Studies of Star Formation with ALMA

Cycle 0 Programs

North American ALMA Science Center

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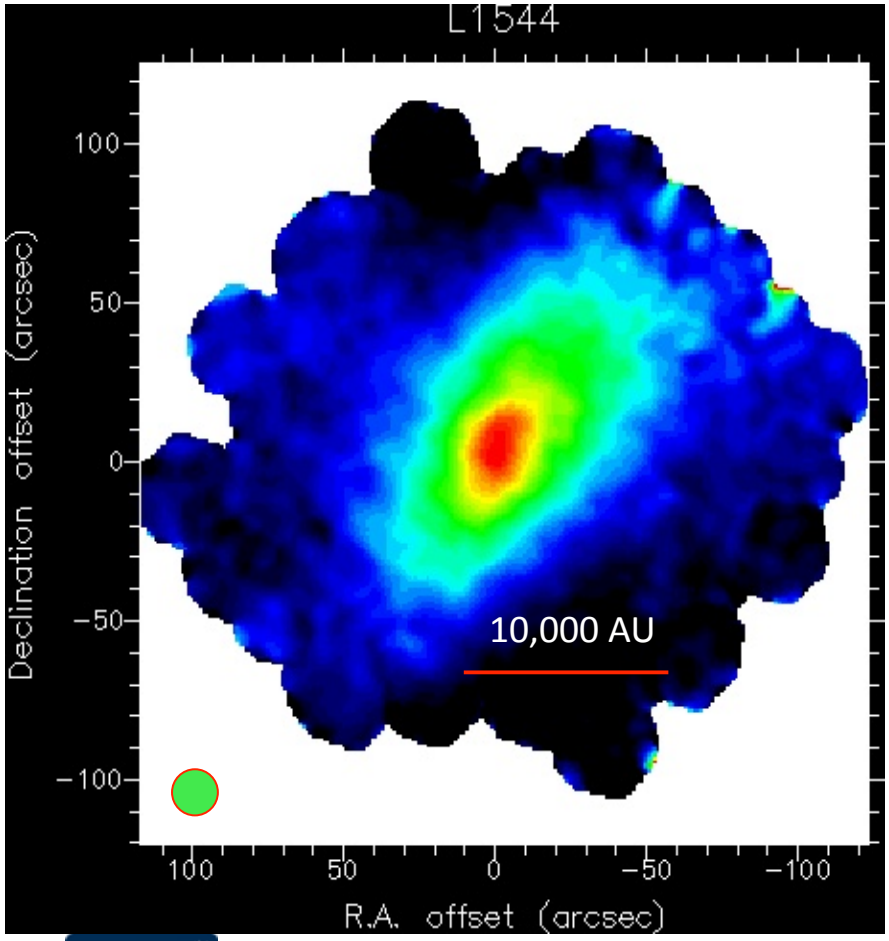
Atacama Large Millimeter/submillimeter Array
Expanded Very Large Array
Robert C. Byrd Green Bank Telescope
Very Large Baseline Array

