

Molecular Line Analysis of Protostellar Core G45.47+0.05

<Team3>

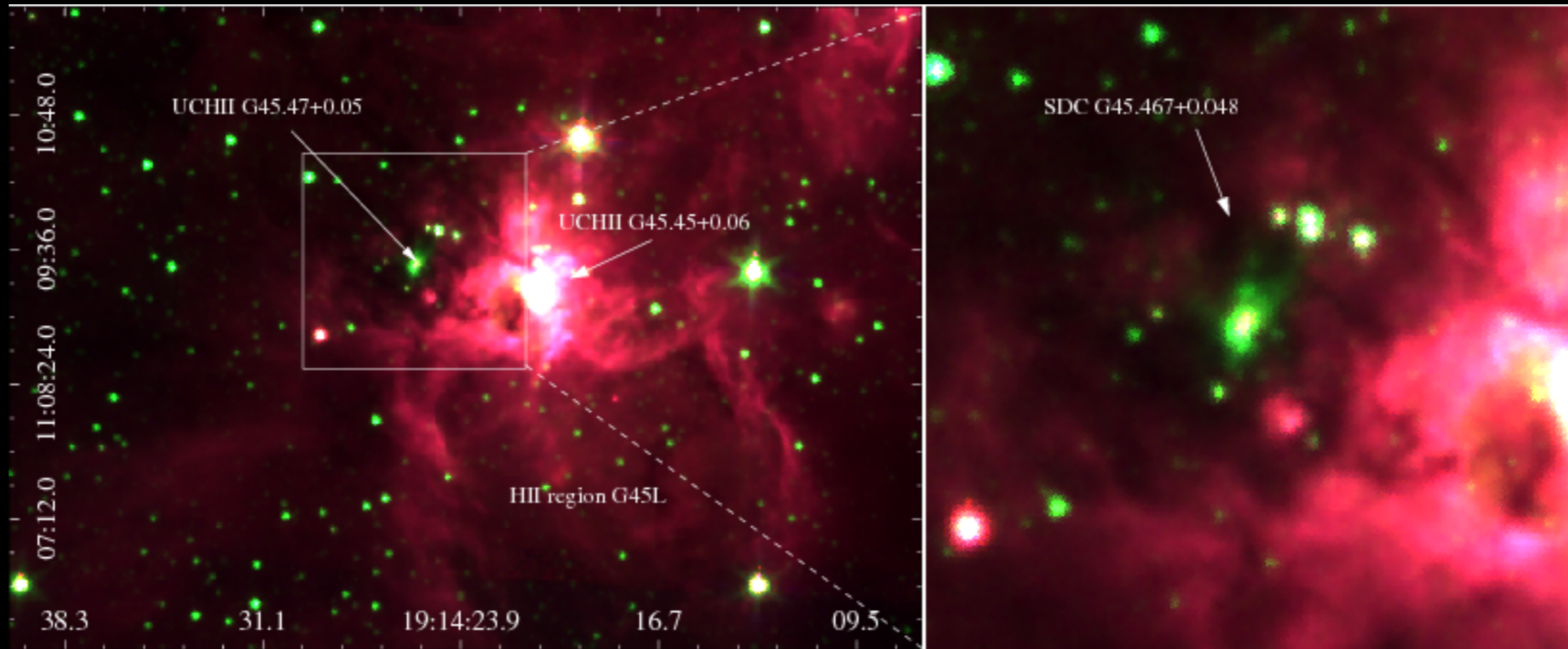
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G45.47+0.05



- Located in the **Ultra Compact H II Region**
- Distance ~ 8.3 kpc (Remijan+04, Ortega+18)
- $V_{lsr} \sim 64$ km/s
- Mass $\sim 300 M_{sun}$ (calculated by Continuum)

$$M = 0.12 M_{\odot} \left(e^{1.439(\lambda/\text{mm})^{-1} (T/10\text{K})^{-1}} - 1 \right) \cdot \left(\frac{\kappa_{\nu}}{0.01 \text{ cm}^2 \text{ g}^{-1}} \right)^{-1} \left(\frac{F_{\nu}}{\text{Jy}} \right) \left(\frac{d}{100 \text{ pc}} \right)^2 \left(\frac{\lambda}{\text{mm}} \right)^3$$

Kauffmann 2007

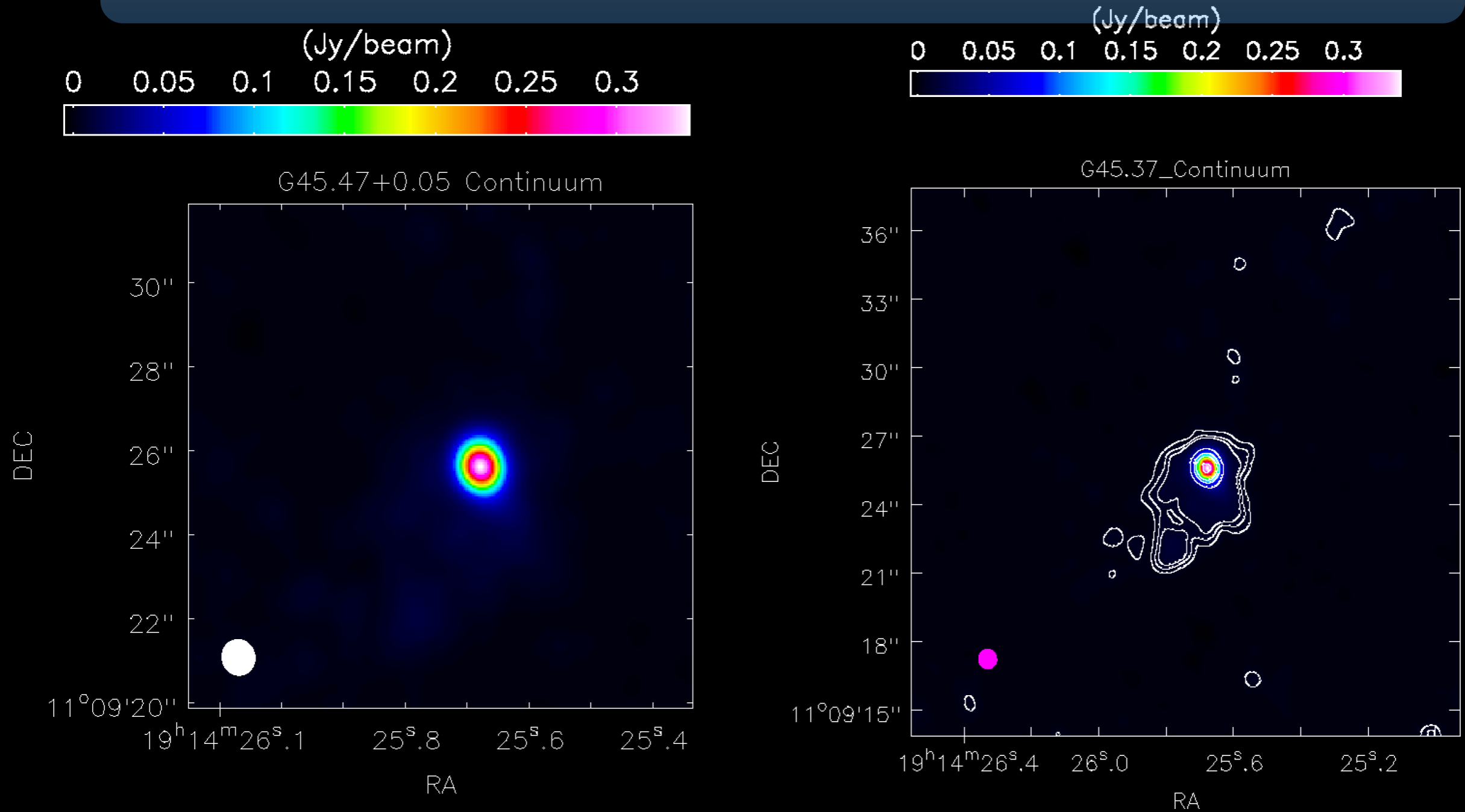
2019.08.02

Observation



- ALMA Cycle 3 (Apr. 24. 2016) with Band 6 (211 ~ 275 GHz)
- 12-m Antenna : 41
- Observed frequencies : Continuum (233GHz),
- Molecular lines : $^{12}\text{CO}(2-1)$, C^{18}O , CH_3OH , H_2CO , SO_2 , SiO , H_2S
- Imaging Analysis, Moments map analysis

