

ALMA summer school

Hands-on 1 : NGC4321 and NGC1808

Thanks to Dr. Kijeong Yim

M100 (NGC 4321)

Barred spiral galaxy (SAB(s)bc), nearby galaxy in the Virgo cluster.

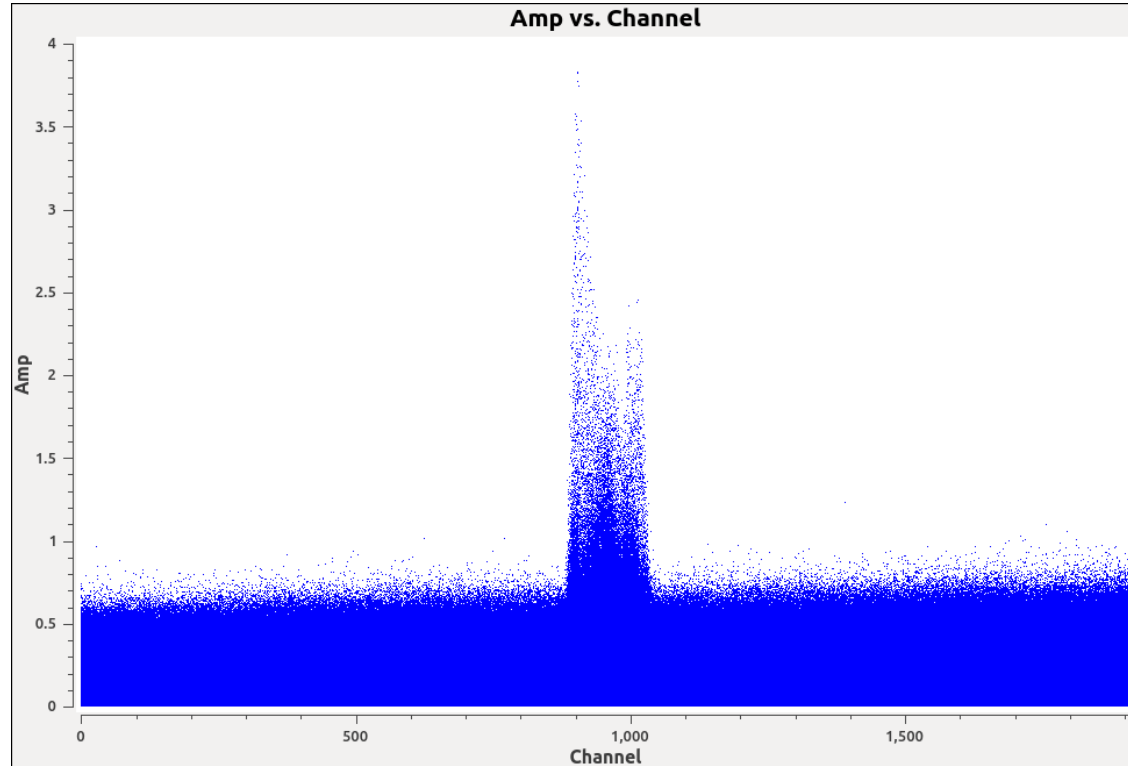
System velocity: 1571 km/s [Rand 1995]
Inclination: 30° (face on)
Diameter: 41.44kpc
Coordinate: R.A.(J2000) 12h 22m 54.89s
Dec.(J2000) $+15^\circ 49'20.70$
Distance: 25.9 Mpc

Comparing with other data

spitzer	24um	[IR]
HST	800nm	[NIR] from MAST
galex	153nm	[FUV]



ALMA Data



CO emission is tracer of the molecular gas
CO $J=1-0$ line emission (band 3)

Parameter setting

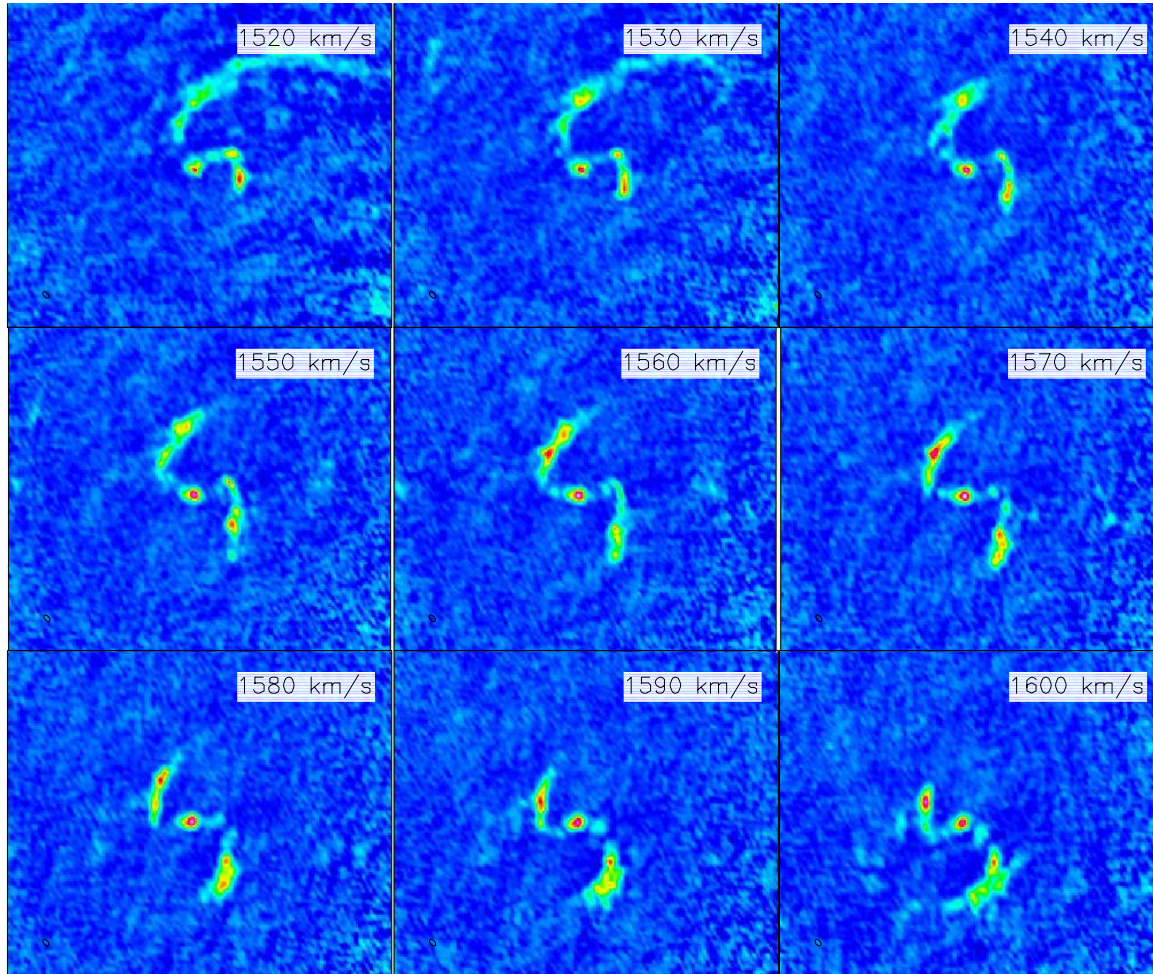
Used Clean with

```
nchan = 60
start = '1300km/s',
width = '10km/s',
restfreq = '115.27120GHz'
threshold = '3.0mJy'
niter=2000,
imsize = [450,450],
cell = '0.25arcsec',
weighting = 'briggs',
robust = 0.5
```

```
#number of channel
#system velocity is ~1570km/s
#1300~1900km/s
#band 3, 12CO J=1-0
# 2sigma

#resolution
```

