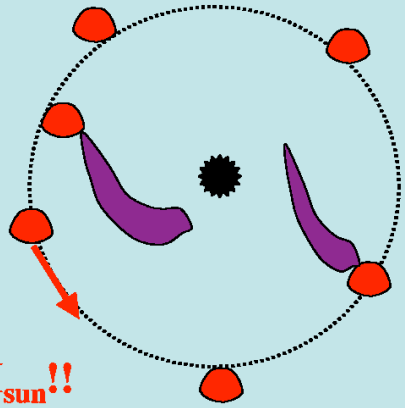
H_2 and HII in central pc (CND & spiral)



- prev. est. of CND densities ~ 10^{6-7} cm^{-3}

  but at 1 pc , $\rho_{tidal} = 10^7$ cm^{-3} !!

  => clouds tidally disrupted

- τ_{orb} (1pc) ~ 10^4 yrs,

  => $\dot{M}_{acc}$ ~ 1 M_{sun}/yr , but M_{SgrA*}~3x10^6 M_{sun}!!

- present is atypical (usually less H_2

- gas does not make it to SgrA*

- HCN (2.7 x 5.1 arcsec) OVRO mm-array
  w/ Christopher, Stolovy, Yun

  → resolve molecular clouds in CND
  → high densities => tidally stable

- Pα (1.87μm, 0.2 arcsec) HST-NICMOS
  w/ Stolovy, Rieke, Christopher, Yusef-Zadeh

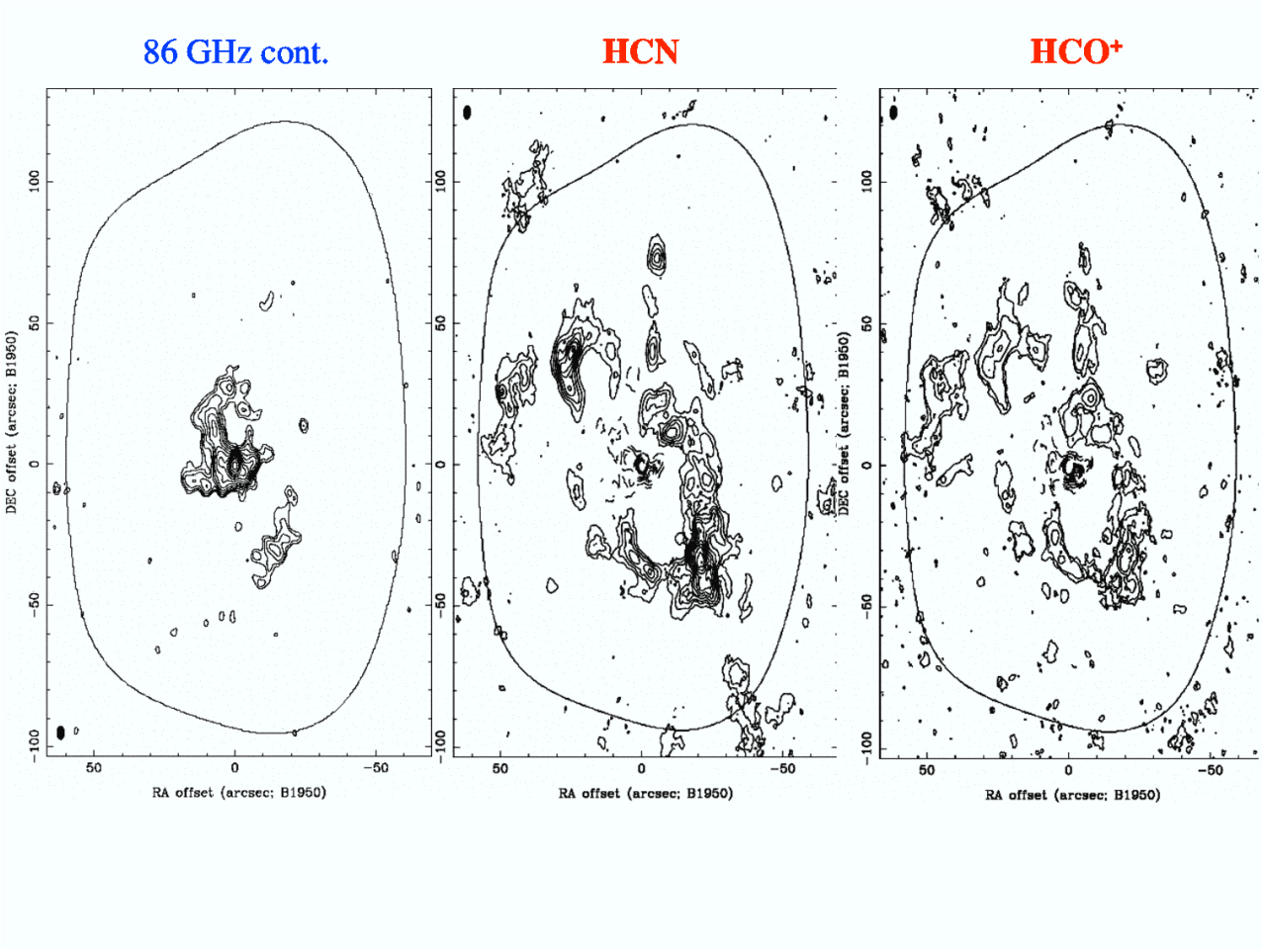
  → extinction from Pα / (6-cm free-free, H92α)
  → ext.-cor. HII and stellar continuum

