How Different Protostars Are in a Growing Binary System
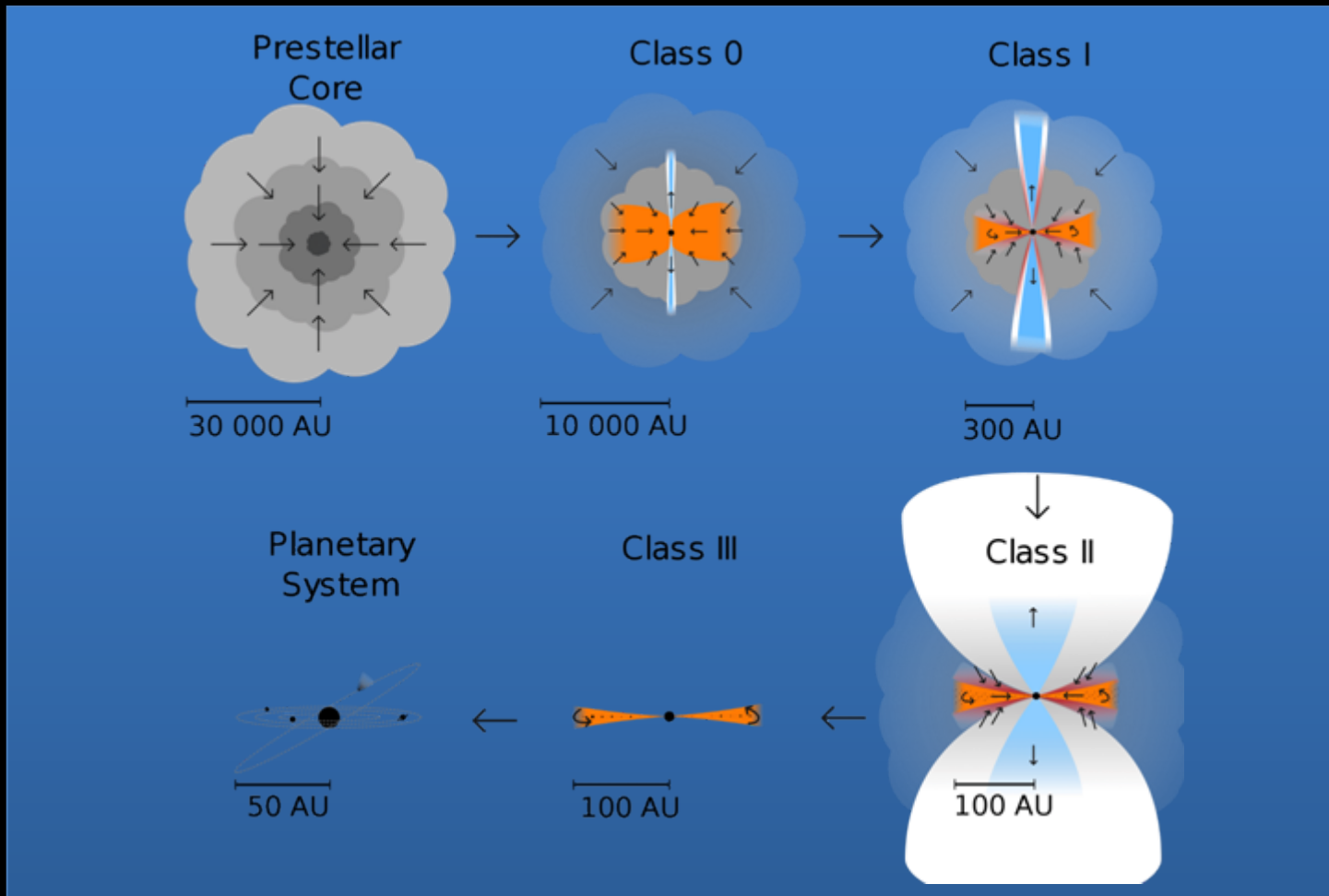
Final Report