NRAO

Starless Cores

L1544

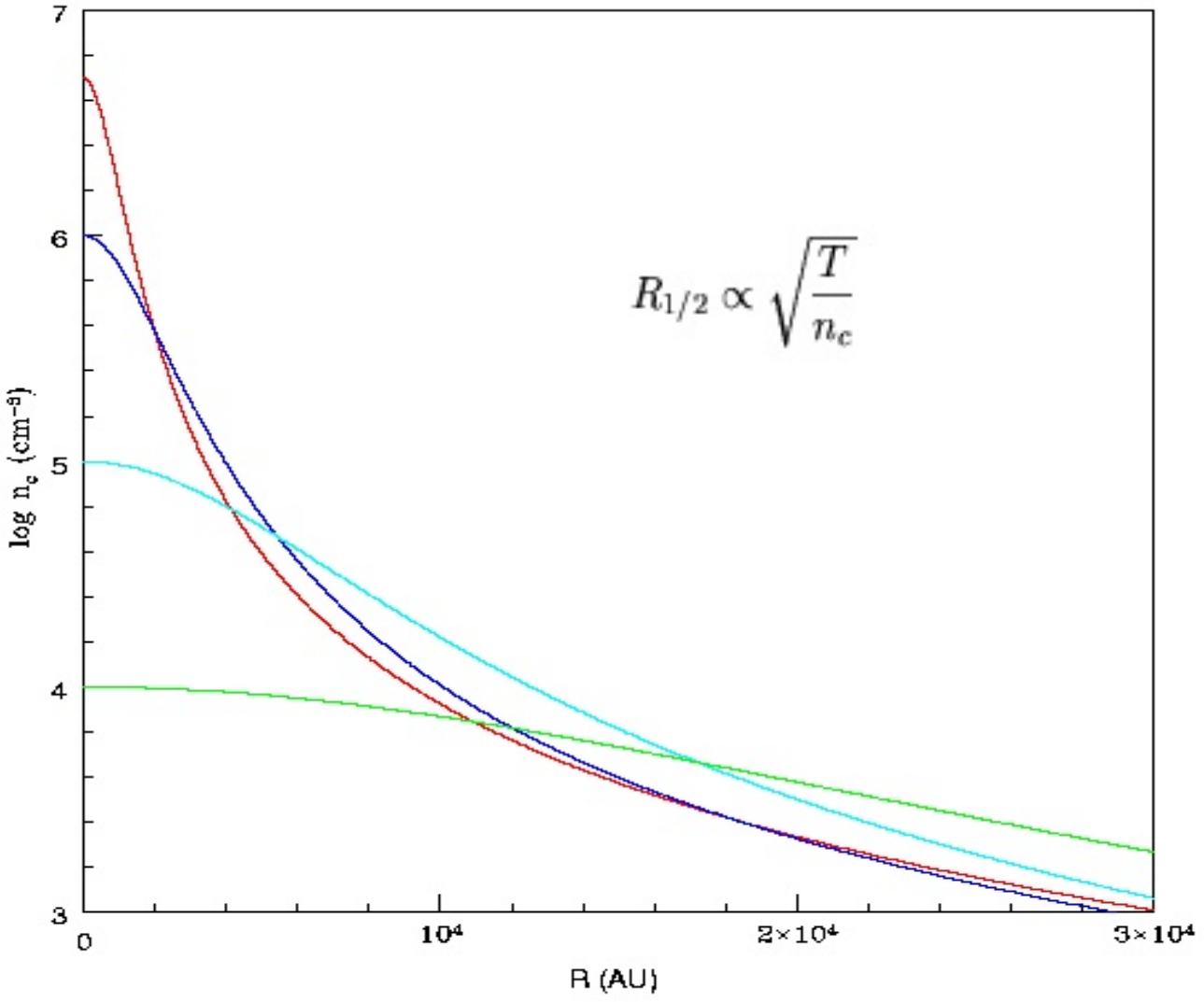


B68

Left: Shirley et al. 2000; Right: B68 Alves et al.