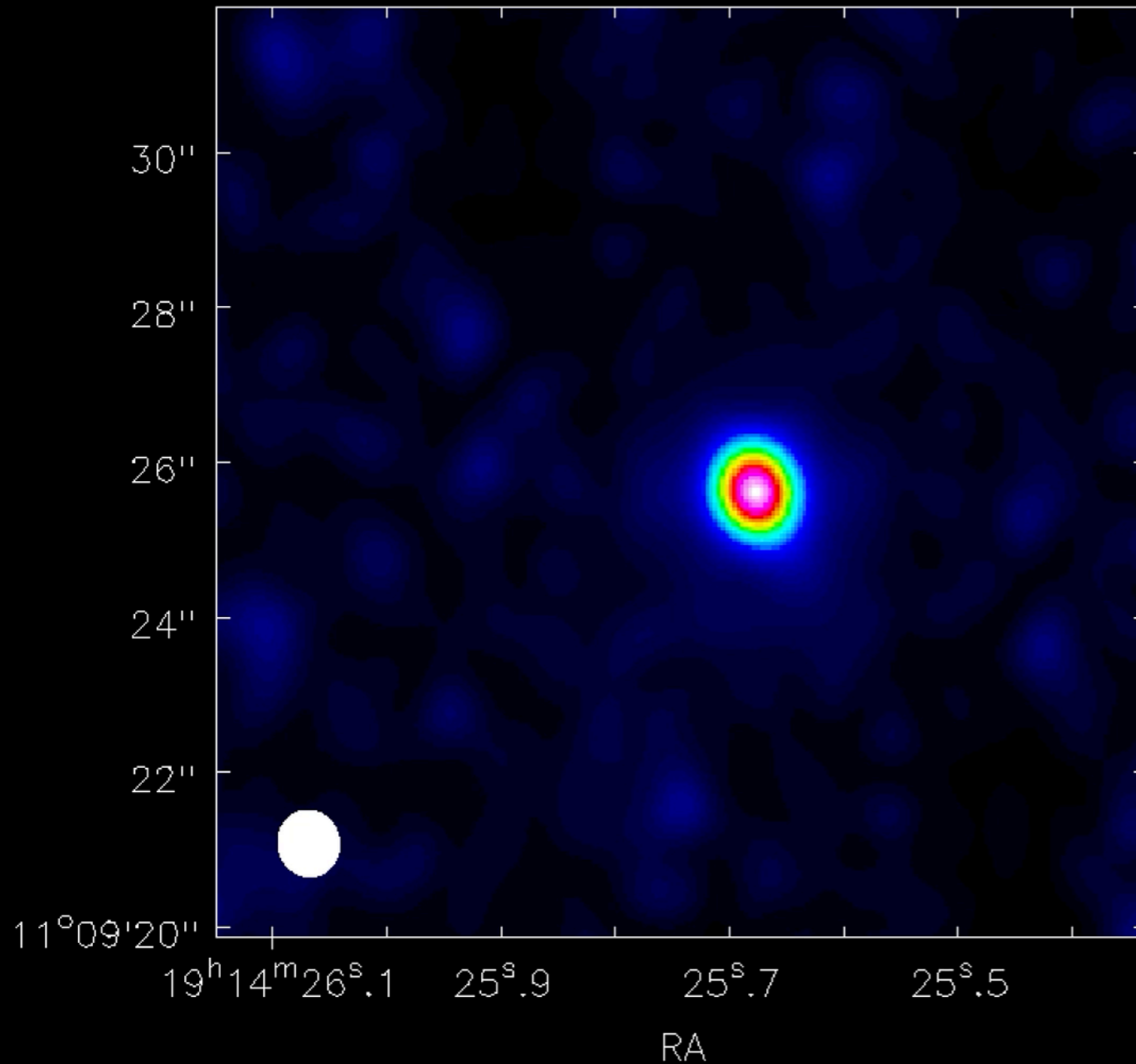
Continuum (233 GHz)



● tclean method used (weighting : briggs, # iteration : 10000)