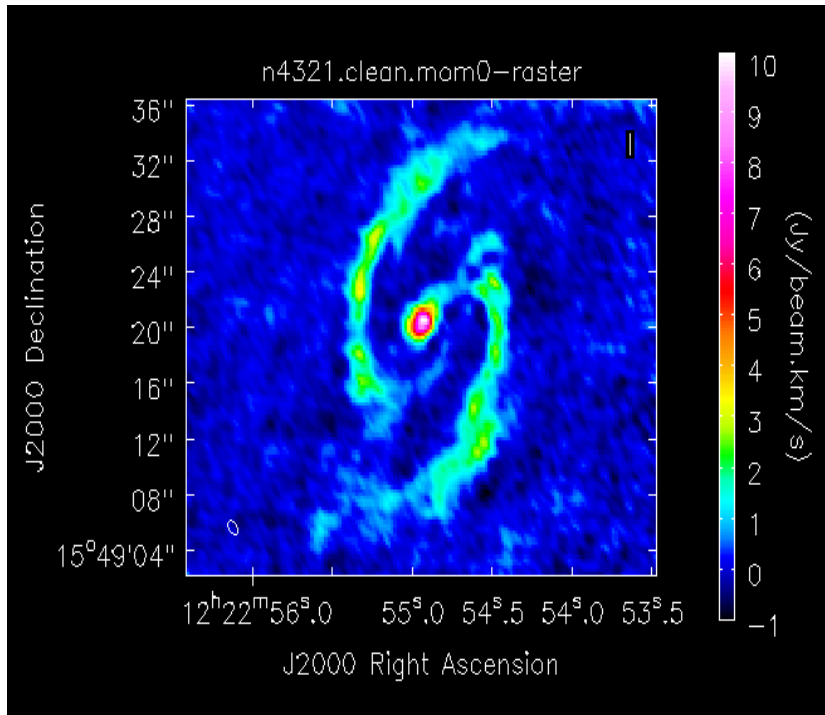
Velocity Channel Map of CO emission



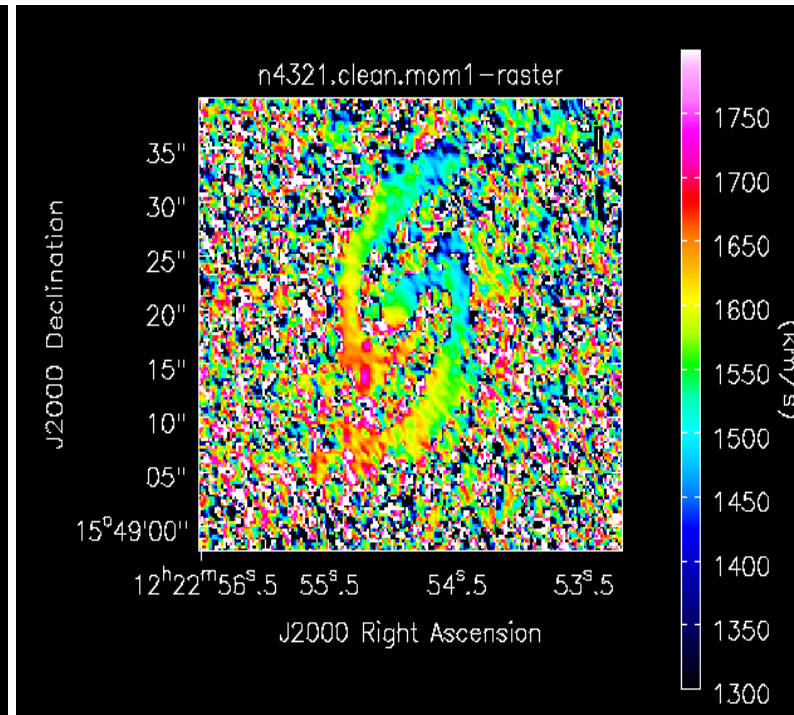
Velocity resolution is $\sim 1.164'' \times 0.672''$

M100

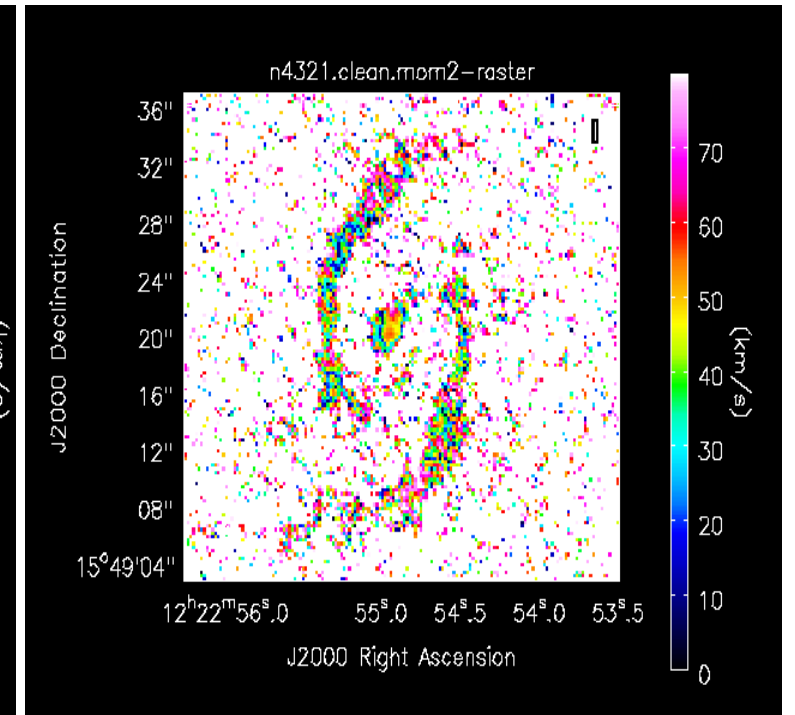
->CO $J = 1-0$ integrated intensity (left), velocity field (mid) and velocity dispersion images (right)



mom0

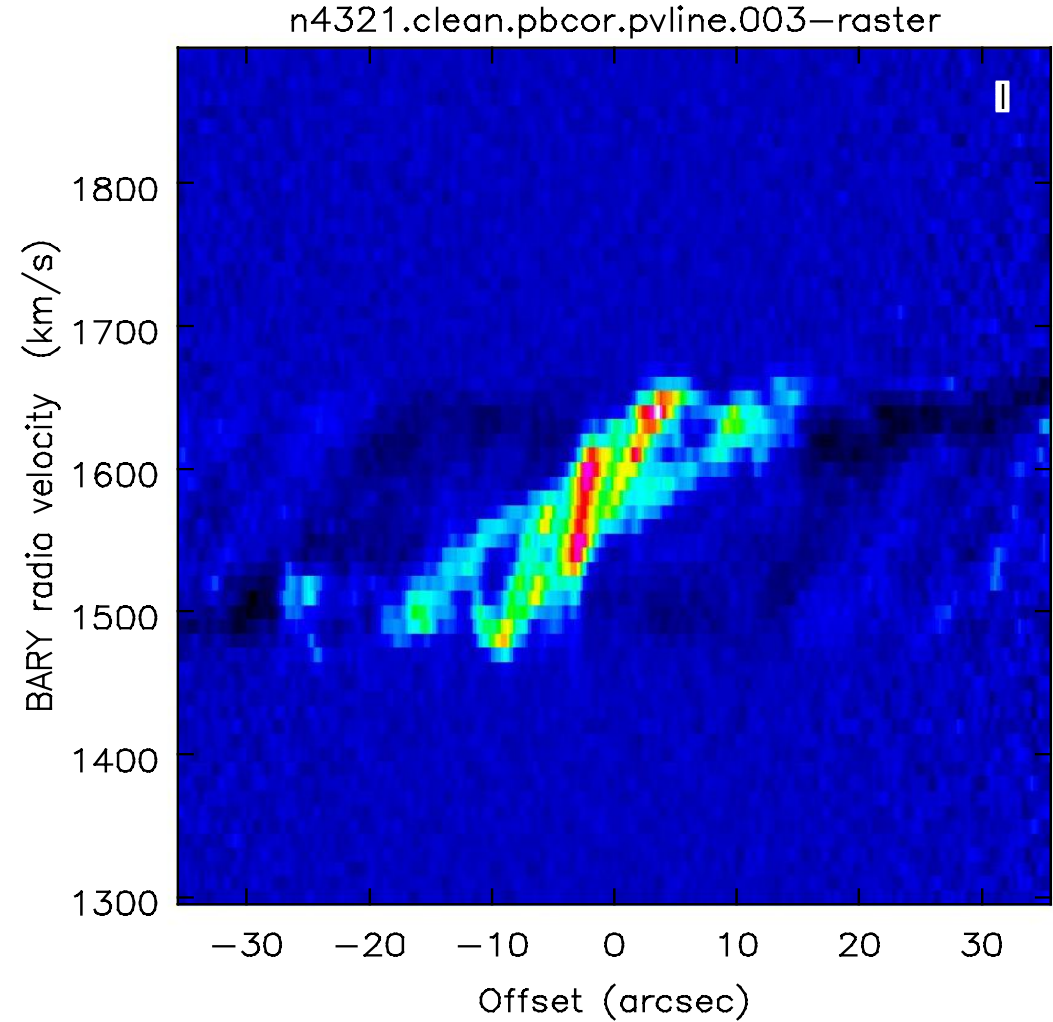
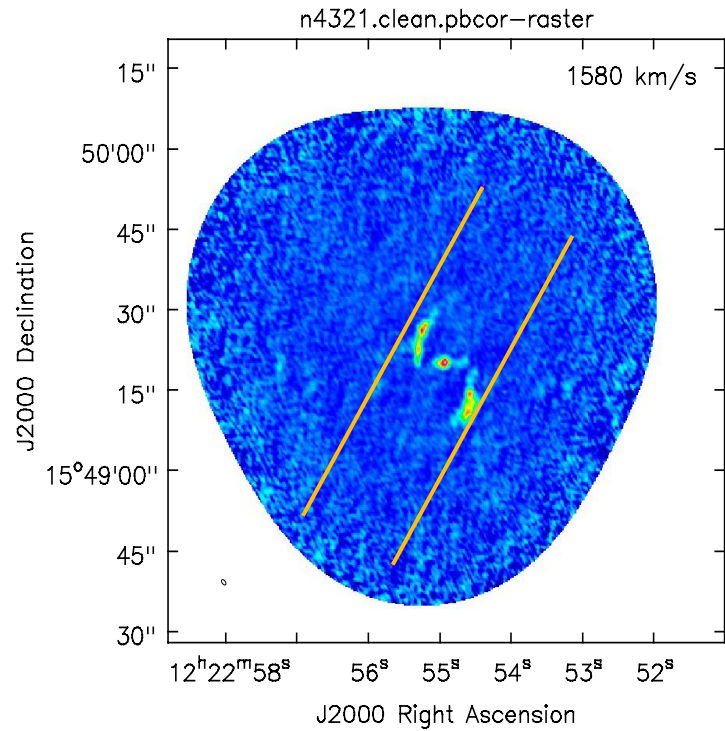


