AME with AMI

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Arcminute Microkelvin Imager (AMI)

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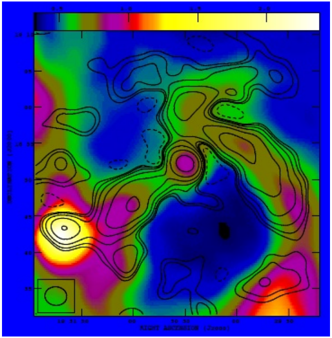
- 10+8 element array
- $14-18\,\text{GHz}$ in $6\times 0.75\,\text{GHz}$ channels
- Large Array sensitivity $\approx 1\,\text{mJy}/\sqrt{s}$
- Primarily an SZ survey telescope.
- Extensive program of radio observations towards star forming regions.

Credit: Nigel Blake Photography

The AMI Galactic Programme

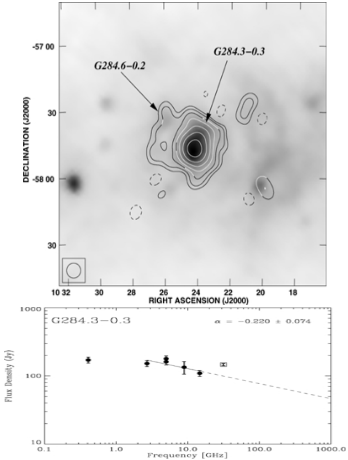


G54.1+0.3

Hurley-Walker et al. 2009

- Most observational Galactic radio continuum studies are done at lower frequencies $\nu \leq 5\,GHz$
- SNRs, HII regions, dark clouds, P*...
- Spinning dust studies

The HII region contradiction

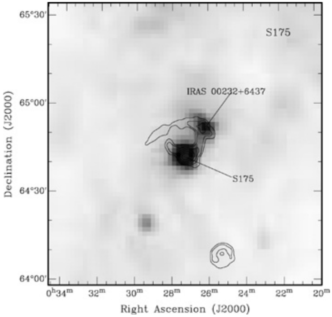


Dickinson et al. 2007

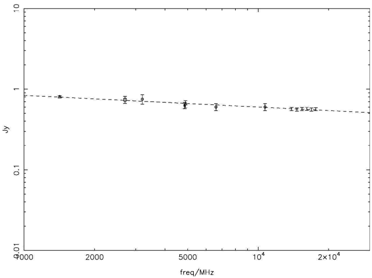
- RCW175: 8.6σ excess at 31 GHz. (Dickinson et al. 2008)
- Southern hemisphere: 6 HII regions
- Frequency coverage: 26–36 GHz
- *Slight* excess observed in all regions
- Most significant excess 3.3 σ.

HII regions

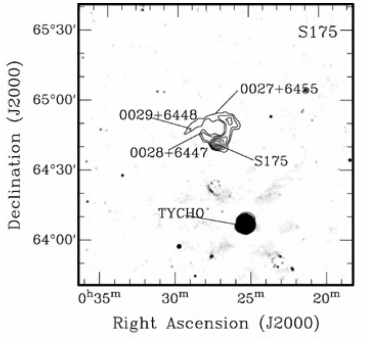
- Small sample (6) of southern hemisphere HII regions showed a slight excess (Dickinson et al. 2007).
- AMI-SA sample (16) of northern HII regions showed **no** excess emission.
- Slight steepening of the spectrum instead