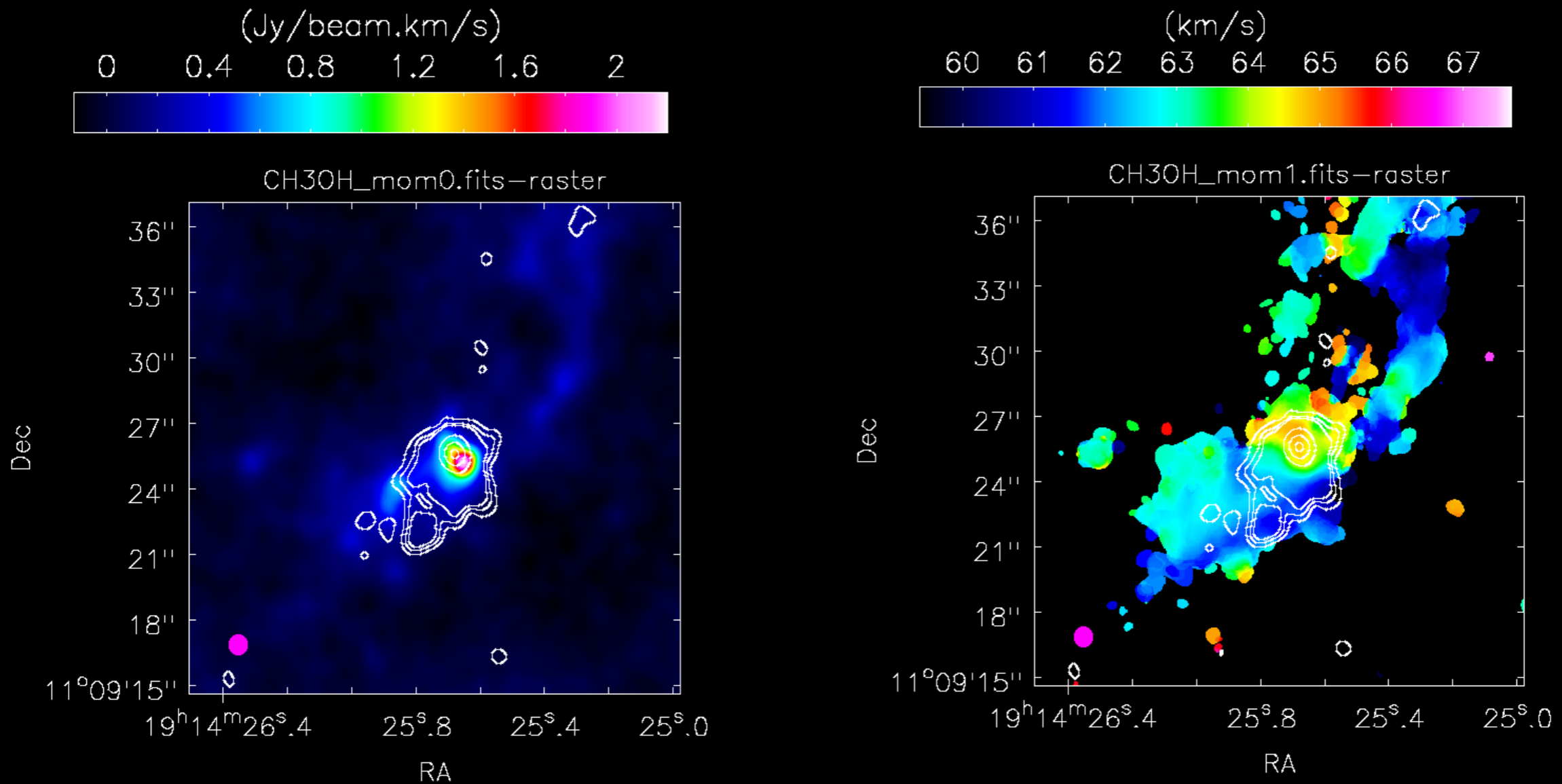
Continuum Weighting Comparison

G45.47+0.05_Dirty



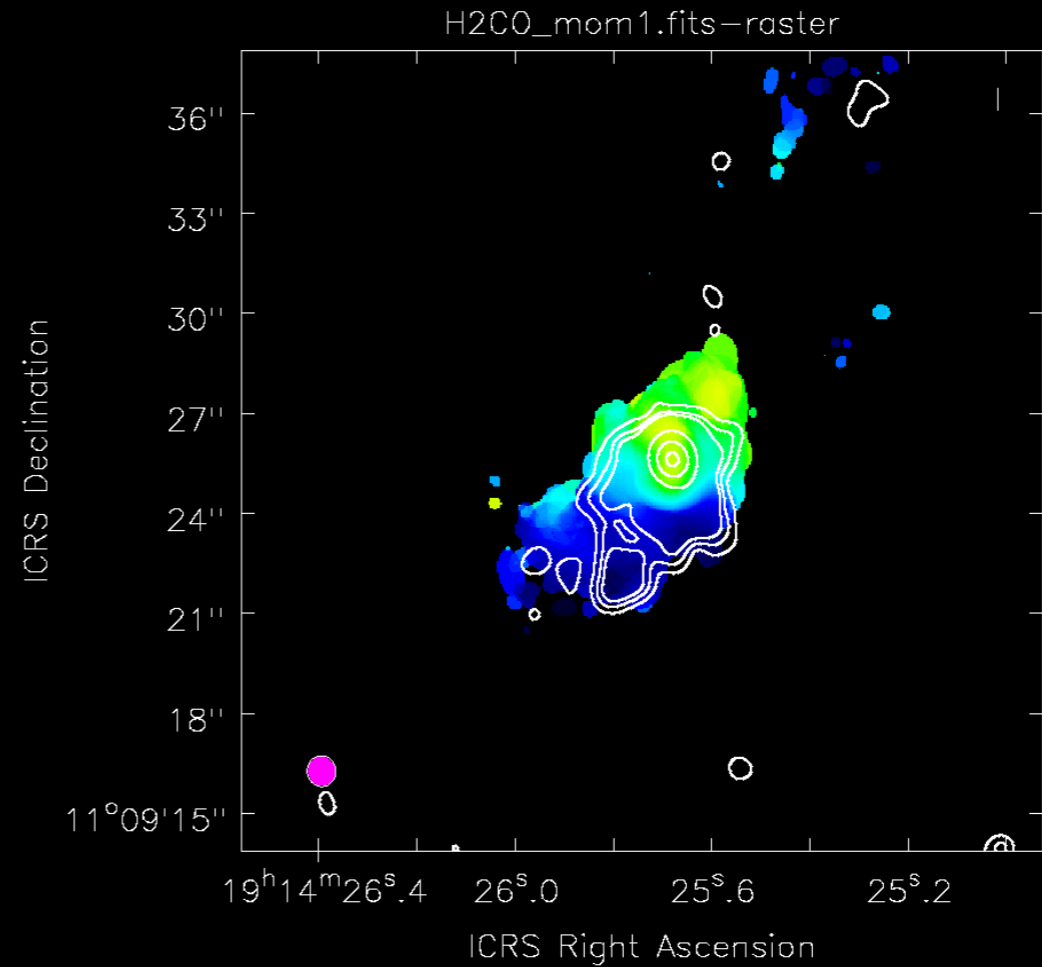
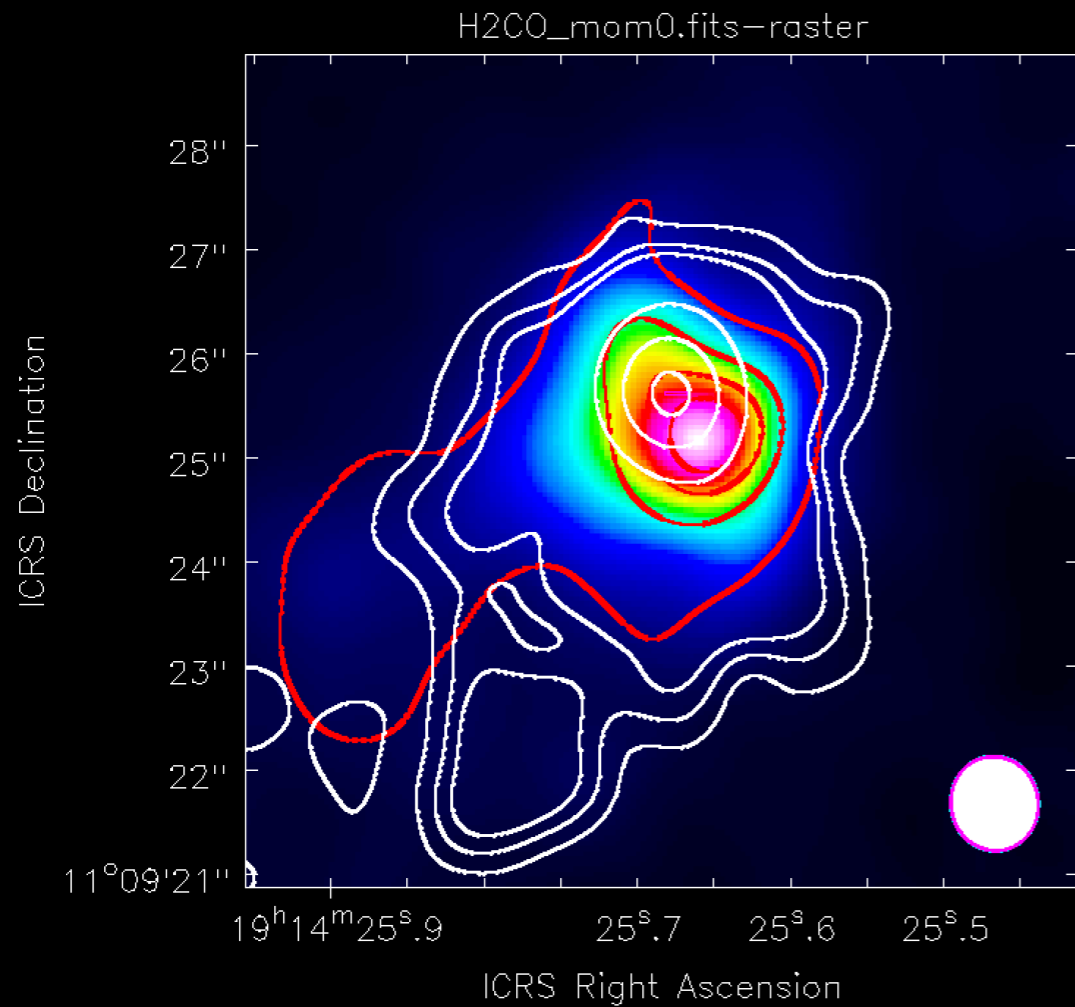
- RMS
Uniform > Briggs > Natural
- Sensitivity
Natural > Briggs > Uniform
- Synthesized Beam size
Uniform > Briggs > Natural

Molecular Line : CH₃OH



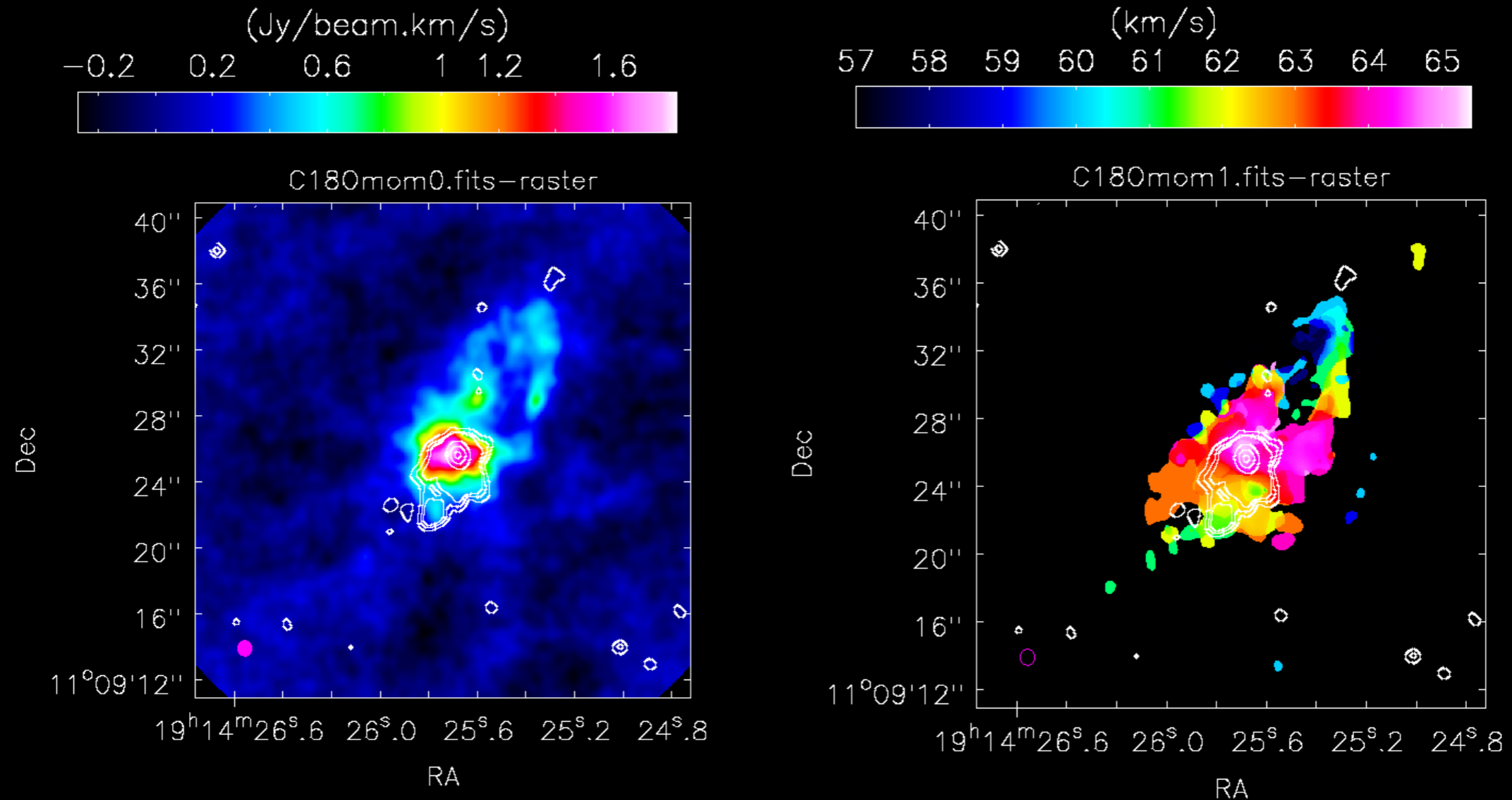
- CH₃OH traces infalling rotating envelope, outflows