mom1



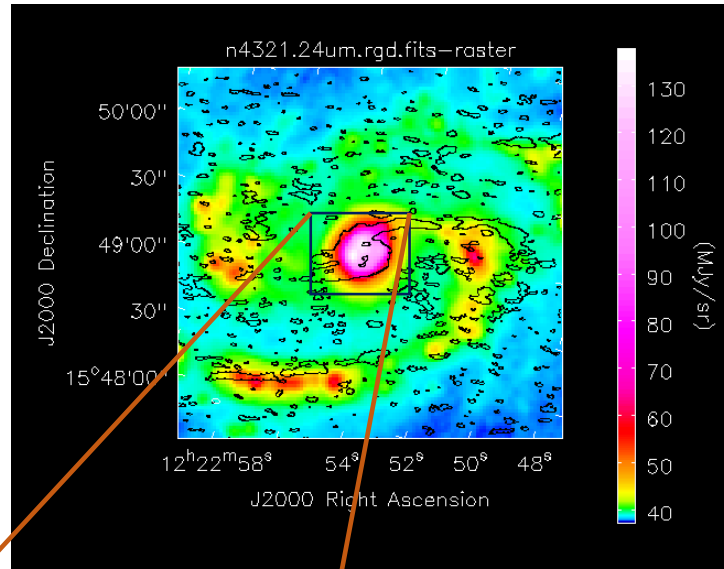
mom2

Position-velocity diagram



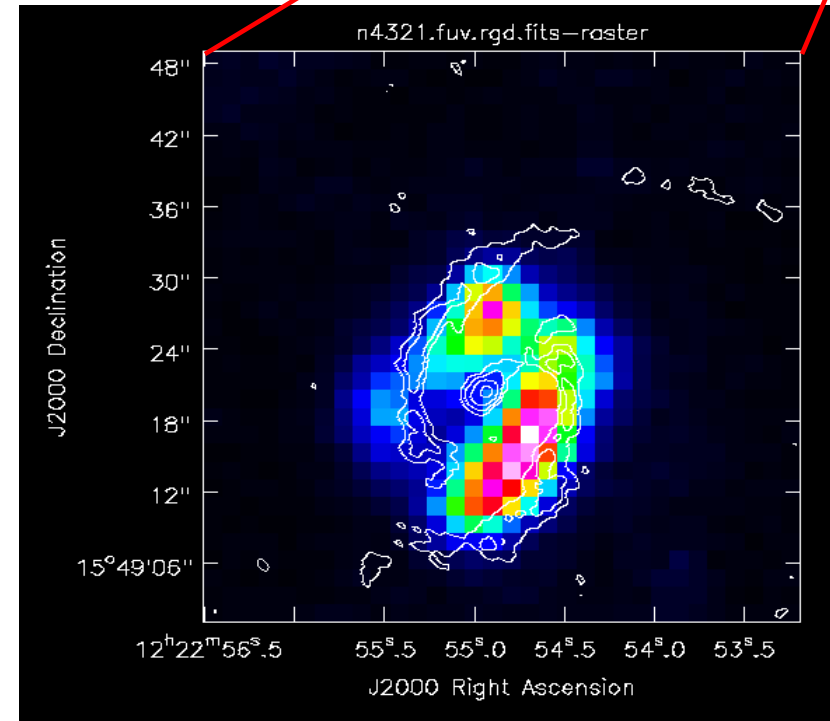
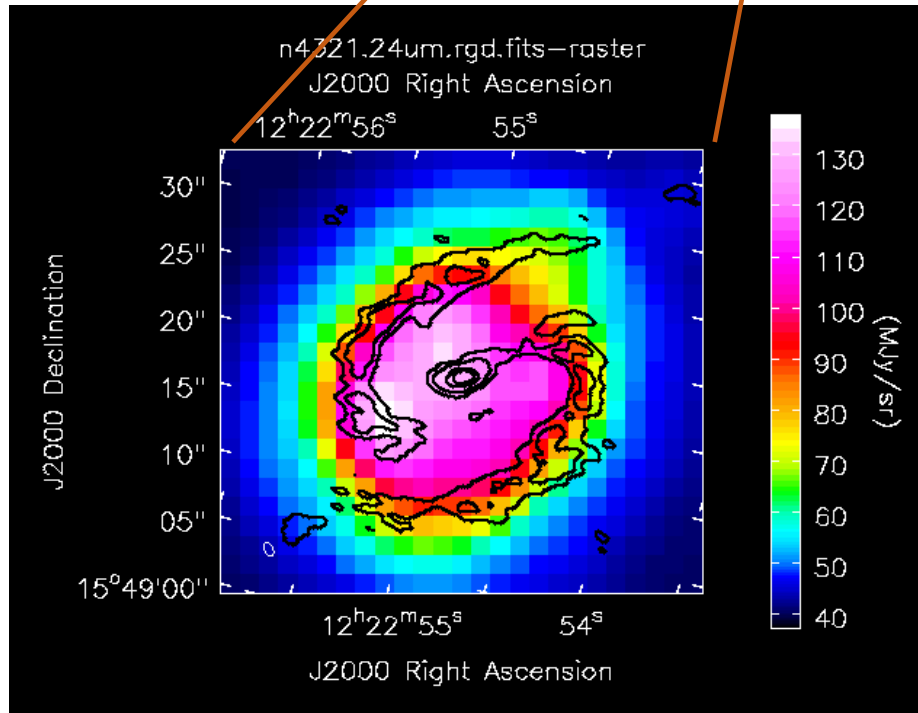
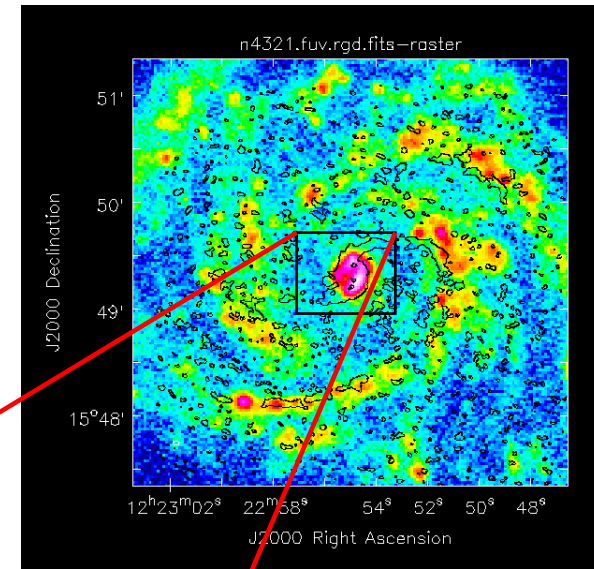
ALMA CO & 24 μm

24 μm images with contours of ALMA CO integrated intensity.