Speaker: He-Xin Zhang (NCU)
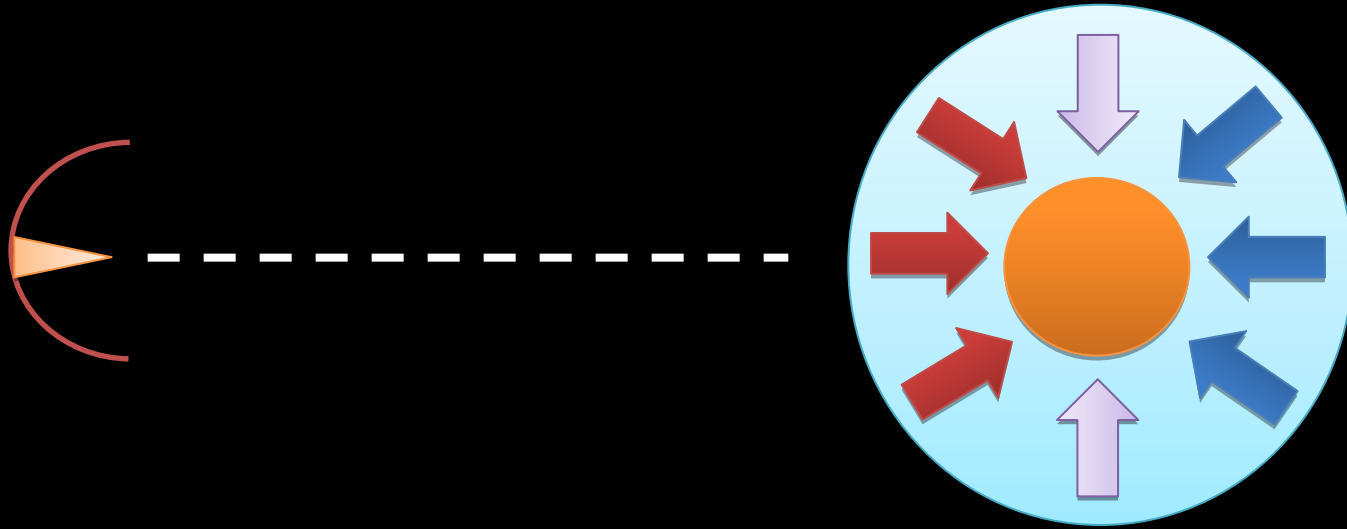
Advisor: Vivien Chen (NTHU)

Outline

- Star Evolution
- Two Layer model (Class 0)
- Inverse P-Cygni Profile
- Introduction: IRAS16293
- Spectrums
- Moment maps
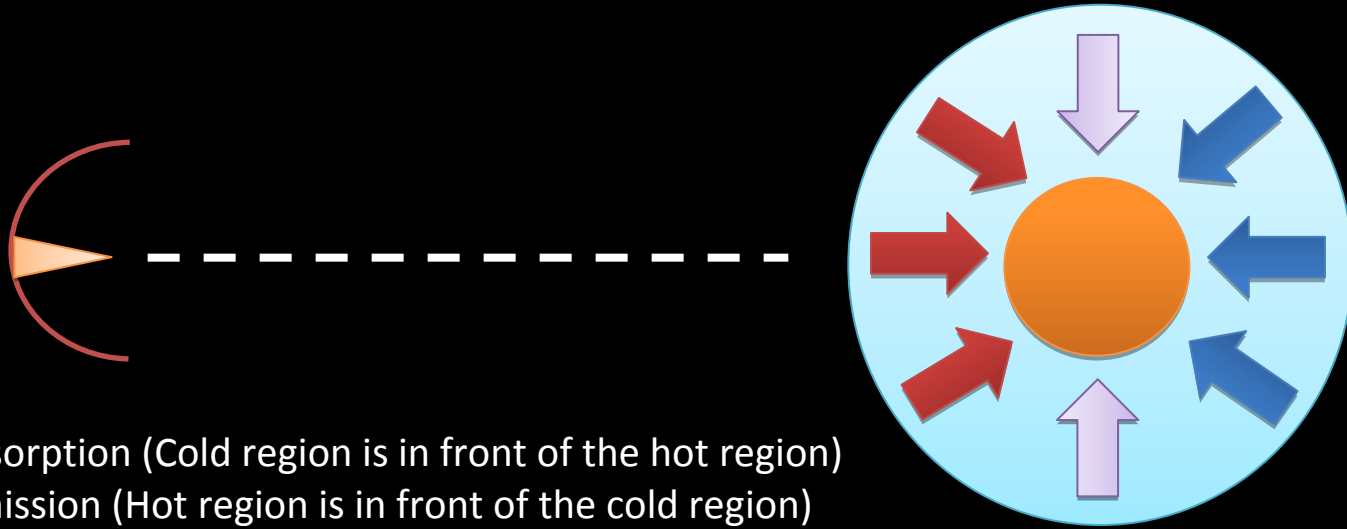- Conclusion

Protostar Evolution


Persson (2013)

Two Layer Model

Big Molecular cloud collapses because gravity is larger than thermal pressure
 → Potential energy turns into the kinetic energy as the radius decreases
 → Temperature of inner region is higher than the outer region