Molecular Line : H₂CO



- H₂CO infalling, rotating envelope, outflow (CH₃OH)
- Peak matches with CH₃OH peak

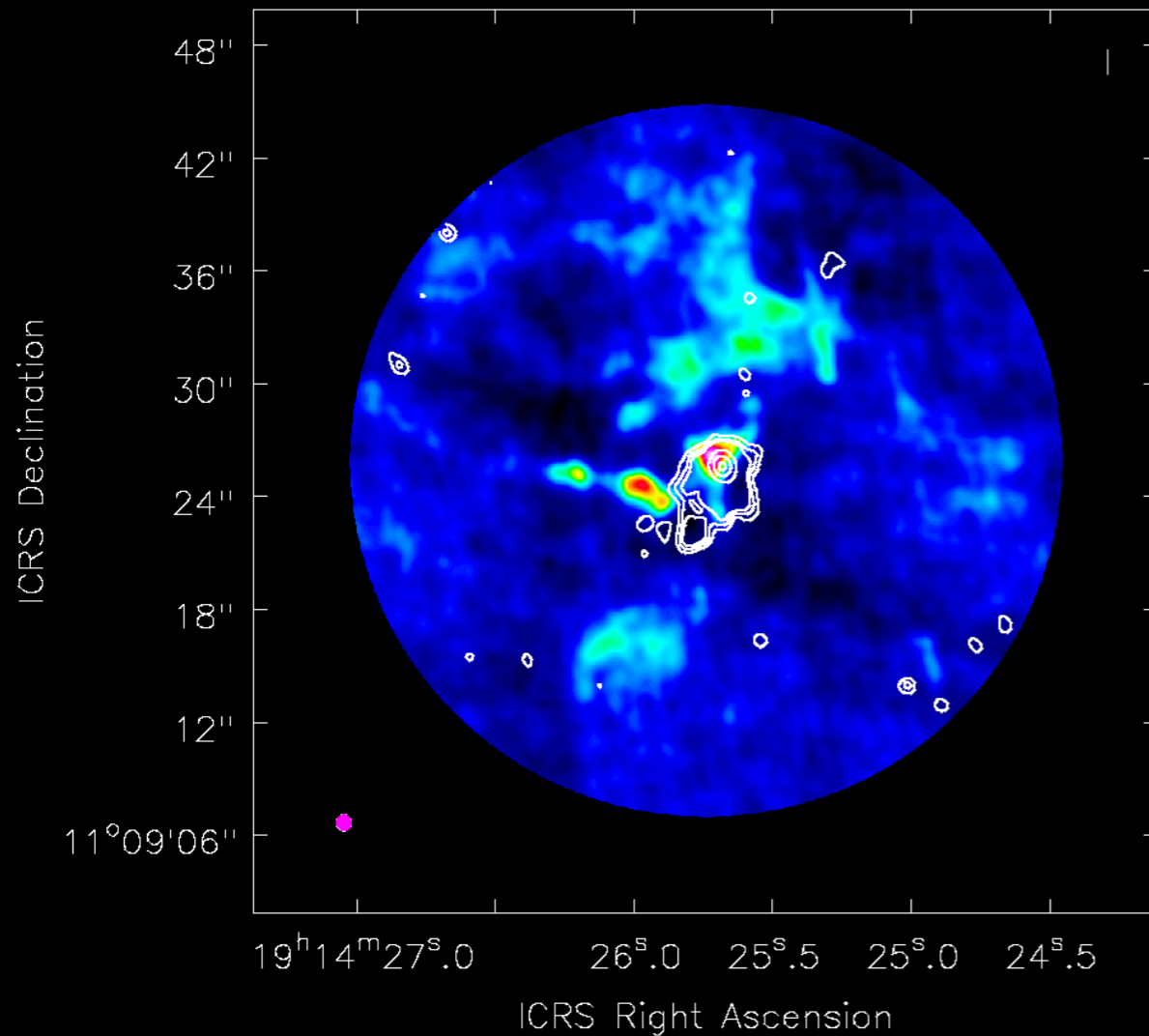
Molecular Line : C¹⁸O



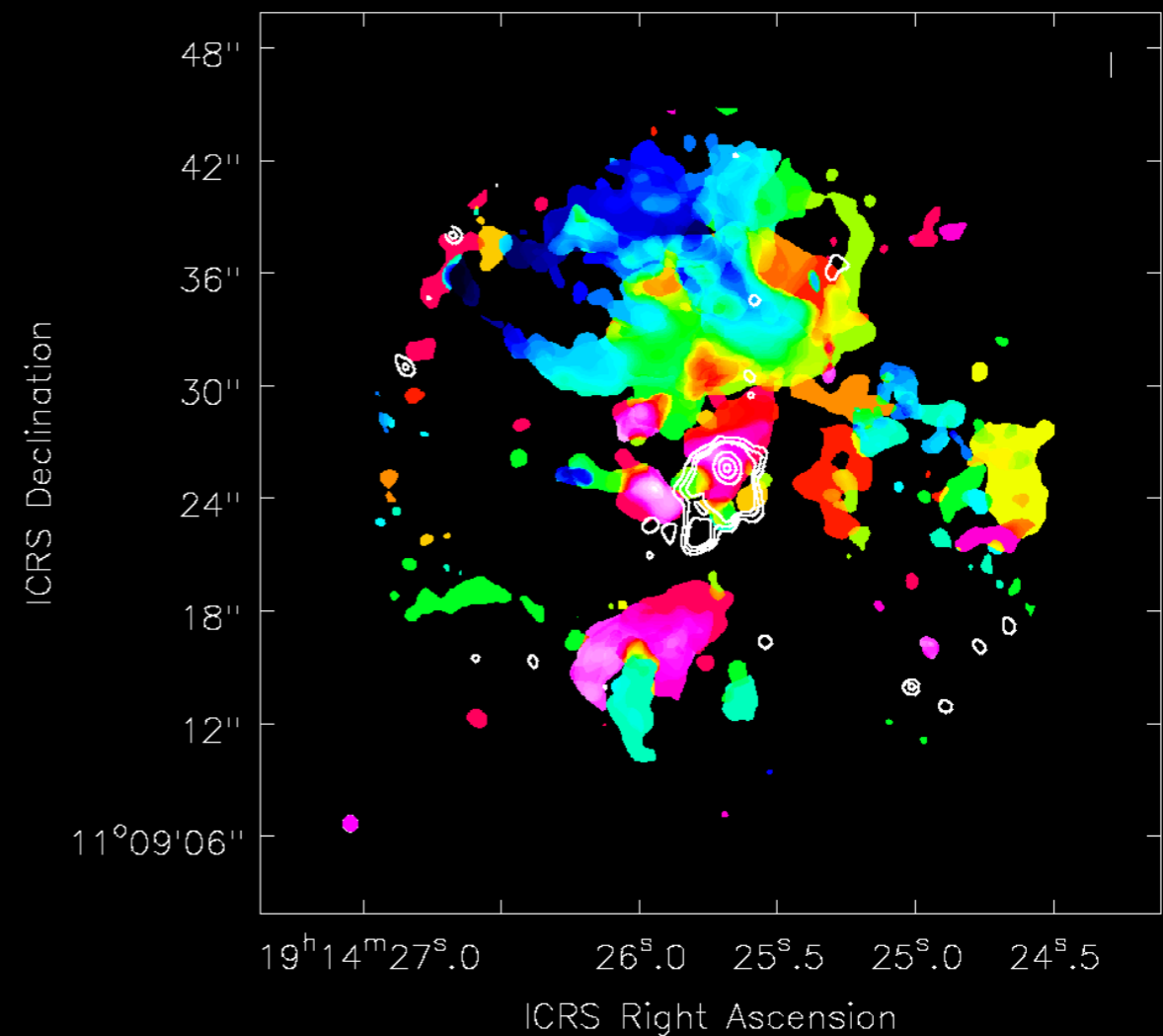
- Optically thin than ^{12}CO
- Traces Envelope, Disk along with CH_3OH , H_2CO
- Showing the extended continuum emission.