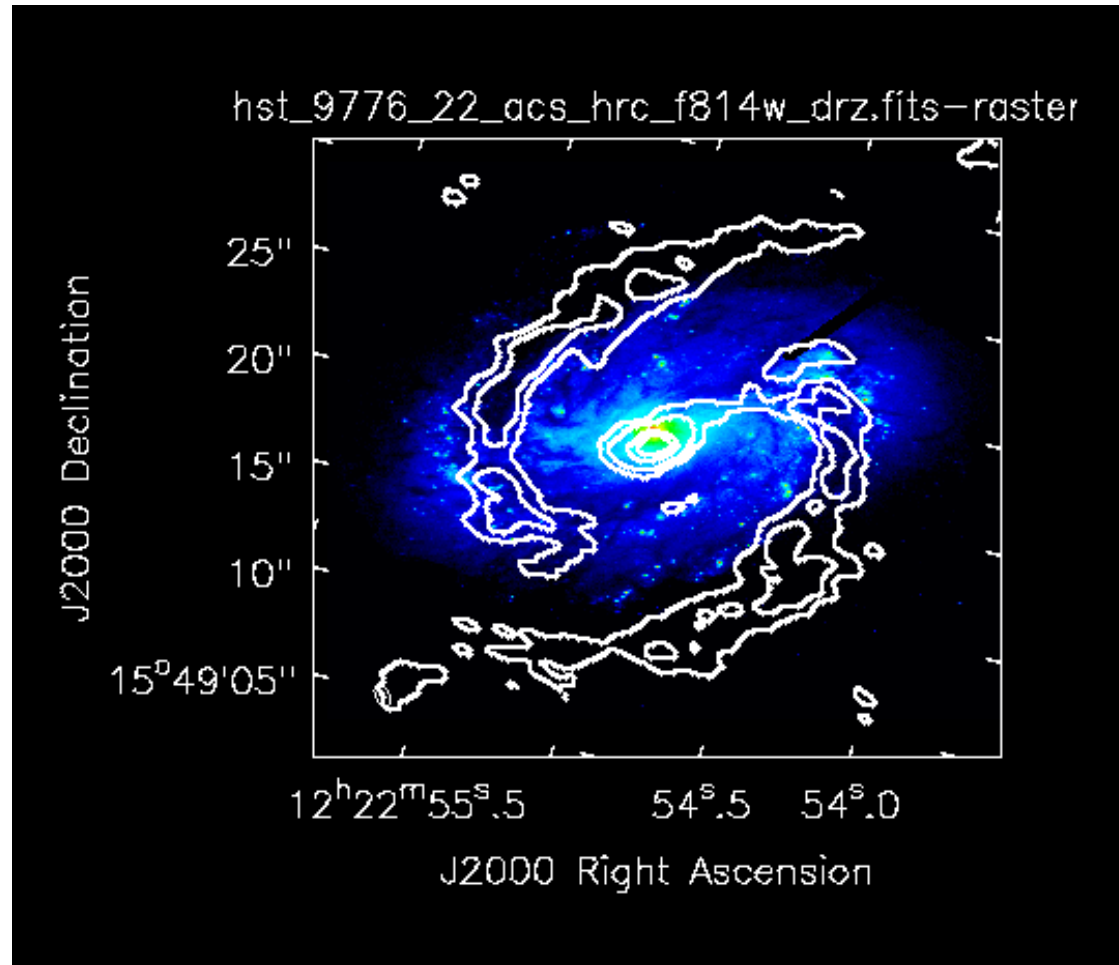


ALMA CO & FUV

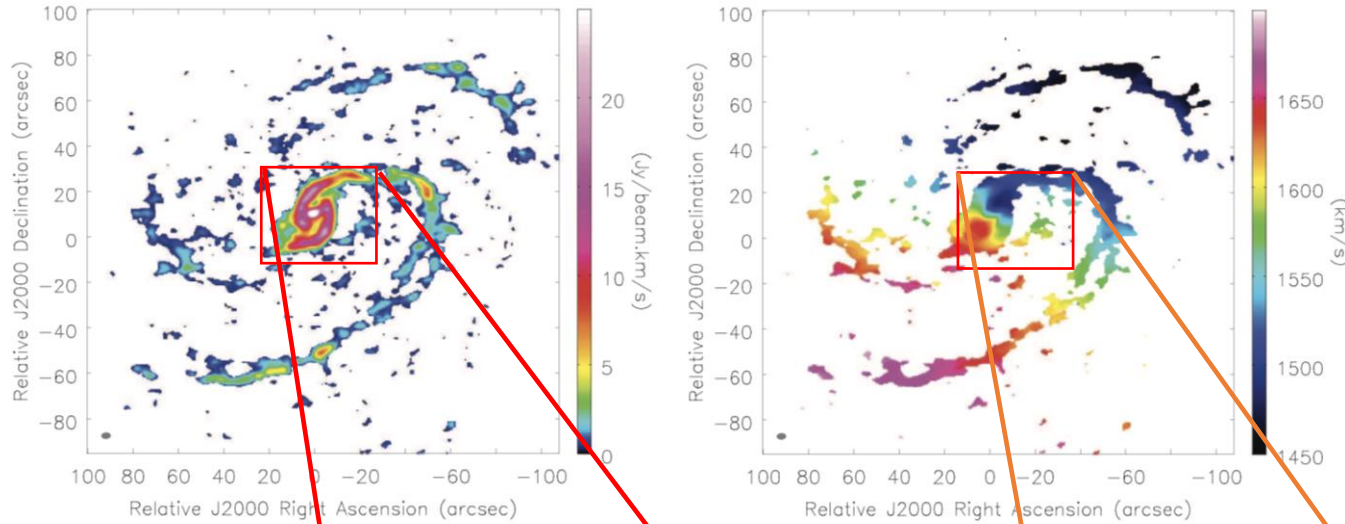
FUV images with contours of ALMA CO integrated intensity.



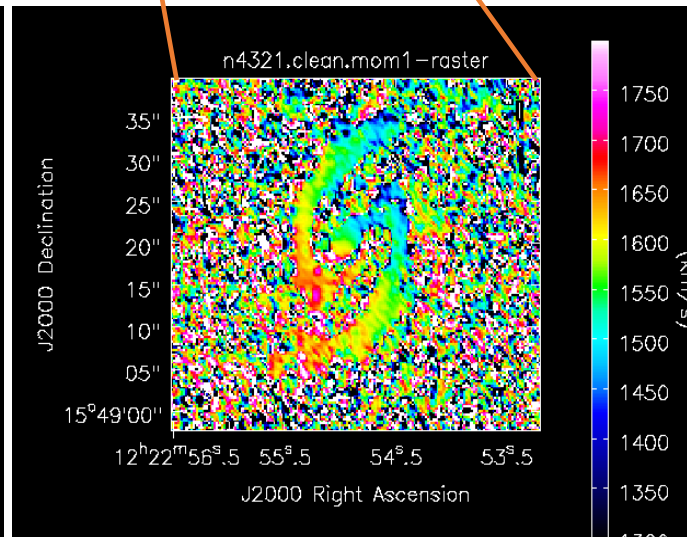
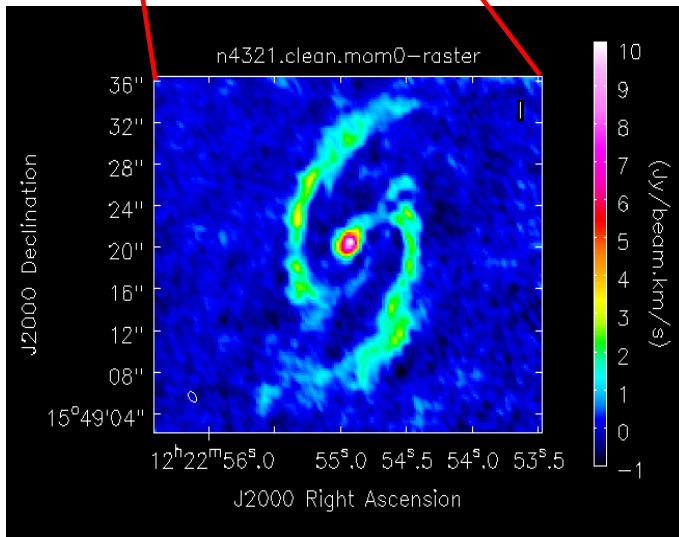
ALMA CO & Hubble Data (NIR, filter=F814W)