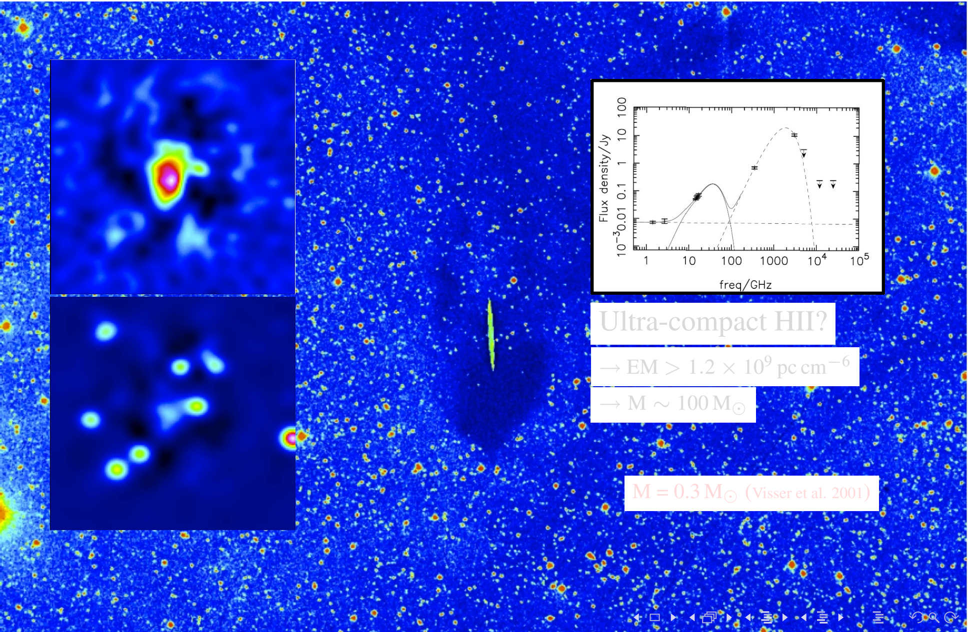
HII regions



- Extended sample of 60 HII regions jointly with Effelsberg 100 m telescope.



Dark Clouds



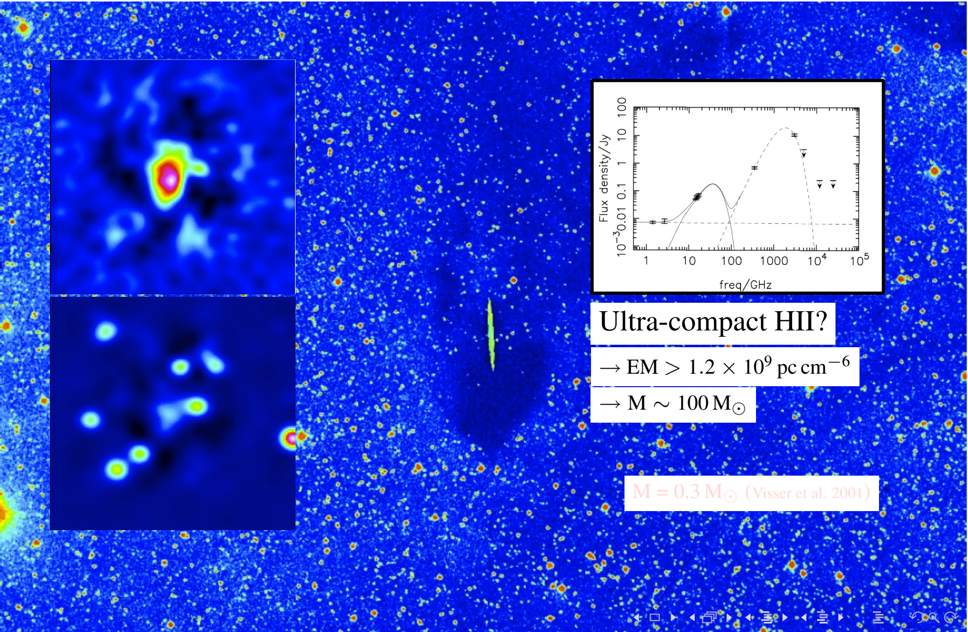
Ultra-compact HII?

$\longrightarrow$ EM $> 1.2 \times 10^9$ pc cm^{-6}

$\longrightarrow$ M $\sim$ 100 $M_\odot$

M = 0.3 $M_\odot$ (Visser et al. 2001)

Dark Clouds



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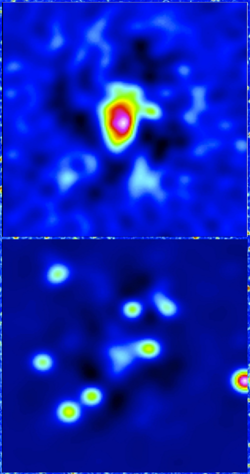