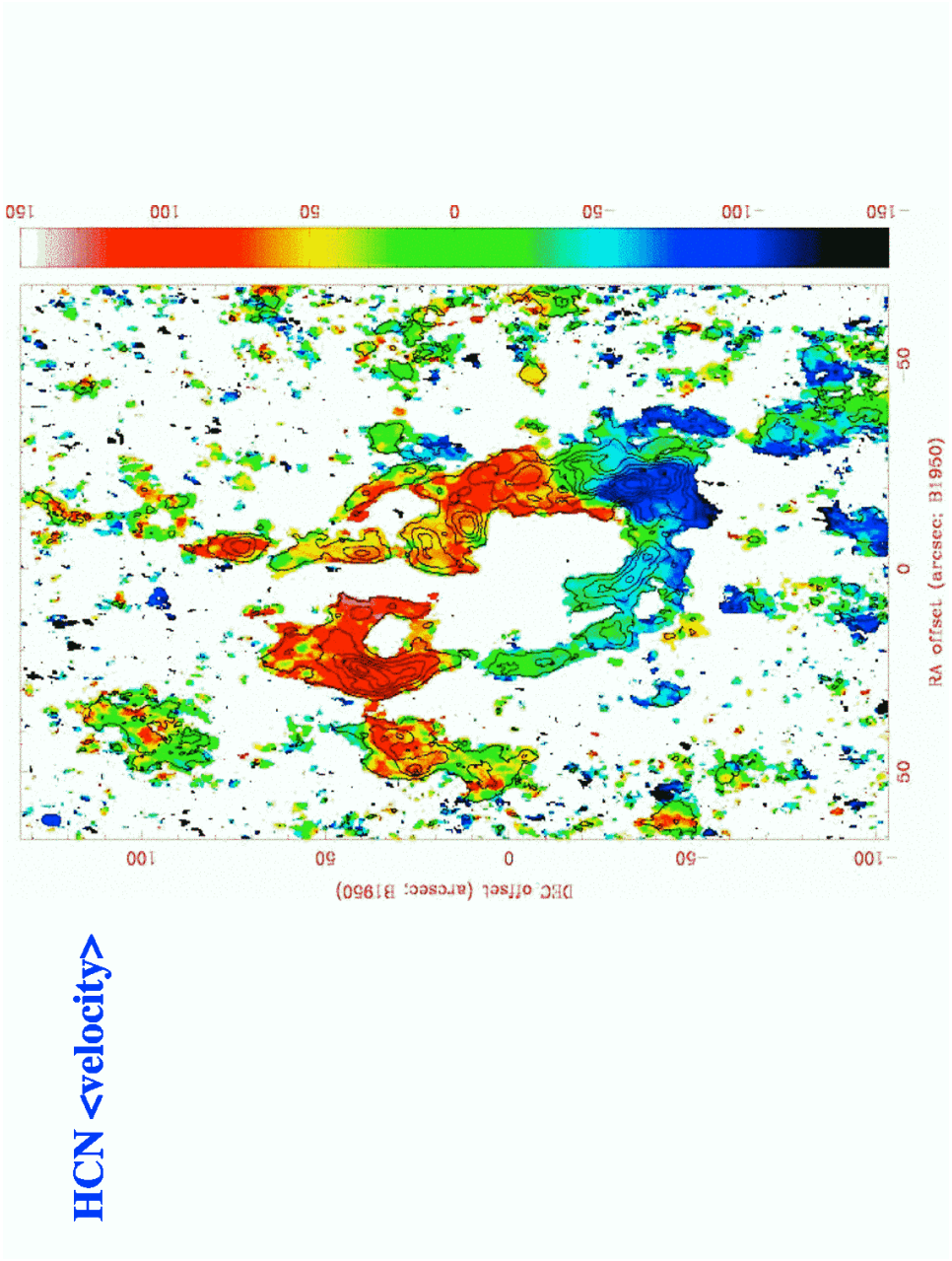
Christopher etal 05 ; Scoville etal 02

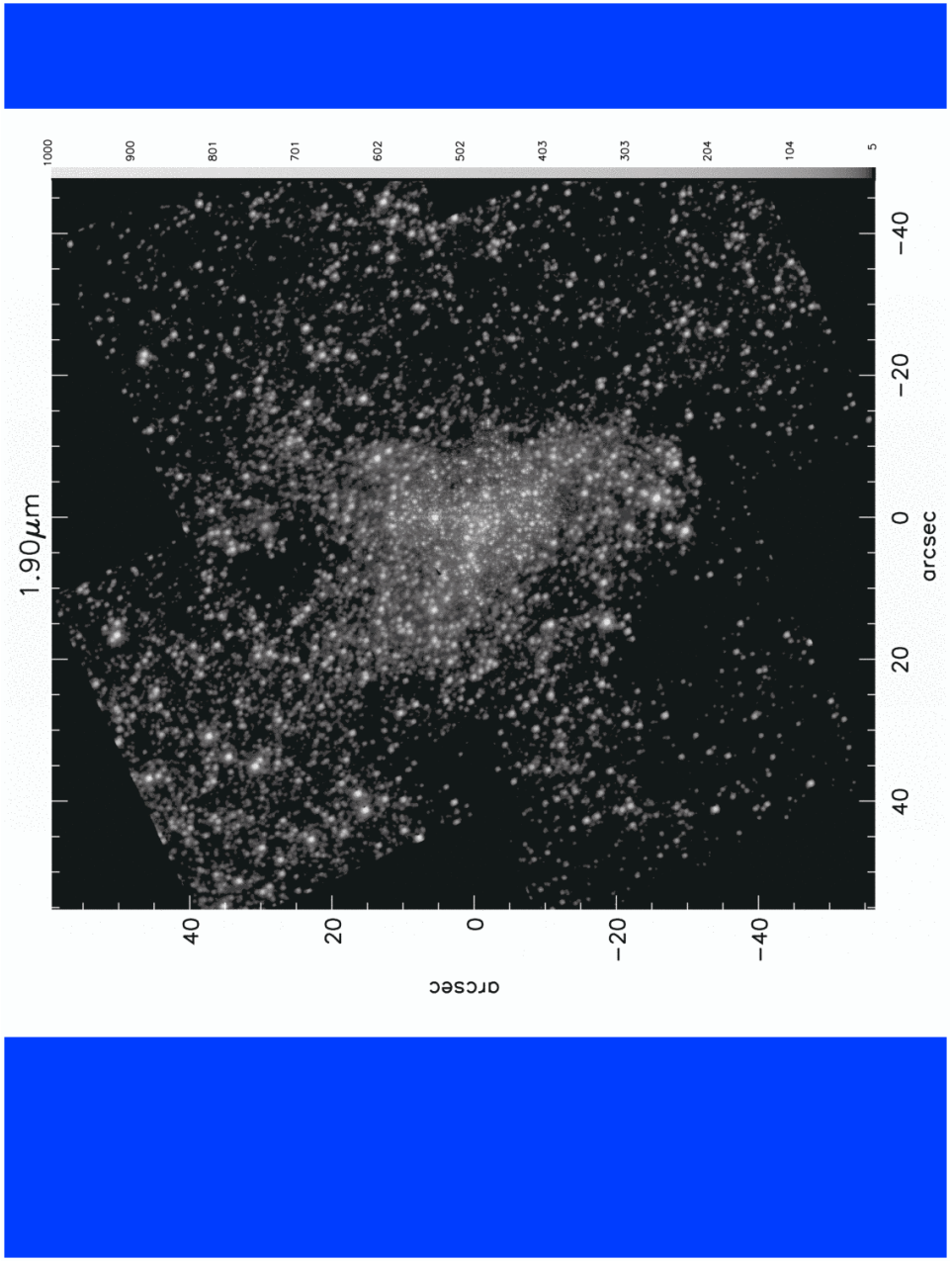
HCN & HCO^+ OVRO mm-arraay

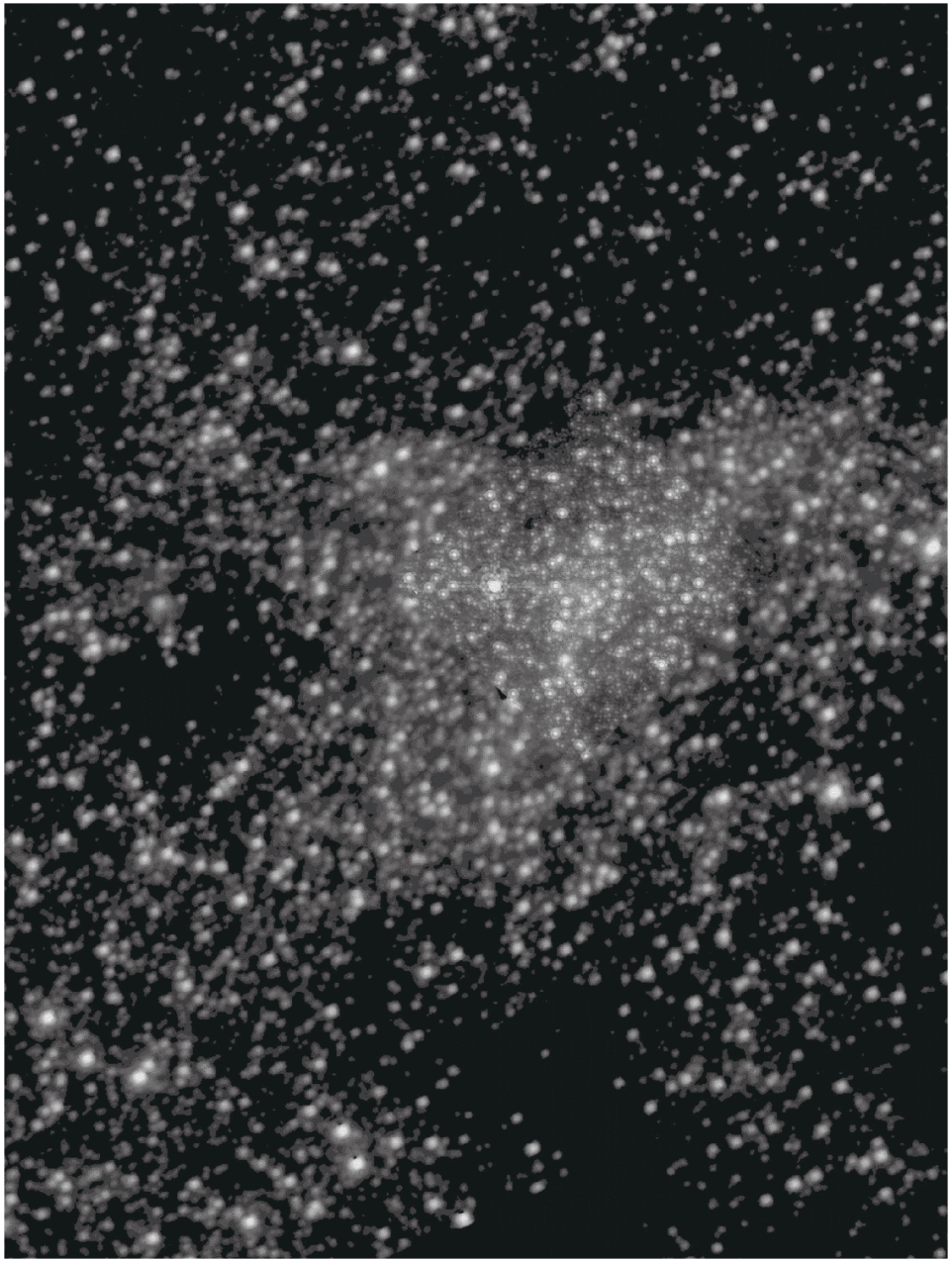
mosaic of 10 pointings covering 120(α) x 210(δ) arcsec
centered on SgrA*