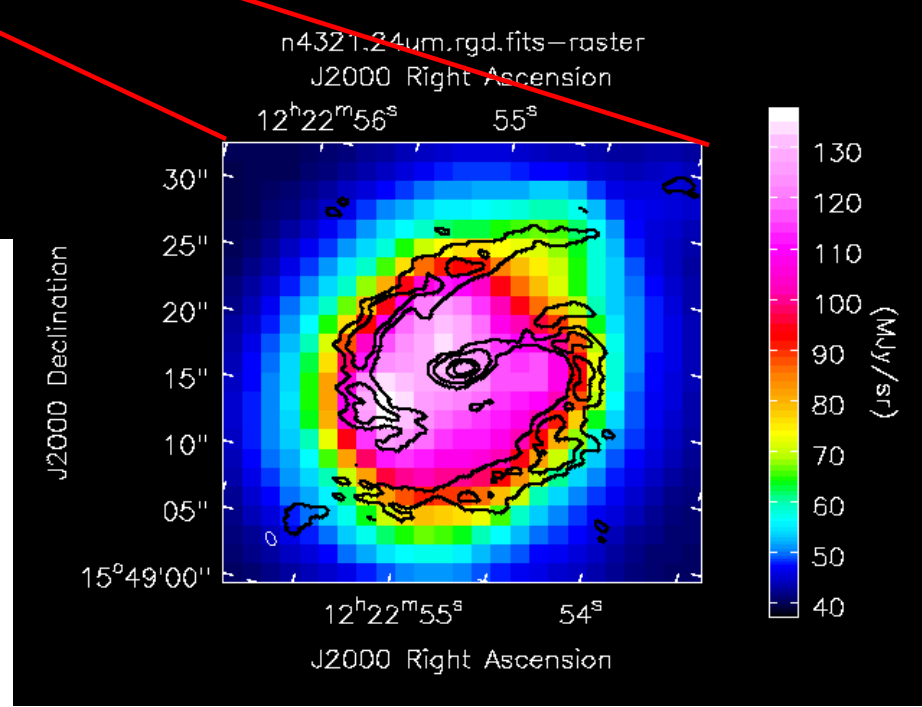
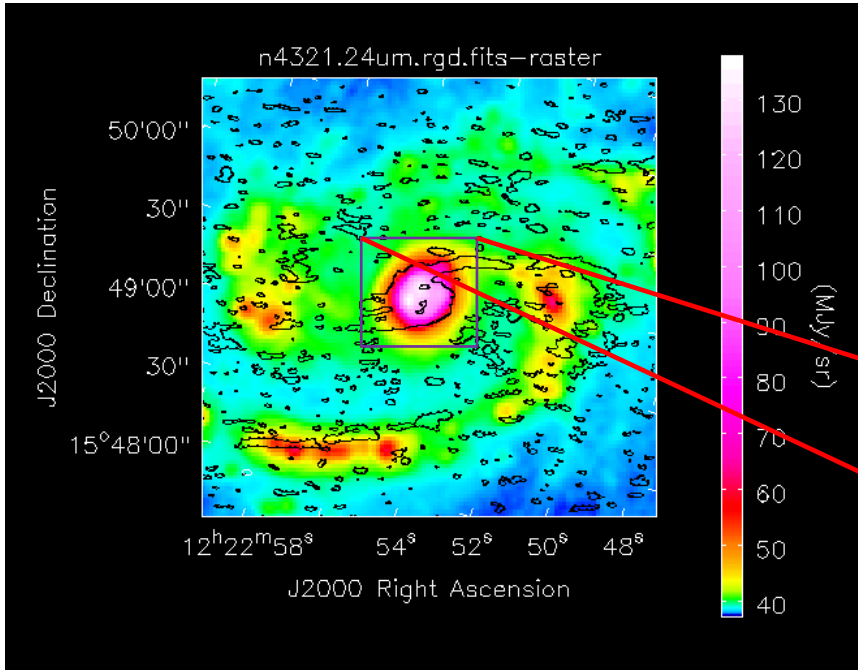
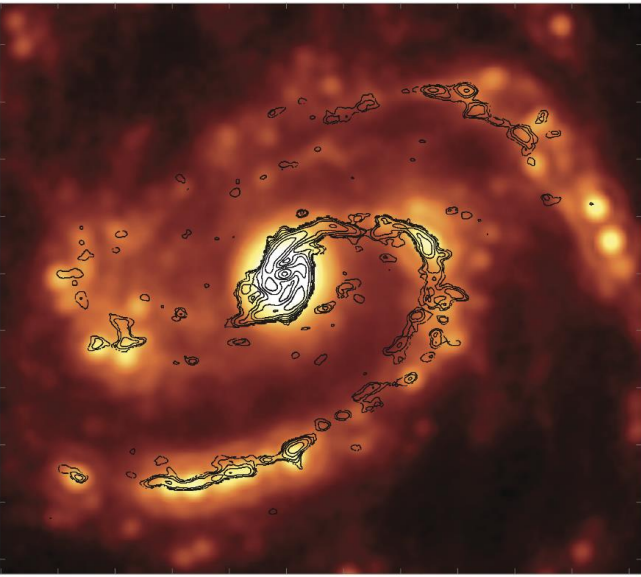
Vlahakis et al. 2013



The CO $J=1-0$ emission clearly trace s the two-armed spiral structure (Vlahakis et al. 2013)

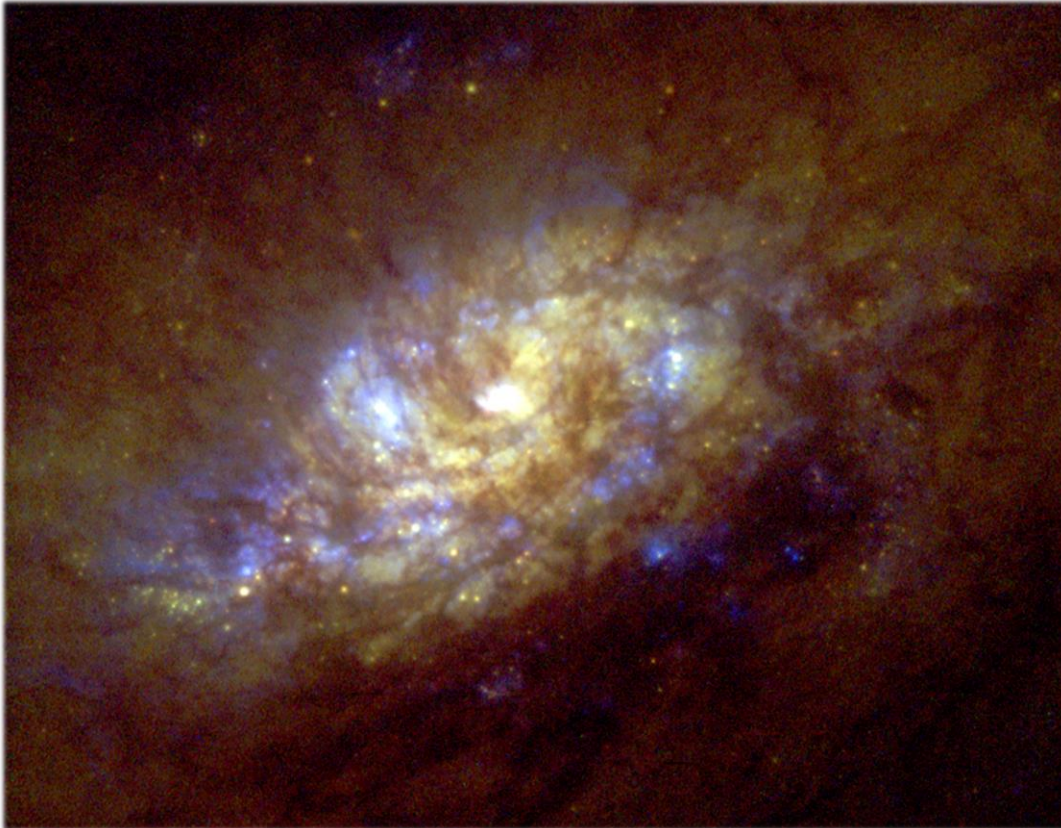


ALMA CO & 24 μm



The CO emission also clearly traces the 24 μm emission. The most strong CO peaks coincident with peaks of 24 μm emission (Vlahakis et al. 2013).

