

The evolved SB galaxy M82

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Motivation

Active galaxies are complex:

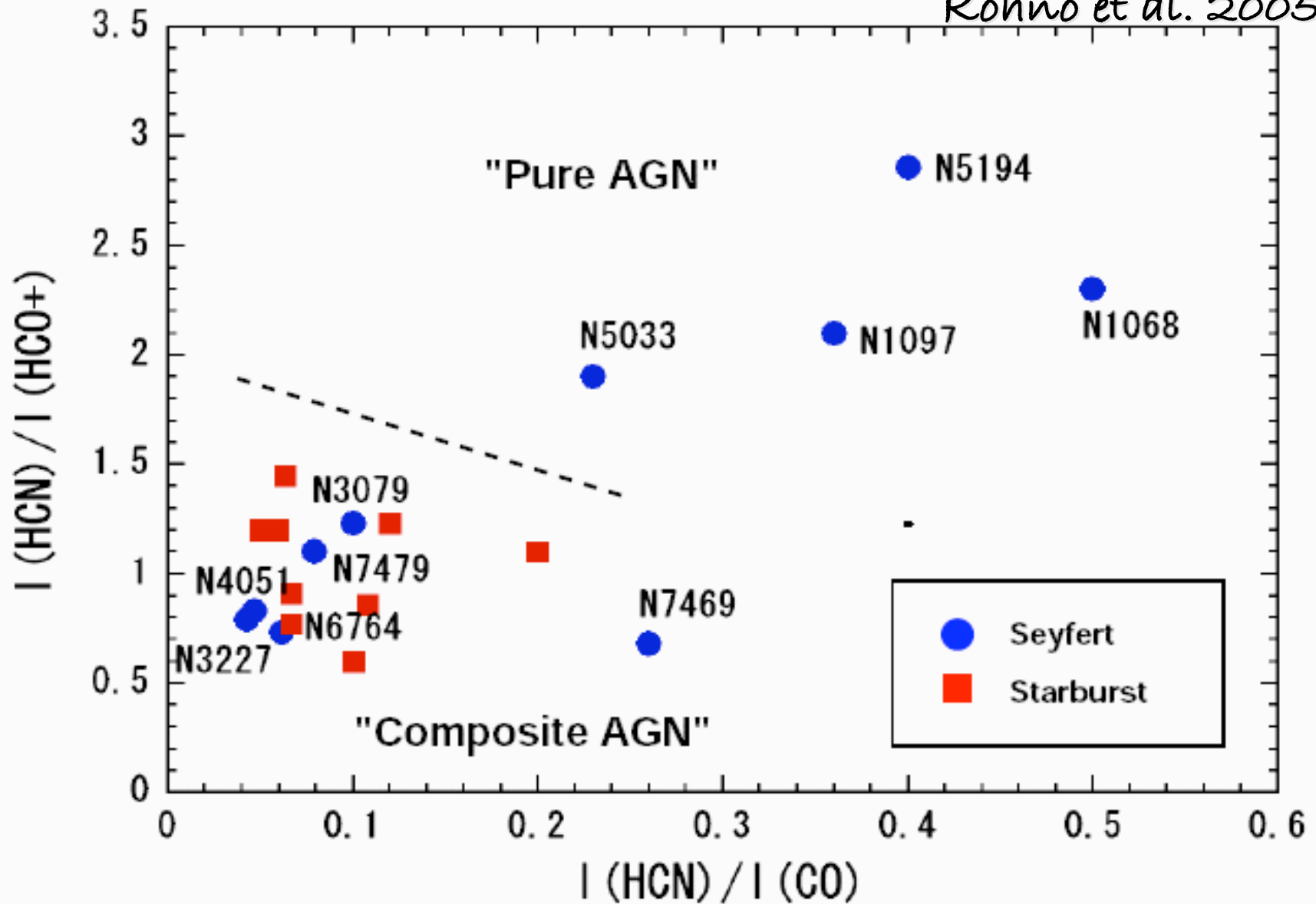
- different types: SB & AGN
- different evolutionary stages: young vs evolved
- different degrees: (low- vs high luminosity)



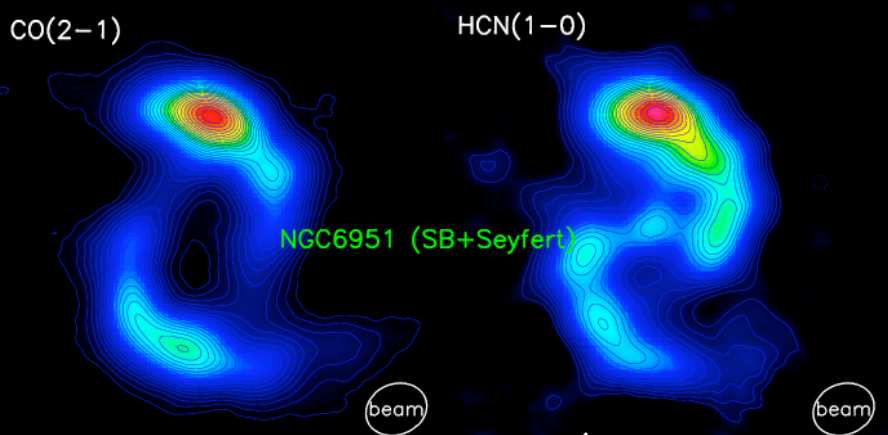
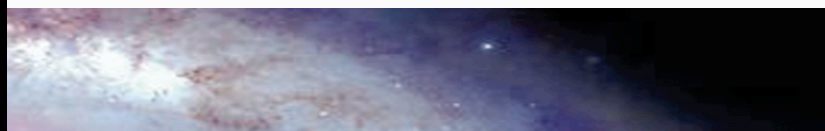
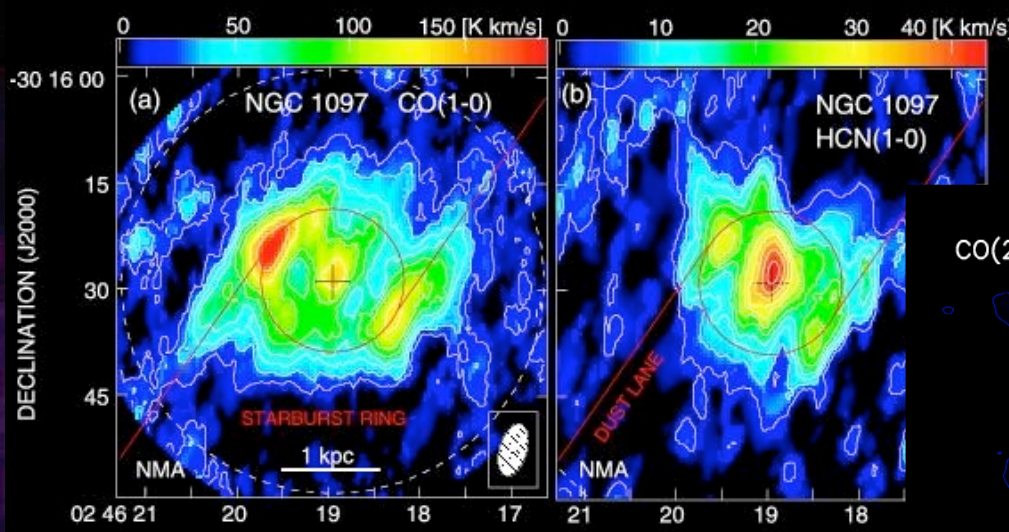
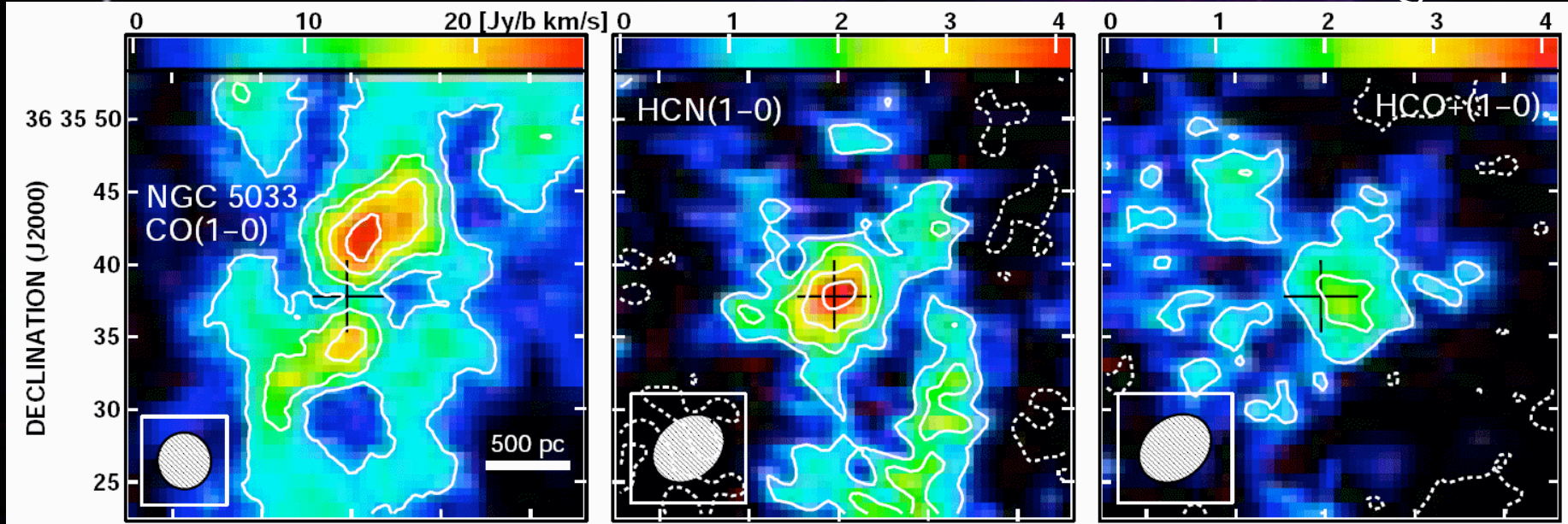
Feedback onto surrounding
molecular gas is different!!