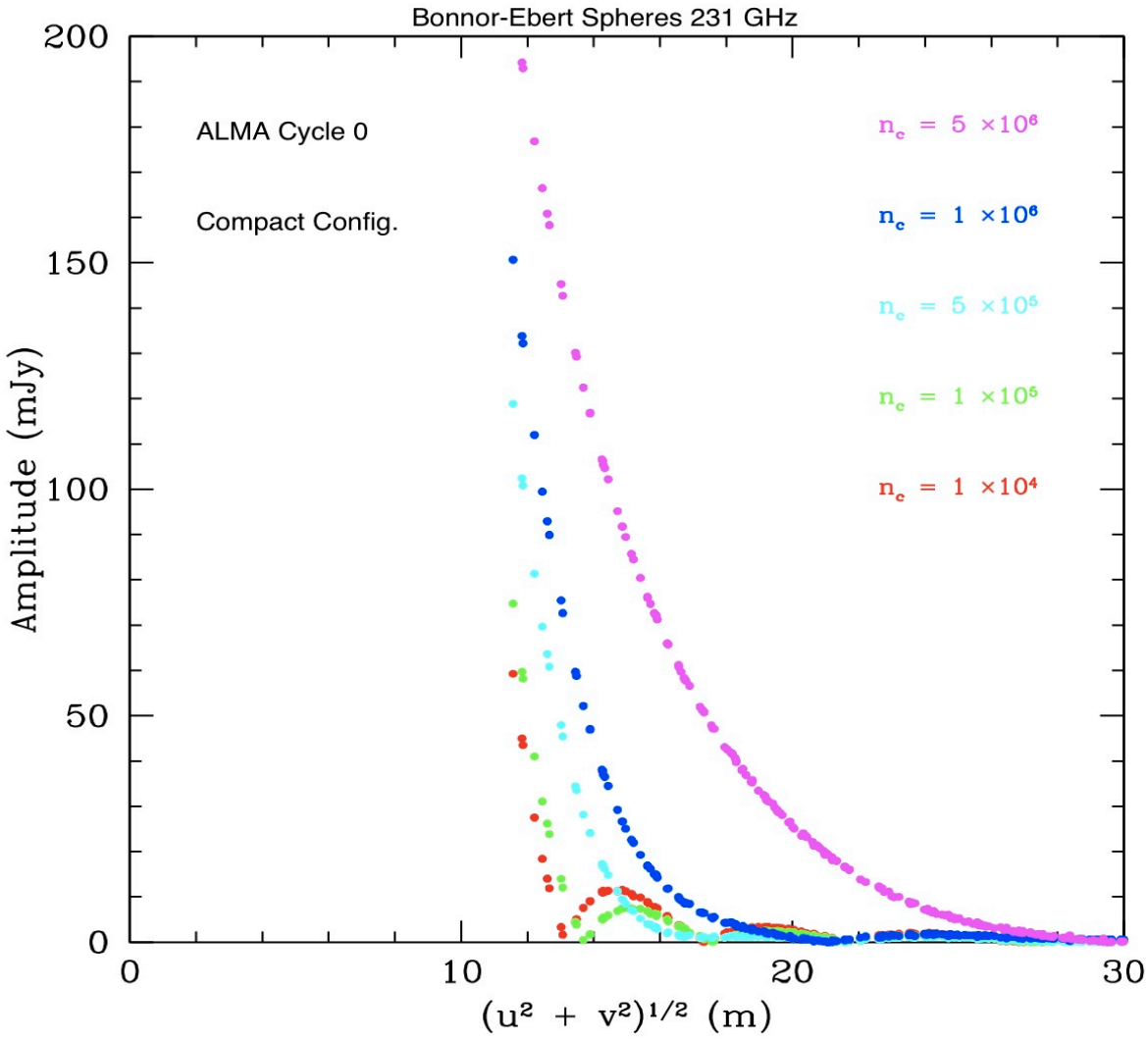
Bonnor-Ebert Spheres

Density



Radius

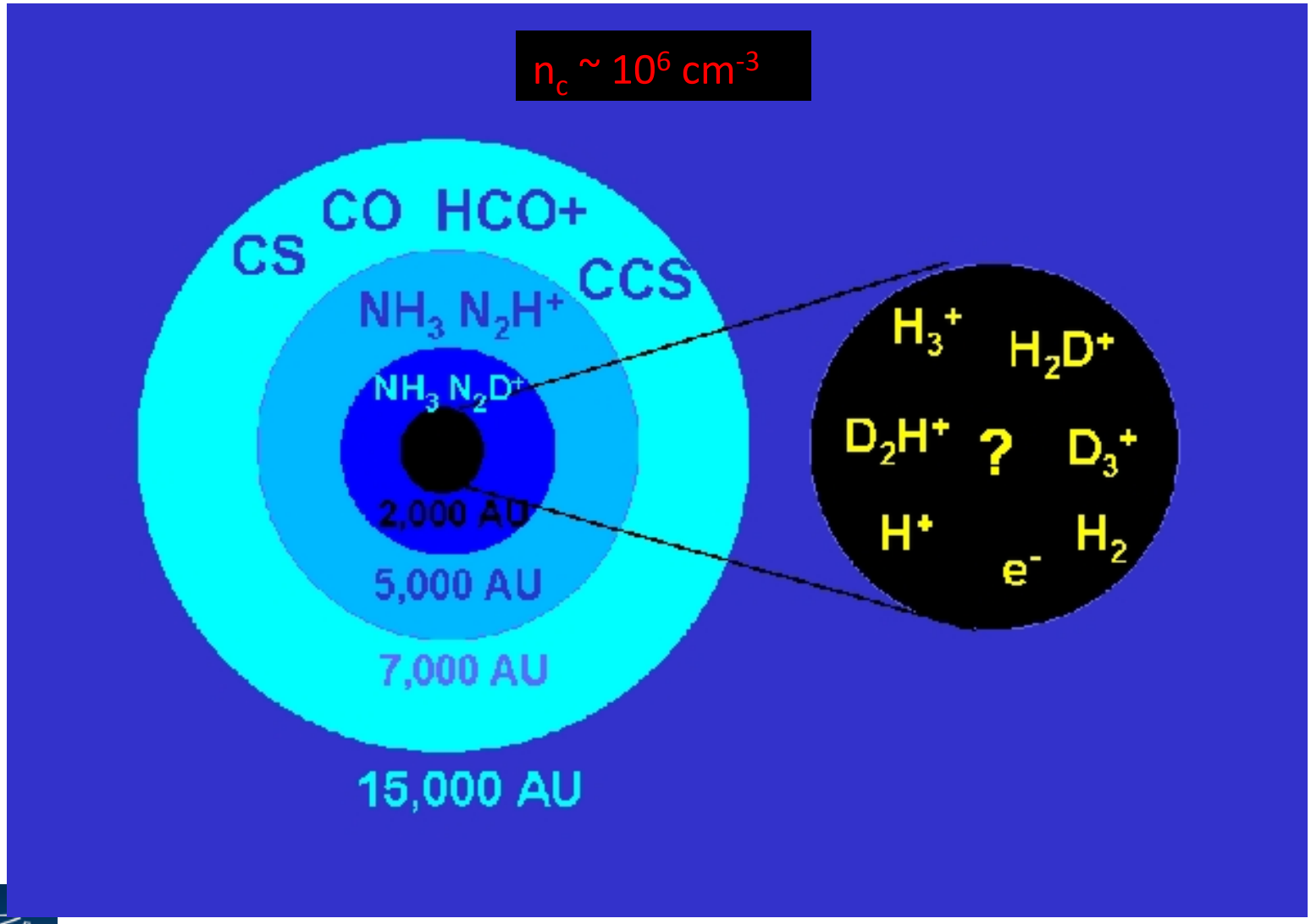
Bonnor-Ebert Sphere Visibility Amplitudes