Introduction of Source



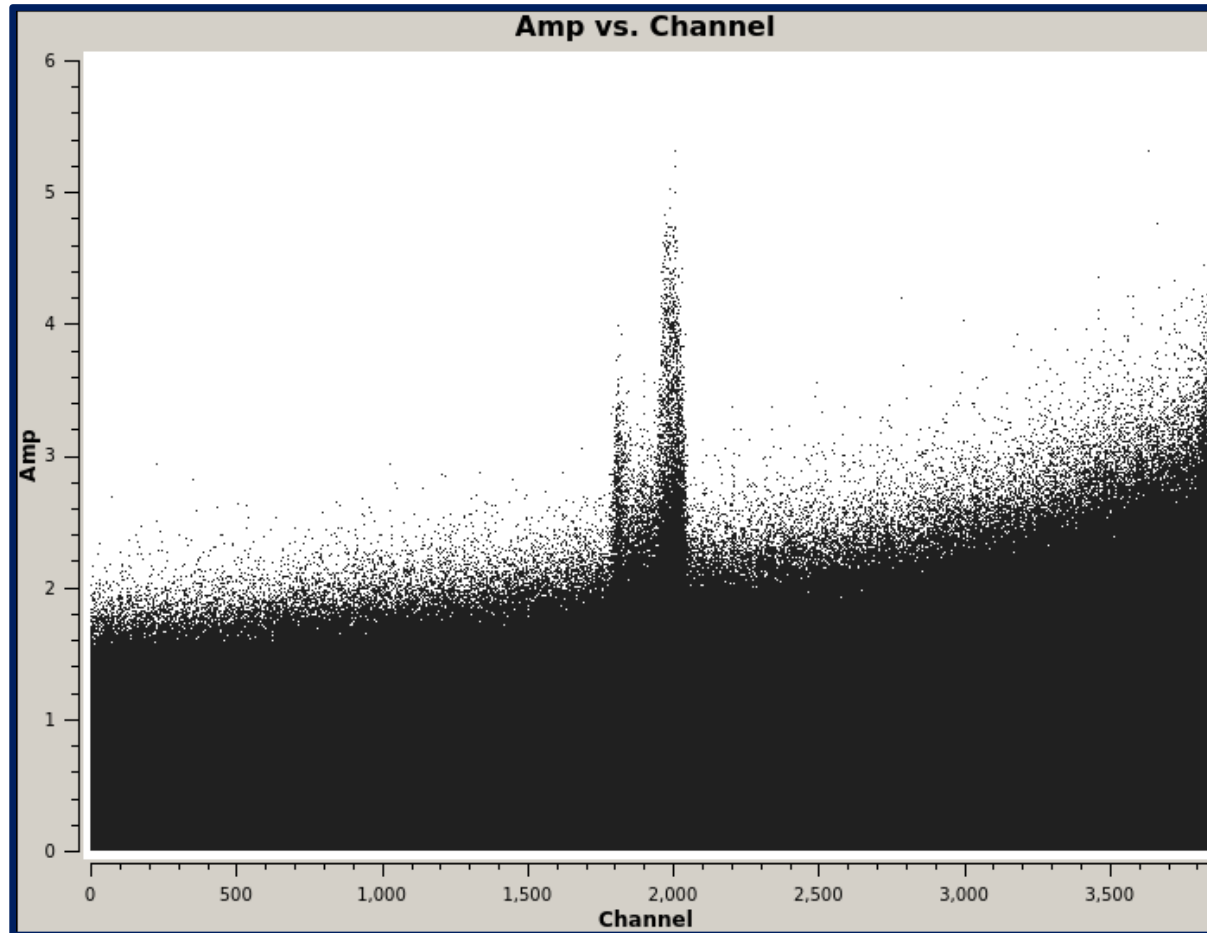
814nm + 675nm + 658nm

NGC1808

Ra(J2000)	05h 07m 42s. 343
Dec(J2000)	-37°30'45.95
Distance	10.8 Mpc
Systemic velocity(LSR)	$963.9 \pm 2.5 \text{ km s}^{-1}$ (global)
Position angle	324°
Inclination	57°
Morphological type	(R)SAB(s)a
Activity	H II, Seyfert 2