Molecular Line : ^{12}CO

12CO.mom0-raster

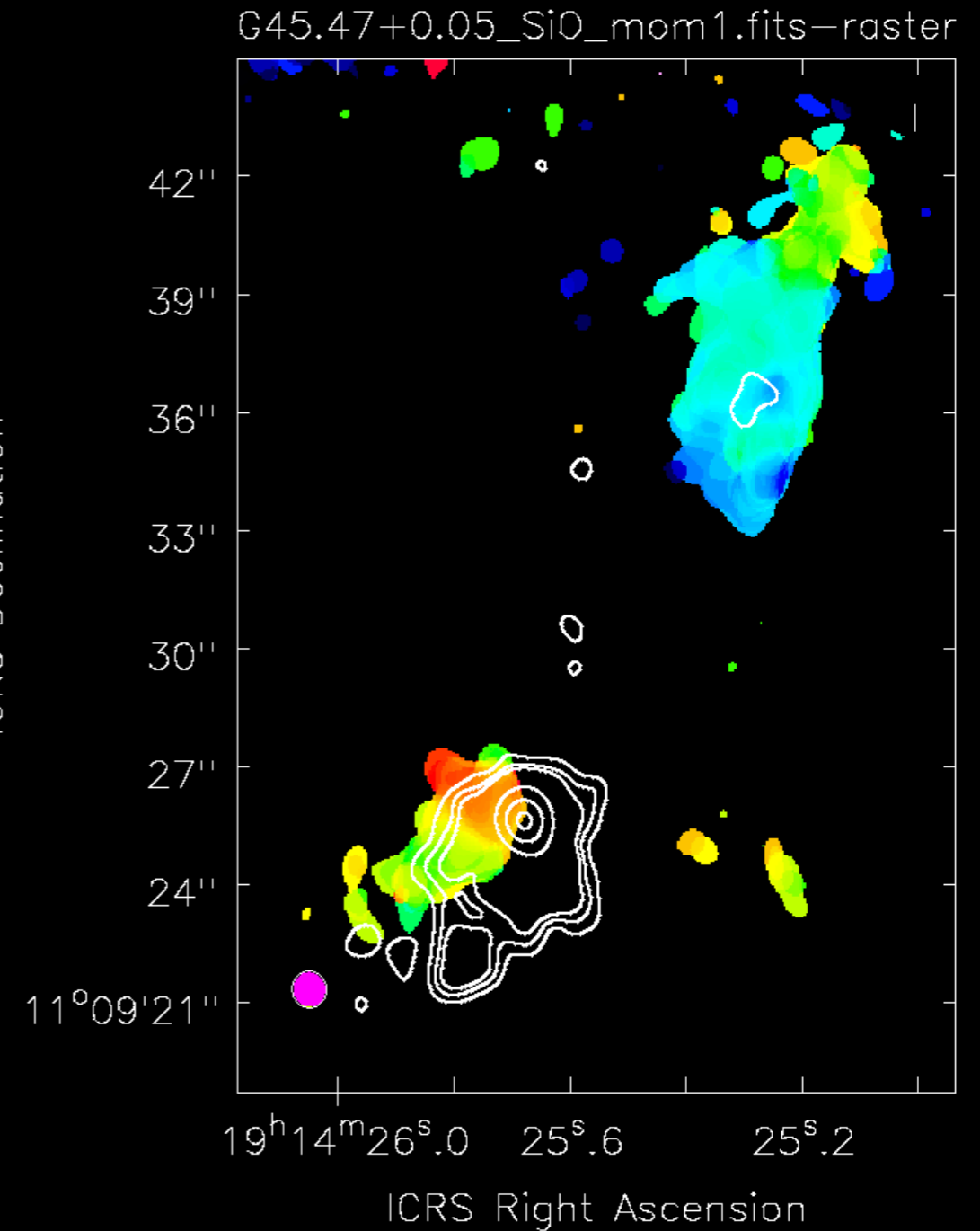
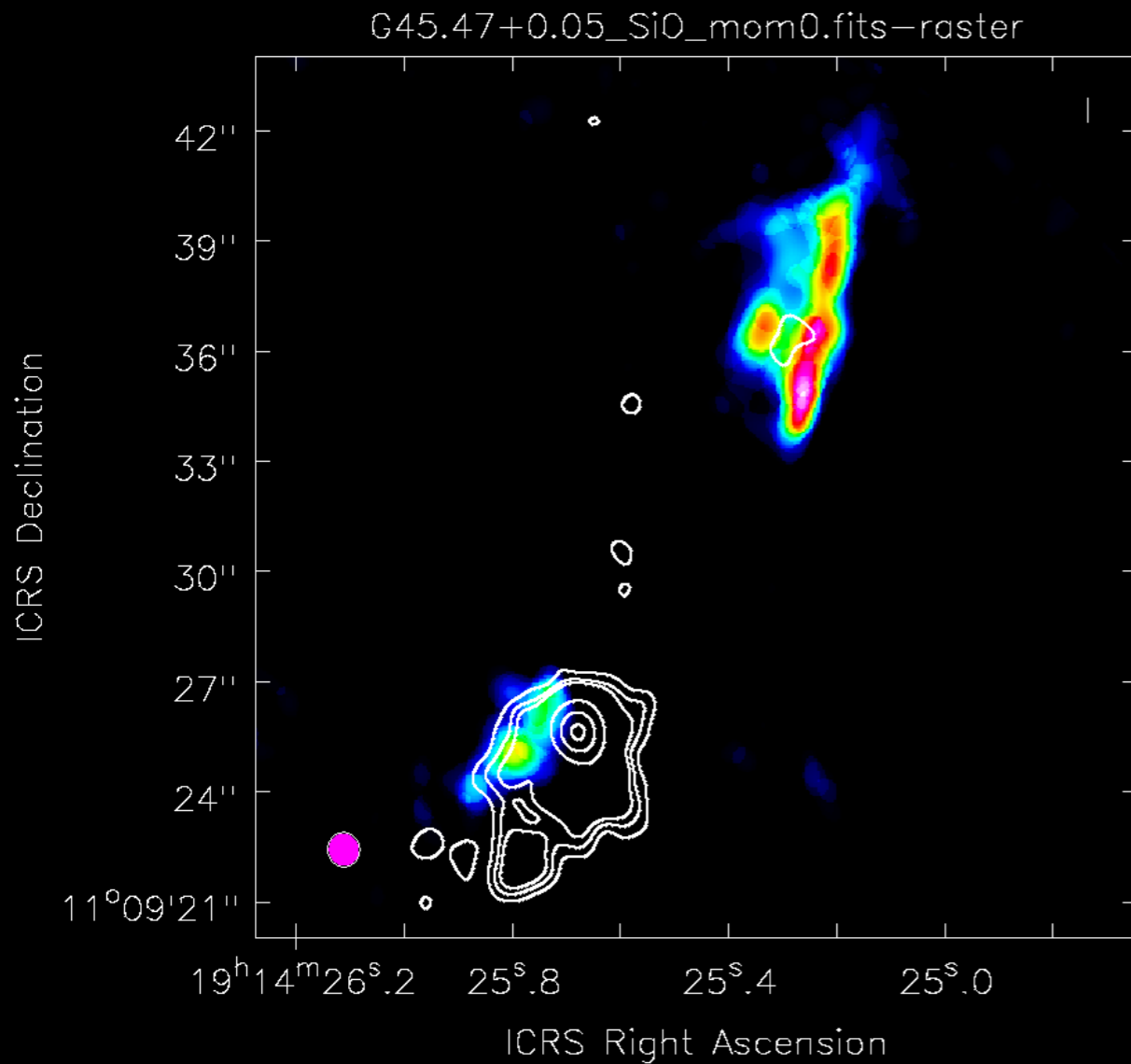