Visibility Amplitude

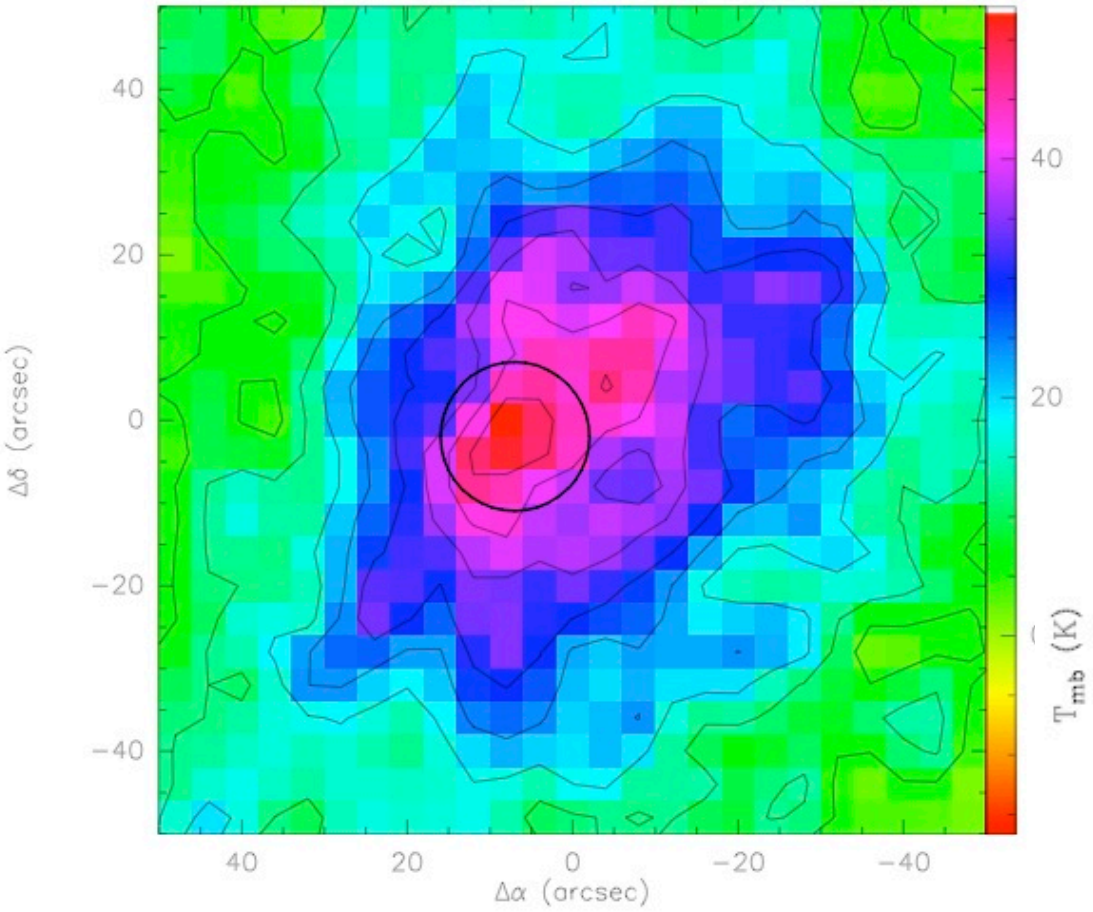
u,v distance

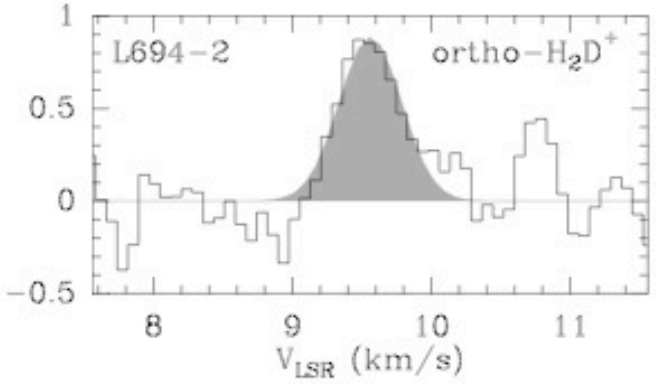
Gas Depletion Cartoon for Starless Cores



