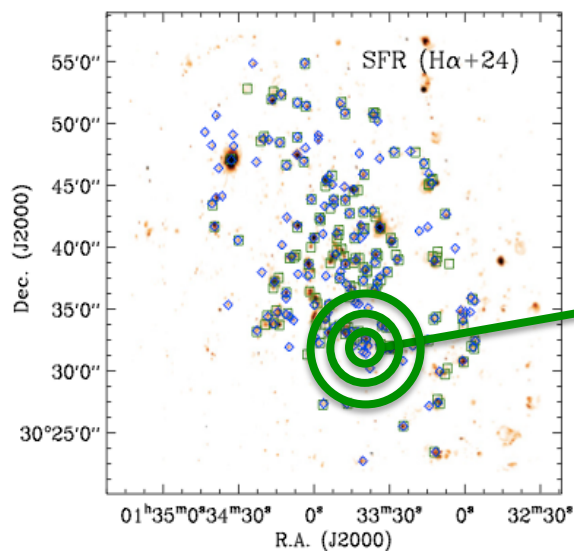
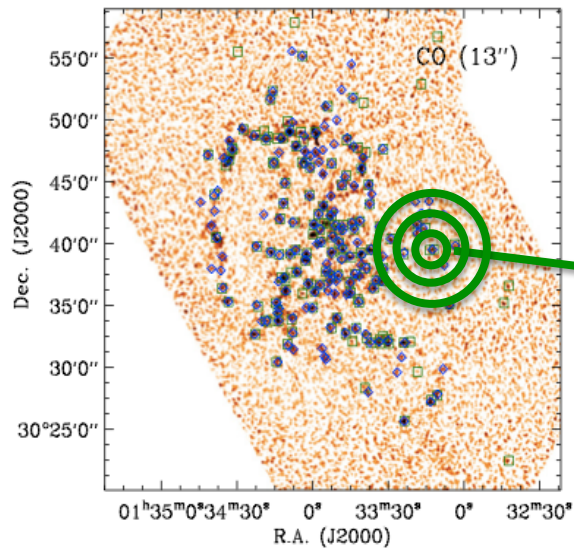
Local Variations of SFR/H₂ Balance



