



# The Role of Magnetic Fields in Star Formation

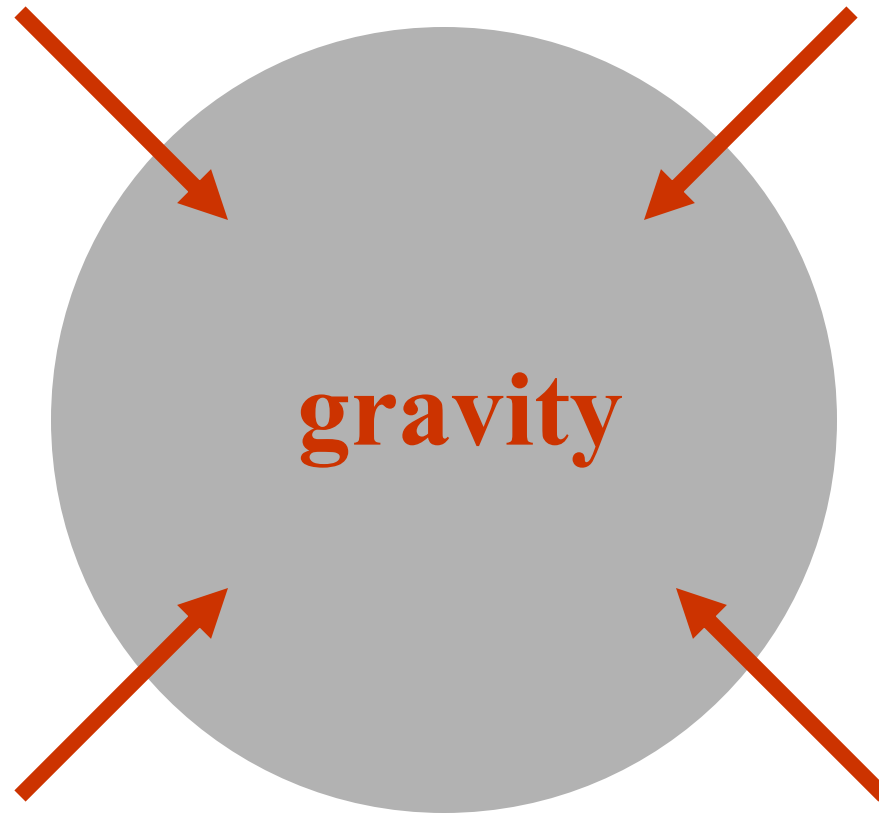
**A. P. Sarma**

Physics Department  
DePaul University

*2006 November 4,  
Sigma Xi Conference, Detroit*

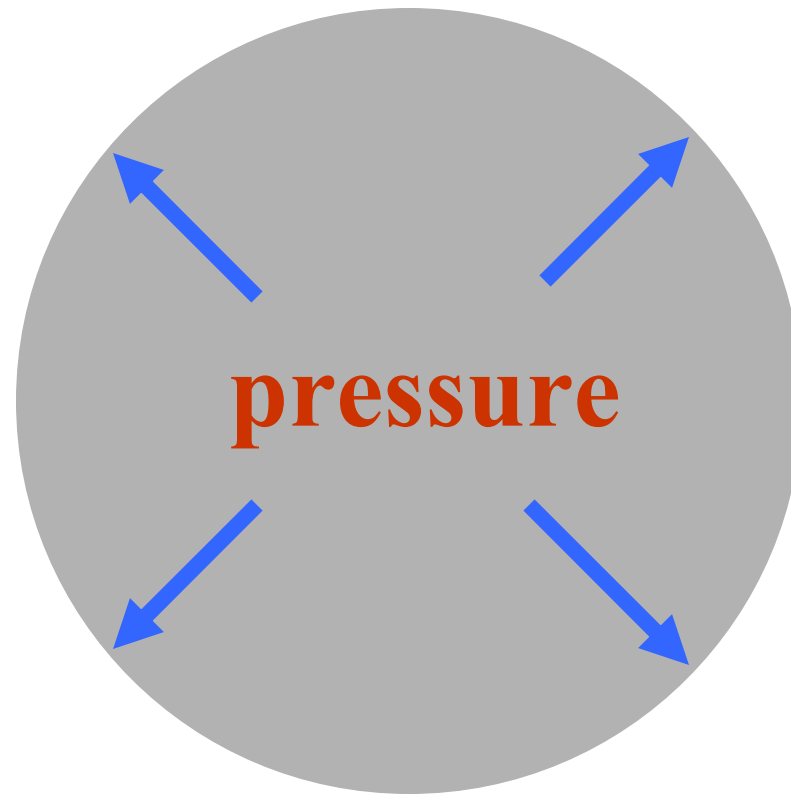
# Star Formation

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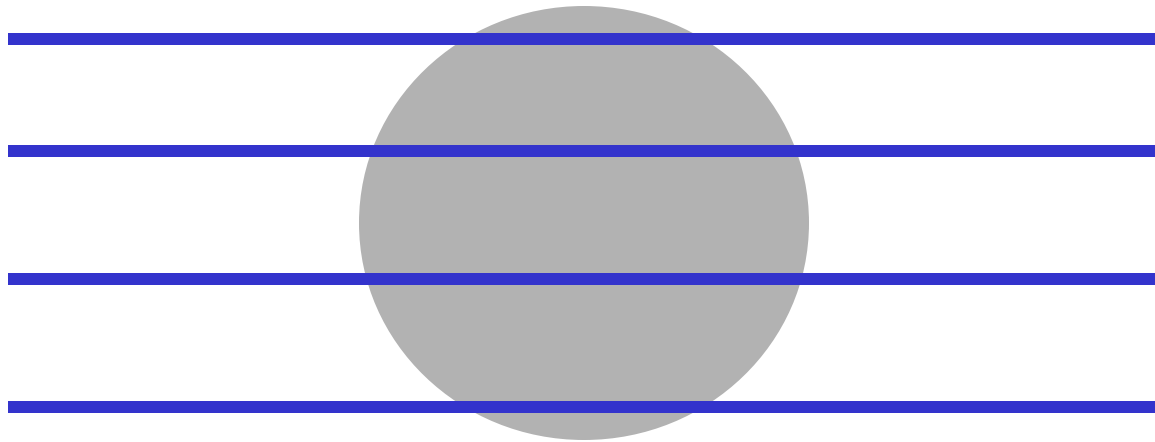
# Star Formation