H_2D^+ in Starless Cores

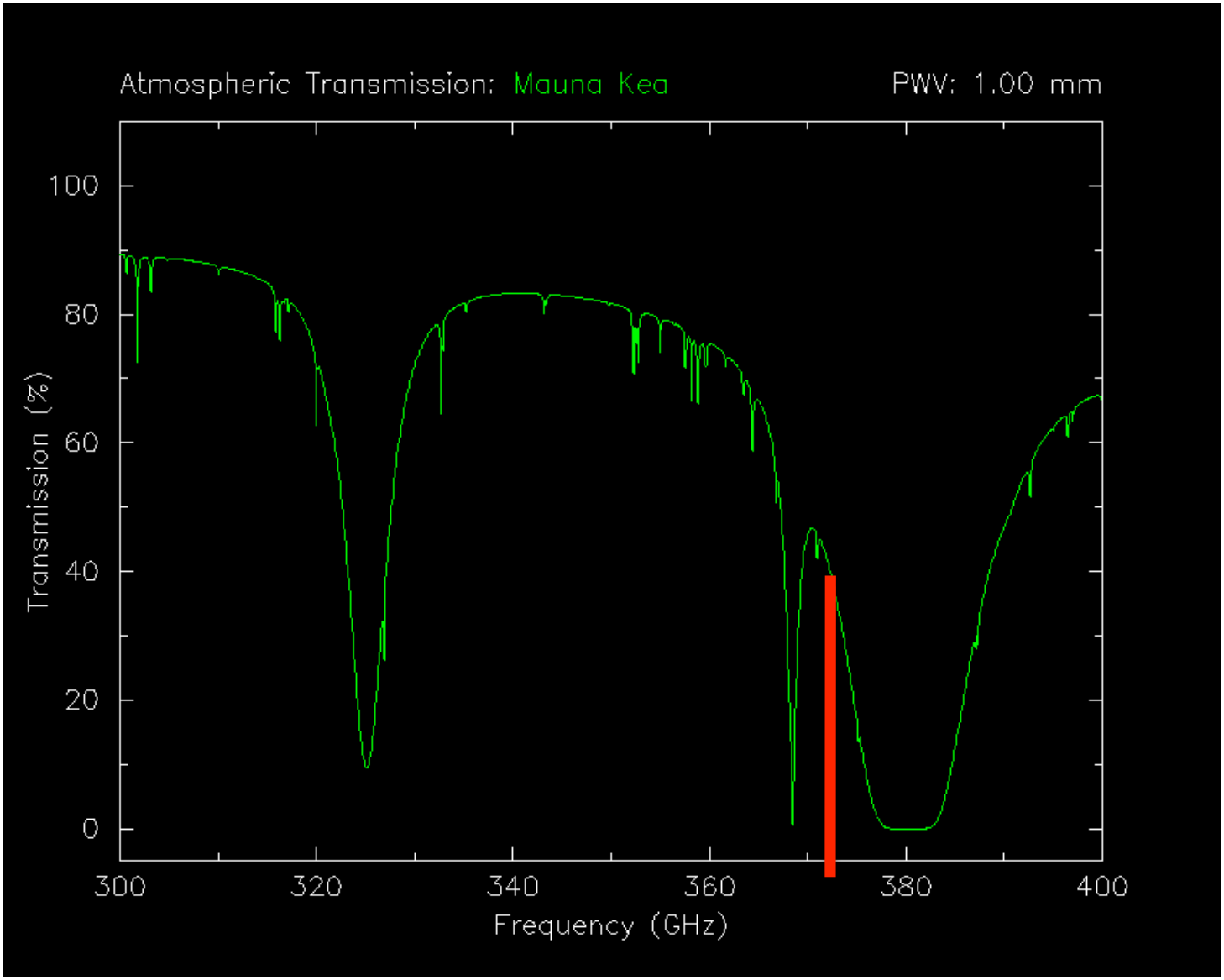
- Cycle 0 project ***PI: Paola Caselli***
- H_2D^+ as a kinematic tracer of inner 1000 AU
- 1200μm image of L694-2 with ALMA FOV shown as black circle