12CO.mom1-raster



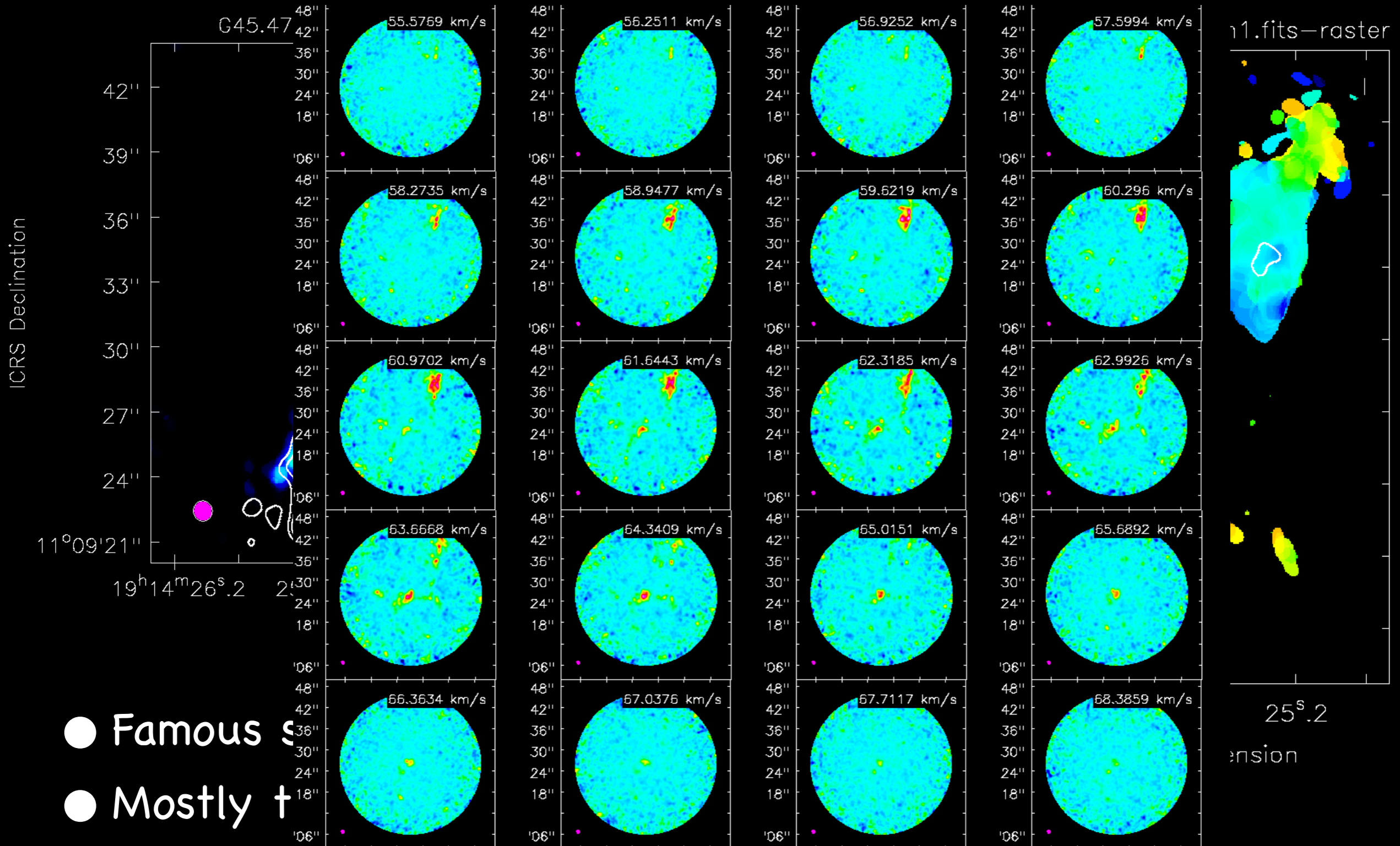
- ^{12}CO used as outflow tracers
- Continuum peak matches with ^{12}CO peak
- No distinctive outflow features.