AGN vs SB

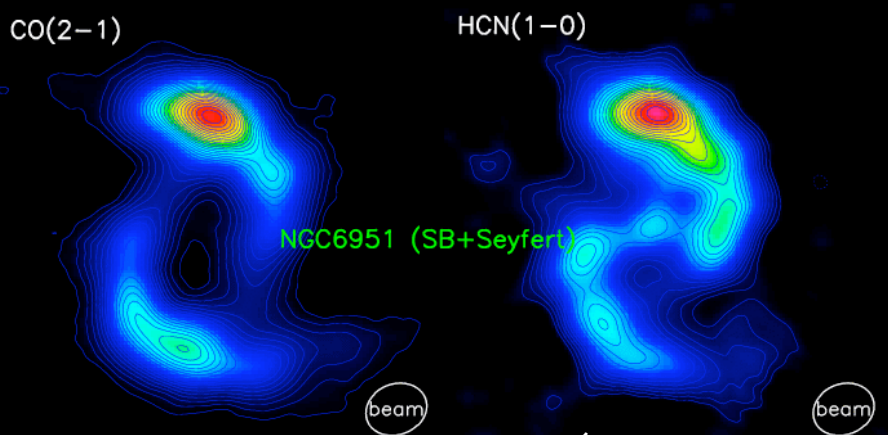
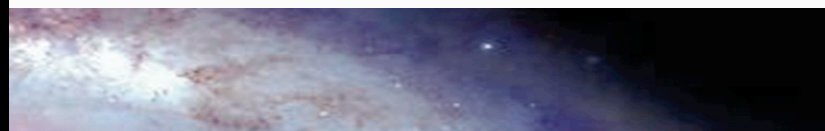
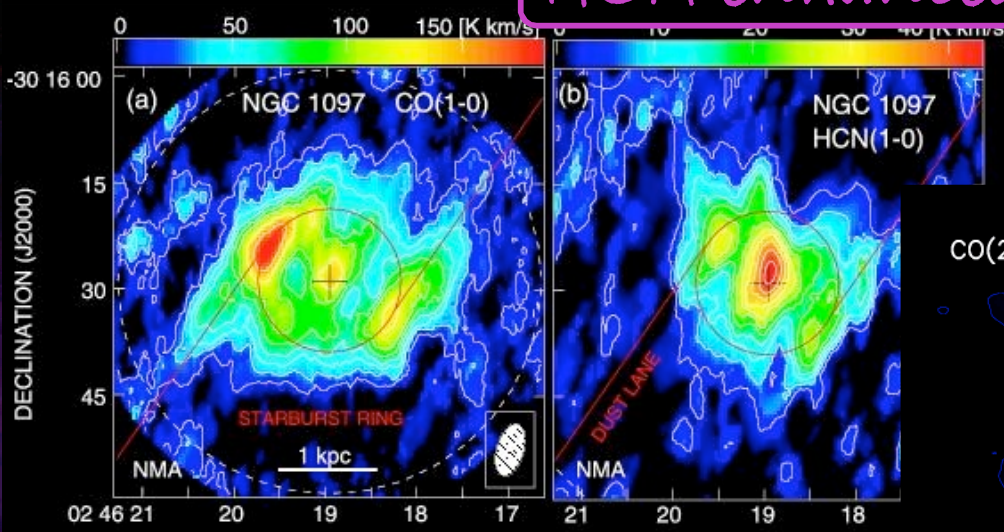
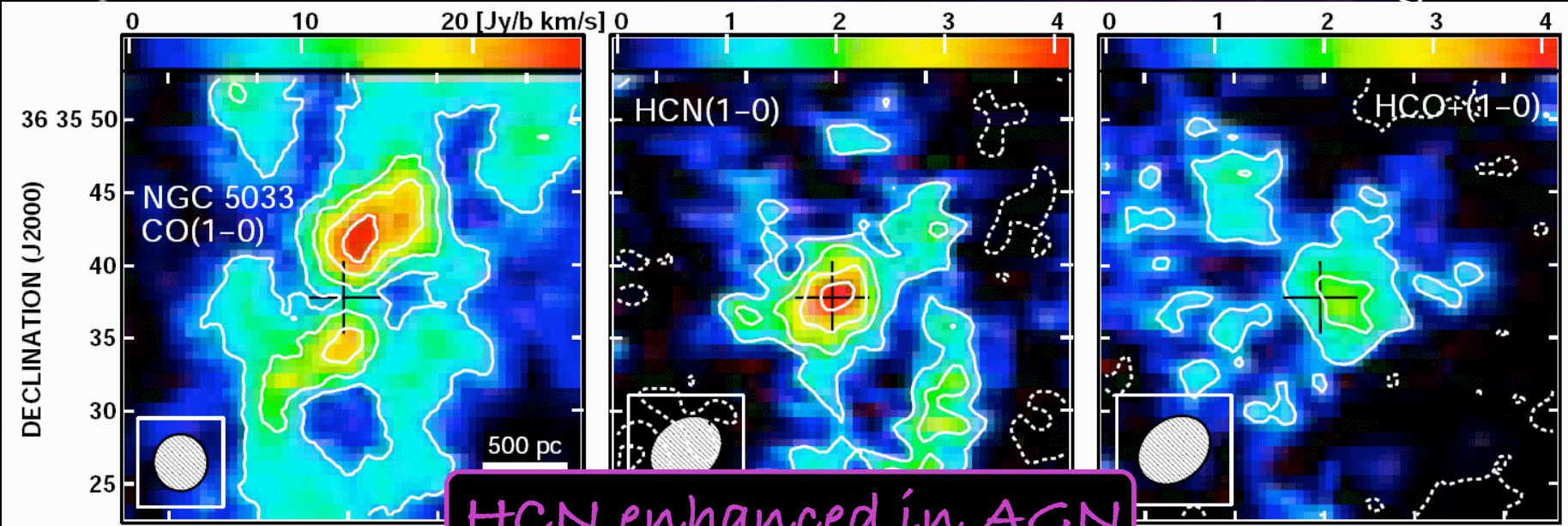
Kohno et al. 2005