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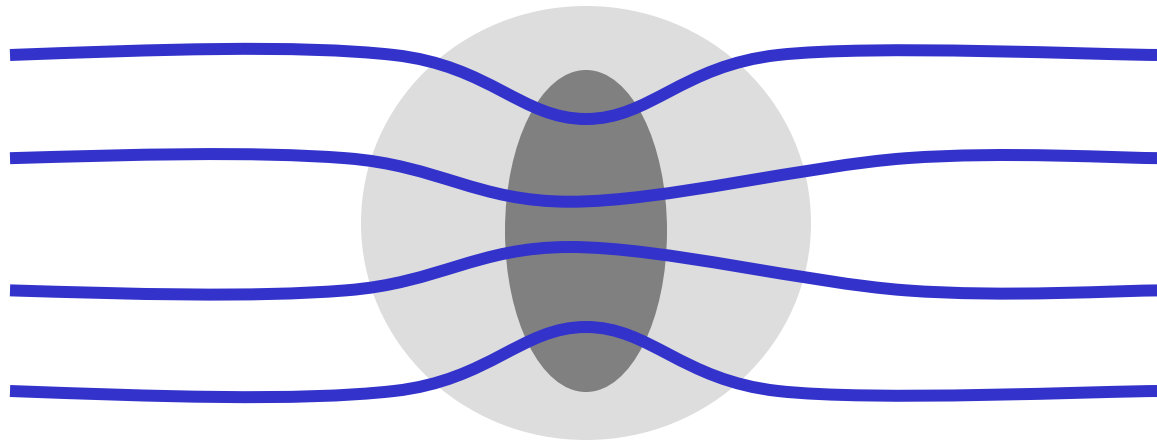
# Magnetic field support

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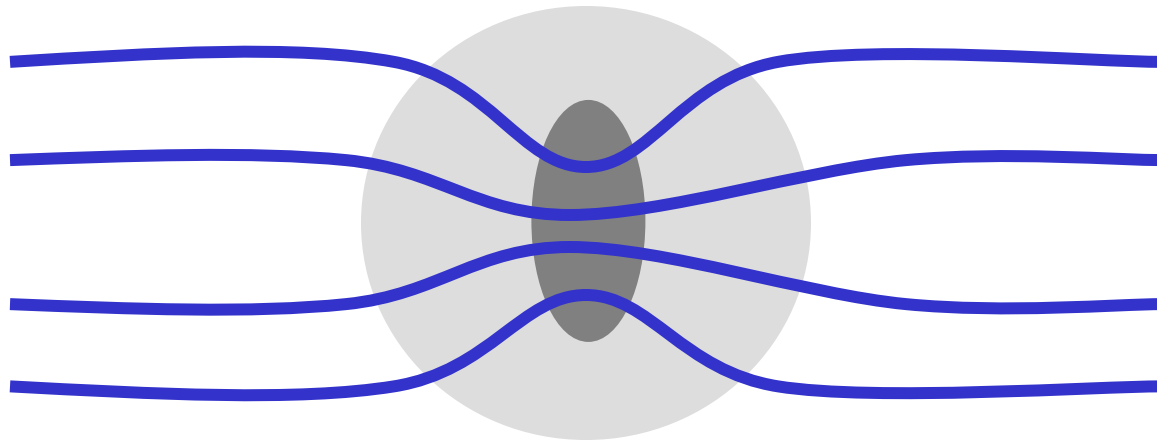
# Magnetic field support

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# Magnetic field support

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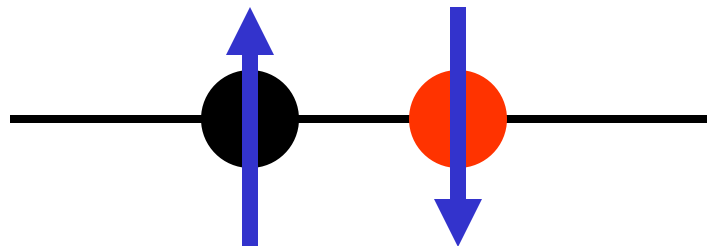
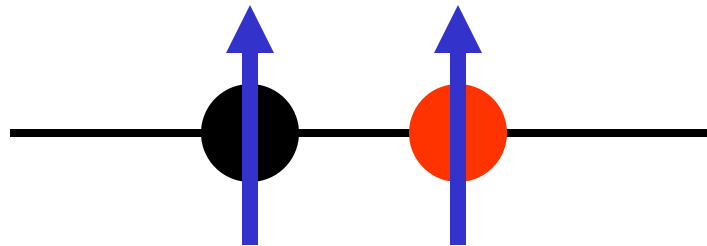
# Magnetic fields

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- Field strength
- Direction

# Atomic hydrogen: 21 cm radiation

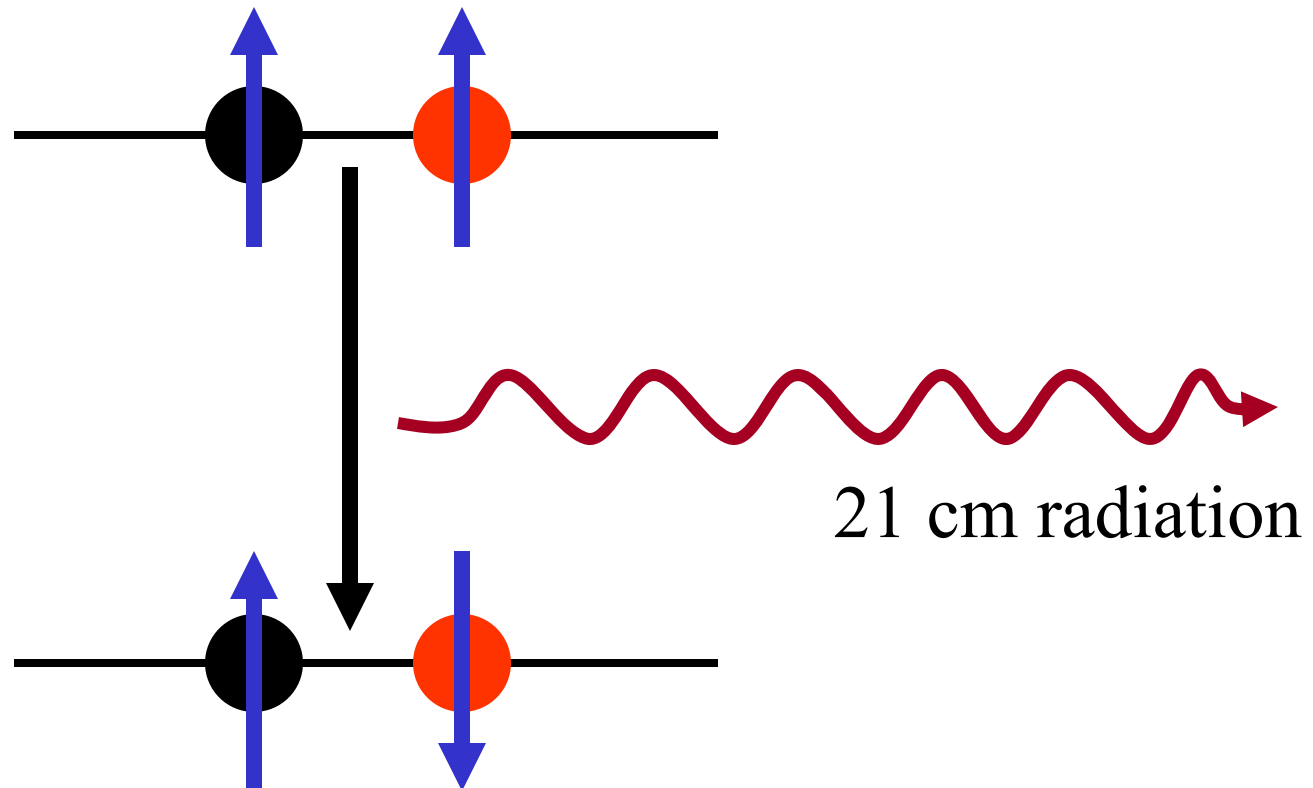
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Hyperfine splitting