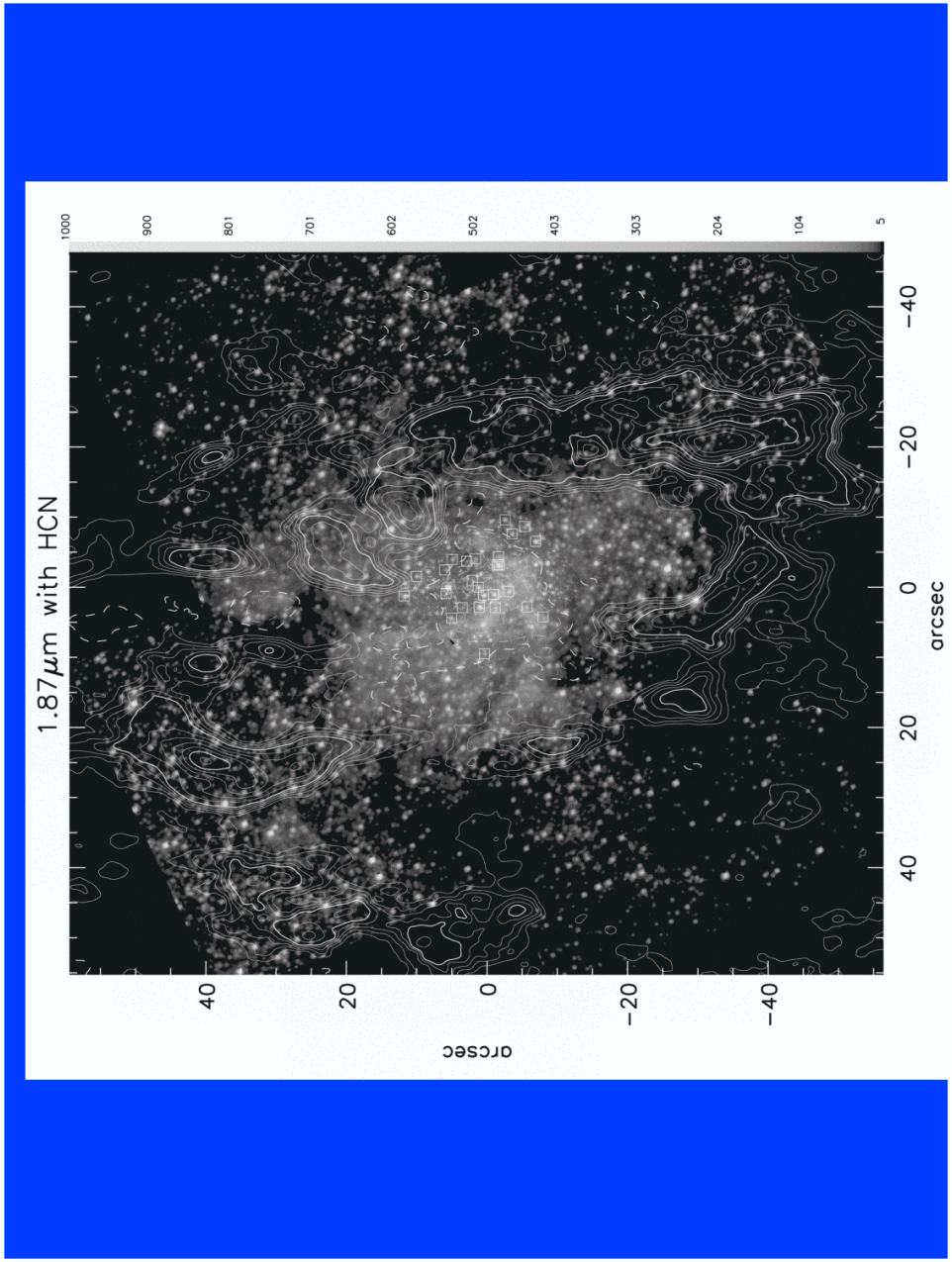
5 x 2.7 arcsec -- 2-3 x higher than previous (Wright etal 01)
and ~ 3 times higher sensitivity




HCN <velocity>
RA offset (arcsec; B1950)
DEC offset (arcsec; B1950)