Molecular Line : SiO

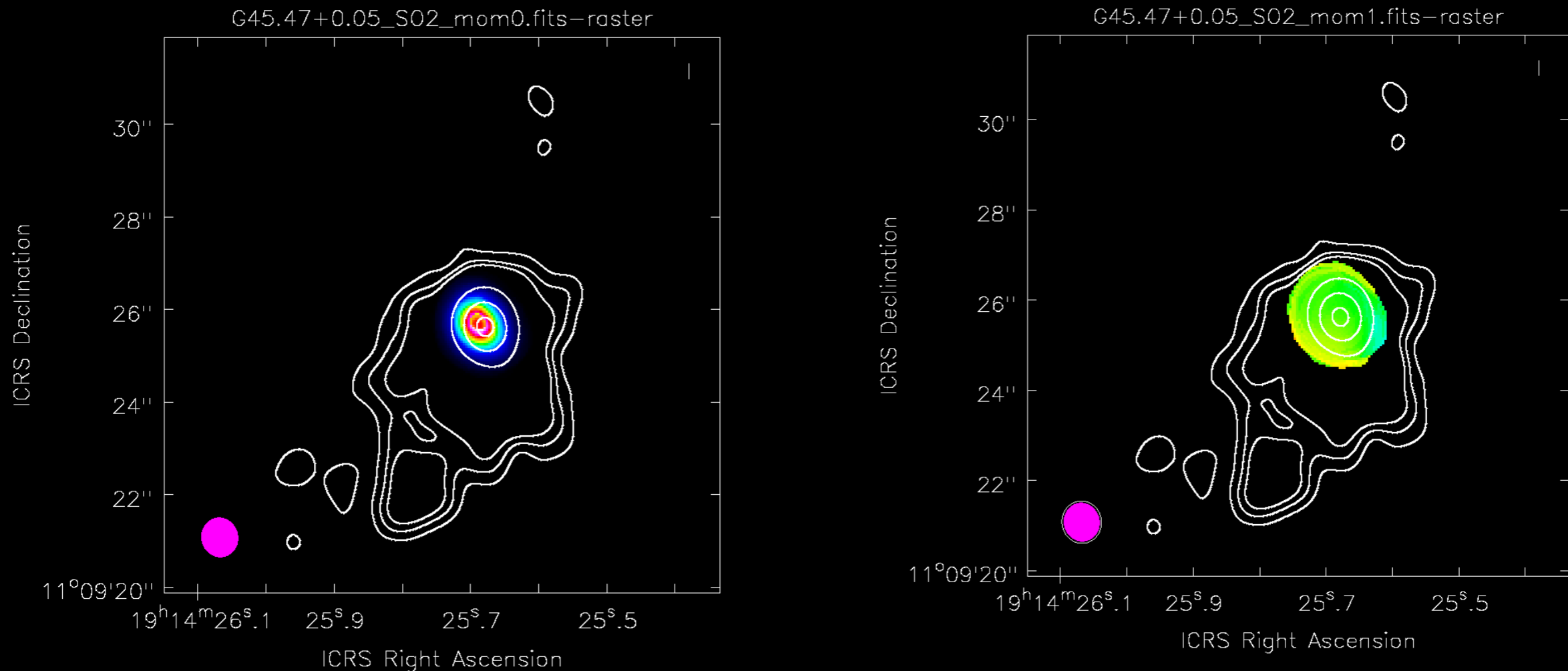


- Famous shock tracer
- Mostly traces jets, outflows

Molecular Line : SiO

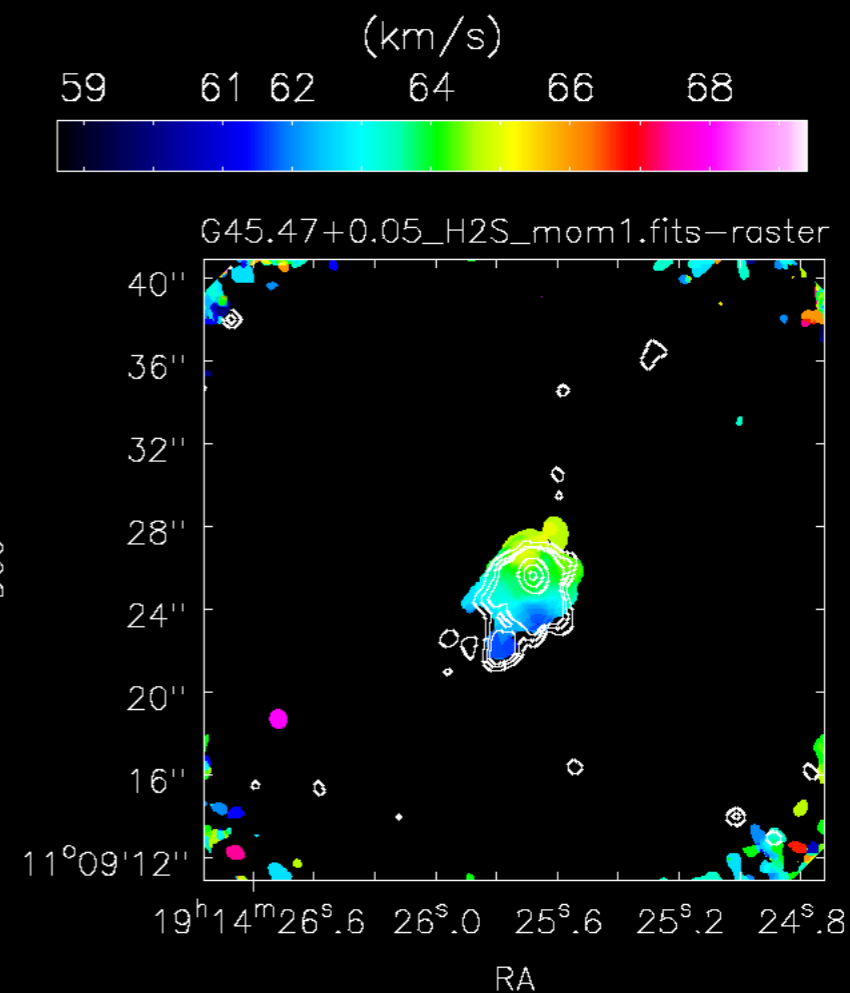
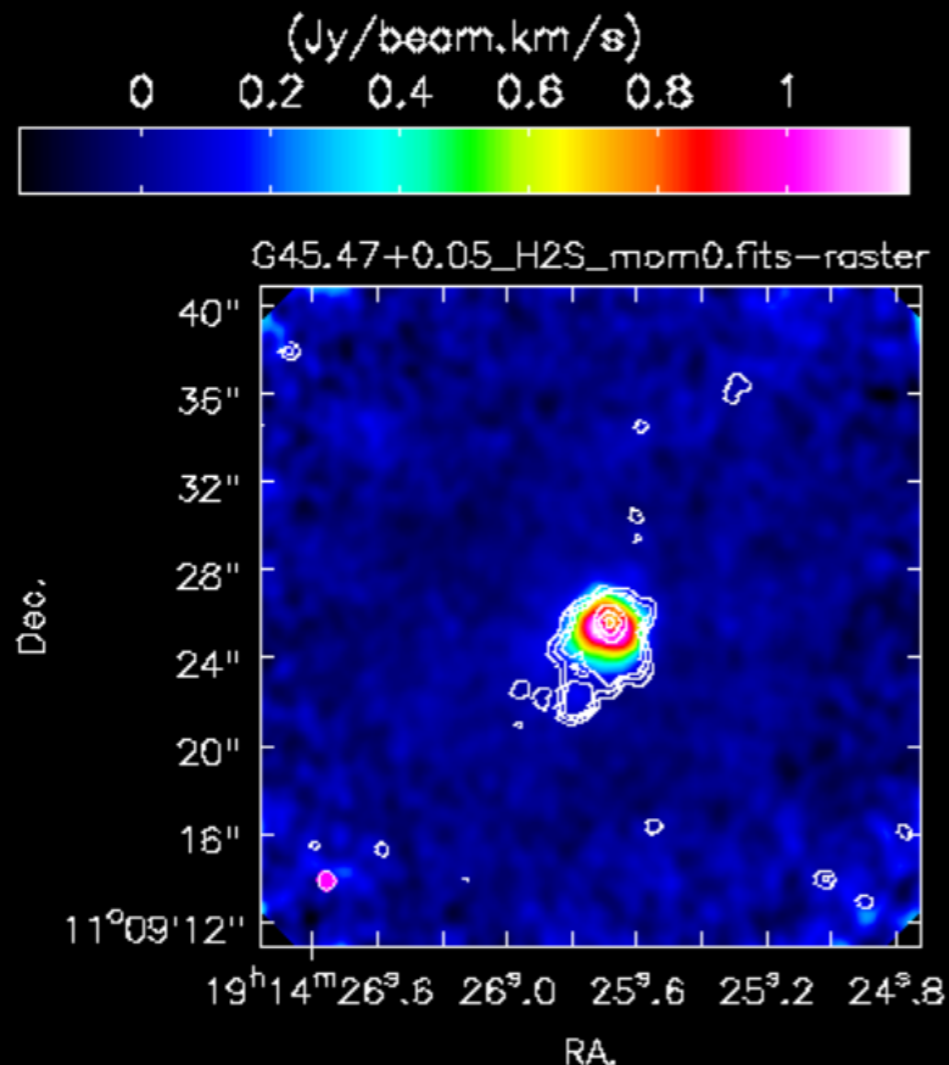


Molecular Line : SO₂



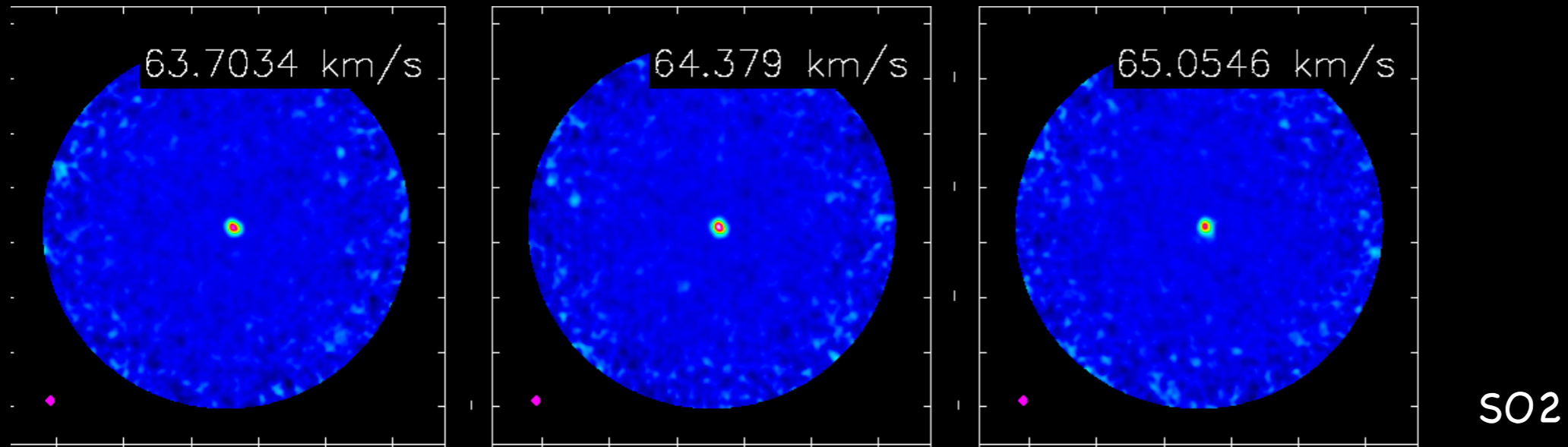
- SO₂ emissions are strongly peaked at the continuum peak
- Traces outer-part of the disk and very inner part envelope.
- SO₂ is seeing most inner part of the central source.