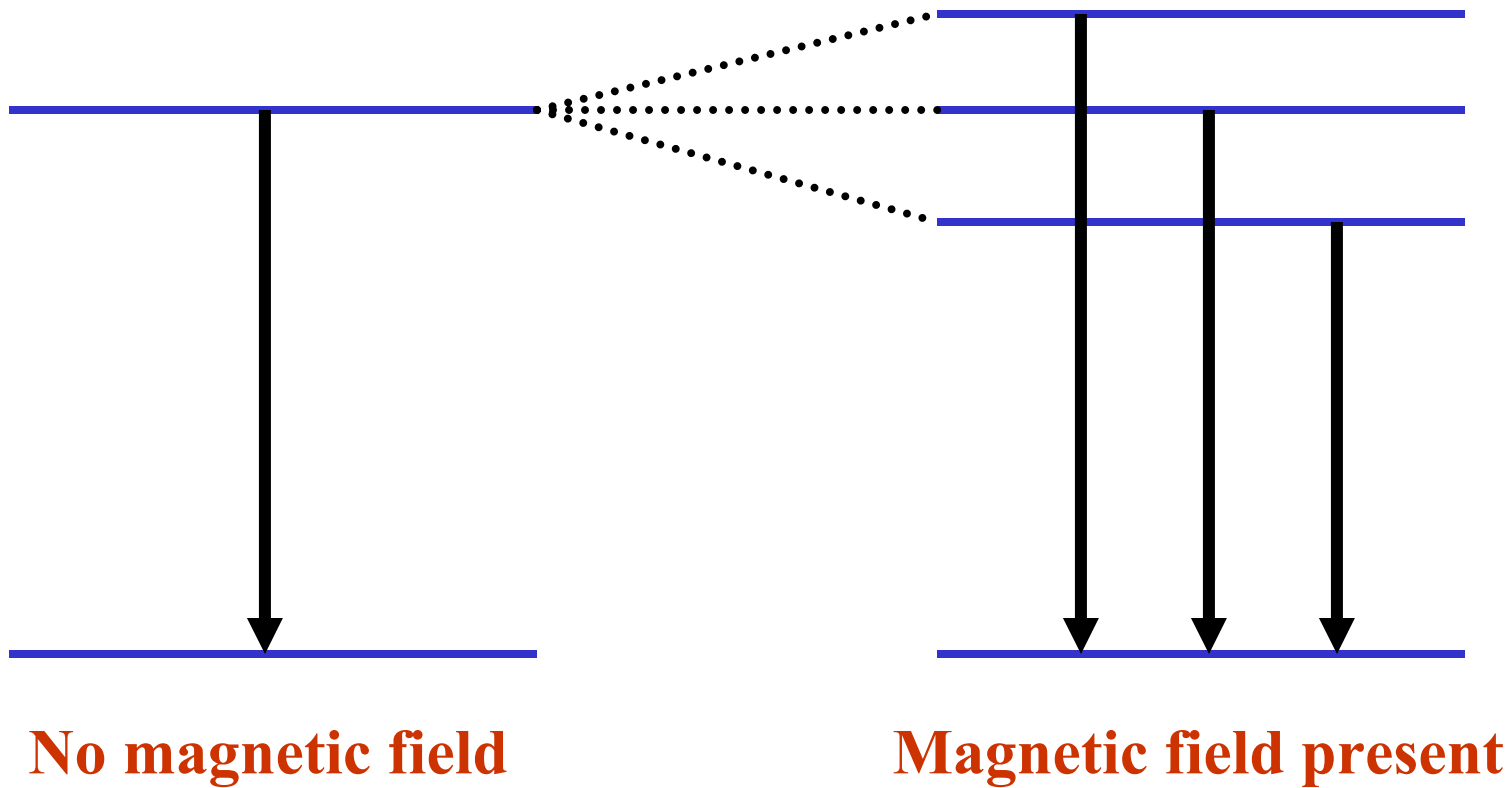
# Atomic hydrogen: 21 cm radiation

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# Zeeman effect

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# Radio telescopes

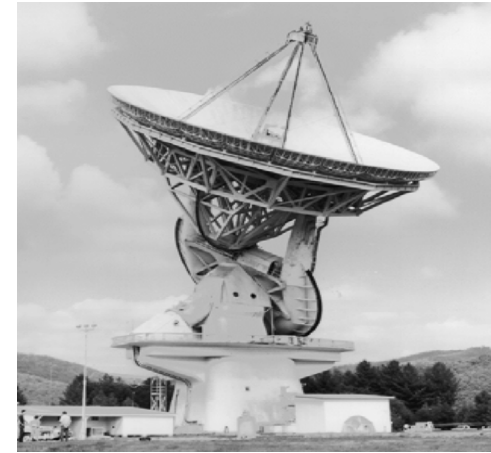
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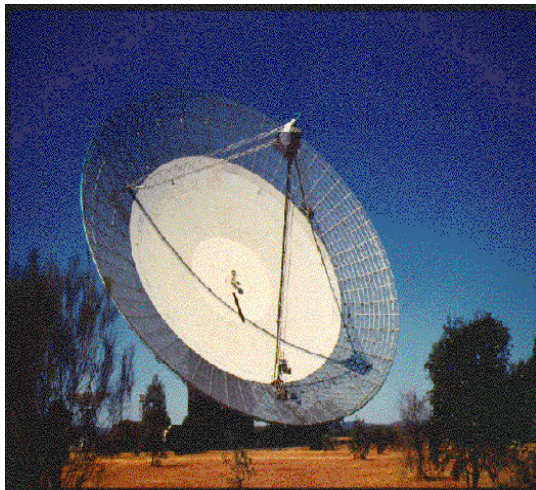
Mopra 22-m,  
Australia