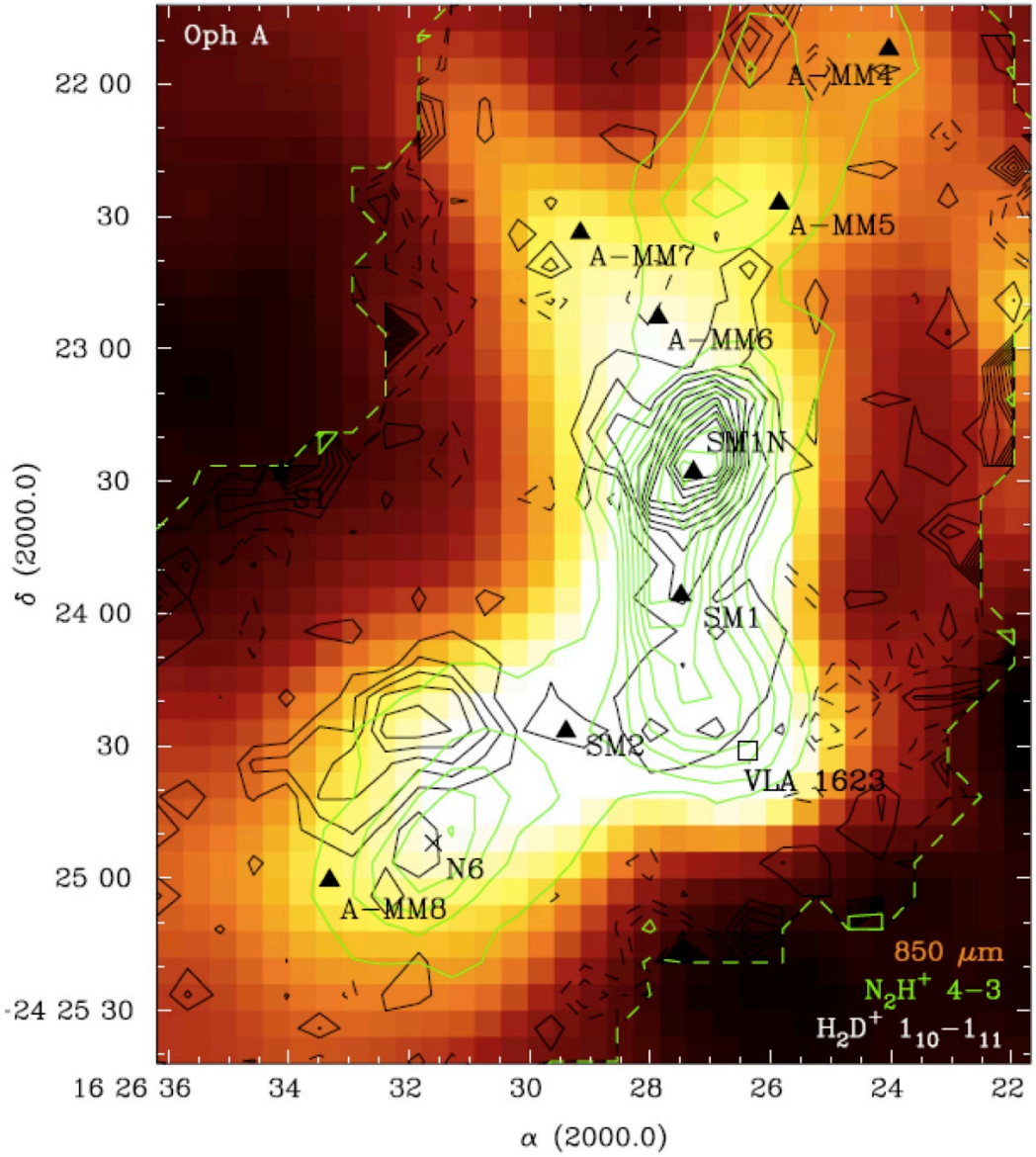
Courtesy P. Caselli

Atmospheric Transmission



Oph A – H_2D^+ in a Clustered Environment

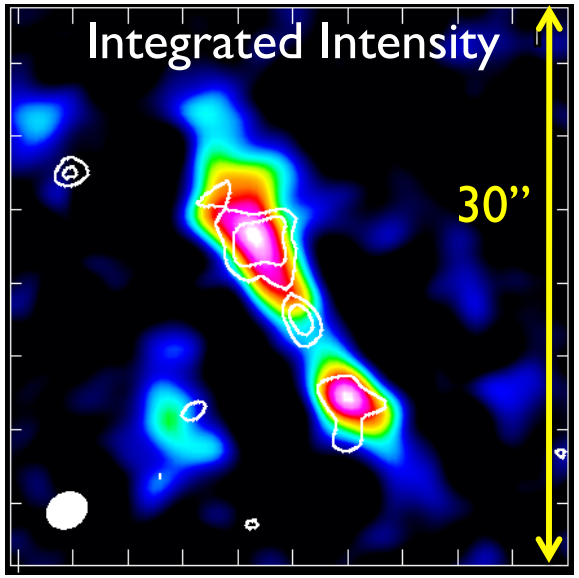
- Cycle 0 project ***PI: Rachel Friesen***
- H_2D^+ in clustered environments.
- 850μm image of Oph A with H_2D^+ (white) and N_2D^+ (green) contours.



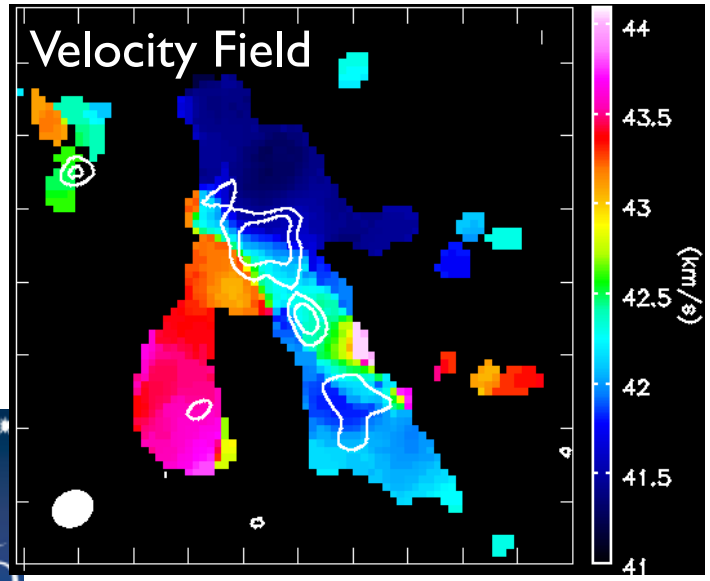
Courtesy R. Friesen. Di Francesco et al, in prep.