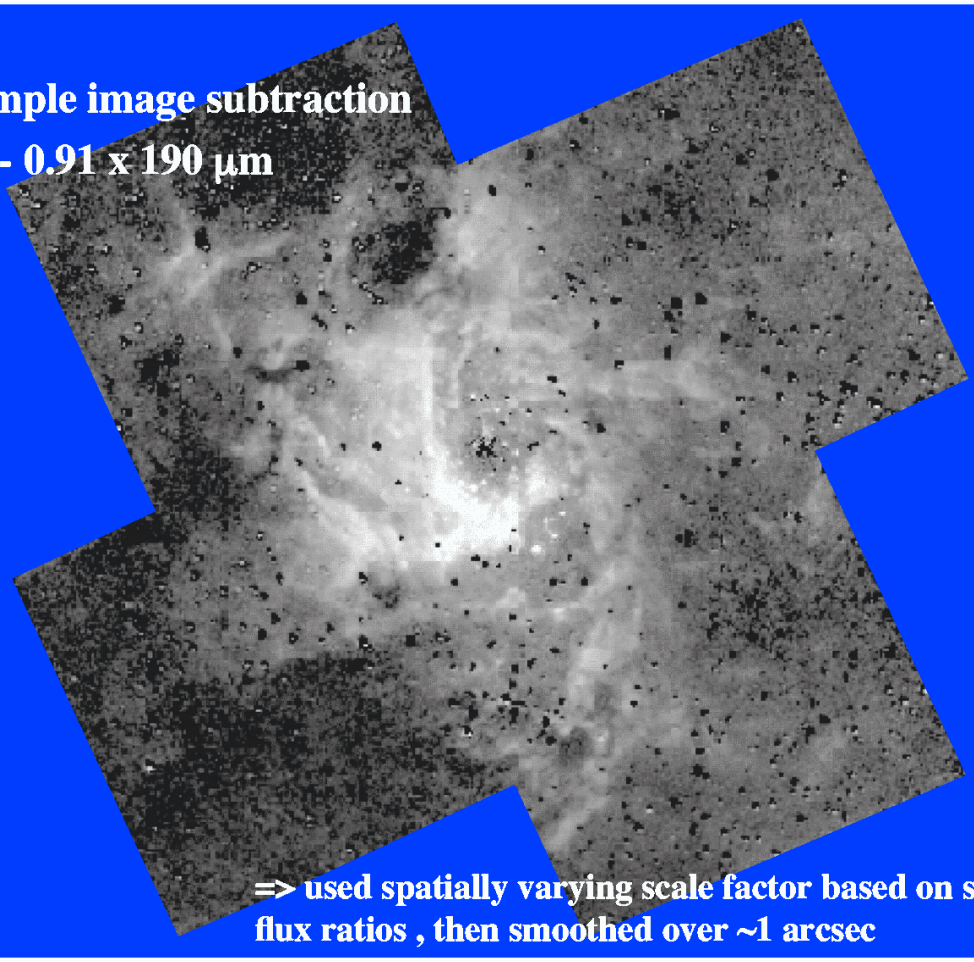

1.90μm
arcsec
arcsec



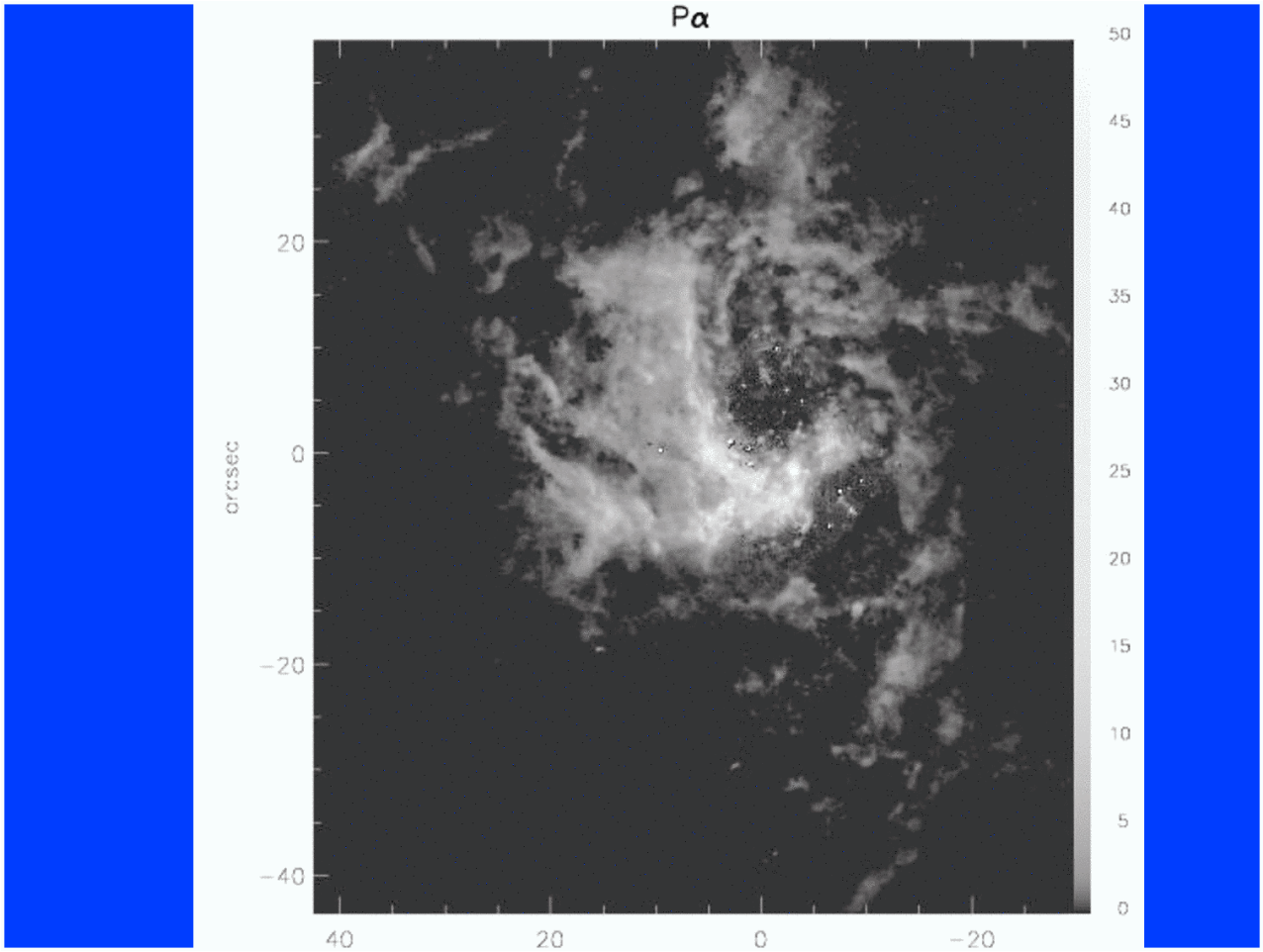

1.87μm with HCN
1000
900
801
701
602
502
403
303
204
104
5
40
20
0
−20
−40
arcsec
40
20
0
−20
−40
arcsec

simple image subtraction

187 μm - 0.91 x 190 μm



=> used spatially varying scale factor based on stellar flux ratios , then smoothed over ~1 arcsec



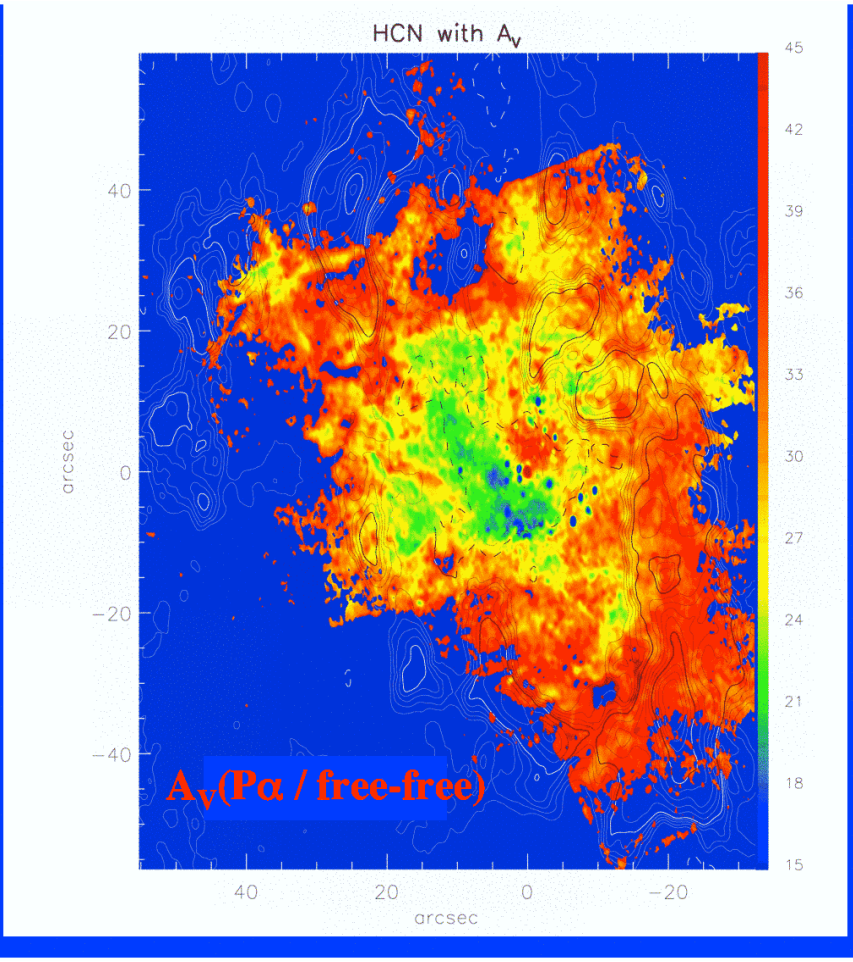
A_V --- derived from :

- ratio of P_α to radio free-free (6-cm , Yusef-Zadeh & Wardle 93)
- ratio of P_α to radio recomb. line (e.g. H92α -- Roberts & Goss 93)
- stellar colors (Blum et al 96)

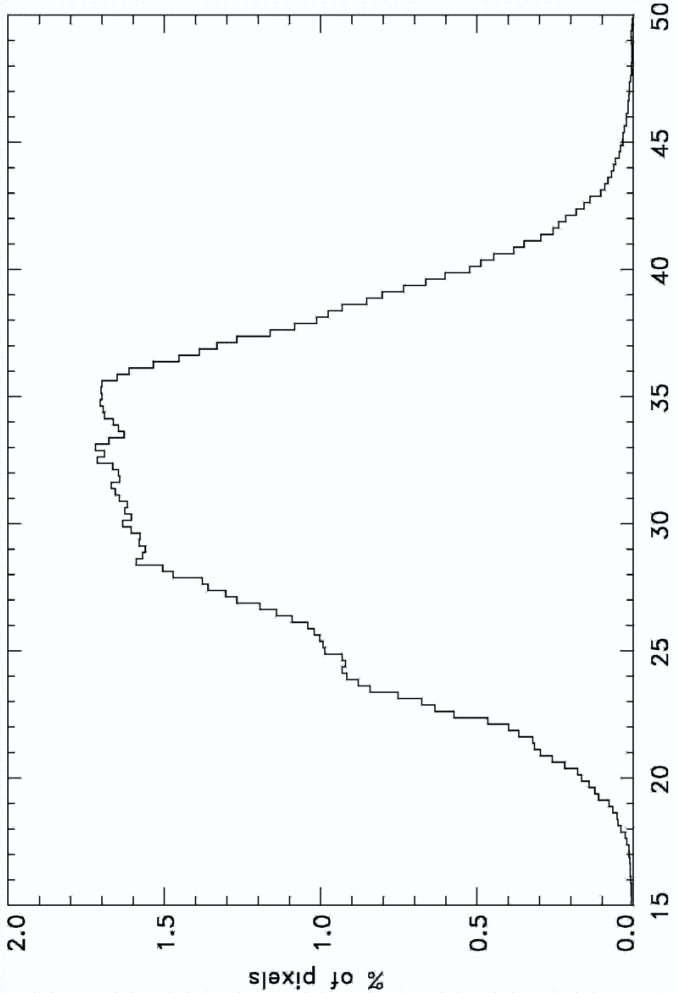
=> $\langle A_V \rangle \sim 30$ mag

Problems :