DRAO 26-m,  
Canada



NRAO 140-ft, WV



Parkes 64-m,  
Australia

Effelsberg 100-m,  
Germany



# Telescopes – Spatial resolution

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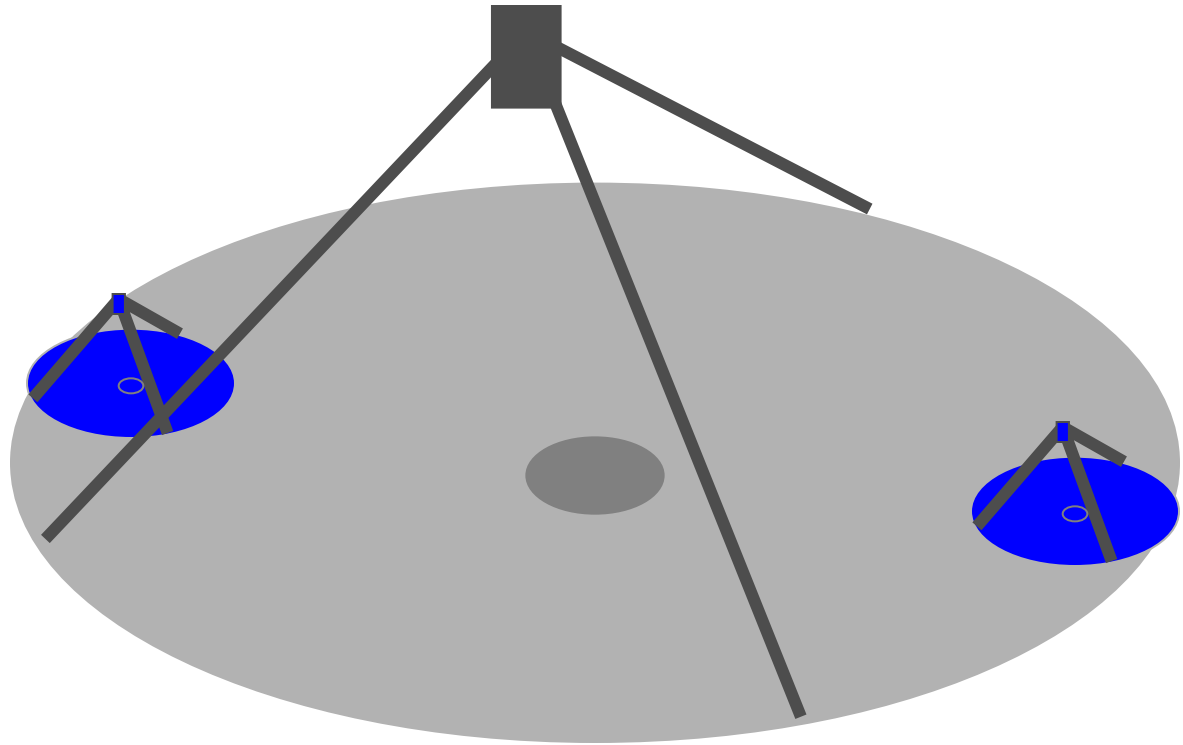


Nearby, see individual leaves

For trees far away,  
see field of green

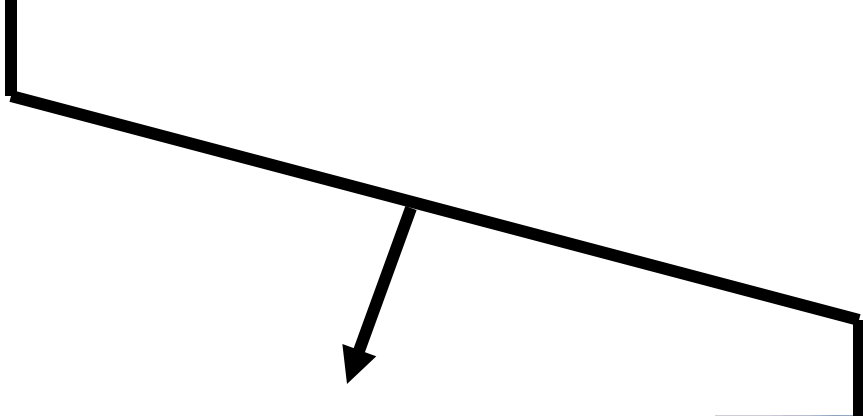
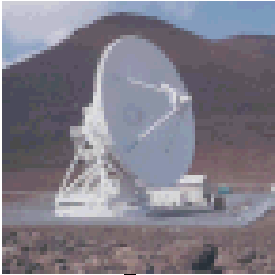
# But ...

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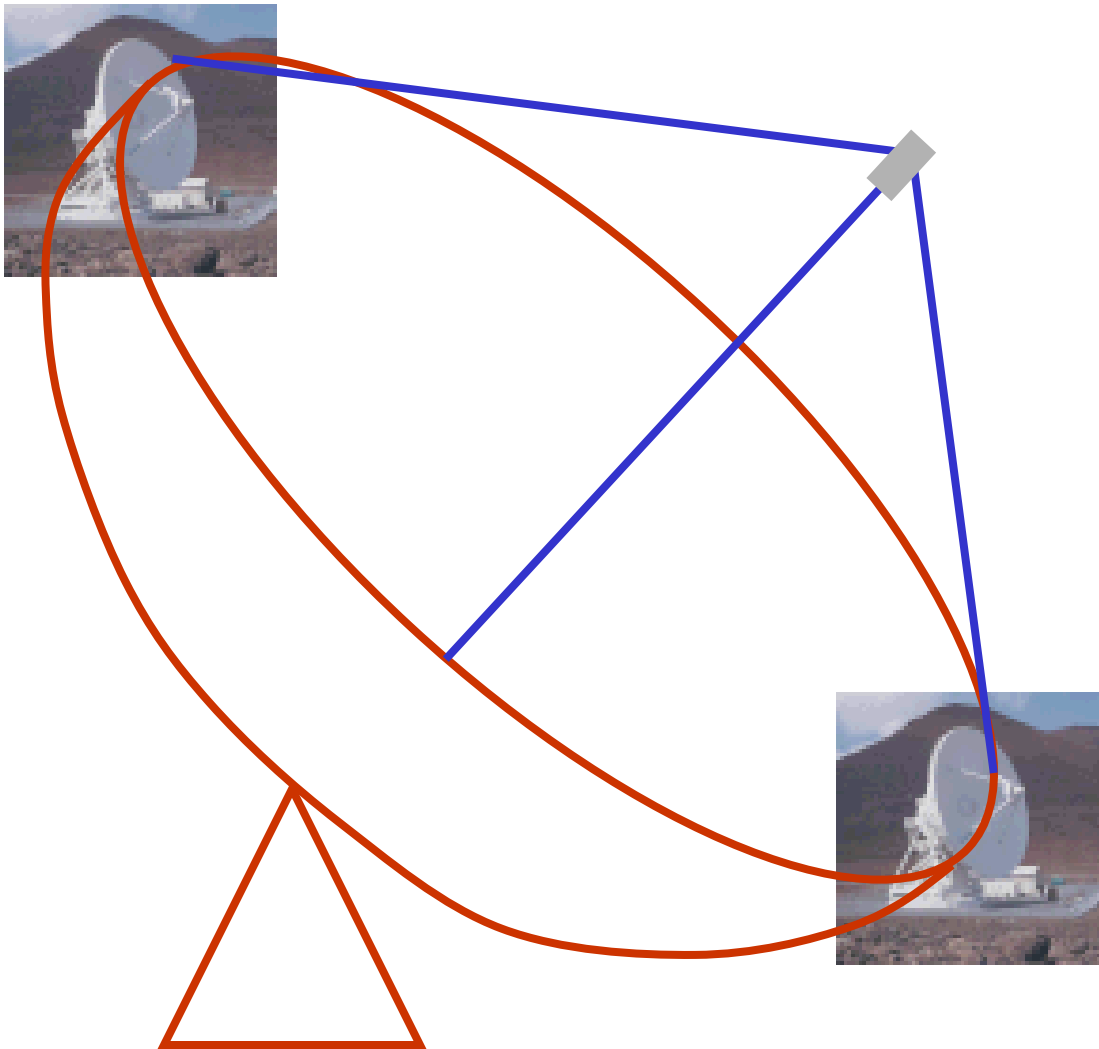
# Interferometry