Kohno et al. 2003 & 2005

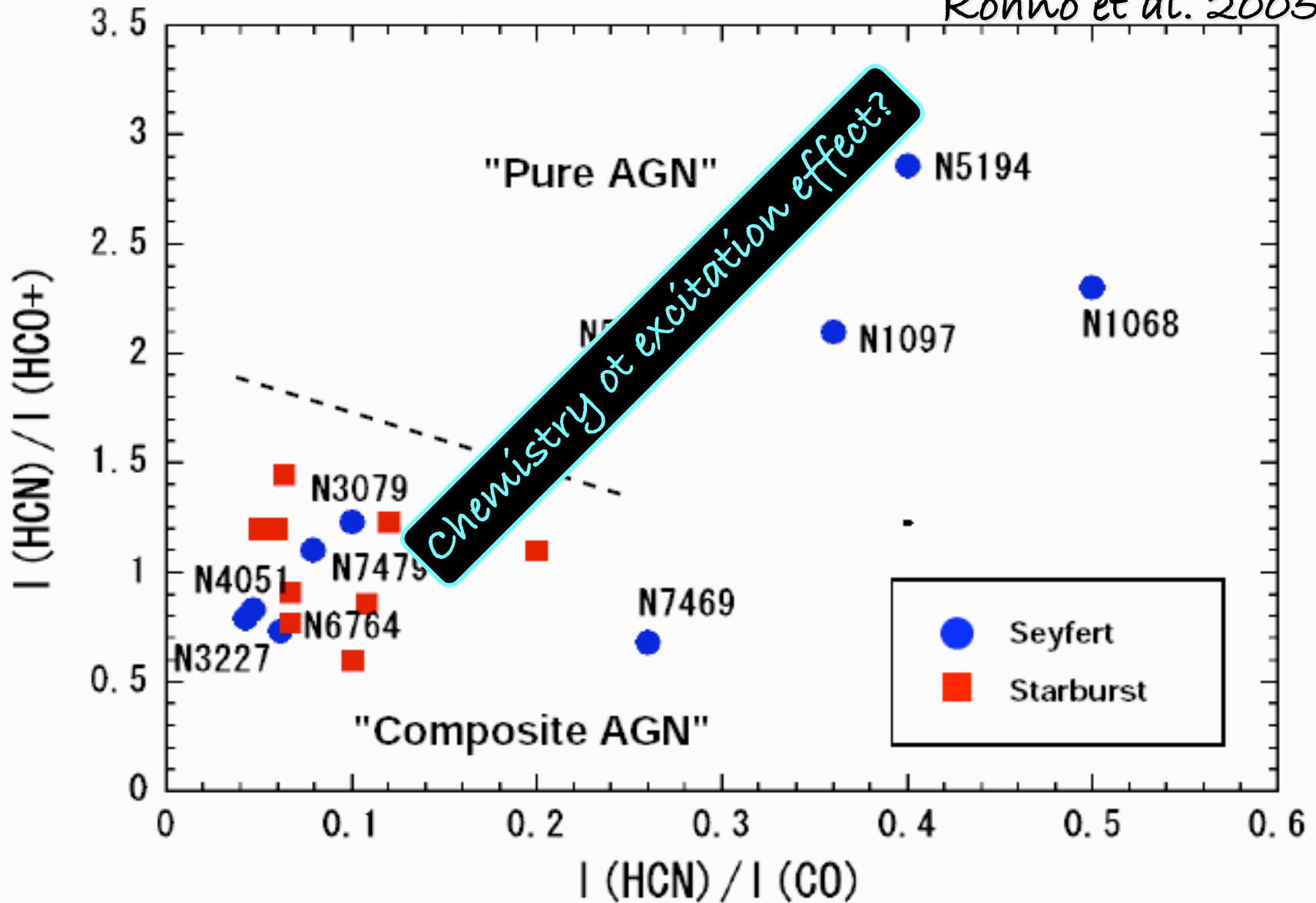


Krips et al 2007

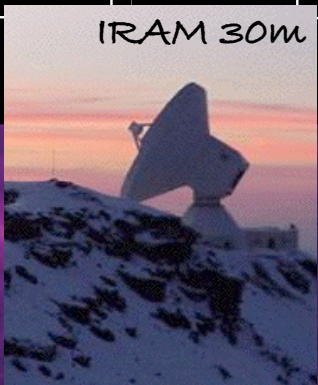
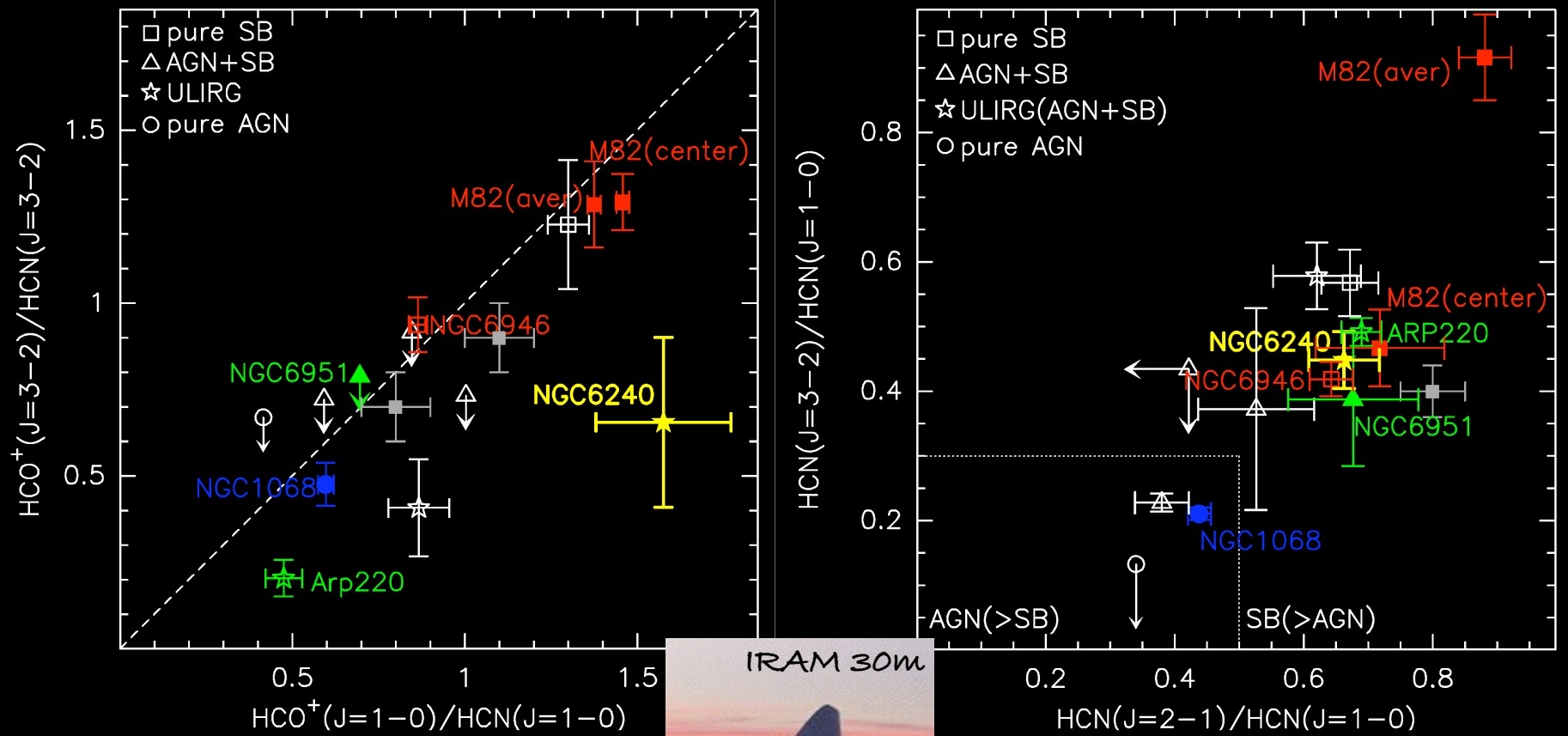


AGN vs SB

Kohno et al. 2005

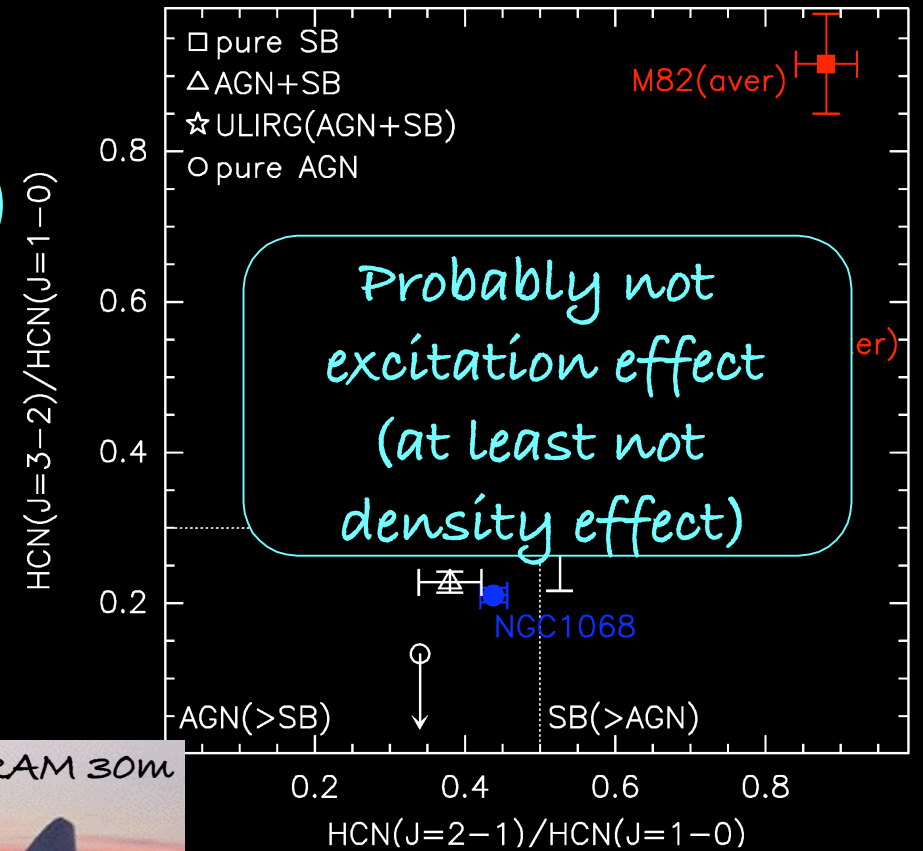
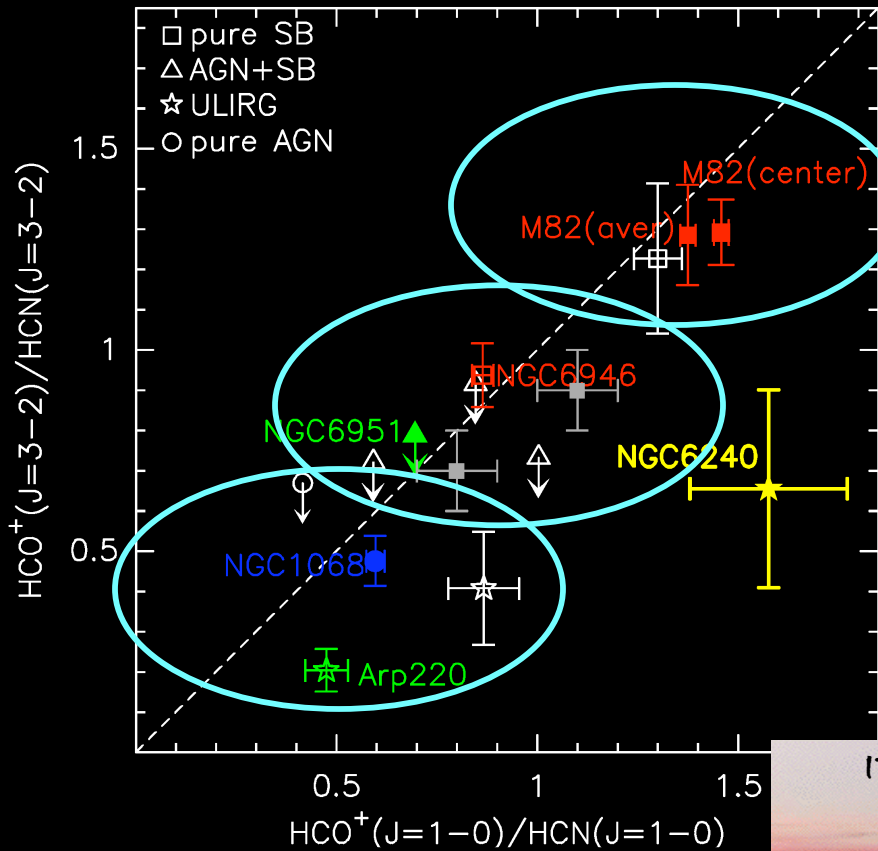