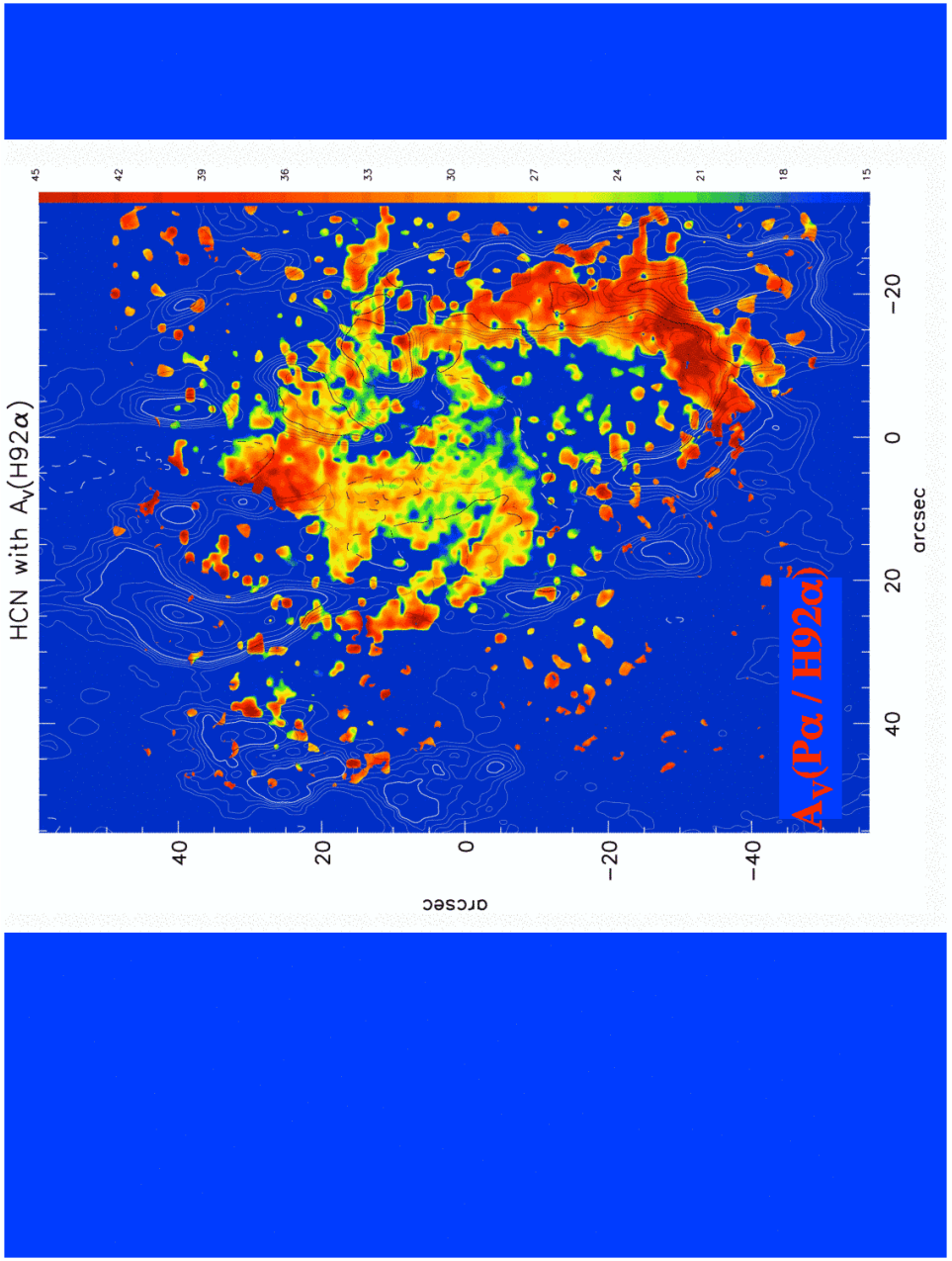
6-cm has non-thermal contributions
SNR of radio recomb. not great
intrinsic stellar colors not constant

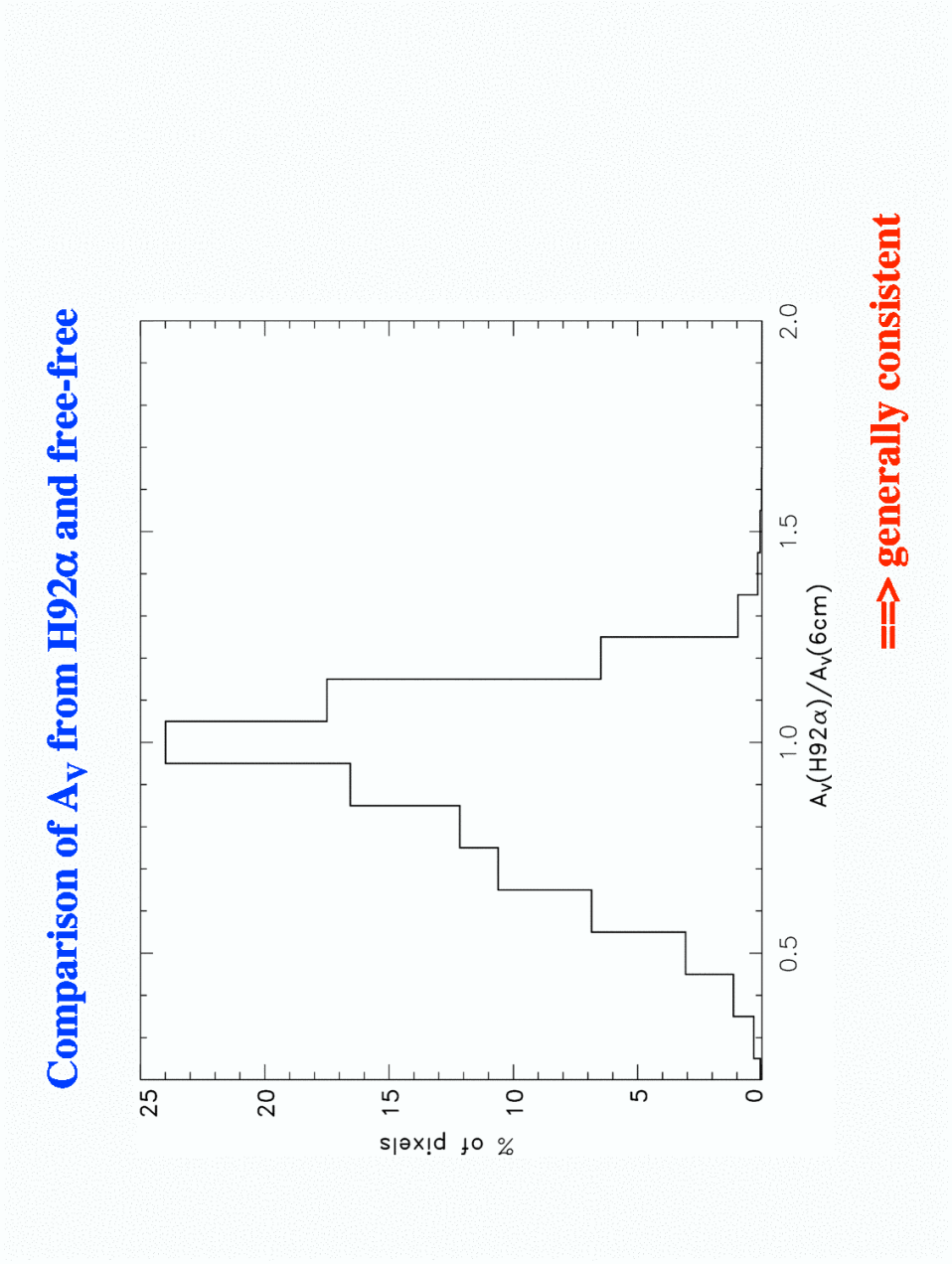


Distribution of A_V :