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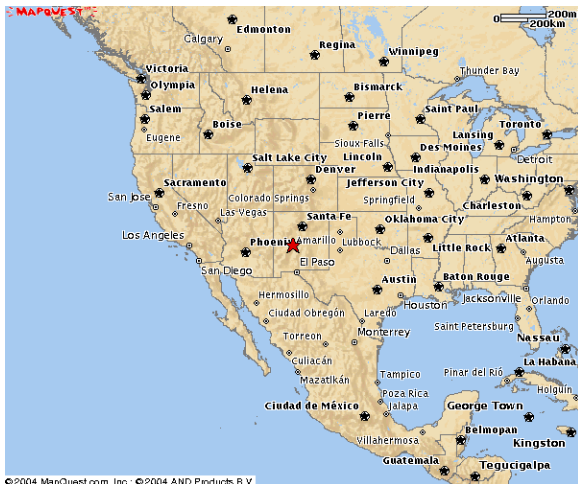


# Interferometry

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# Interferometers: VLA



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# Interferometers: VLA



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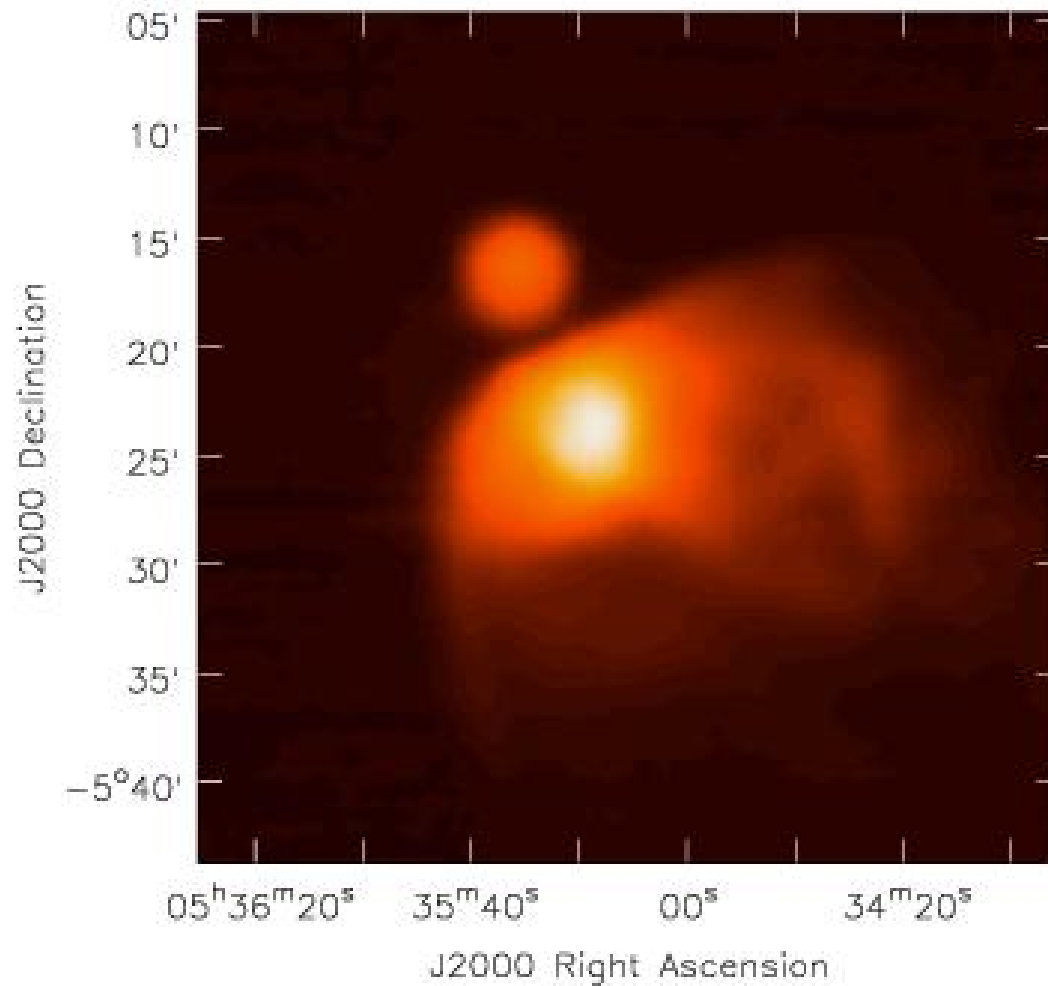
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*Very Large Array, New Mexico, USA*