Dusts and grains move away us → Red shift
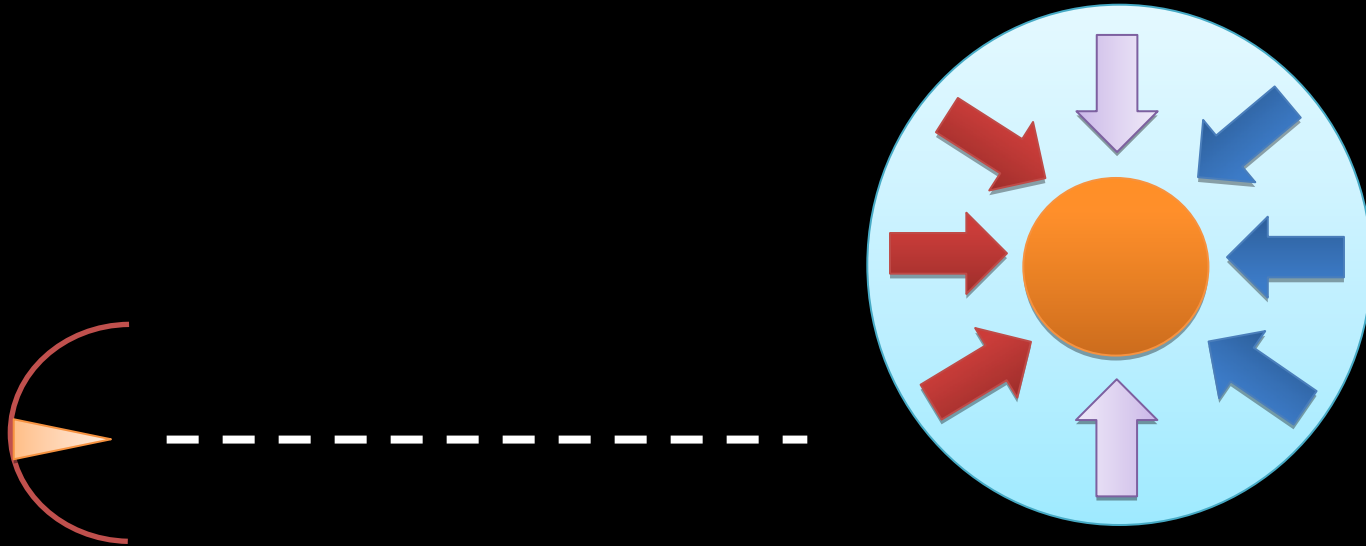   move close us → Blue shift
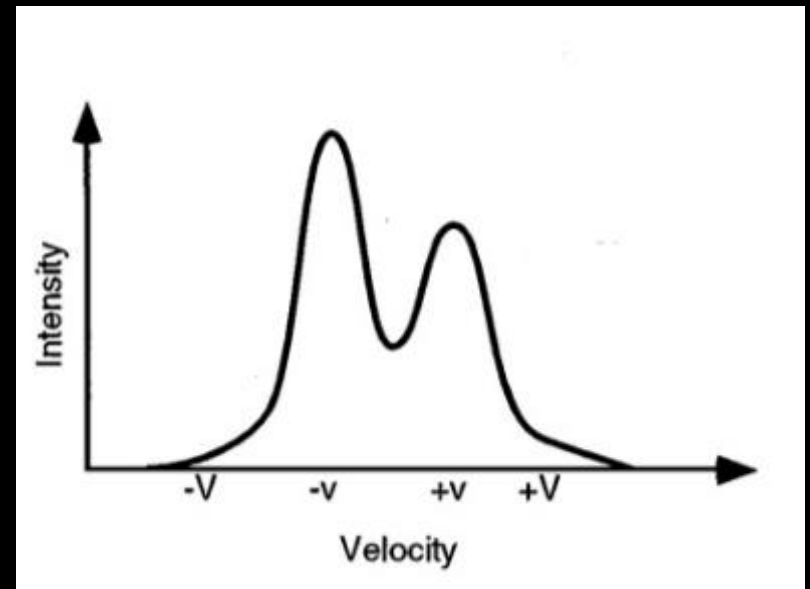
Two Layer Model