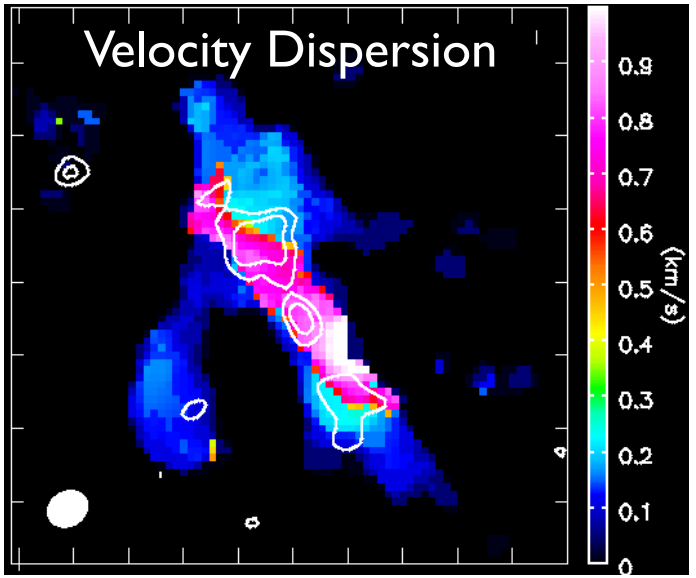
The Dynamics of Massive Starless Cores

Goal: Determine the dynamical state of 4 massive starless cores using several chemical tracers in order to distinguish between different theories of massive star formation



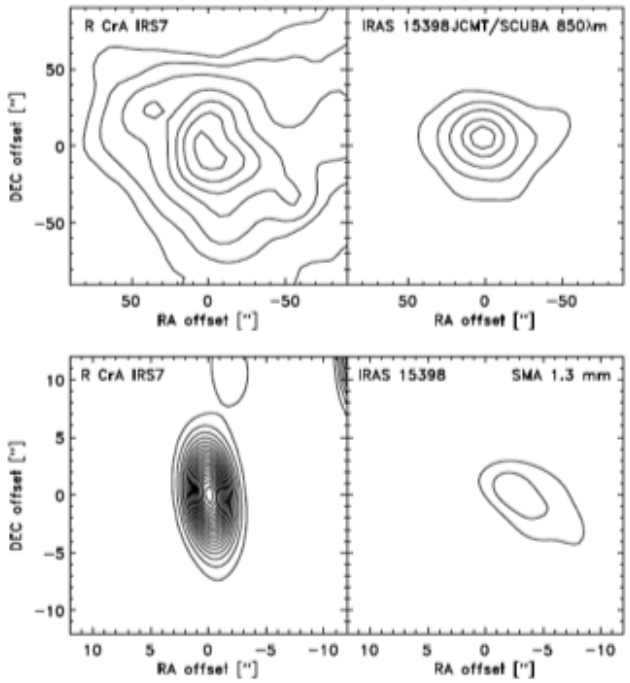
- Reference Images for target “G2” from Cycle 0 project 236 by PI ***Jonathan Tan***
- 40min(!) compact config; ~2.2” resolution
- **DCO+ line** at 216.1 GHz
- White contours show 1.3mm continuum