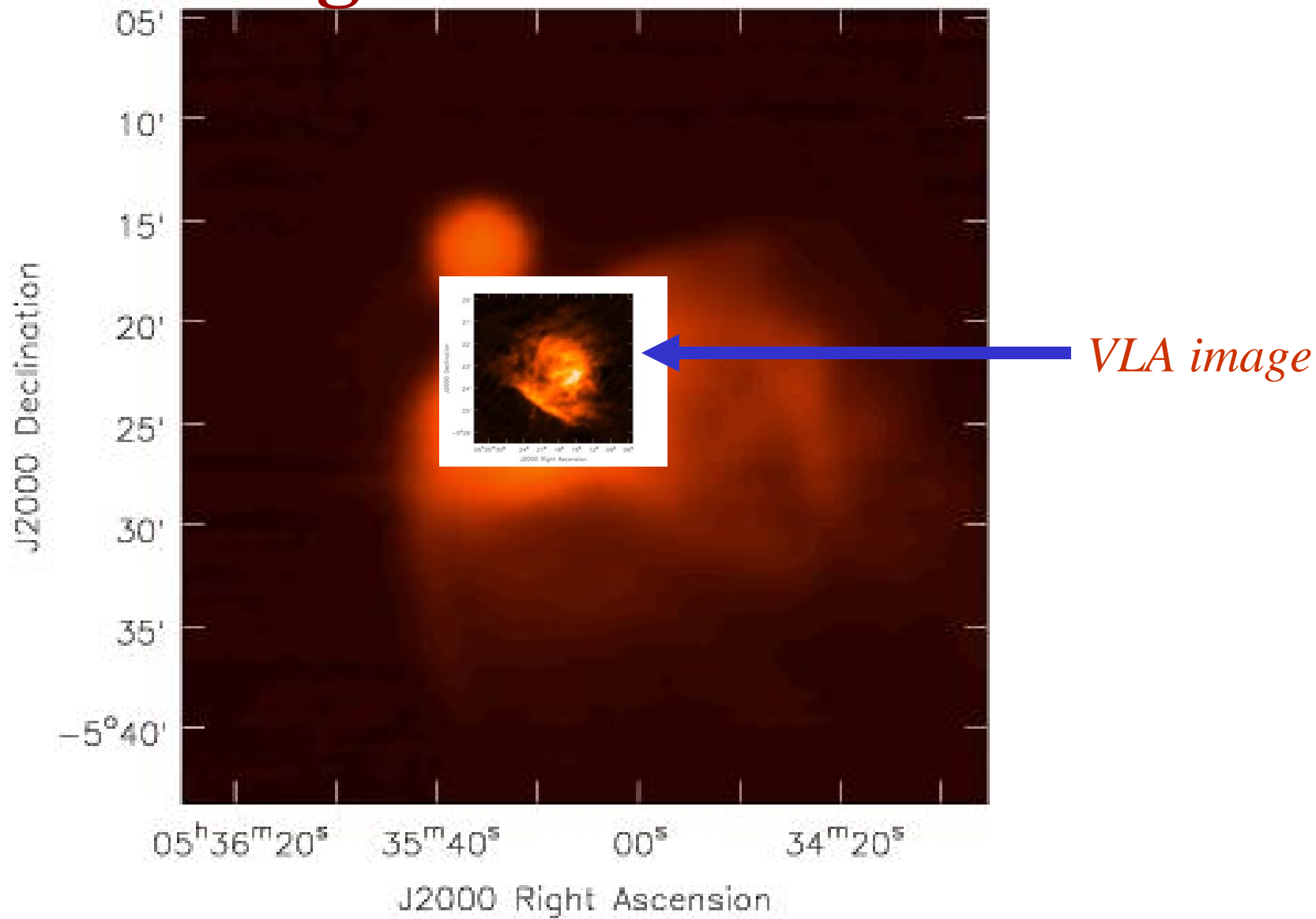
# Single dish image

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*Orion nebula,  
GBT*

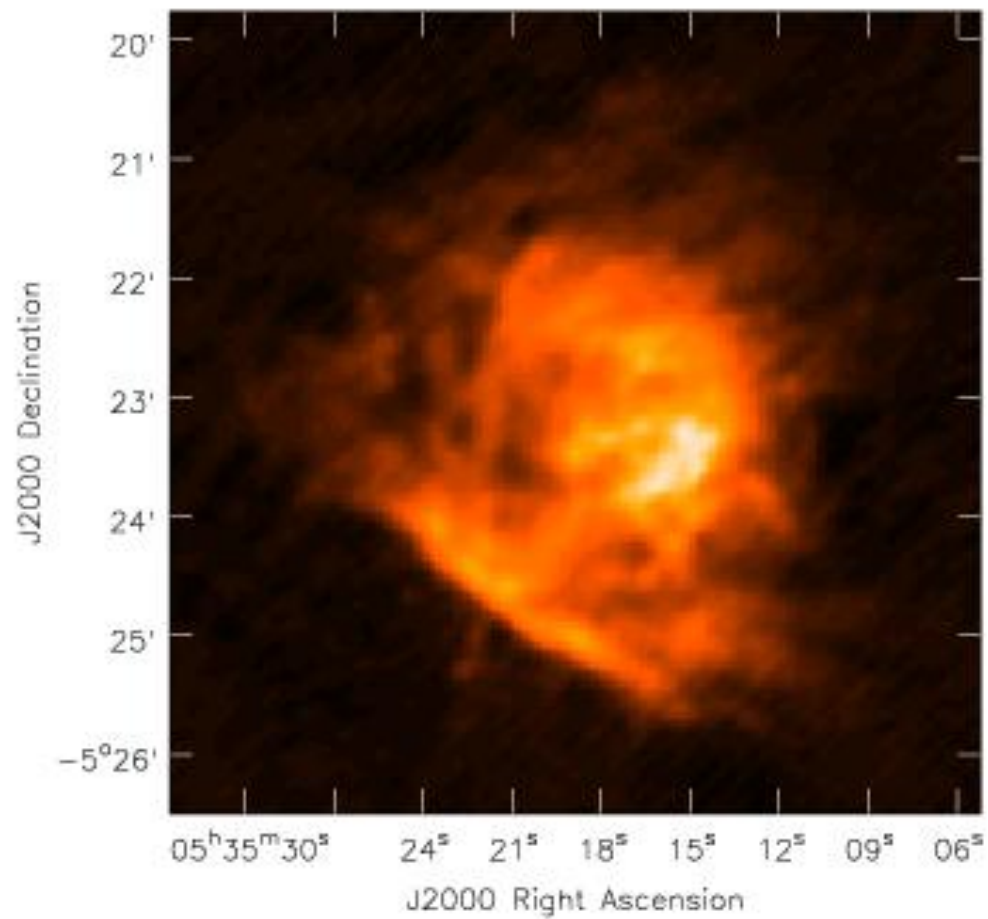
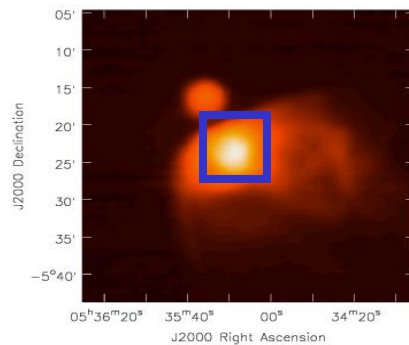
# Single dish vs. interferometer