Salak et al. 2016

Continuum Subtraction



uvcontsub

`vis = 'ngc1808co.ms.split.cal'`

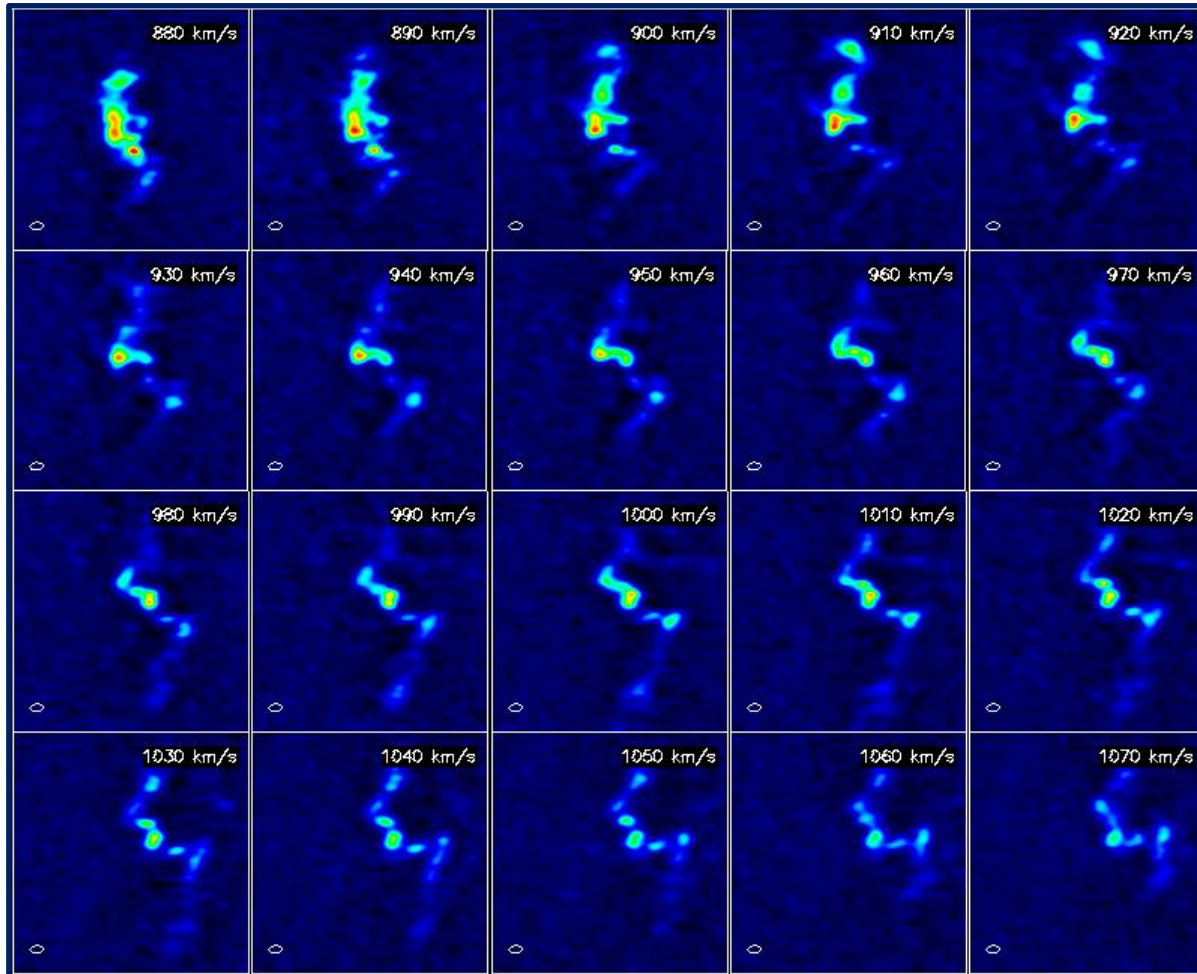
`field = ''`

`fitspw = '0:0~1499;2501~3800'`

`fitorder = 0`

`spw = '0'`

Imaging

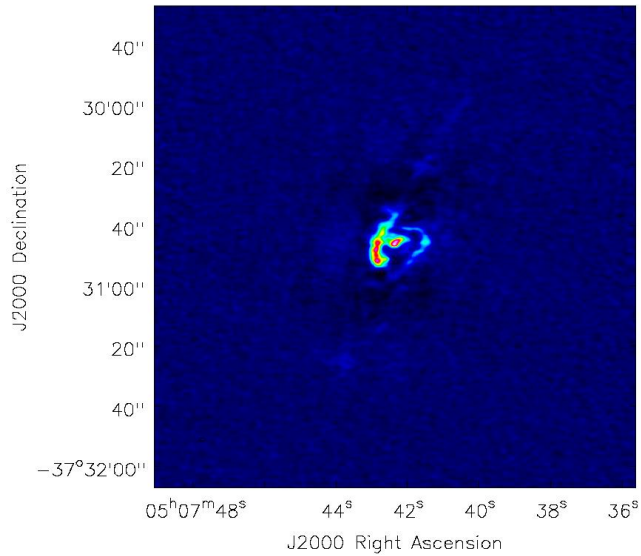


clean

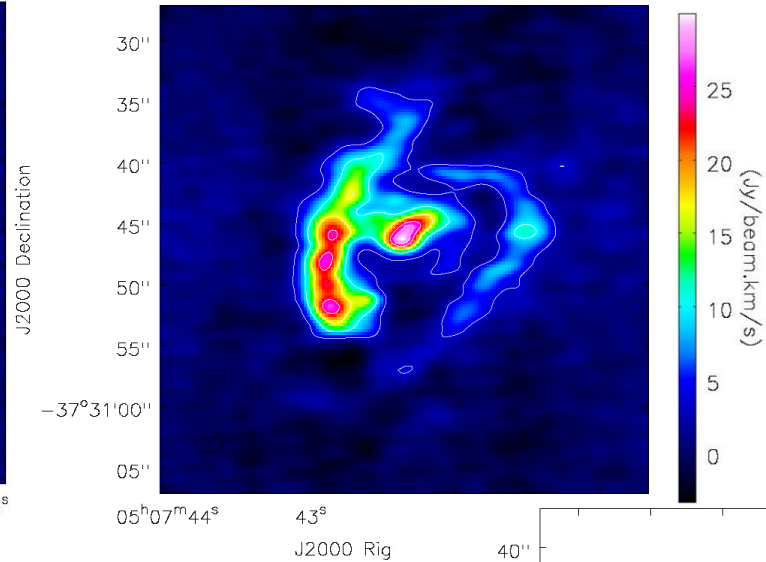
```
mode = 'velocity'  
cell = '0.25arcsec'  
imsize = 640  
start = '750km/s'  
width = '2.5km/s'  
nchan = 200  
weighting = 'briggs'  
robust = 0.5  
niter = 10000  
restfreq = '115.272120GHz' (12CO J = 1-0)  
outframe = 'LSRK'  
interactive = False  
imagermode = 'mosaic'  
phasecenter = 'J2000 05h07m42.34s -37d30m47s'  
threshold='15mJy' (1 $\sigma$  ~ 7.5mJy)
```

Beam size ~ 2.208" x 1.274"

Image Analysis



Moment 0



Moment 1

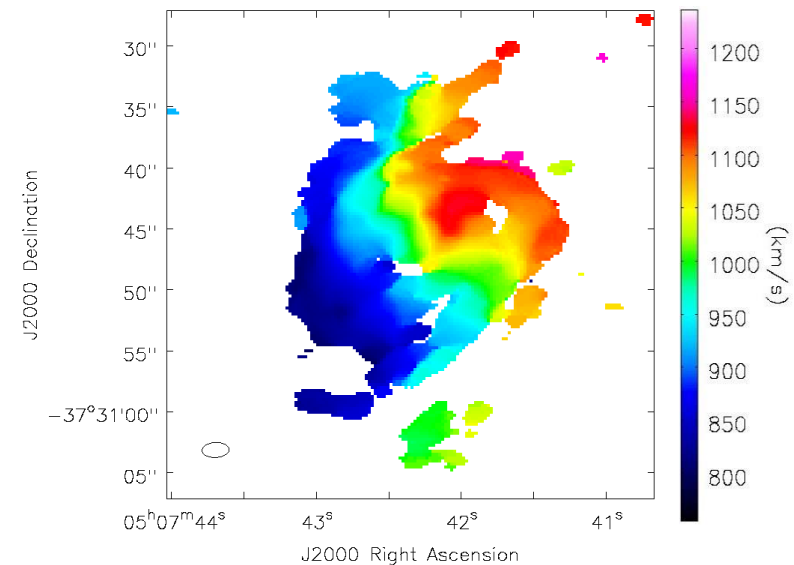
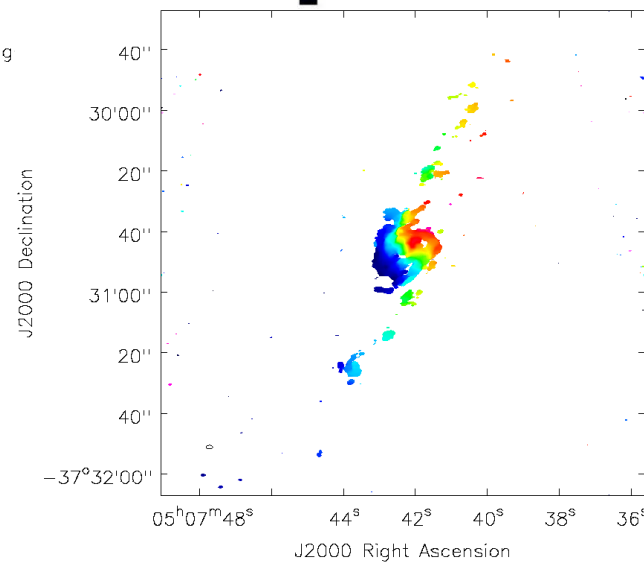
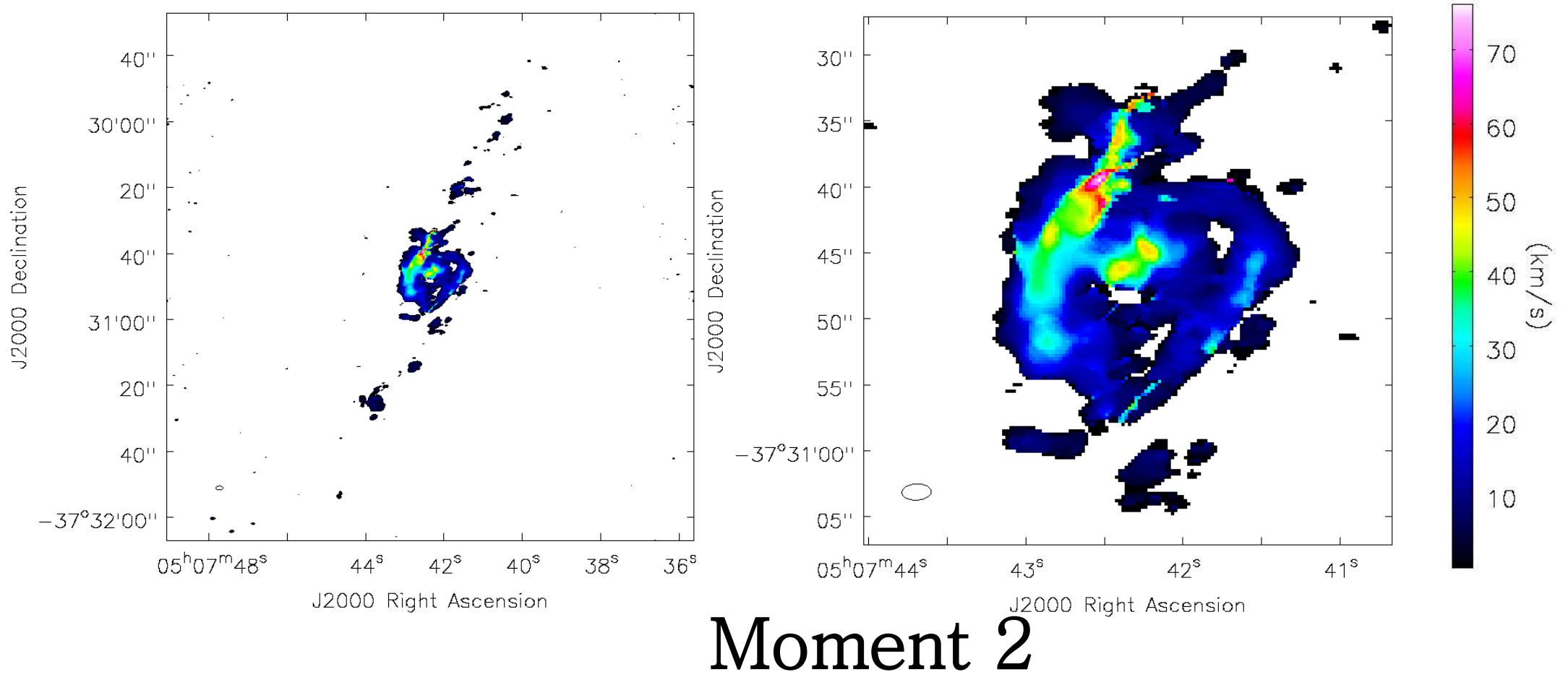