Local Variations of SFR/H₂ Balance



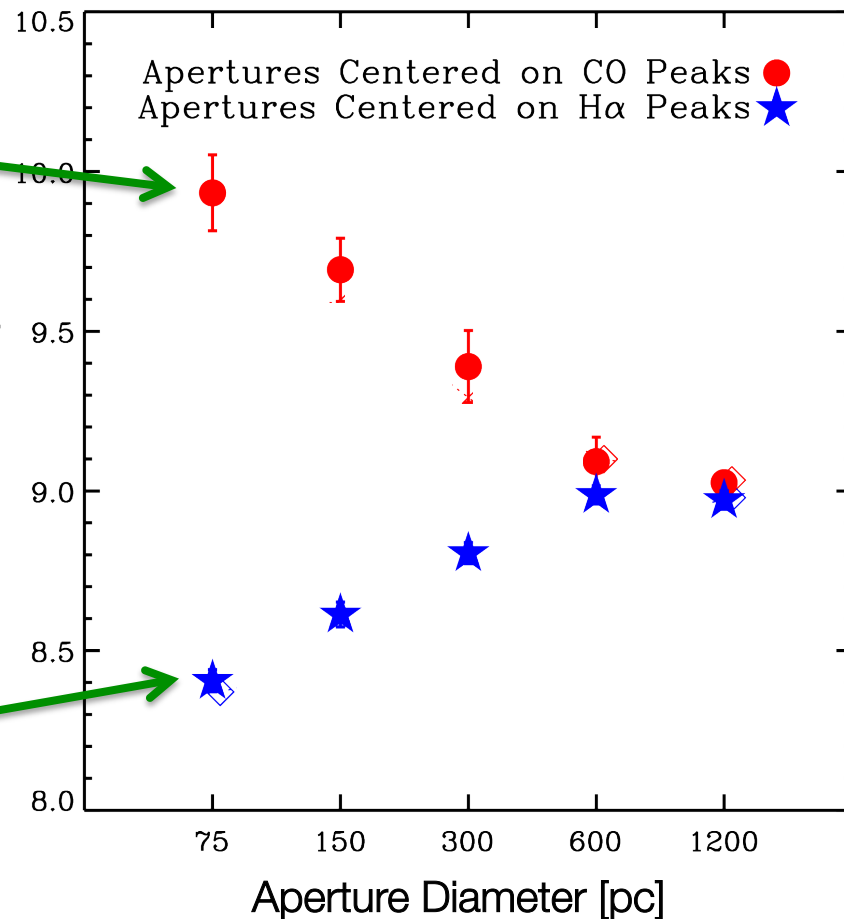
Local Variations of SFR/H₂ Balance



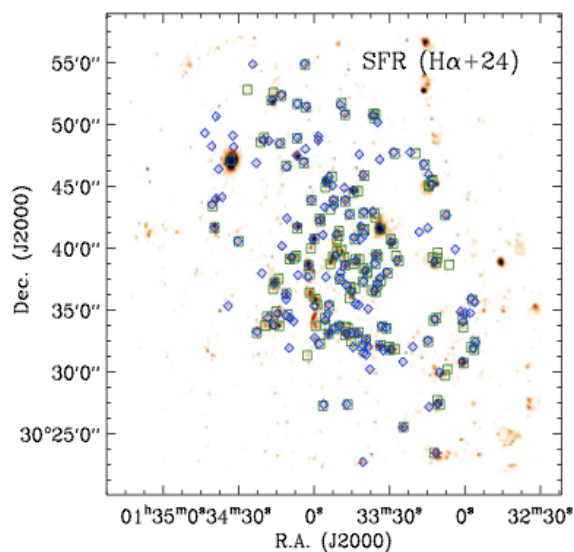
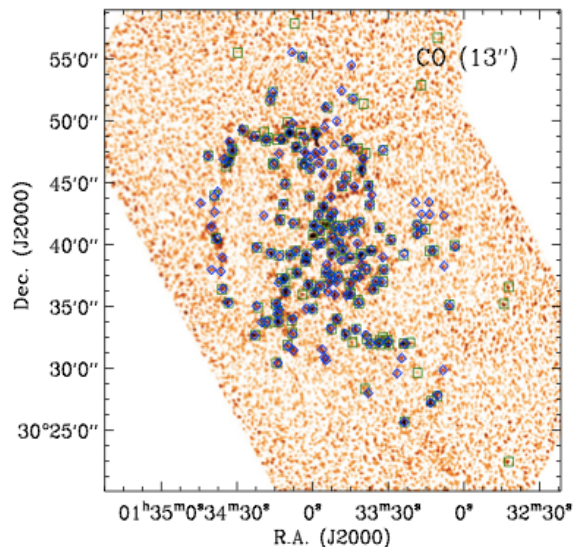
CO-to-H α Ratio

Median Log₁₀ τ_{dep} [yr]