# Single dish vs. interferometer

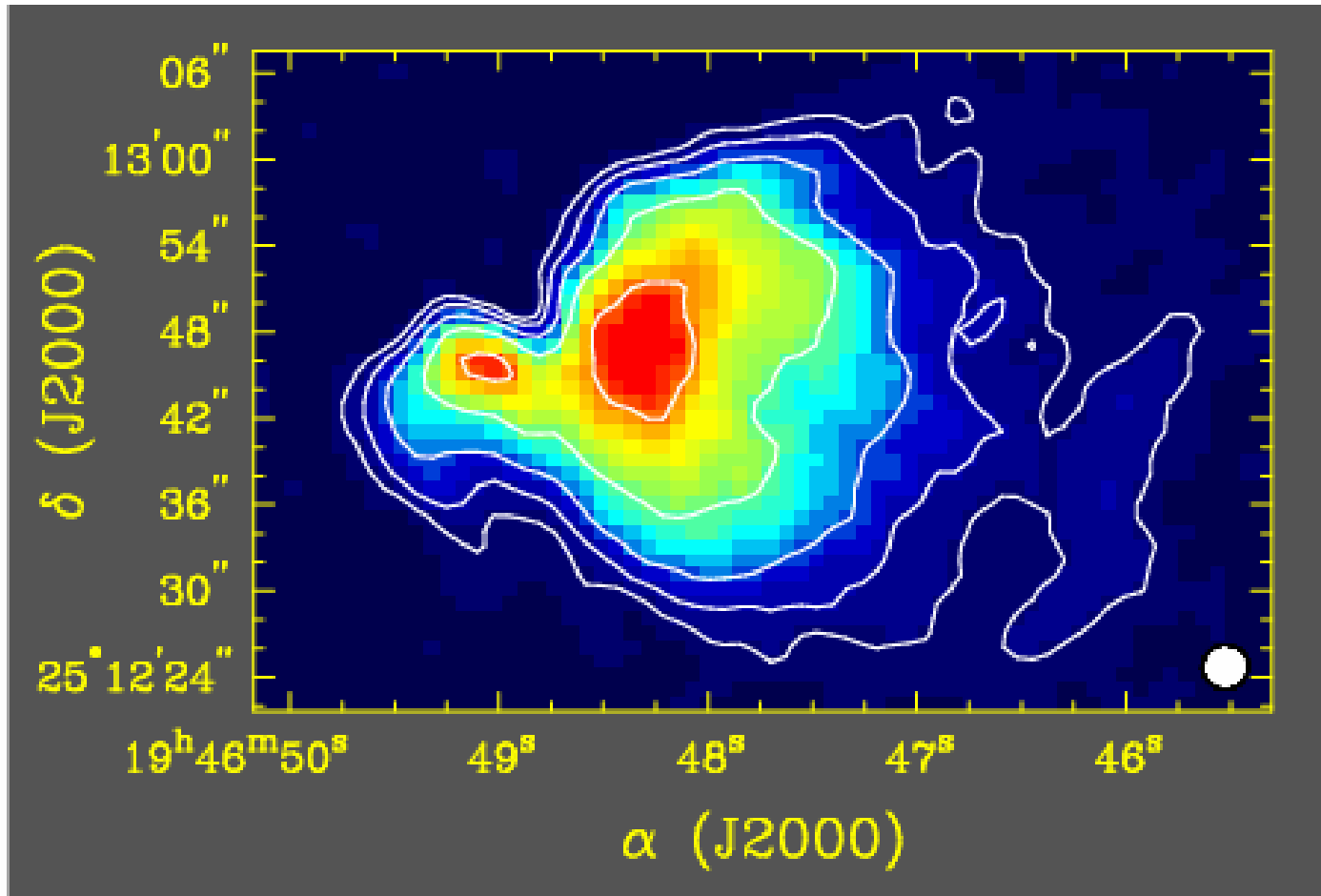
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*VLA image*



# Star Forming Region S88B

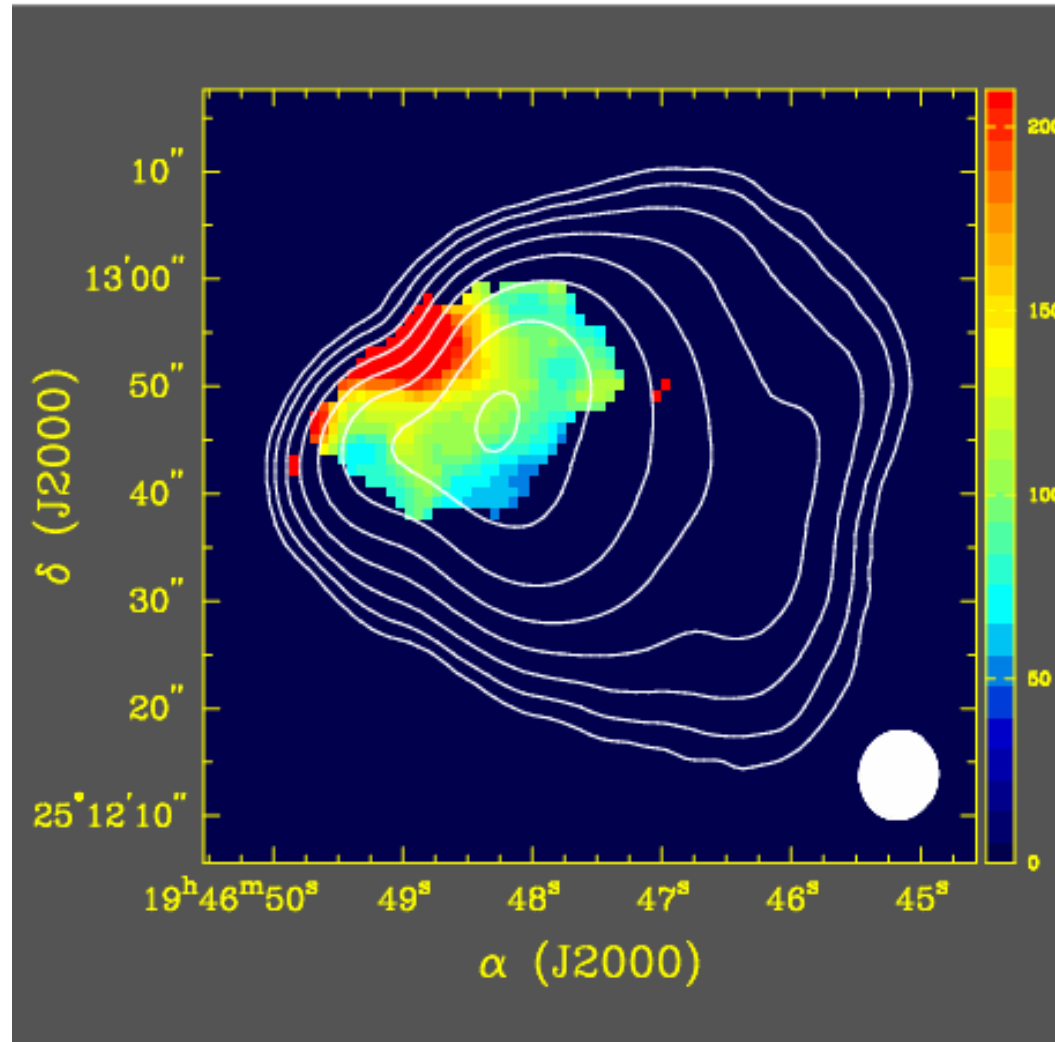
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*VLA B&C array, 1665 MHz*