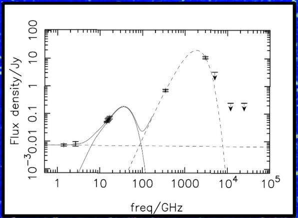

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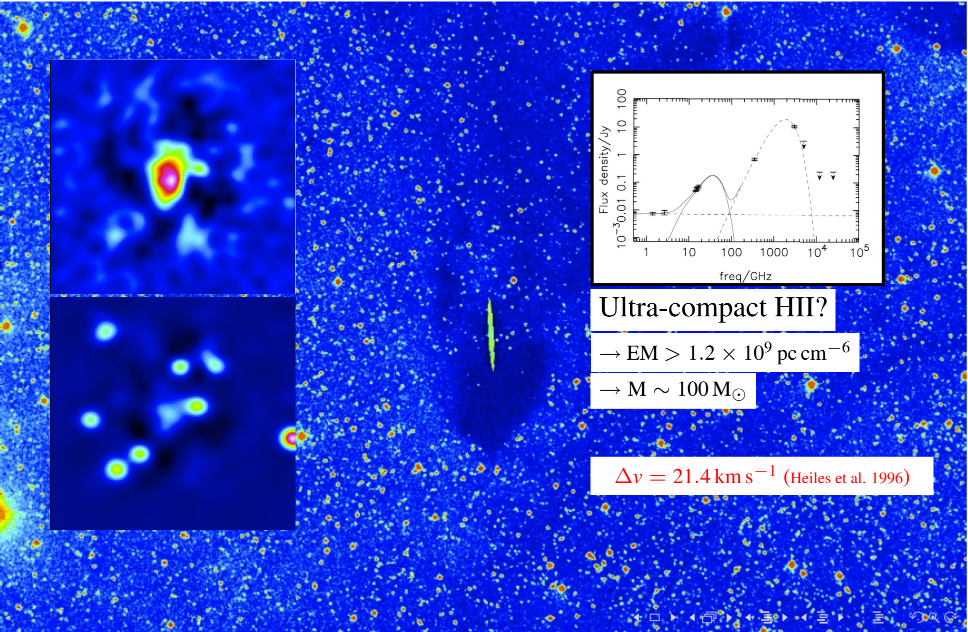
LDN 1111



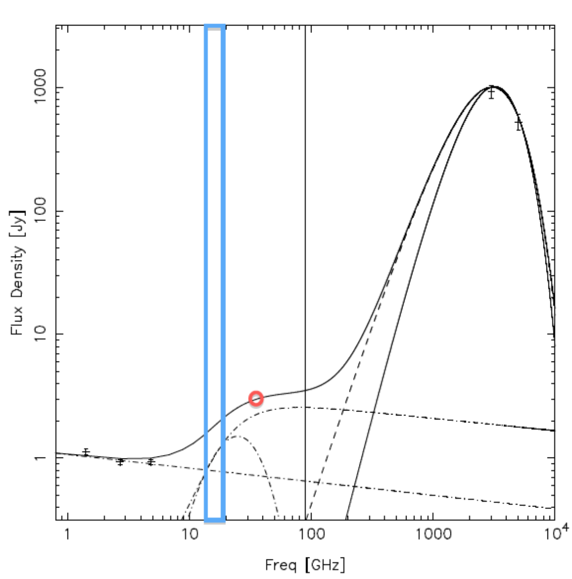
Ultra-compact HII?

$\rightarrow$ EM $> 1.2 \times 10^9\,\mathrm{pc\,cm^{-6}}$

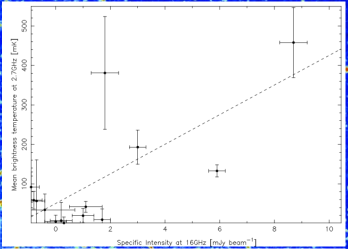
$\rightarrow$ M $\sim 100\,\mathrm{M_\odot}$

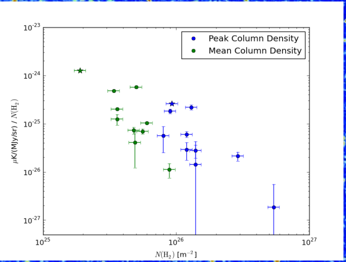
$\Delta v = 21.4\,\mathrm{km\,s^{-1}}$ (Heiles et al. 1996)

UC/HCHII regions



Dark Clouds



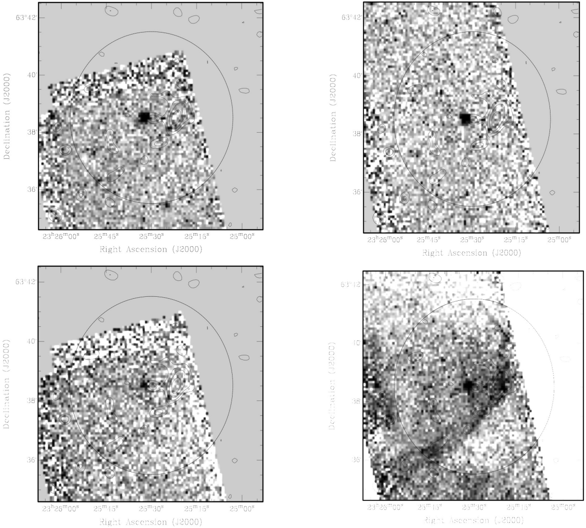


No correlation with:

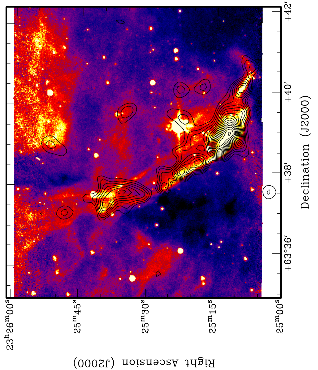
- Mass
- Protostellar activity
- Position

And not a sample bias.