H₂ Depletion Time

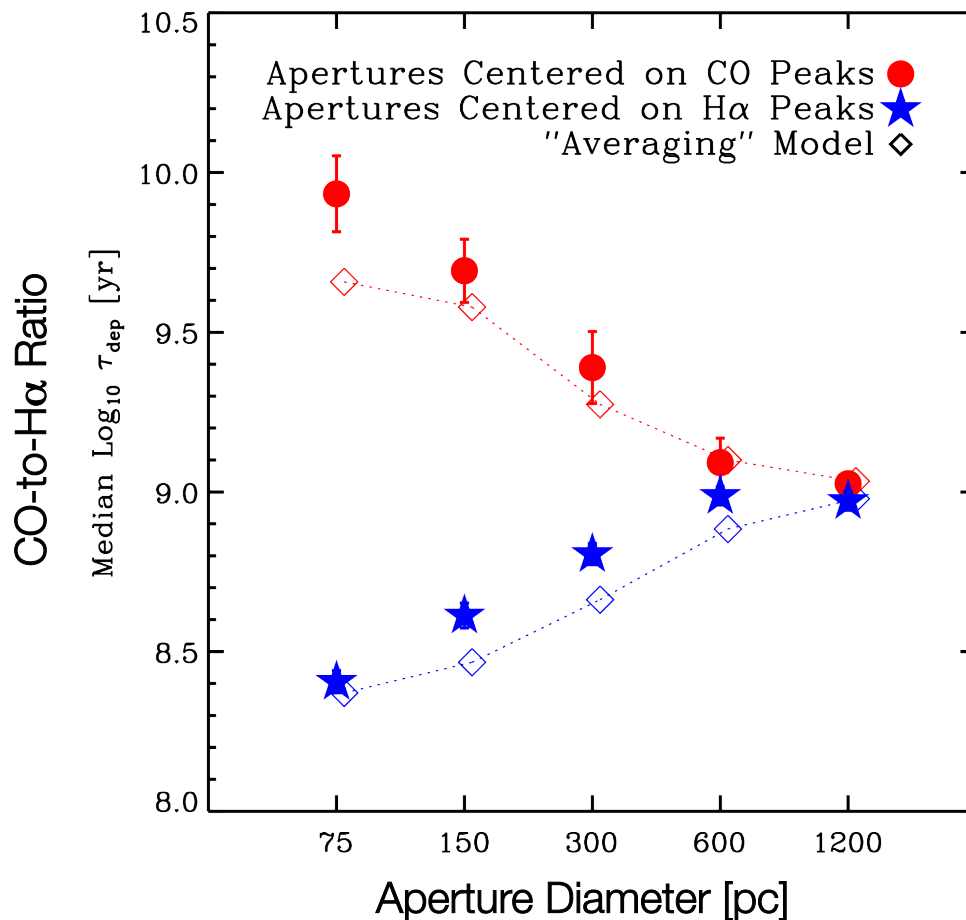


Local Variations of SFR/H₂ Balance

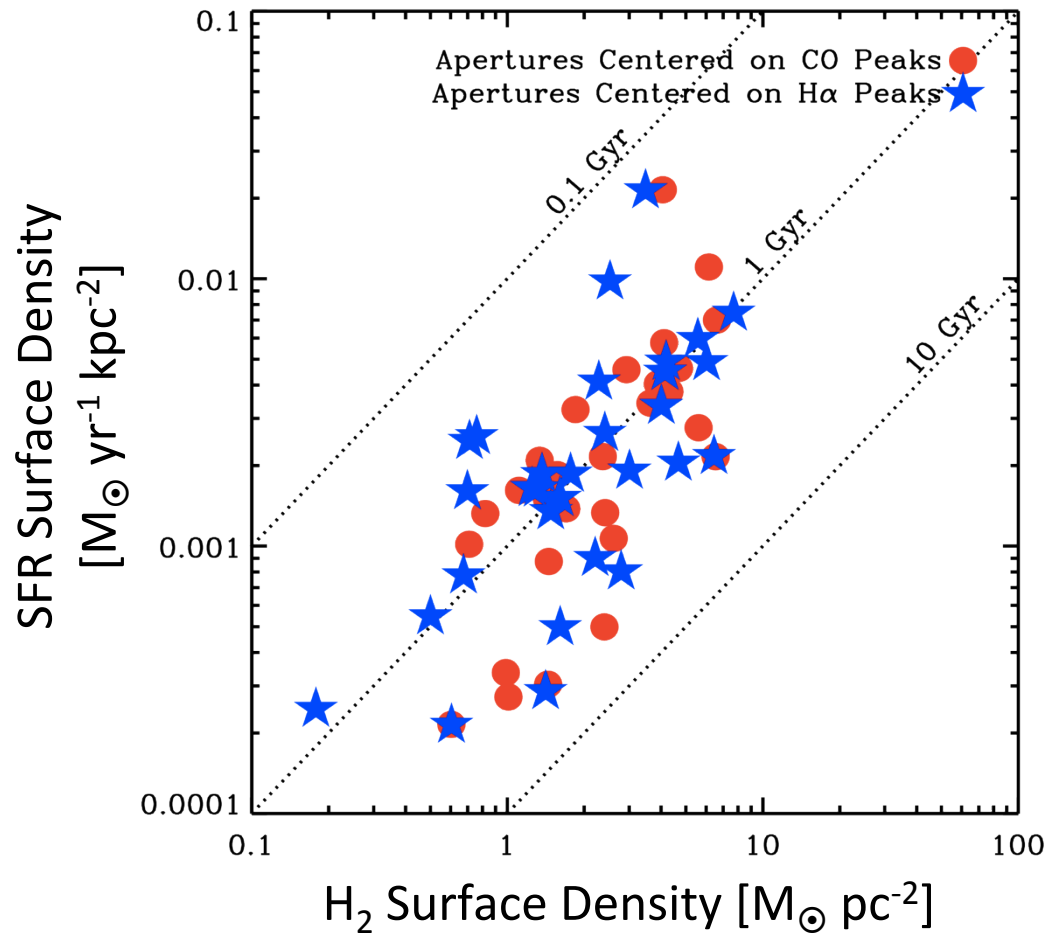


