Interstellar Medium and Star Formation in the Andromeda Galaxy

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CO Map from IRAM 30m

IRAM 30m: 
85 pc x 2.5 km/s 
rms ~ 30 mK
CO Map from CARMA

Brick 15

CARMA:
175 hours
335 p mosaic
20 pc x 1 km/s
rms ~ 250 mK
Cloud Decomposition

**Brick 15**

*CPROPStoo*

Rosolowsky & Leroy 2006; Leroy et al. (in prep)

- locate "islands"
- break into "clouds"
- get moments & flux
Cloud Decomposition

Brick 9

Right Ascension

Declination

500pc

Intensity [K]

0 4 8 12 16 20
Cloud Decomposition

Brick 21

Declination

Right Ascension

Intensity [K]

500 pc
Cloud Properties I

**Radius**
- Brick 15
- Brick 9

**Velocity Dispersion**
- Limit

**Aspect Ratio**

**Peak Temperature**
Linewidth – Size Relation
Luminosity – Radius Relation

![Graph showing the relationship between CO luminosity and radius for different types of galaxies including spirals, dwarfs, and outer disk.]
Larson’s “Parameter”

What controls nature of clouds (ie offsets)?
… concordance of properties for neighboring clouds?
Concordance of Cloud Nature?

500pc avg cloud properties ($\sigma^2/l$) for neighboring clouds
Concordance of Cloud Nature?
Cloud Motions

Median: 2.44 km/s
MAD: 5.80 km/s
Concordance of Cloud Motions?

Distance

$H_2$ Surface Density @ 200pc

Cloud Mass

SFR Surface Density @ 200pc
Cloud Dynamics

![Image of a scientific graph showing cloud dynamics with a color scale indicating Local Moment 1 in km/s, with axes for Declination and Right Ascension.](image)

- Declination: 41°50′0″ to 56°0″
- Right Ascension: 00°45′15″ to 44°45′"
PHAT SF Histories

Grad: Alexia Lewis (U Washington)

Image with red borders and labeled areas:
- Brick 16
- Brick 15

Images for different time periods:
- FUV: 125 - 130 Myr
- Hα: 35 - 40 Myr
- CO: 5 - 10 Myr
- HI: 5 - 10 Myr

Poster label
PHAT Extinction Map

Extinction $A_V = 1, 2, 3$ mag

Julianne Dalcanton (U Washington)
PHAT Extinction Map

Figure Credit:
Cheoljong Lee (UVA)

Julianne Dalcanton
(U Washington)
PHAT Extinction Map

Dust Surface Density \( [M_{\odot}\text{pc}^{-2}] \)

Figure Credit: Cheoljong Lee (UVA)

Bruce Draine (Princeton)
PHAT Extinction Map

Grad: Cheoljong Lee (U Virginia)

Figure Credit: Cheoljong Lee (UVA)
CARMA Survey of Andromeda

Final CARMA Survey
pointings: 1500
area: 0.1 deg$^2$ ~ 15 kpc$^2$
beam: 20pc x 1 km/s
clouds: 500-1000
completion: end 2013