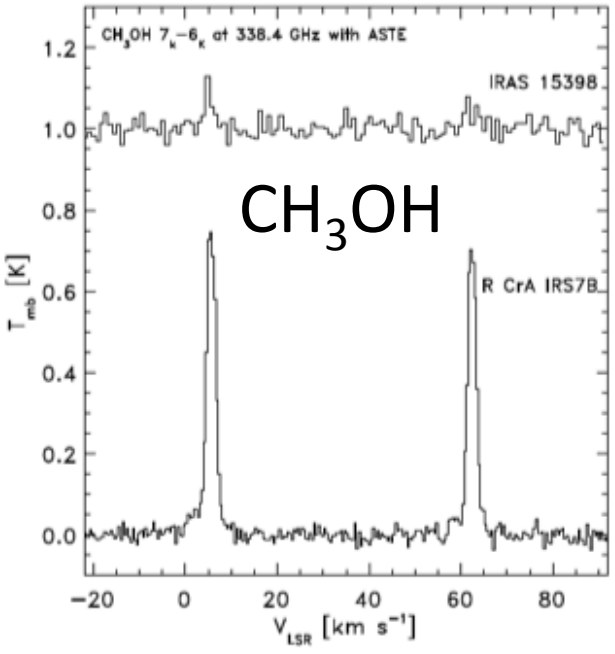




Courtesy J. Tan

Disks and Organics in the Inner Regions of Low-Mass Protostars



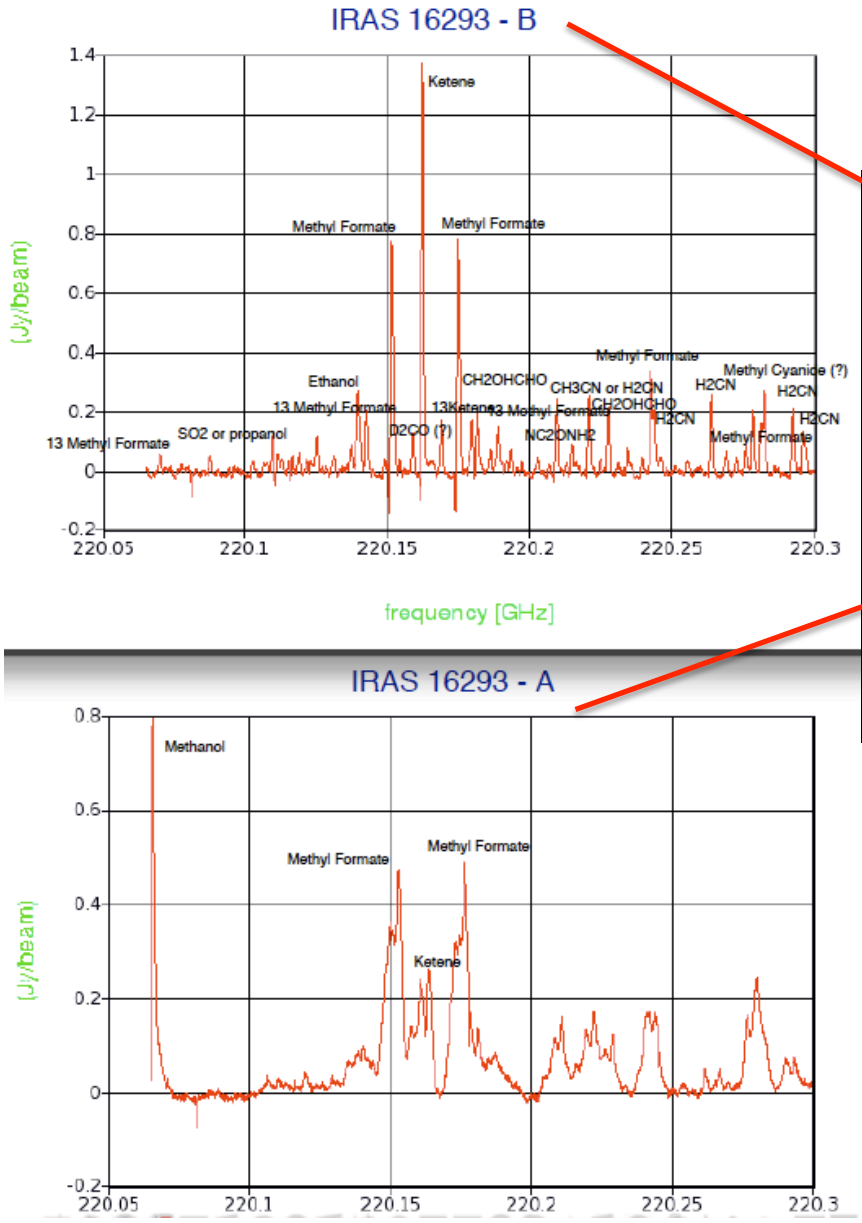


- Cycle 0 project
  PI: Jes Jørgensen
- LEFT: Continuum of 2 low-mass Class 0 protostars targeted
- RIGHT: Methanol observations toward the cores

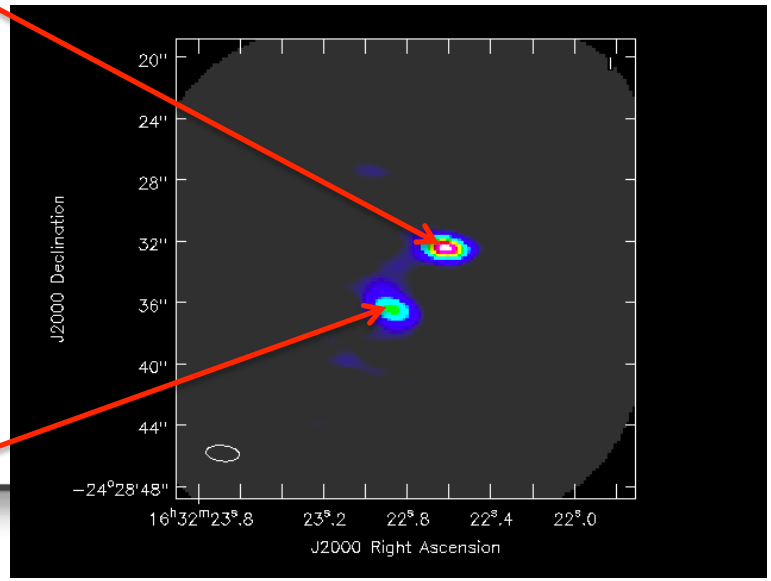
- Proto-planetary disks first formed during these early stages
- Is there a relationship between complex organics and the physical properties of the inner envelope and disk in these protostars?

Courtesy J. Jorgensen

ALMA Test Data: IRAS16293



ALMA Test Data



J. Turner, K. Sheth & ALMA CSV team

- Note narrow lines toward pre-protostellar core B with infall apparent in Methyl Formate and Ketene lines(!).
- Note broad lines in core A1/ A2.