Molecular Line : H₂S

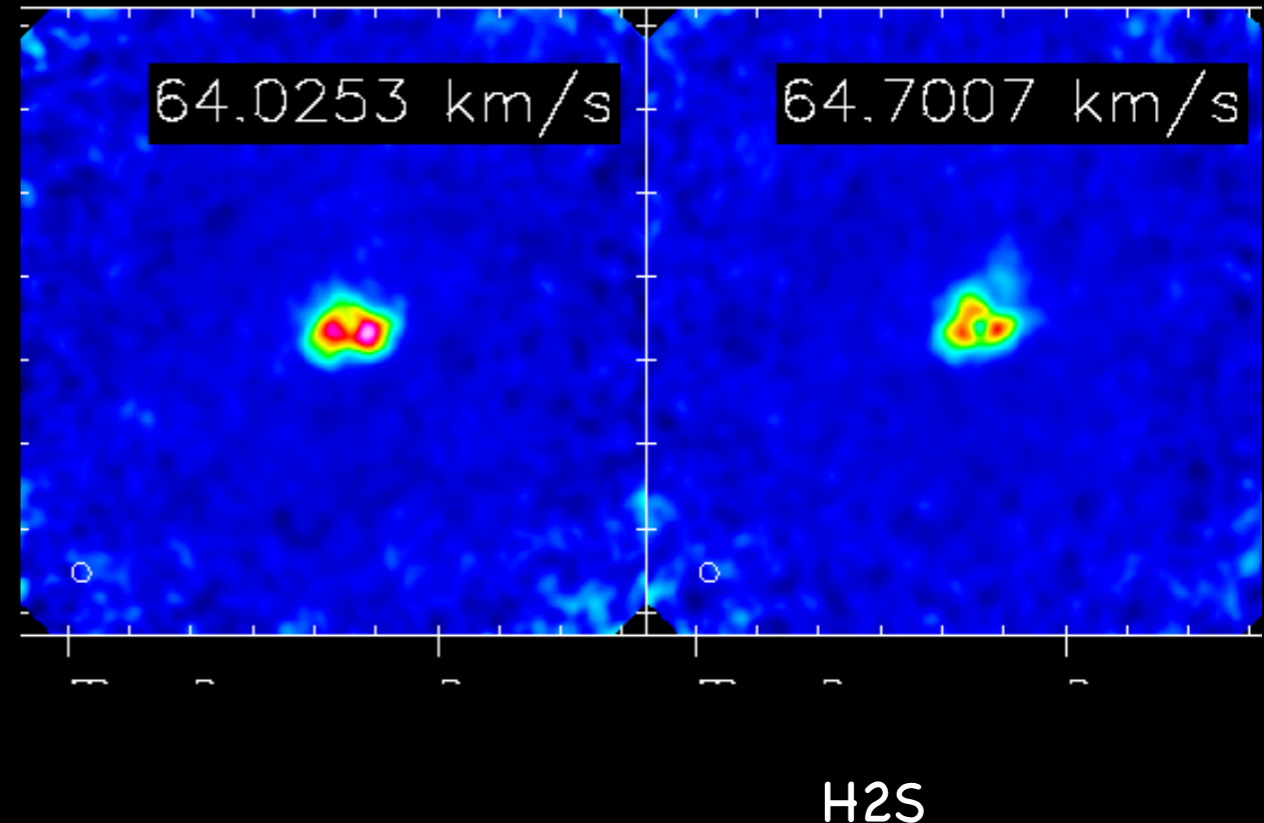


- Traces extended structure than SO₂
- Like SO₂, peaked at the continuum center.

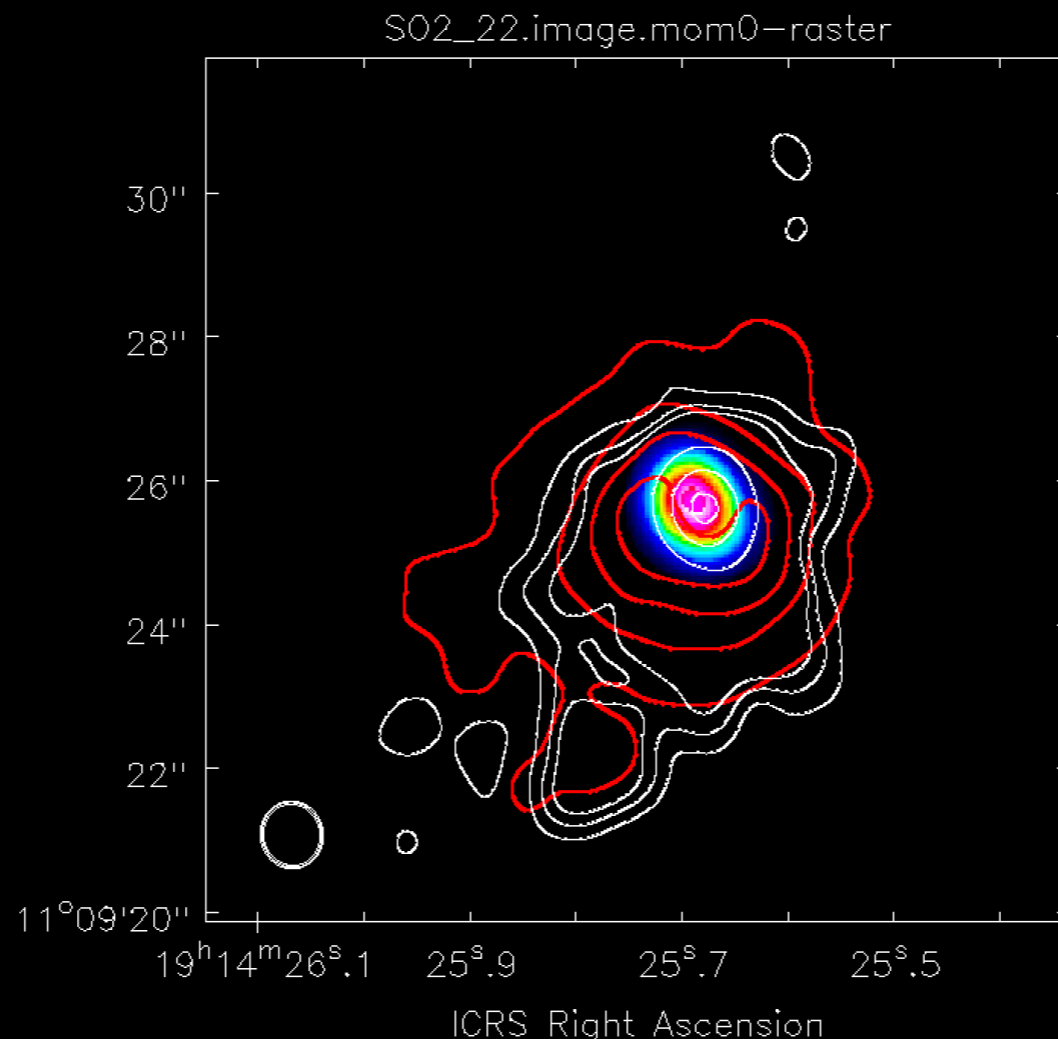
H₂S and SO₂ – Anticorrelation?



- $V_{lsr} = 64 \text{ km/s}$
- H₂S shows a hole at the continuum peak while SO₂ peak matches with the continuum peak
- Anti-correlation?

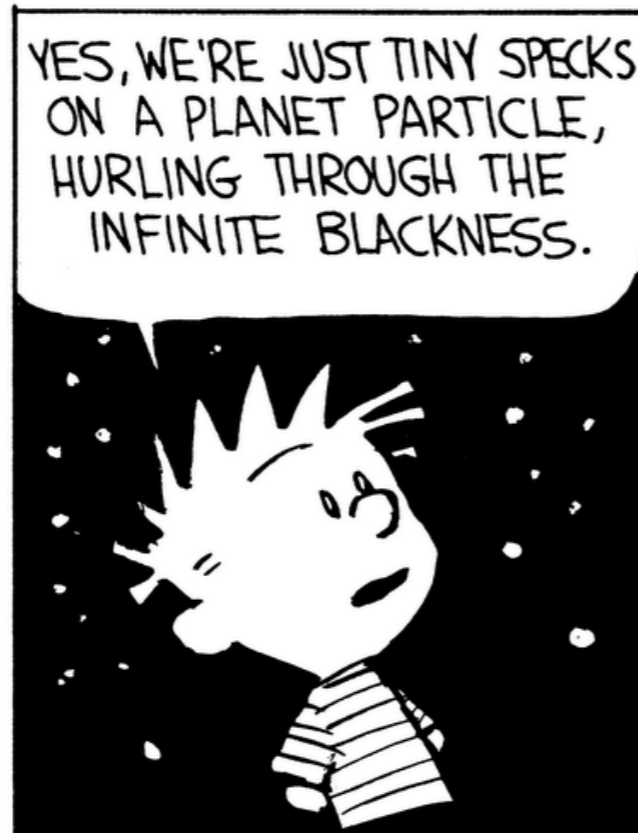


H₂S and SO₂ – Anticorrelation?



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- Anti-correlation?

Thank you!!



Please Feel Free to ask!!