Red shift: Absorption (Cold region is in front of the hot region)
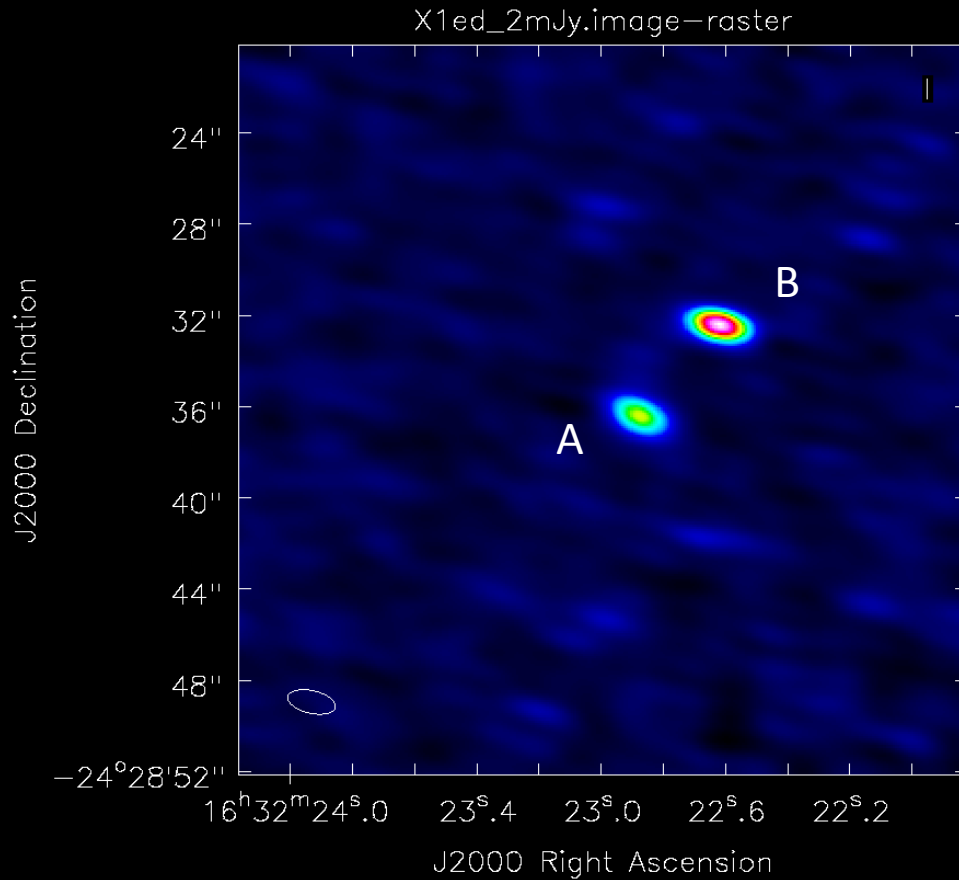Blue shift: Emission (Hot region is in front of the cold region)
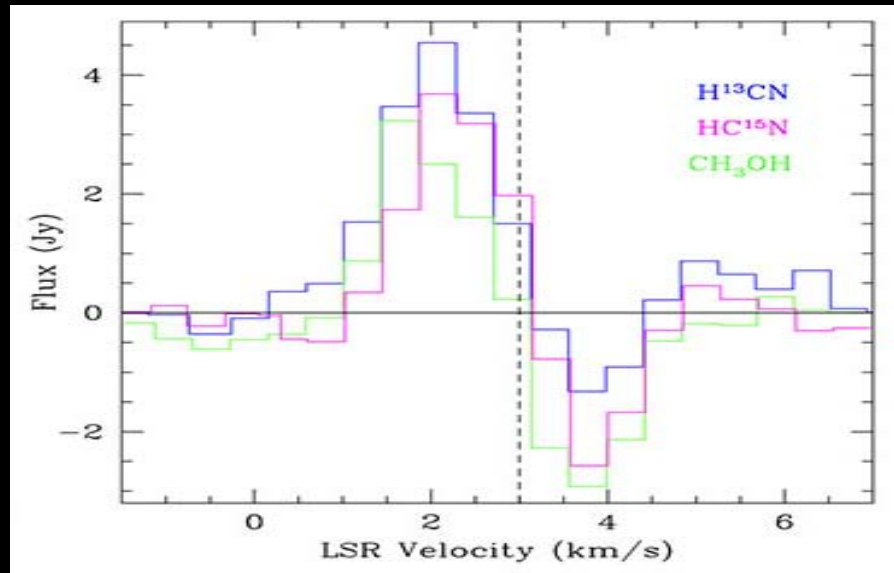
Two Layer Model