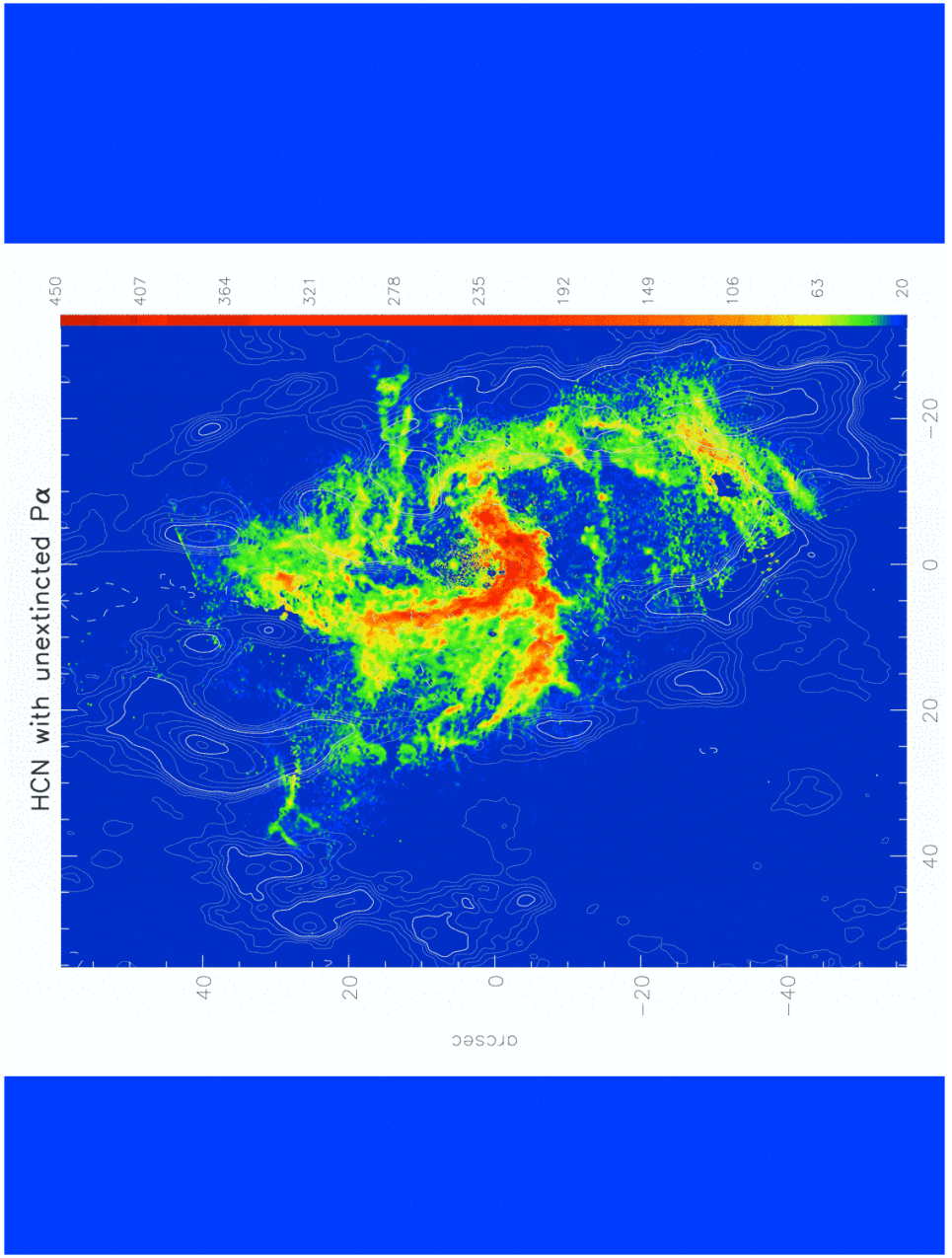


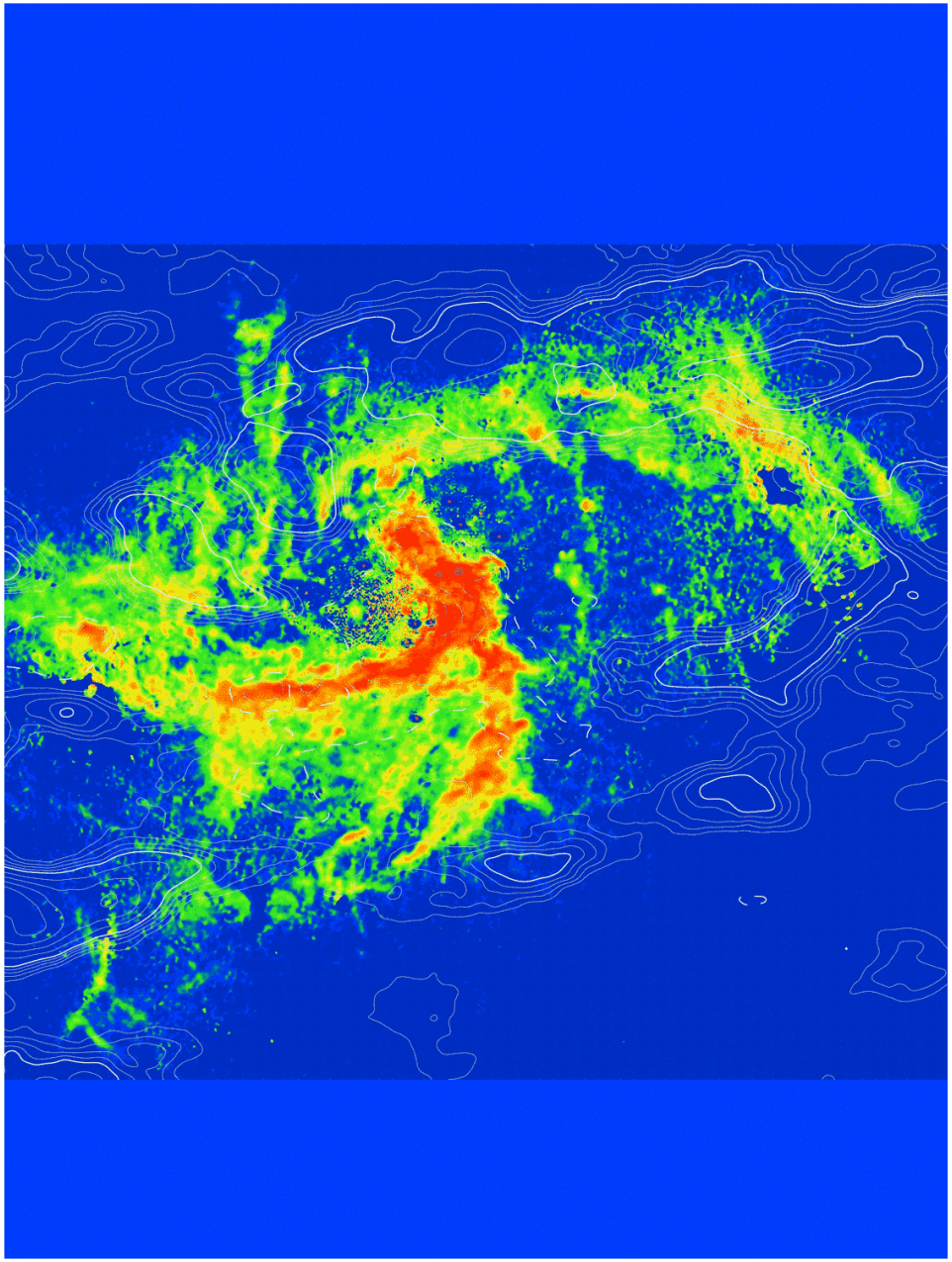
median A_V~ 31.2 mag , range 20 -- 45 mag