$\langle \# \rangle$ of High Mass Star Forming Regions

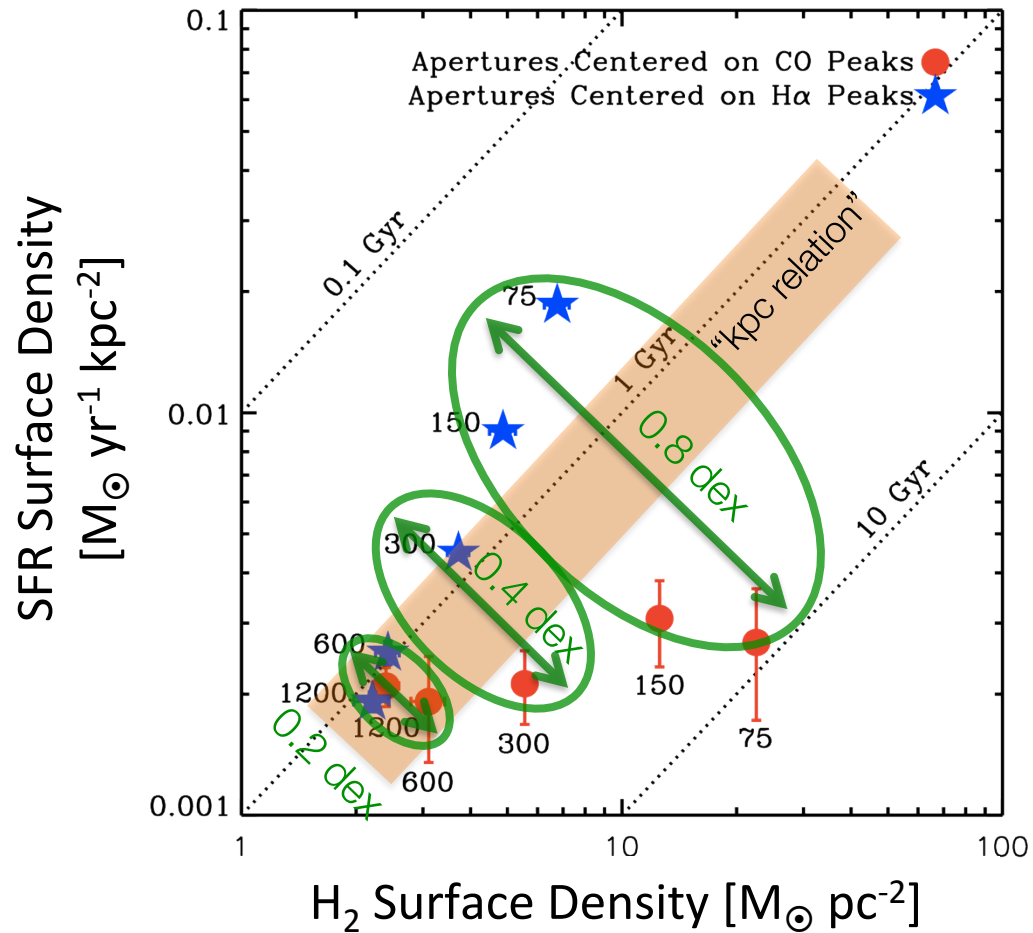
1.1 1.4 2.1 5.2 16



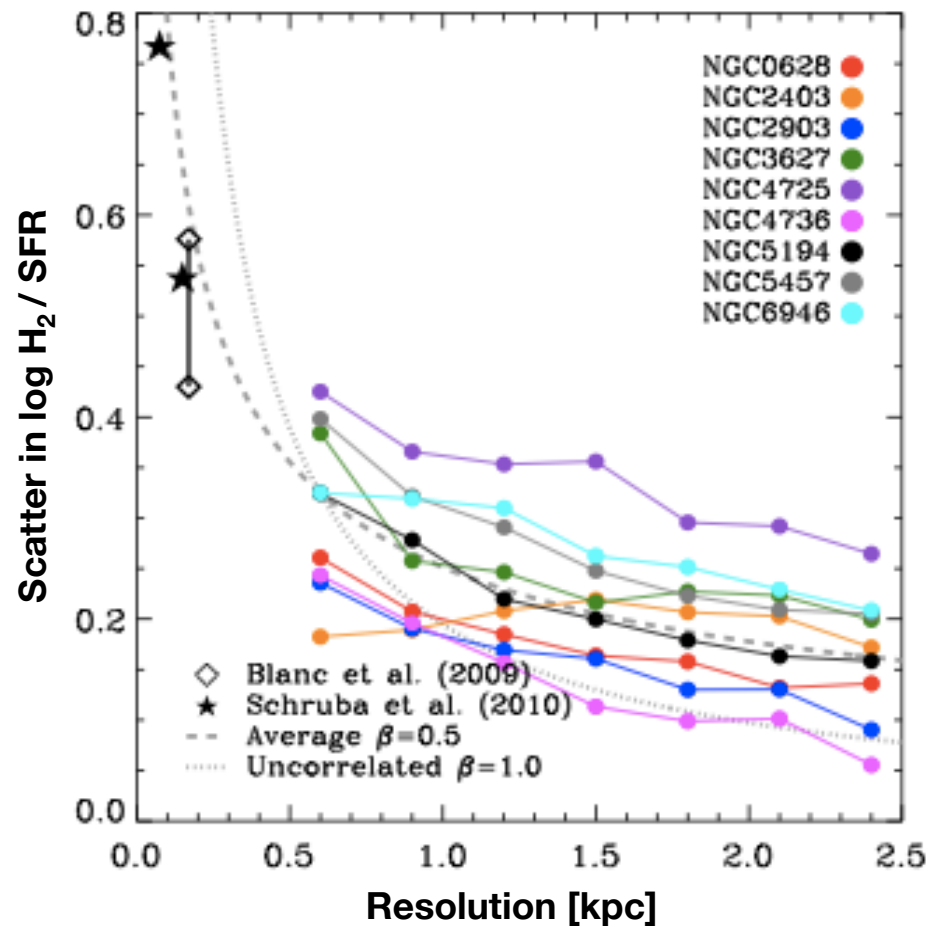
Recovery of SF Relation at 1 kpc



Putting it all together ...



Scale Dependence of SF Relation



CARMA Survey of Andromeda

*THIS IS NOT
... THE END*