Multi-J HCN & HCO⁺ in SB & AGN



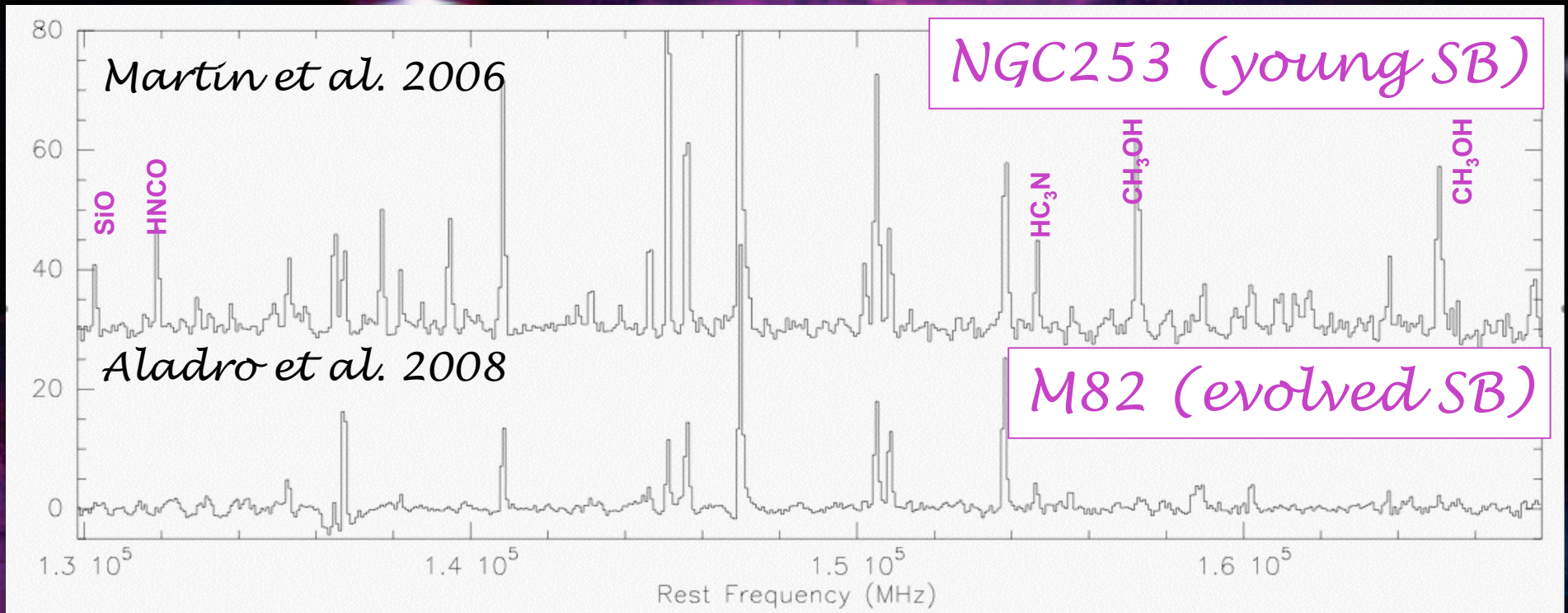
Krips et al 2007

Multi-J HCN & HCO+ in SB & AGN



Krips et al 2007

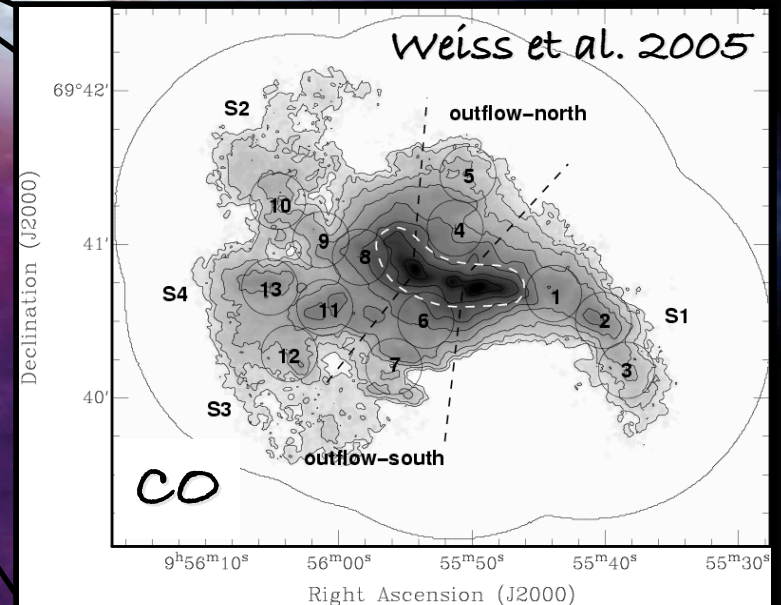
Young vs Evolved SB



The evolved SB galaxy M82

Some Facts:

- the prototype of a nearby (3.6 Mpc) evolved SB galaxy:
 - * dominance of PDR chemistry along disk
(e.g., García-Burillo et al. 2002, Fuente et al. 2006)
 - * high number of SN explosions
- galactic superwinds
- expanding superbubble and massive black hole in center
(e.g. Matsuhita et al. 2005)
- lots of data at other λ available



PdBI Observations

Observing date: March - May 2007 (PdBI)

Molecular Lines: HCN(1-0) & HCO⁺(1-0)

Configuration: C+D (~4" ang. resolution)

Number of antennas: 5-6

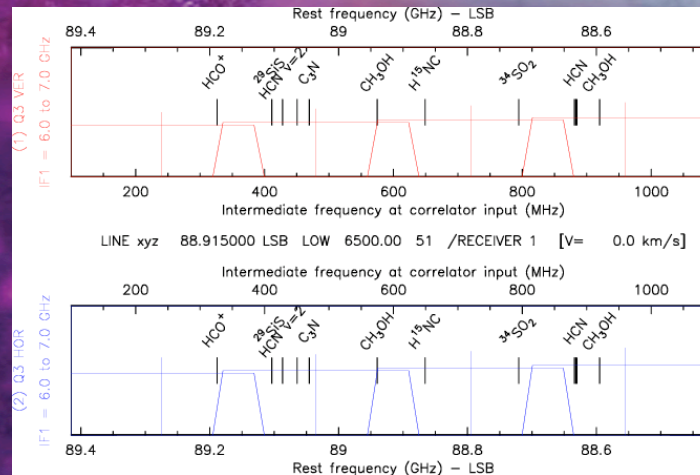
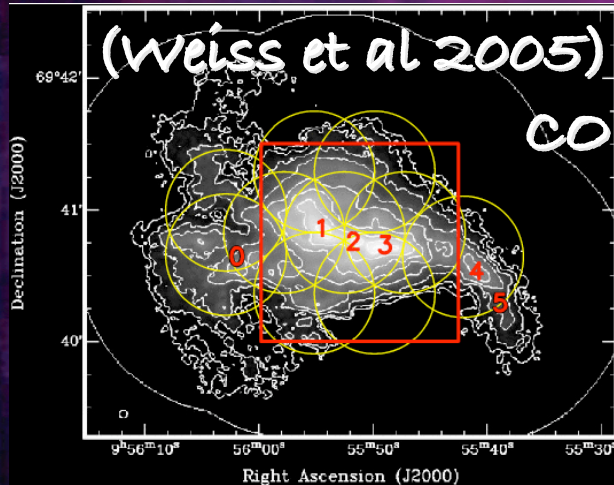
Observing mode: mosaic (10-fields)

Frequency setup: Q3+Q3

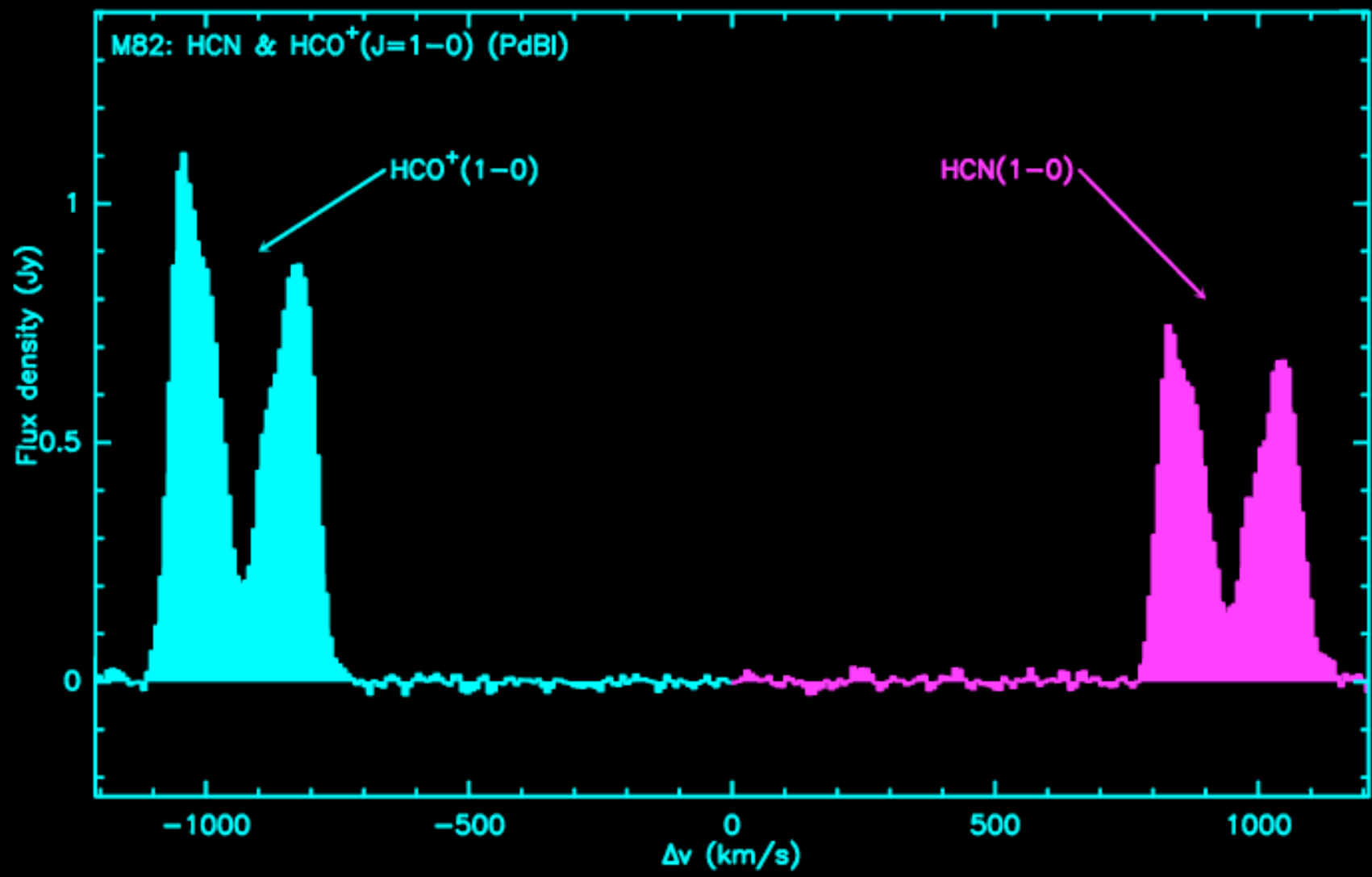
Spectral resolution: 2.5MHz (~8km/s at 3.5mm)