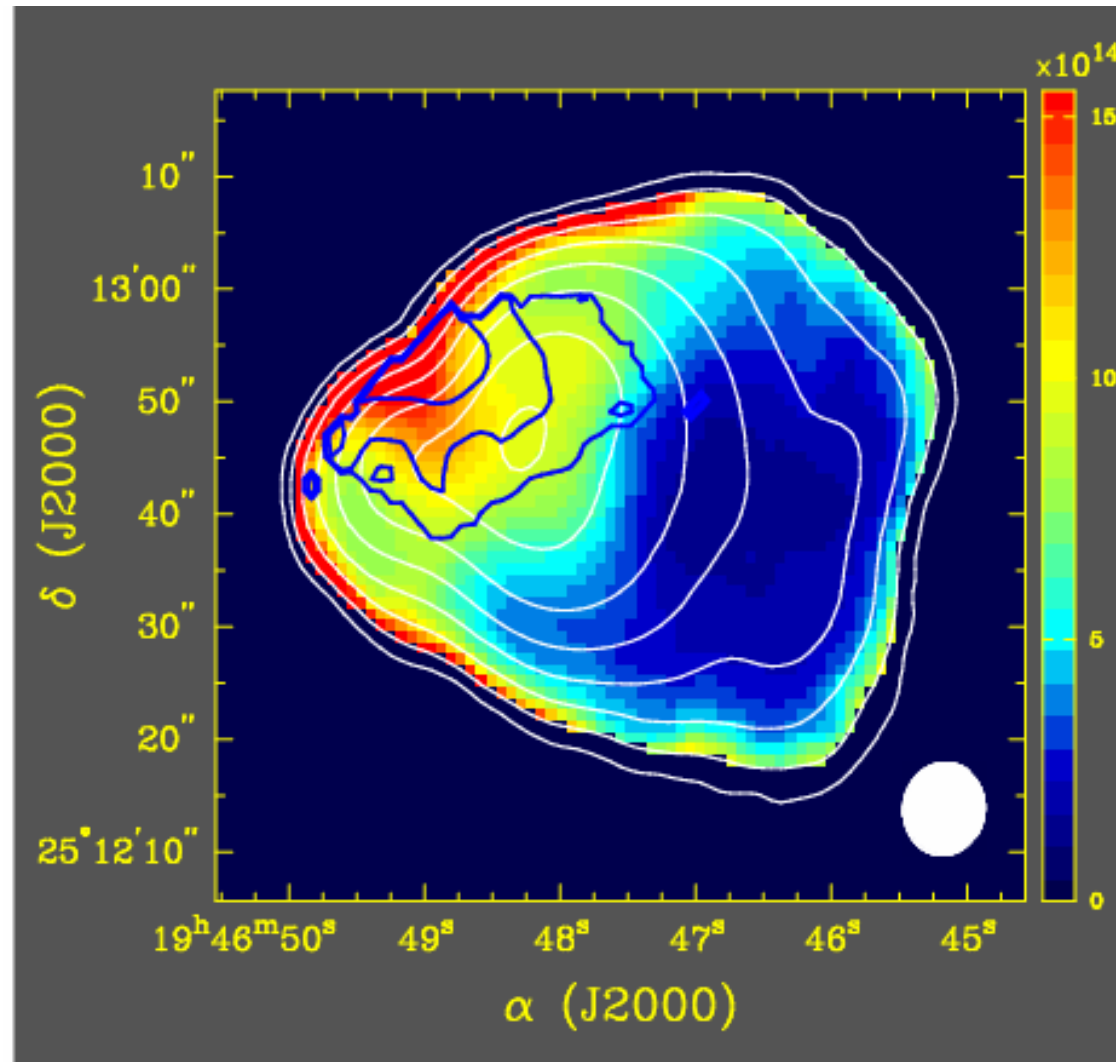
# S88B: Magnetic fields

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# S88B: Magnetic fields & Density

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# Magnetic fields

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- Mass-to-magnetic flux ratio ( $\lambda$ ) can be measured from observations.
- We find  $\lambda \approx 3$ .

*Calculations by Maggie Eftimova,  
former graduate student, DePaul*

# Magnetic fields

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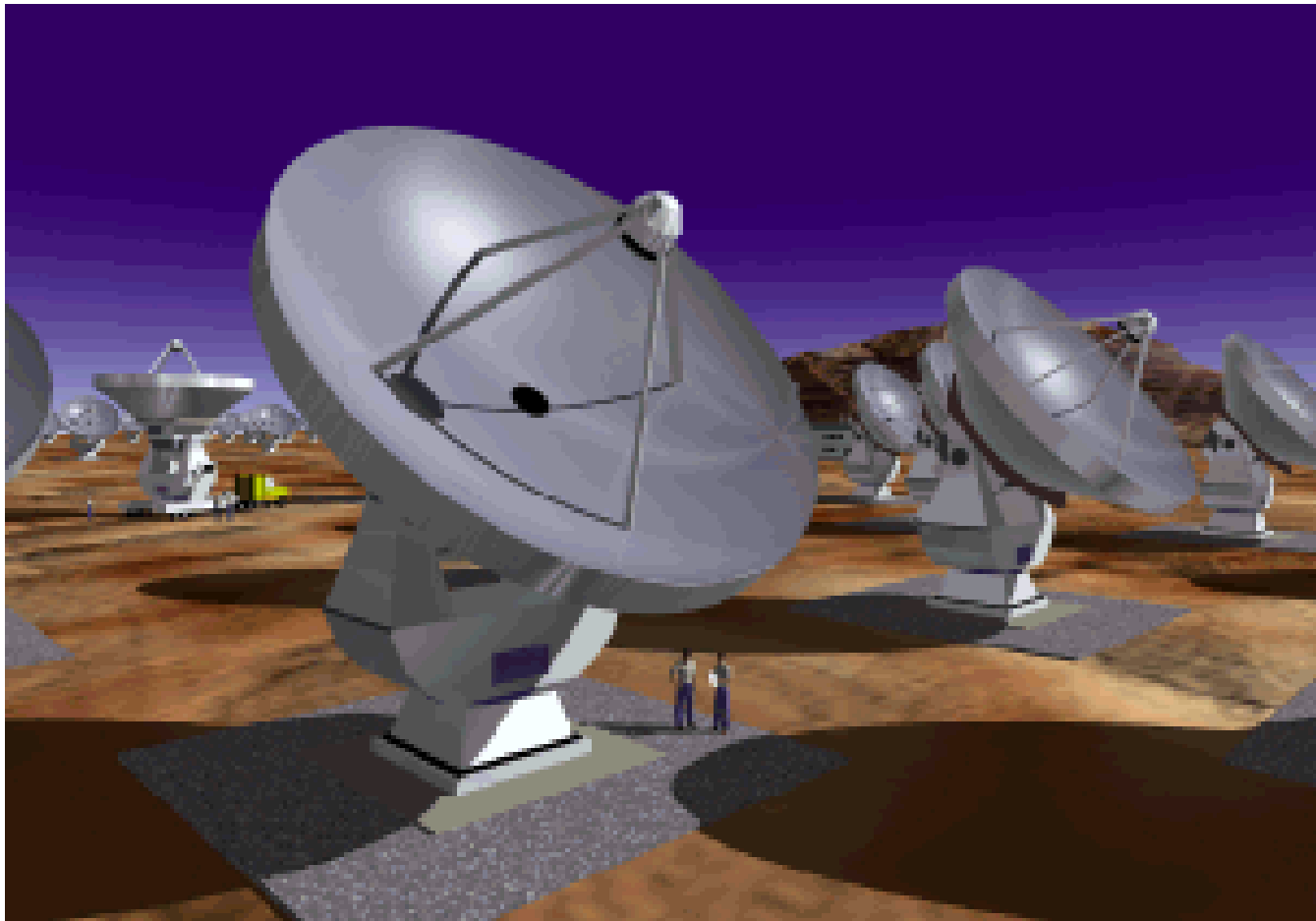
- Molecular clouds are initially subcritical ( $\lambda < 1$ ), and the field provides support against gravitational collapse.
- In the dense cores of these clouds,  $\lambda > 1$  (supercritical), leading to core collapse.

# What's next?

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# The future: ALMA

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*Atacama Large Millimeter Array (ALMA), Chile*