Why 8 micron is the best micron

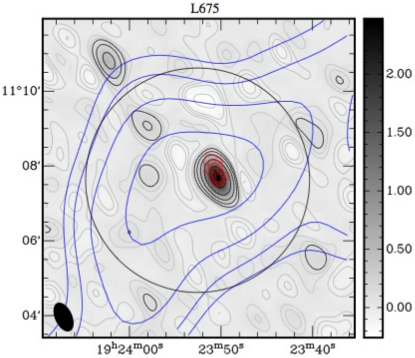


LDN 1246



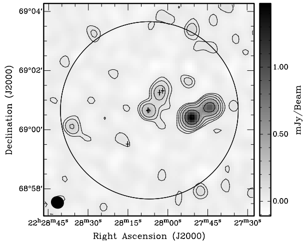
- Correlated radio and 8 μm emission on small scales
- Not a BRC (no optical counterpart)
- Knots indicate possible embedded star formation

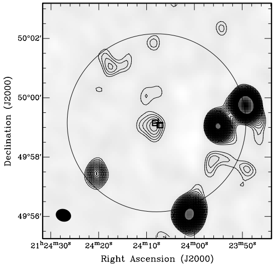
LDN 675



- Is low mass star formation:
- - a contaminant?
- - a cause?

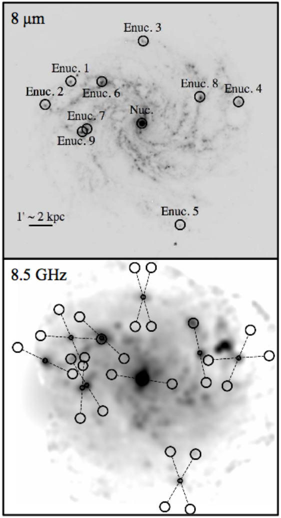
Radio protostars



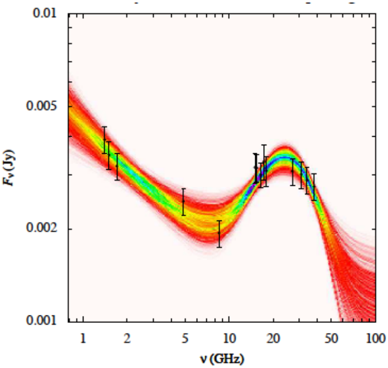


- Radio emission from protostars has a rising spectrum.
- In the case of a spherically symmetric stellar wind it has $\alpha = -0.6$.
- At 15 GHz we can see protostars quite clearly with AMI-LA.
- ...even the newly discovered VeLLOs.

Extra-galactic spinning dust

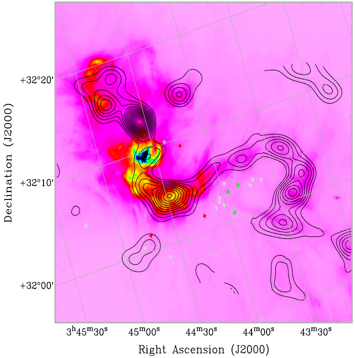


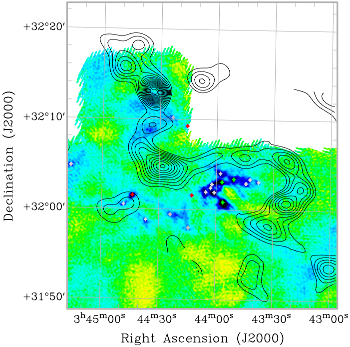
NGC6946



Murphy et al. 2010; Scaife et al. 2010

Perseus Molecular Cloud





Tibbs et al. in prep.

Scaife in prep.

Conclusions

- AMI has concentrated primarily on observing larger samples of objects rather then individual targets.
- Suitable for picking out clouds which are good targets for more detailed study.
- Allows us to examine the more global trends.
- Has revealed AME in a number of dark clouds.
- Has revealed interesting sample characteristics.
- Has highlighted the need for further large statistical studies.

Credit: Nigel Blake Photography