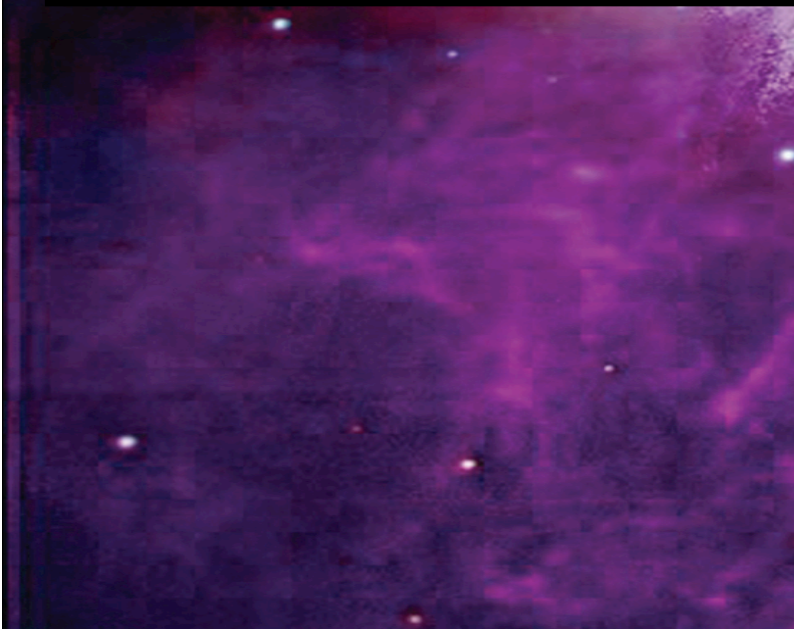
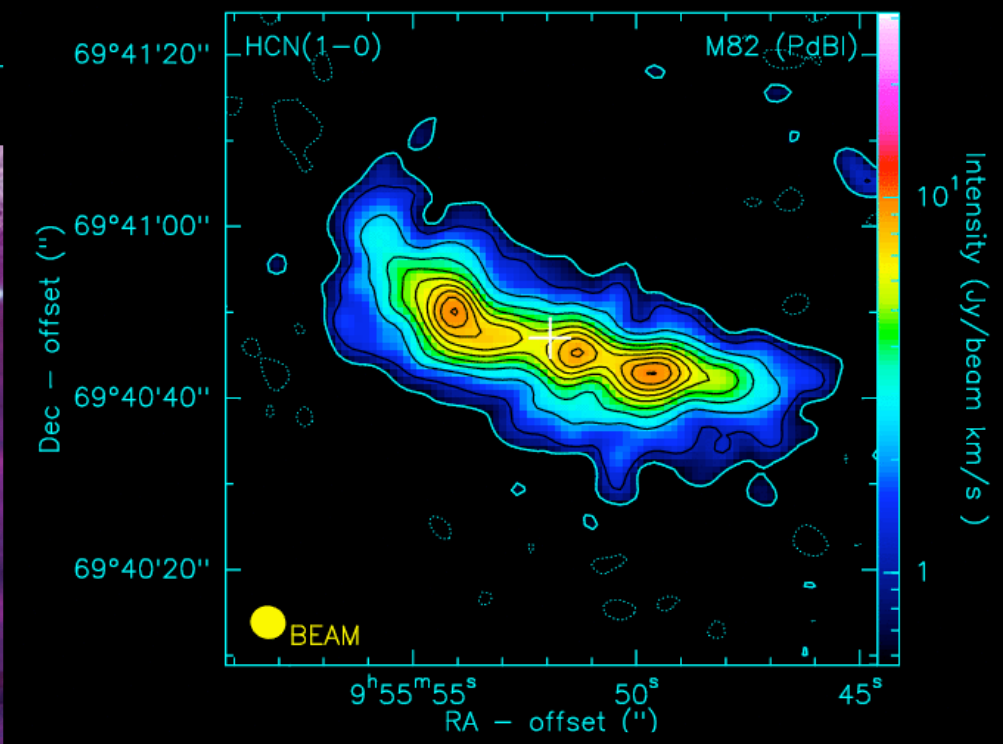
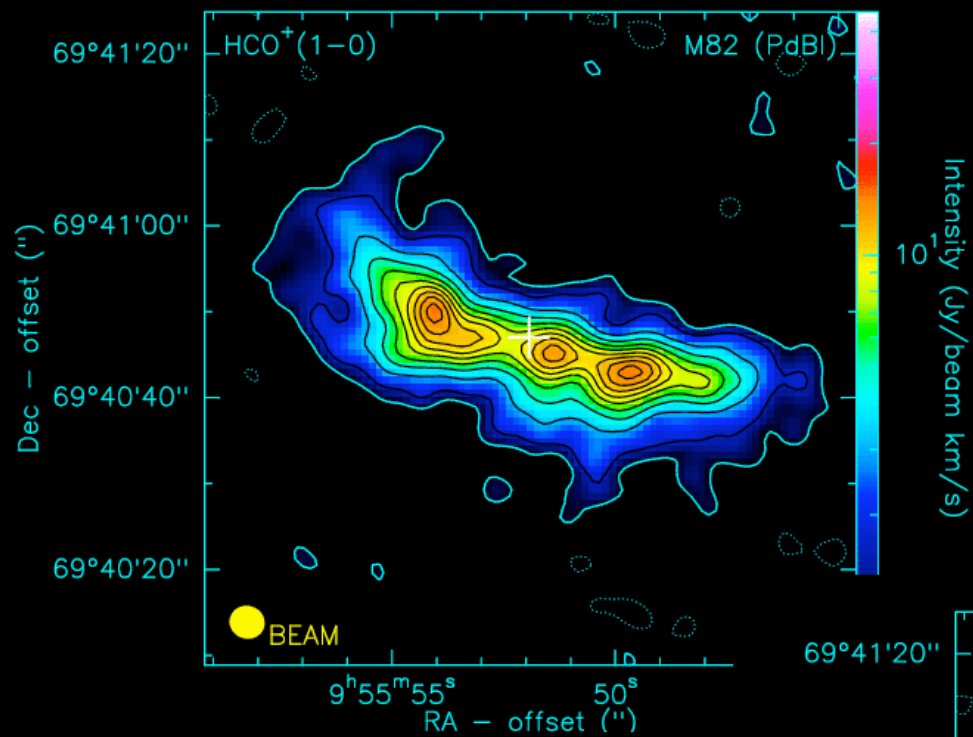
Observing time: 2 tracks (~1h on-source per field)

Reached RMS noise: ~3mJy per field at 2.5MHz res.