Almost all in region of the same temperature
Continuum is not too powerful

IRAS16293

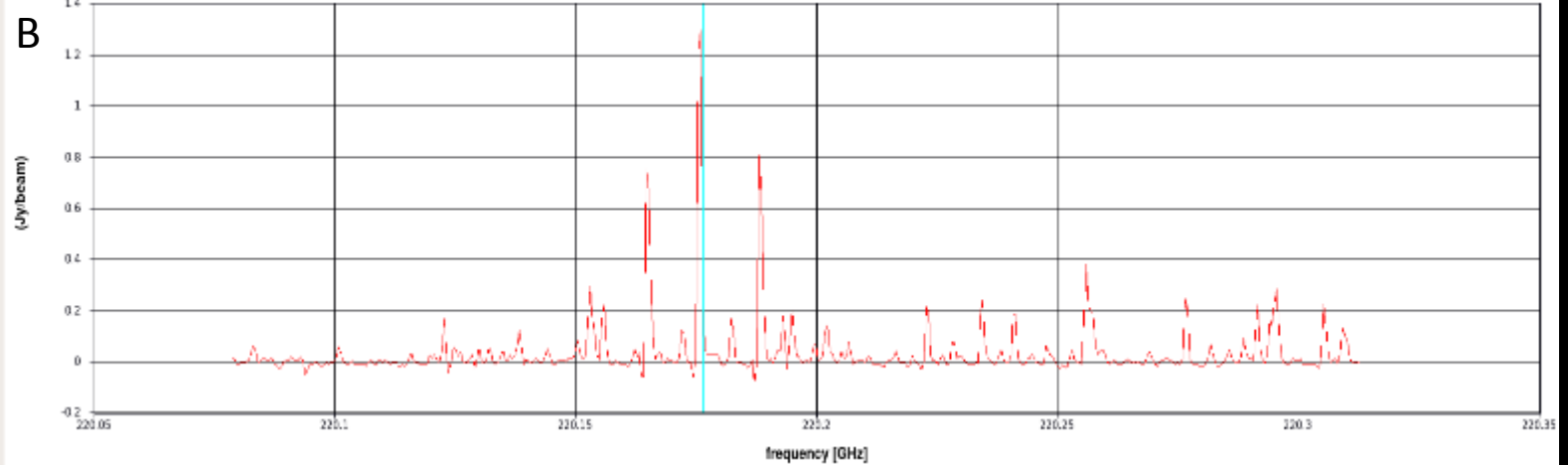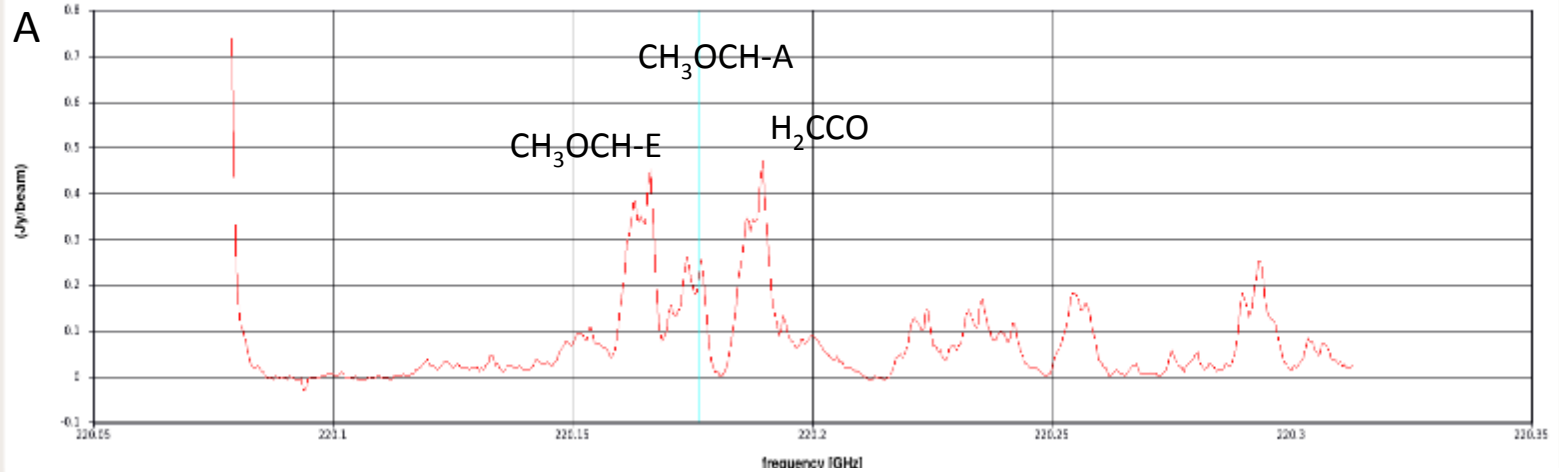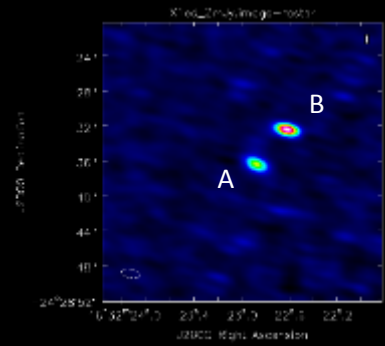Observed on August 16~18, 2011 in Band 6