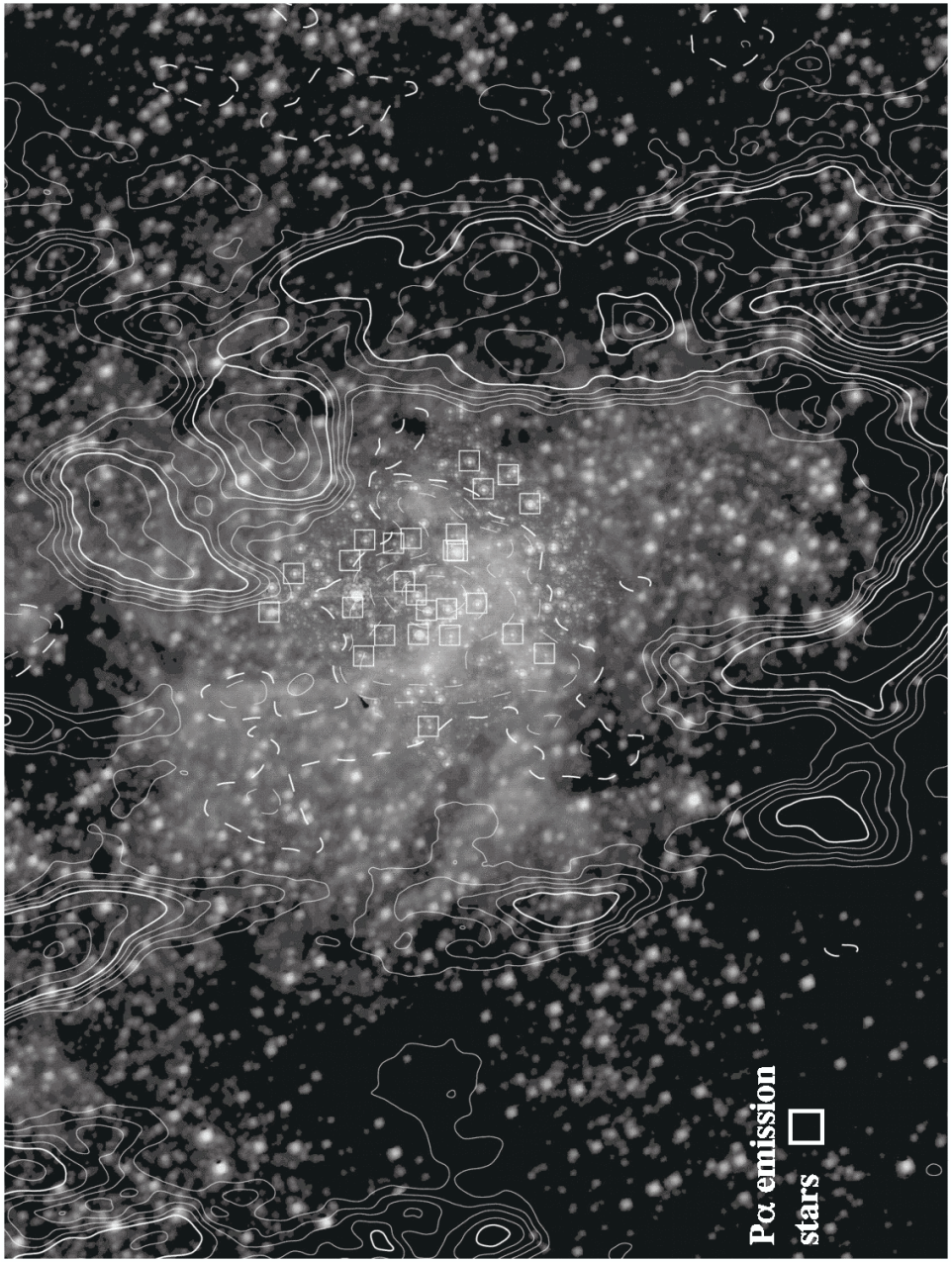




==> generally consistent






Pα emission
stars

OVRO imaging, resolves the HCN emission regions

=> cloud properties -- size, ΔV, T_B

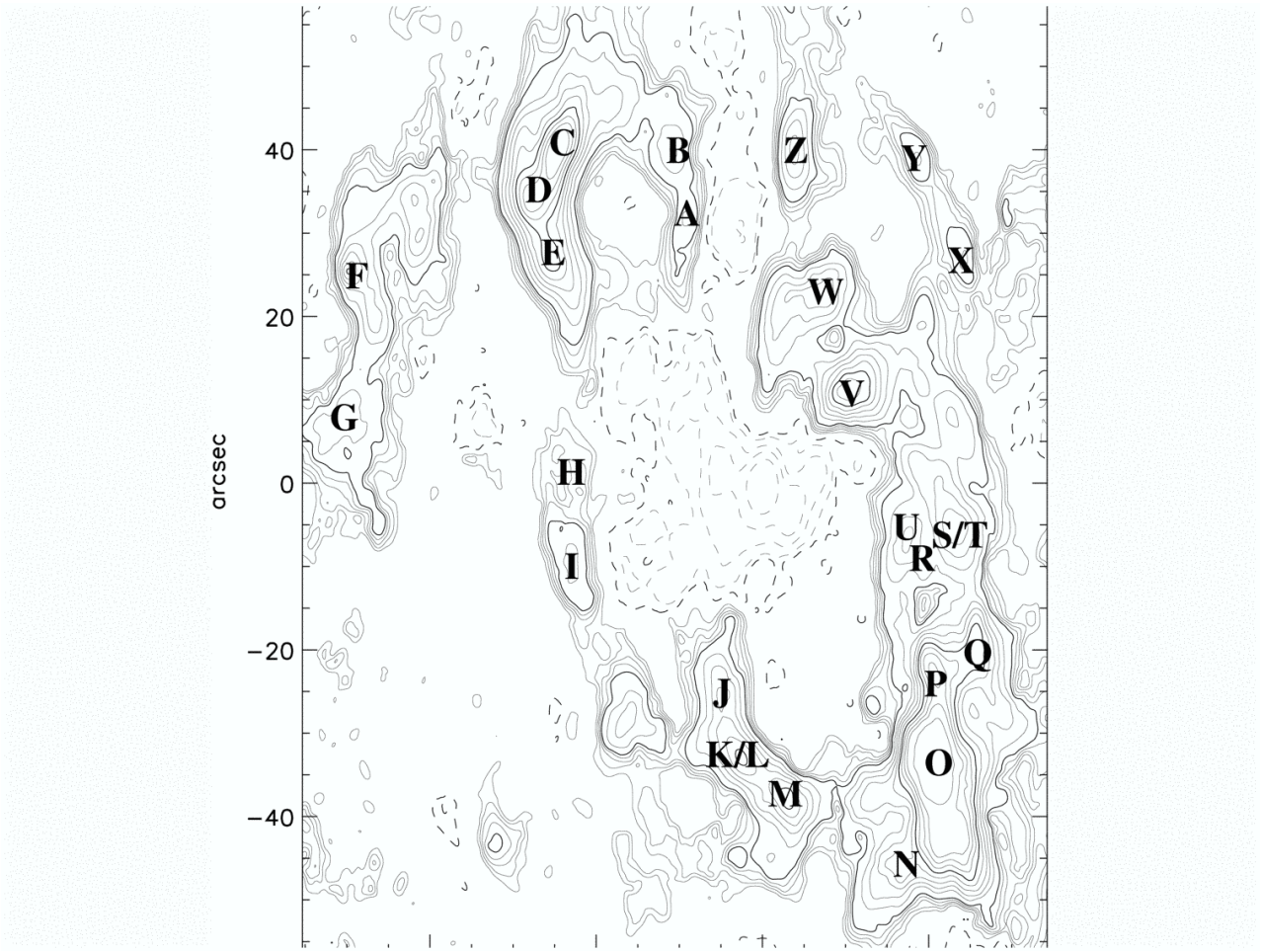
- **virial masses**
- **optically thin HCN mass estimates** (lower limit)
- **column densities** (N_{H2} , <= HCN / $H^{13}CN$)
- **densities**