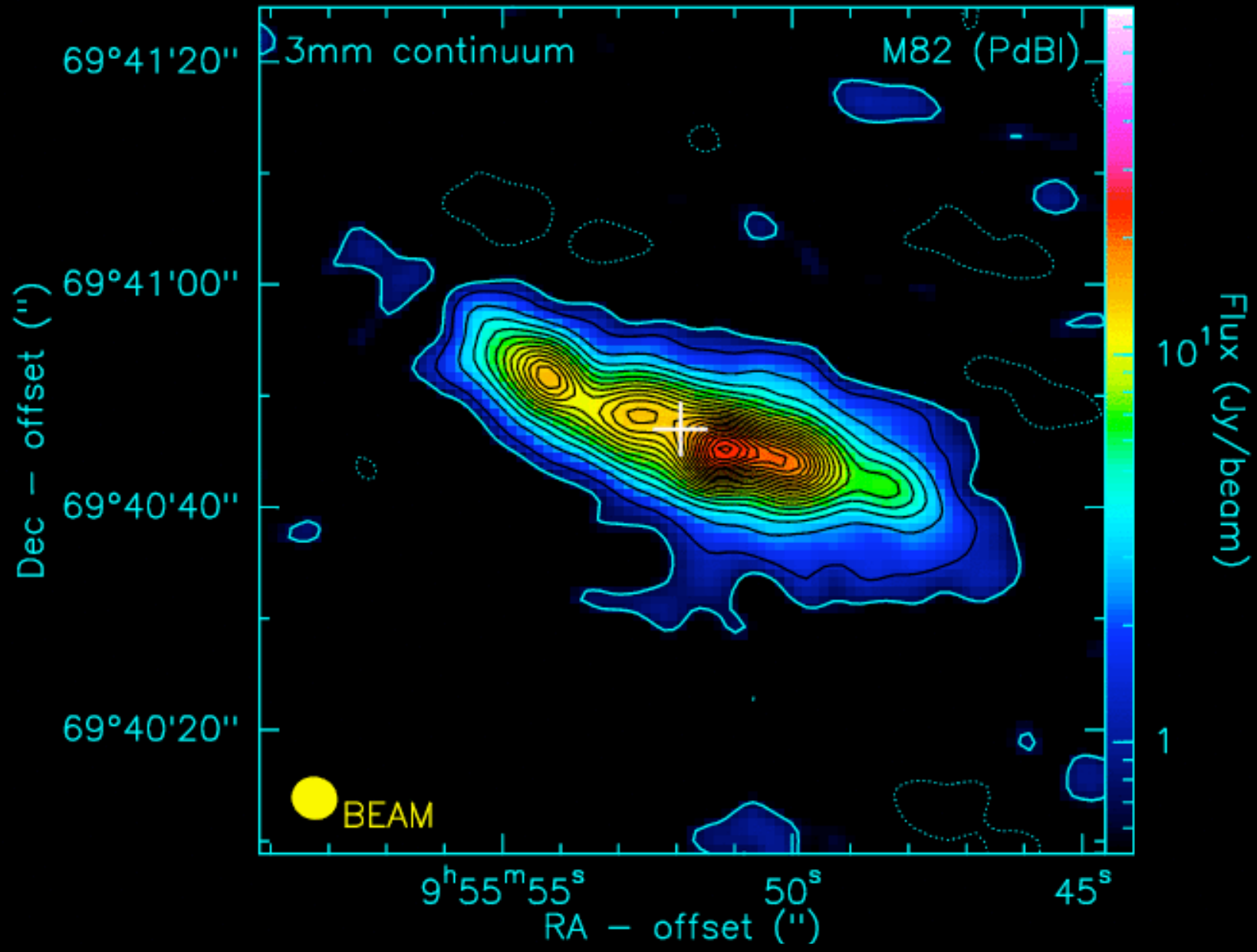


The evolved SB galaxy M82



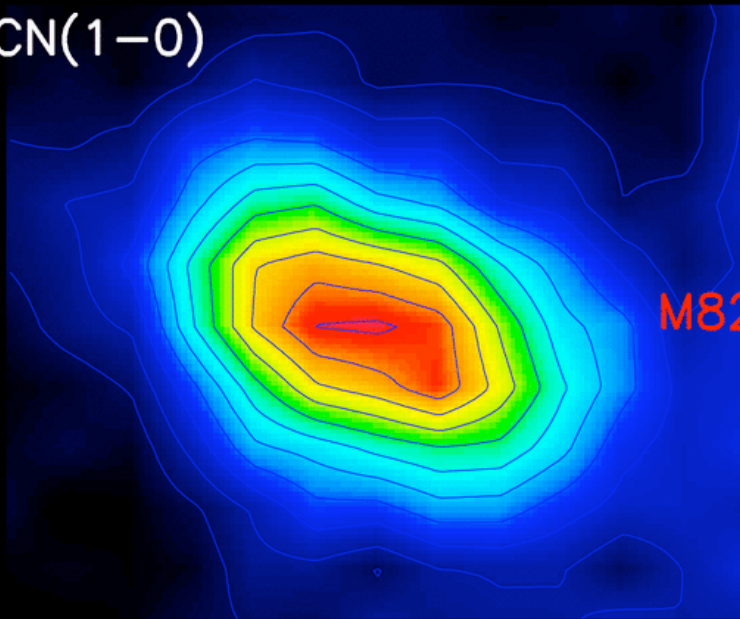


The evolved SB galaxy M82



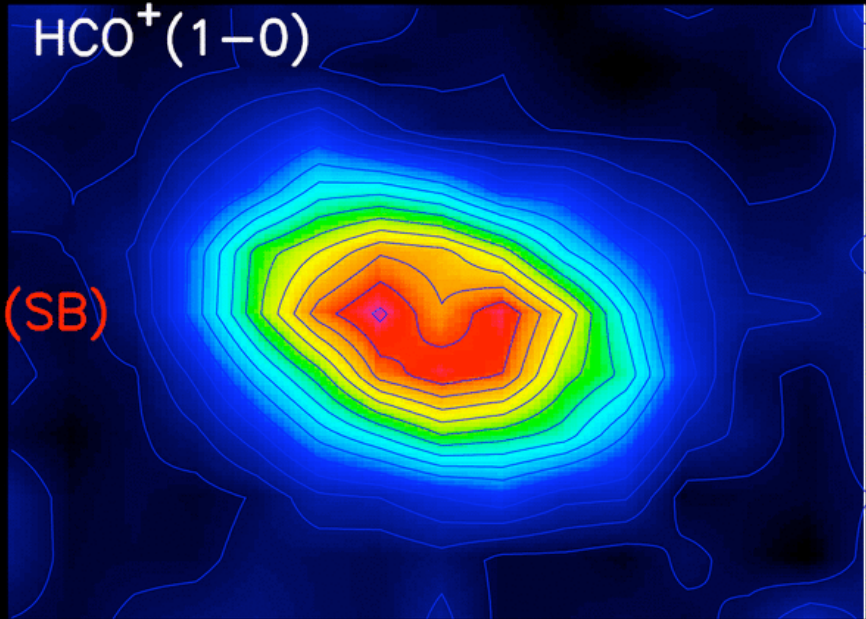
IRAM 30m observations

HCN(1-0)

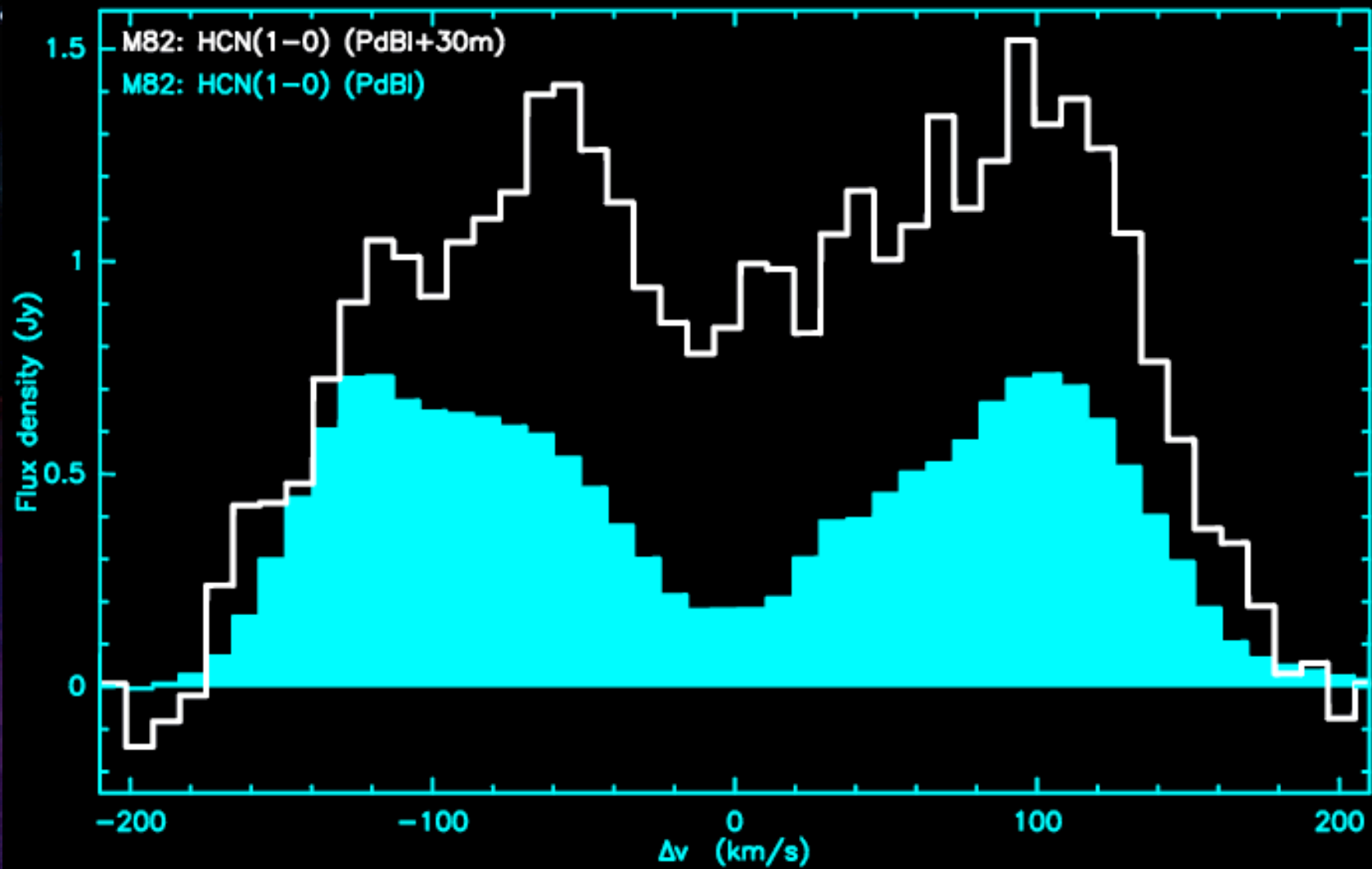


M82 (SB)

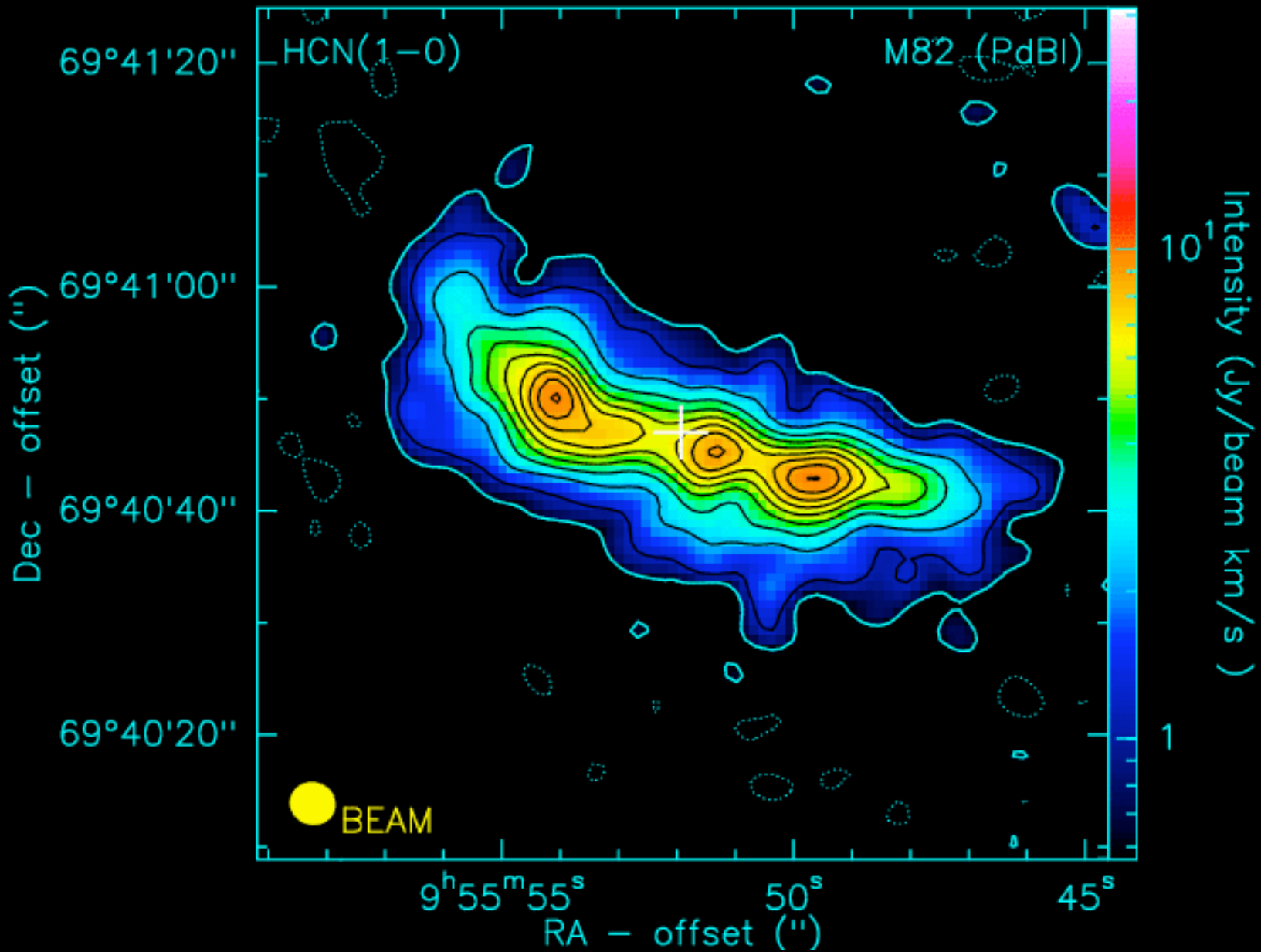
HCO⁺(1-0)