It is at a distance of ~120 pc
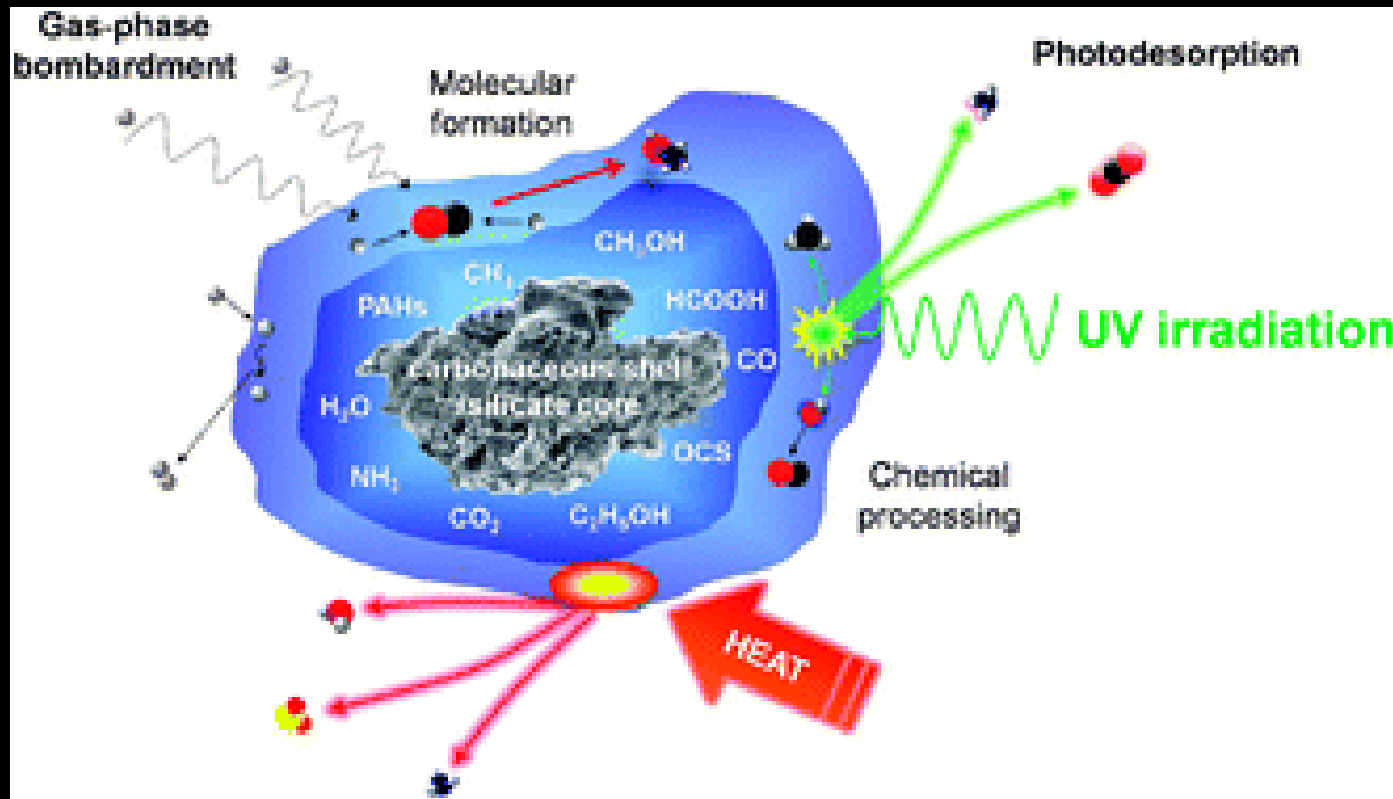
Sources A and B are separated by 600AU