  from : virial masses

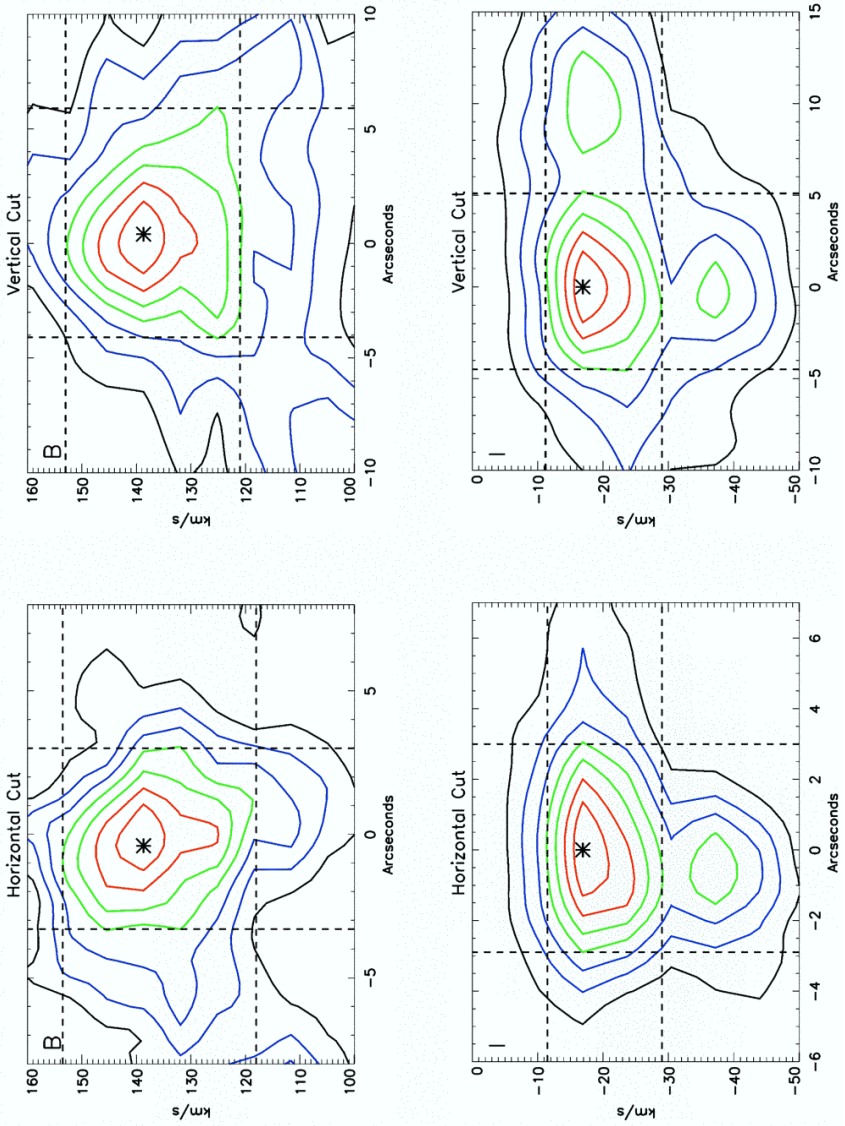
  N_{H2}/ 2R

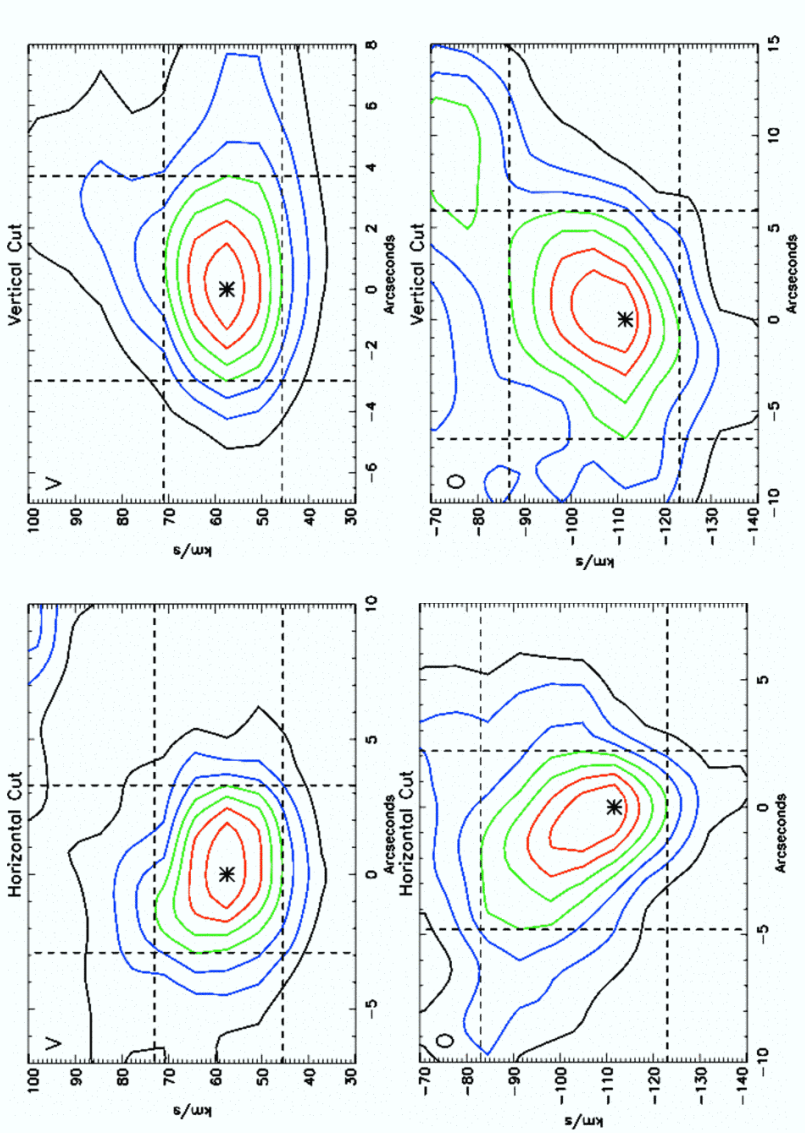
  HCN excitation (=> > 10^6 cm^{-3})

  adopt $\tau_{HCN} \sim 4$

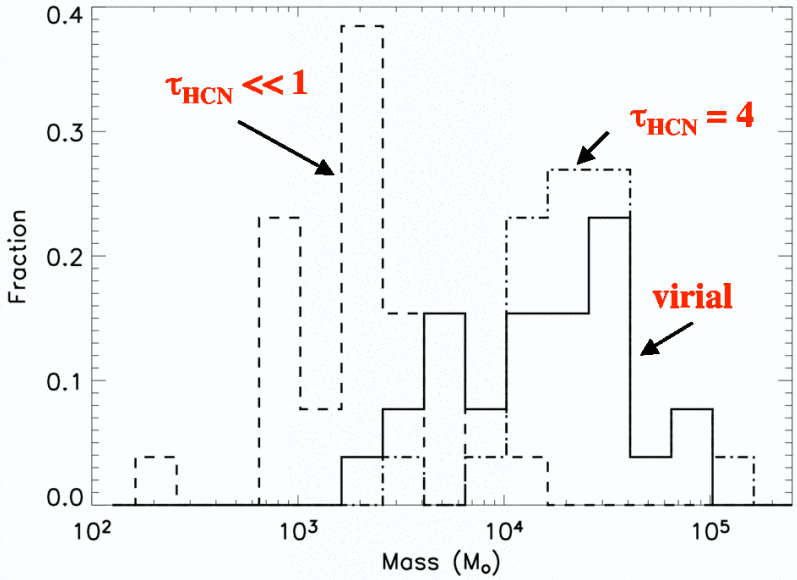


‘rotation’ curves on perp. cuts for cores



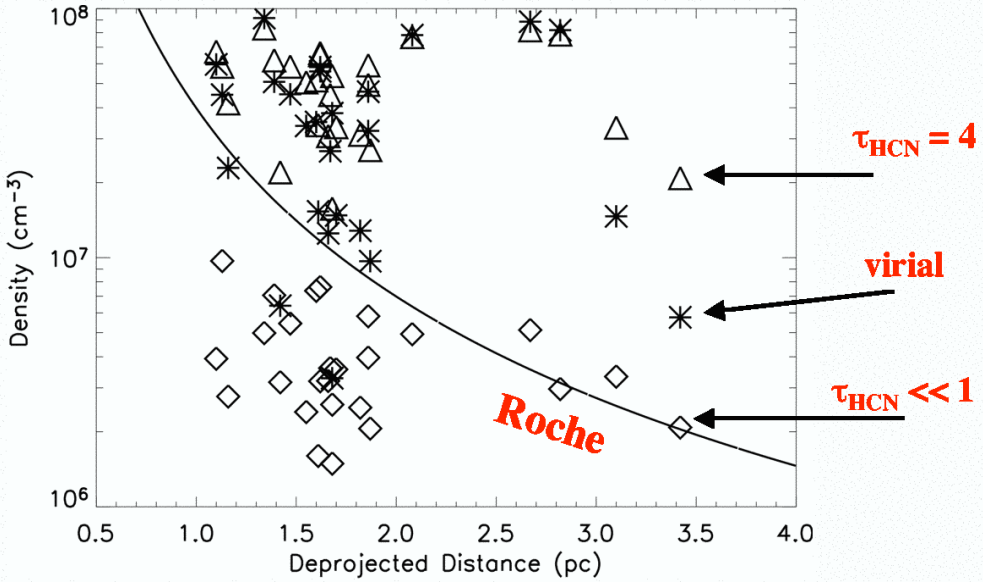


derived masses for gas cores



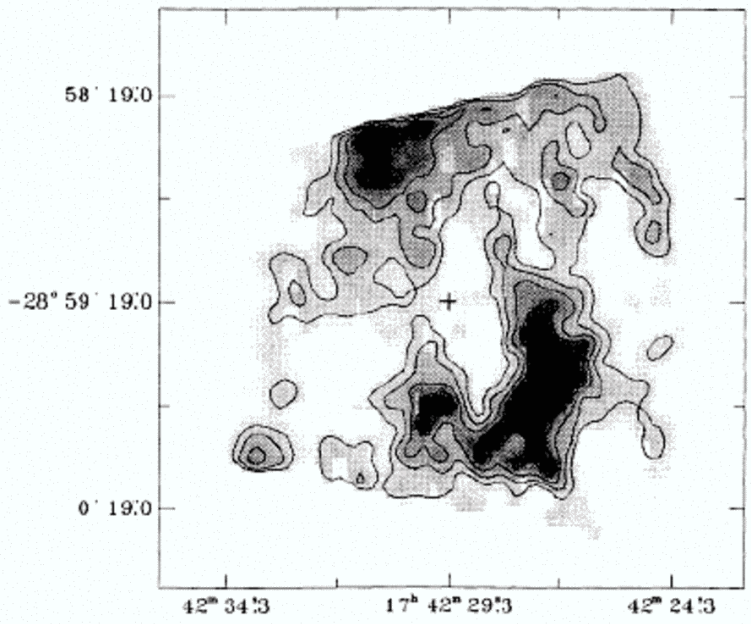
virial and $\tau_{HCN} = 4$ agree ==> masses 10^4 -- 10^5 M_{sun}

comparison of densities w/ Roche densities



==> most cores can be tidally stable

dust continuum at 450 μm at 7 arcsec res.
(Dent et al)



peak flux 8 Jy/beam => $\tau \sim 0.1$ at 450μm
=> column density ~ 1/2 of that from virial thm.

higher resolution ==> cores are smaller ==>

- **densities are ~ 4 x10^7 cm^{-3}**
  (3 - 7 x greater than prev.)
  size ~ 0.25 pc ==> > $10^{25}$$cm^{-2}$ ==> 10^4 mag ext.

==> clouds are tidally stable
==> longer lifetimes (i.e. >> τ_{dyn} ~ 10^4 yr)

can form Sgr A* young stars in CND !!

total H_2 mass ~ few x 10^5 M_{sun} w/i 3 pc !!

cores/cluster decay by dyn. frict. ??