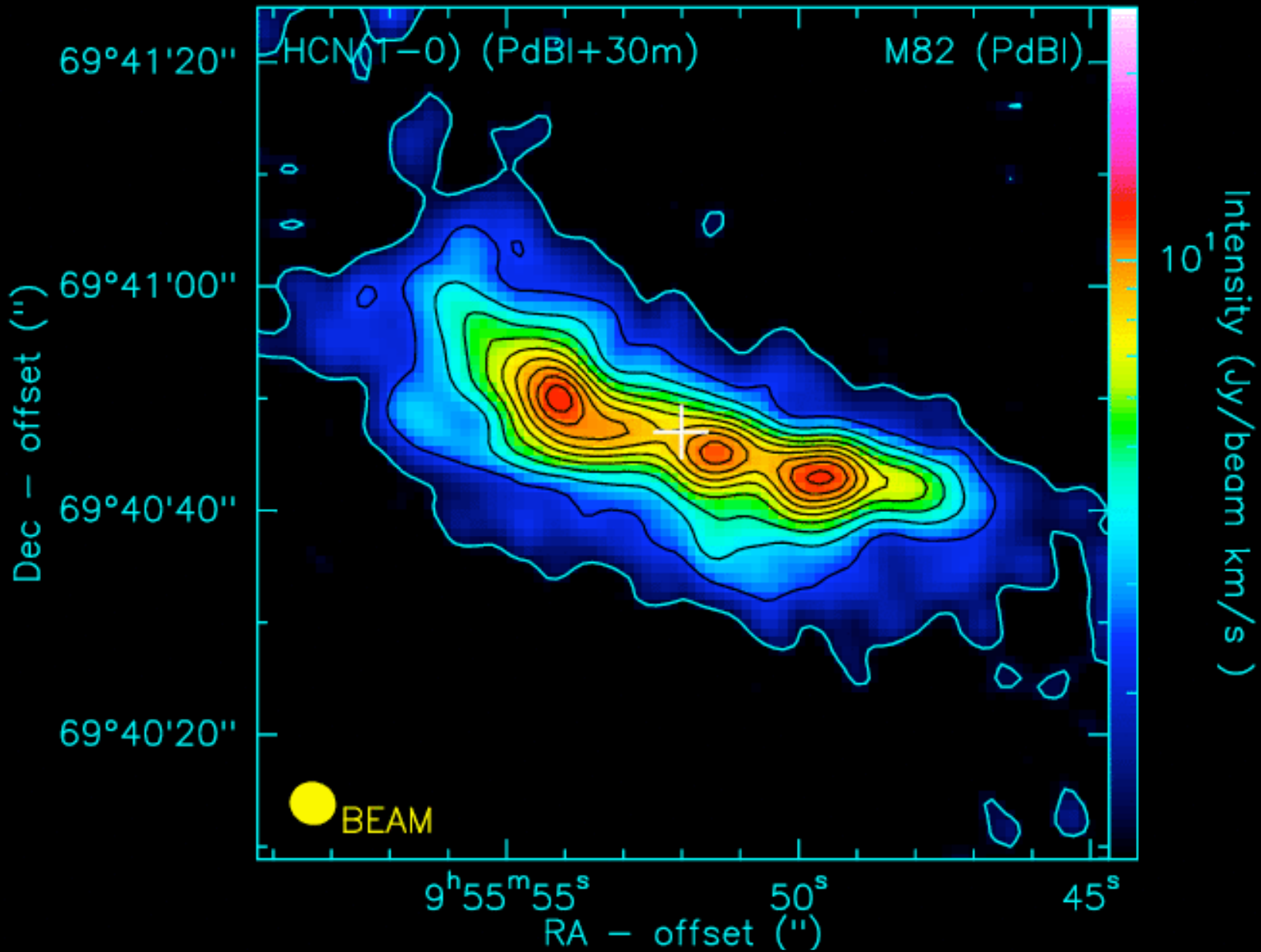
IRAM 30m vs. PdBI data



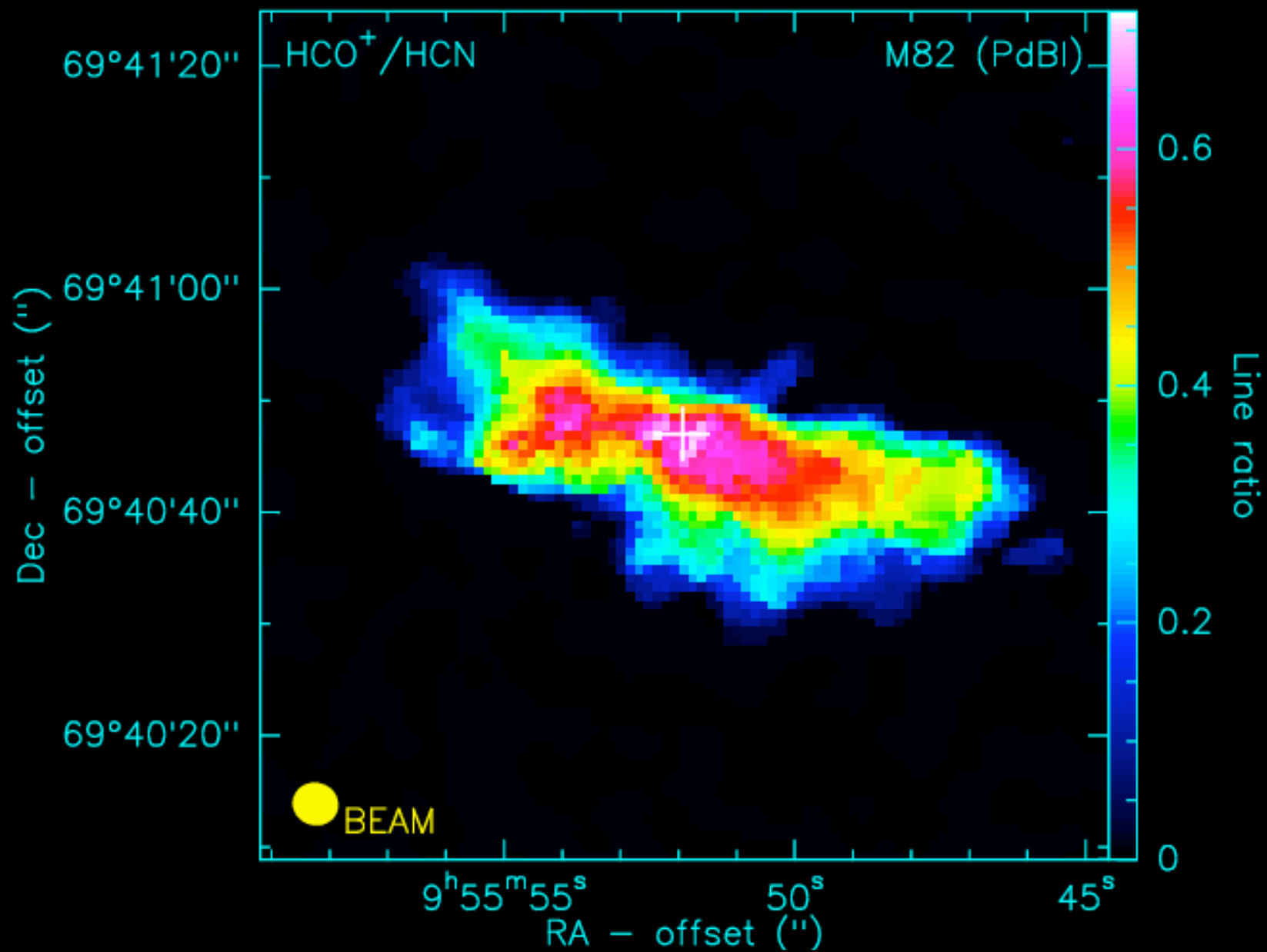
The evolved SB galaxy M82



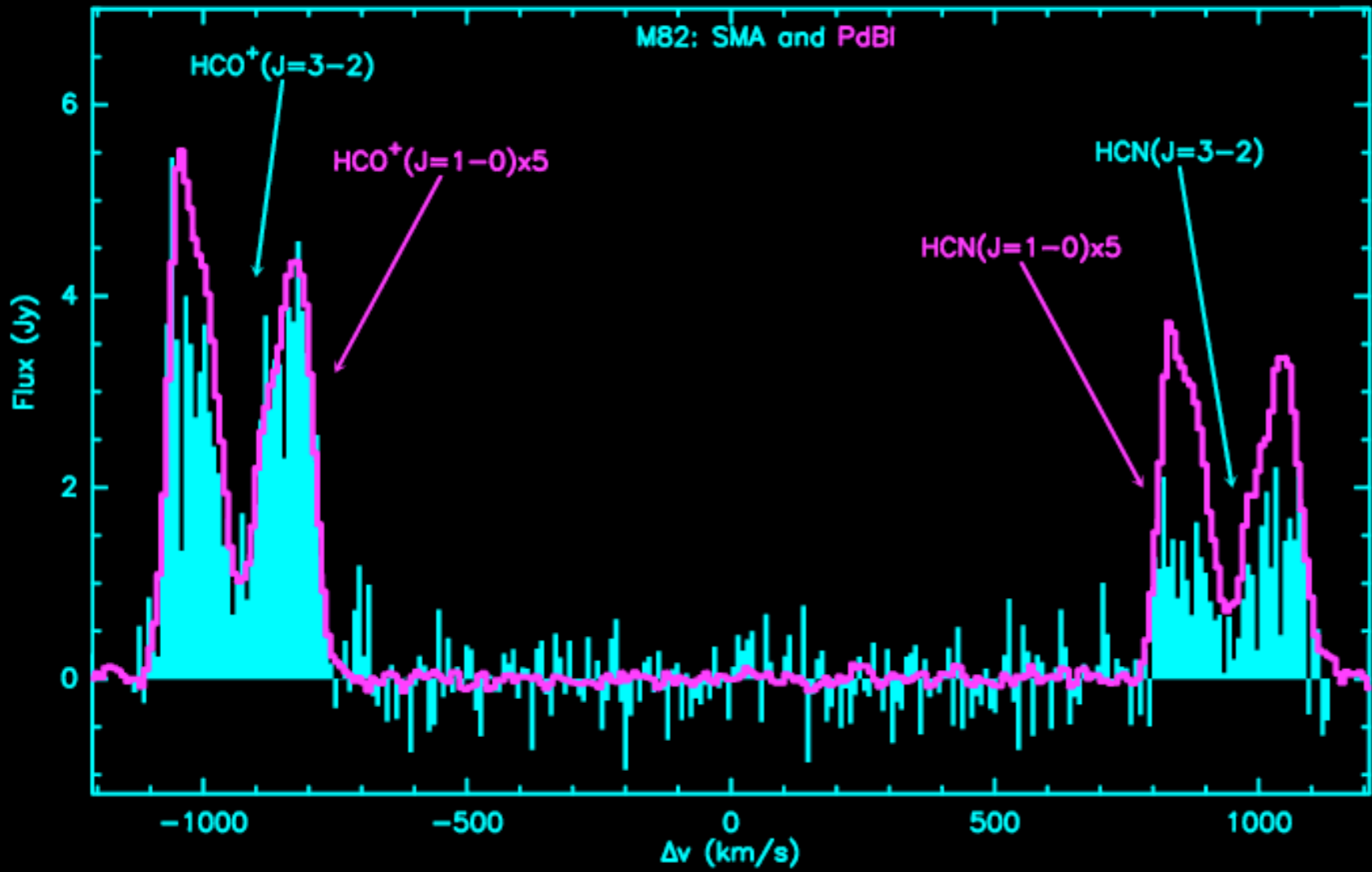
The evolved SB galaxy M82



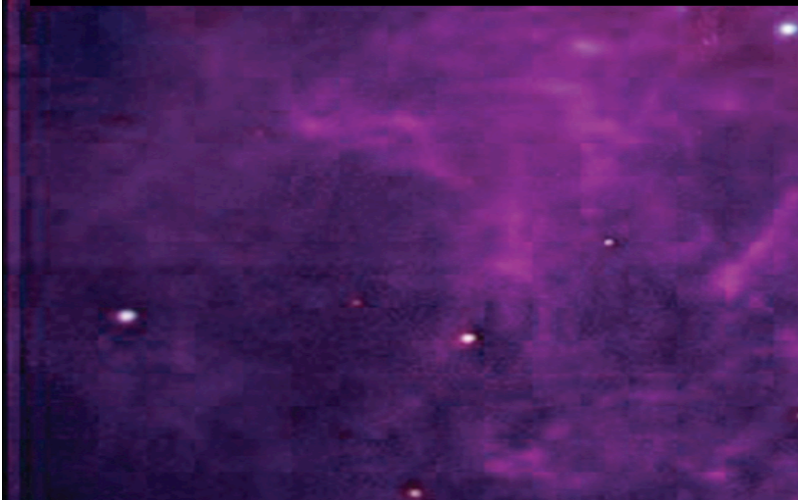
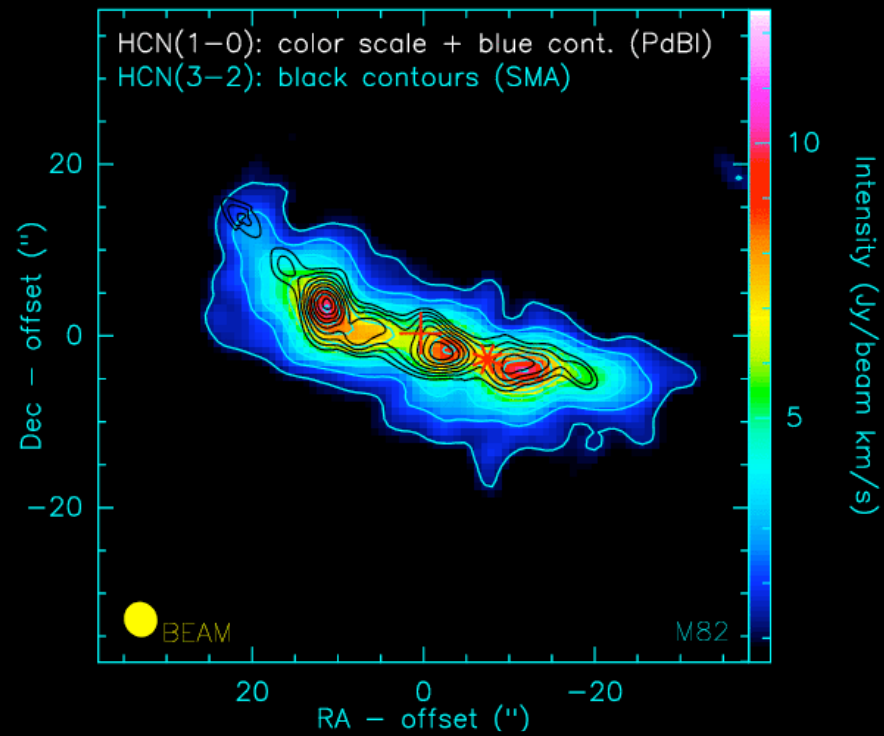
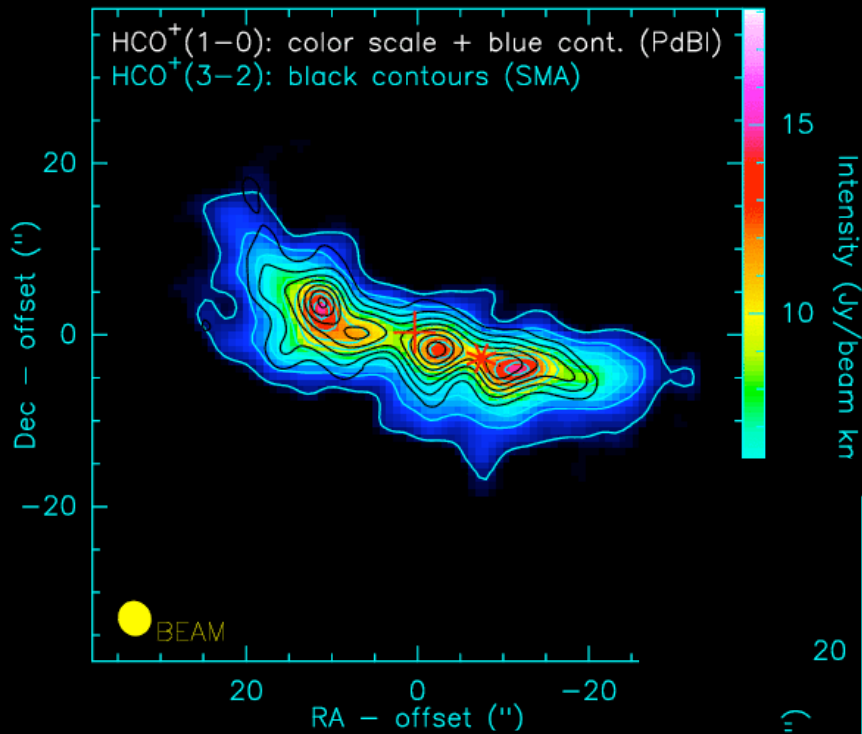
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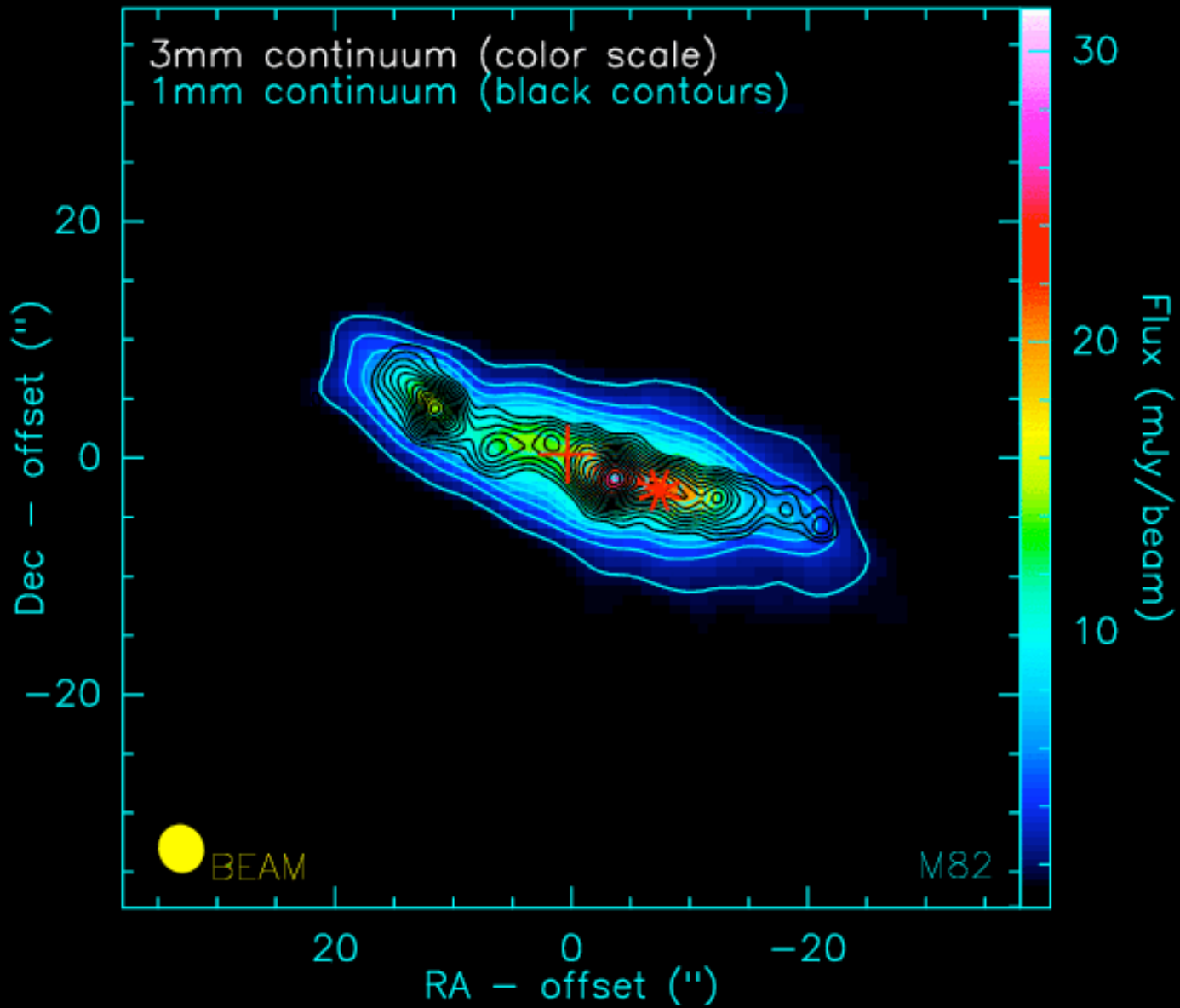
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Summary

Trying to take chemical and excitational fingerprint of the evolved SB galaxy M82:

- HCN & HCO⁺ data at $J=1-0$ and $J=3-2$
 - + 3mm and 1mm continuum (from PdBI & SMA)
- line ratios show variations along disk
 - ⇒ indicating different excitation conditions and chemistry along the disk
- continuum ratio changes
 - ⇒ indicating a temperature gradient (see Petitpas et al.)
- kinematics support superbubble

still a lot to do...