Embedded in an envelope of size ~ 3000AU

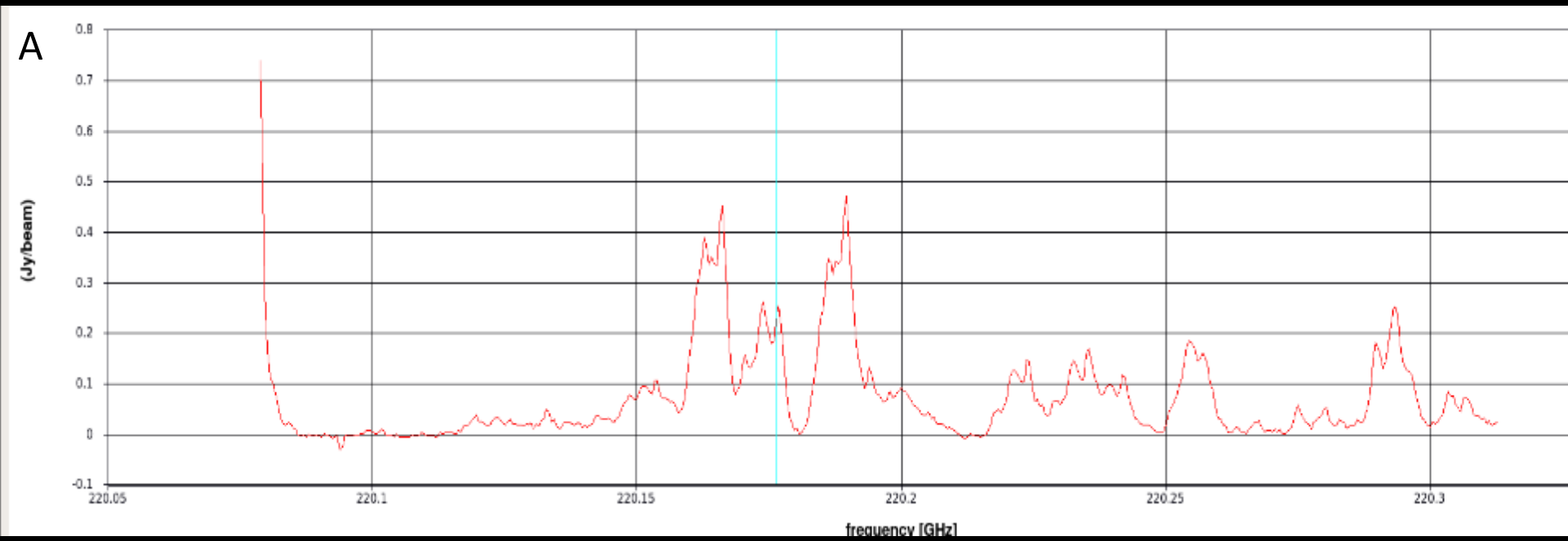Rich chemistry with hot-corino properties at scales of ~ 100AU
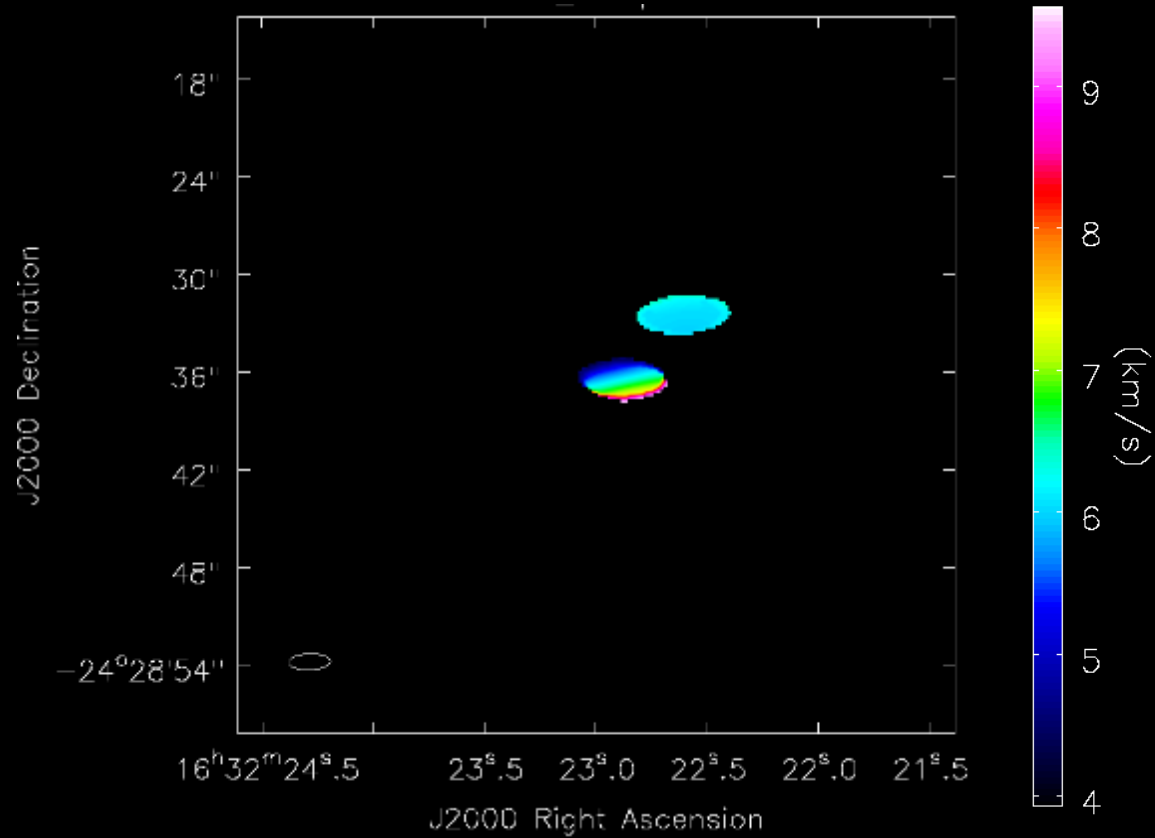
Spectrum

Production of high chain molecules

Daren (2010)

Spectrum of Source A

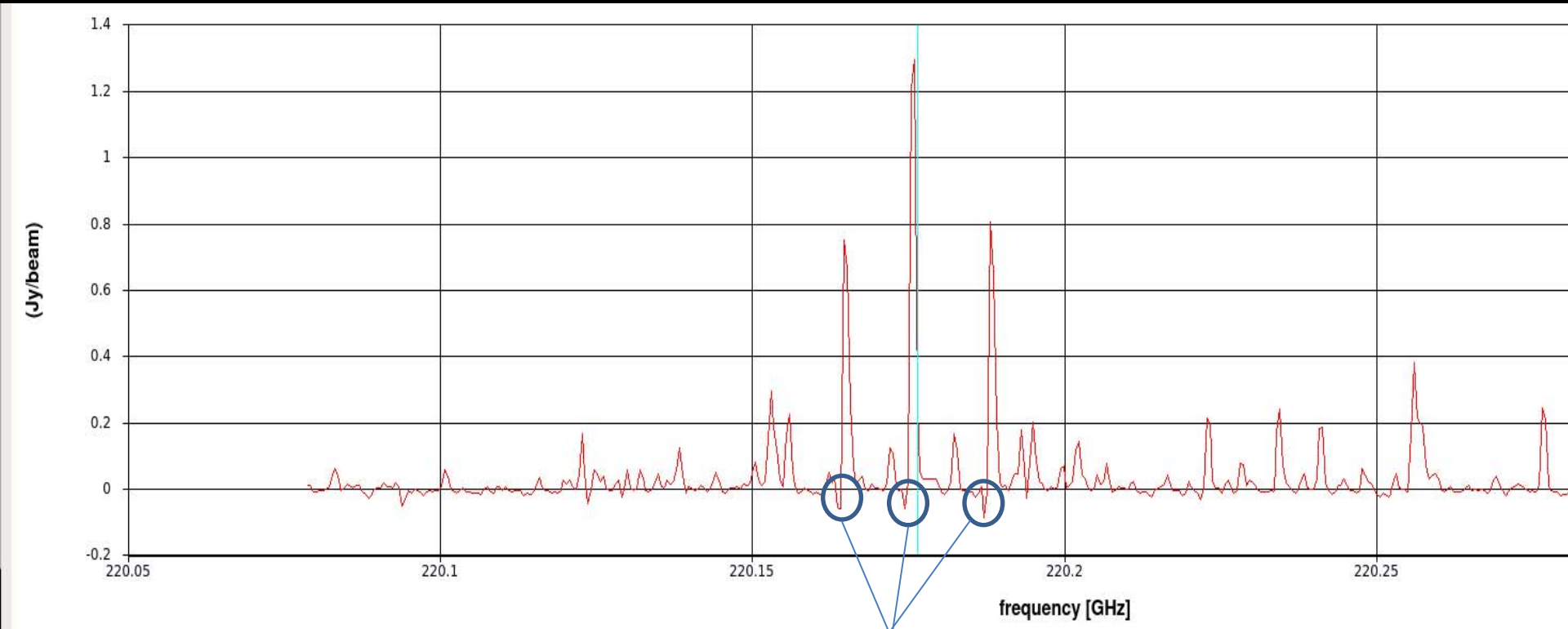# Moment1 Map

Velocity variation is ~ 5.5 km s^{-1} (Source A)

Spectrum of Source B

Absorption spectrum at red shift

Conclusion

Source B presents the inverse P-Cygni profile at spectrum.
→It is at class 0

Source A is the edge on the plane, and its velocity gradient is too large
→It may be not at class 0.
Source B presents the collapsing gas
→Source A may be at class 1.
(Maybe A has a disk rotation to make a steep velocity variation?)

We should increase the antenna array's resolution and sensitivity to check the spectrum at the envelope.
→ It can increase the confidence of the two layer model.