Image Analysis



Moment 2

Image Analysis

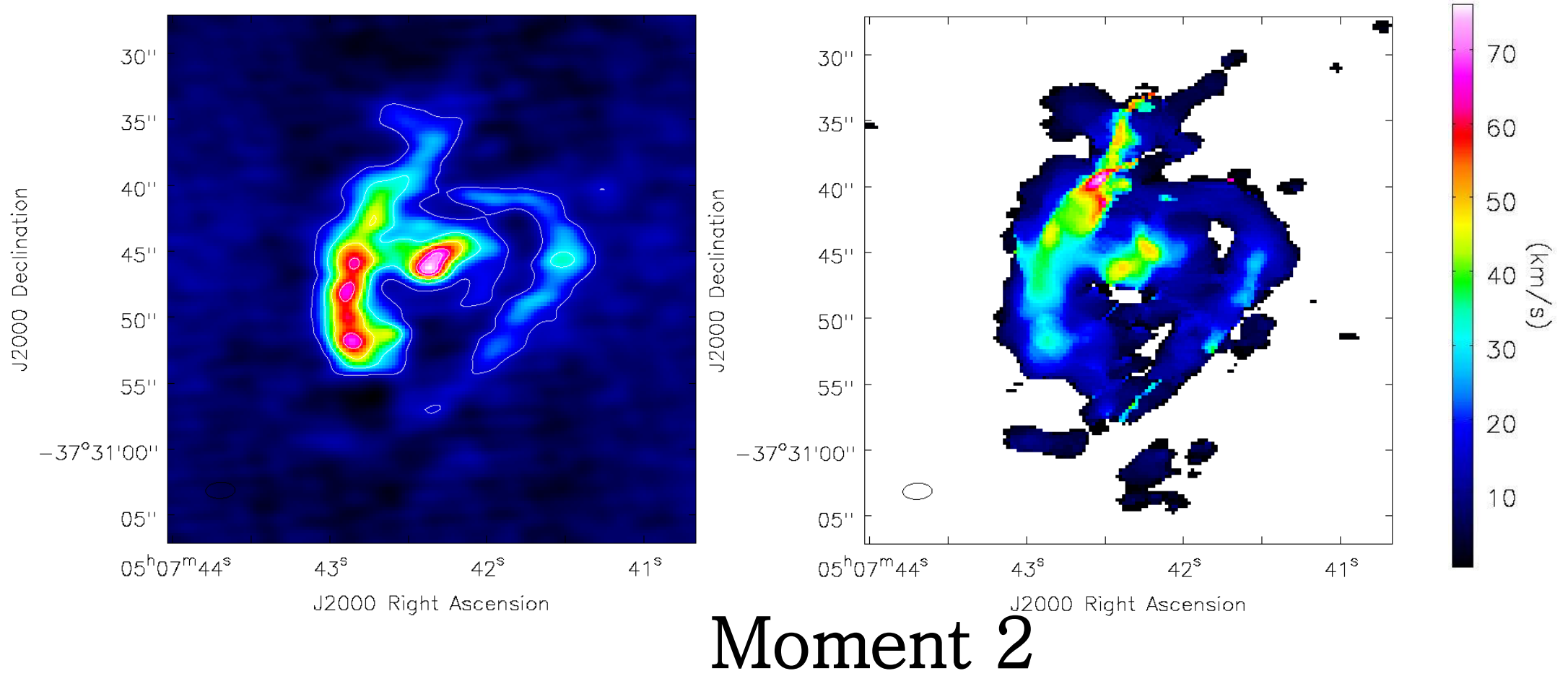


Image Analysis

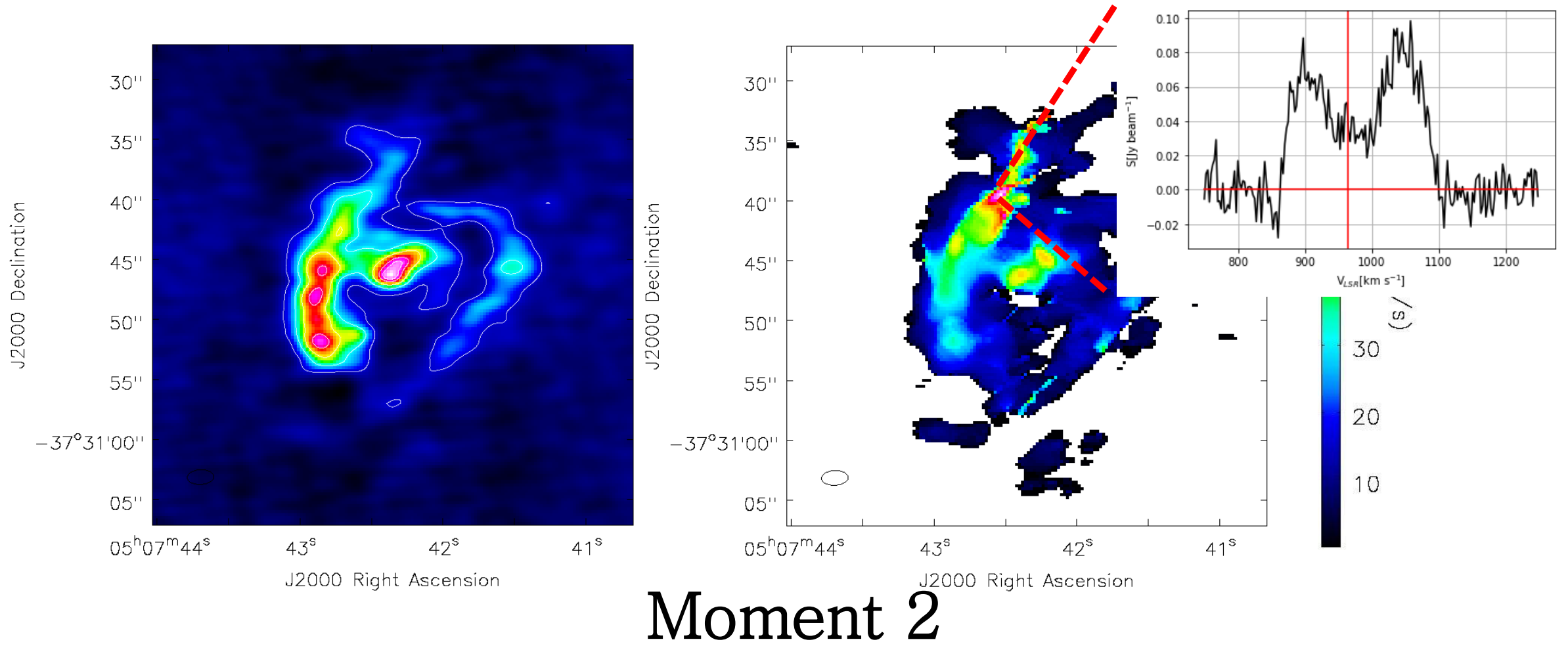
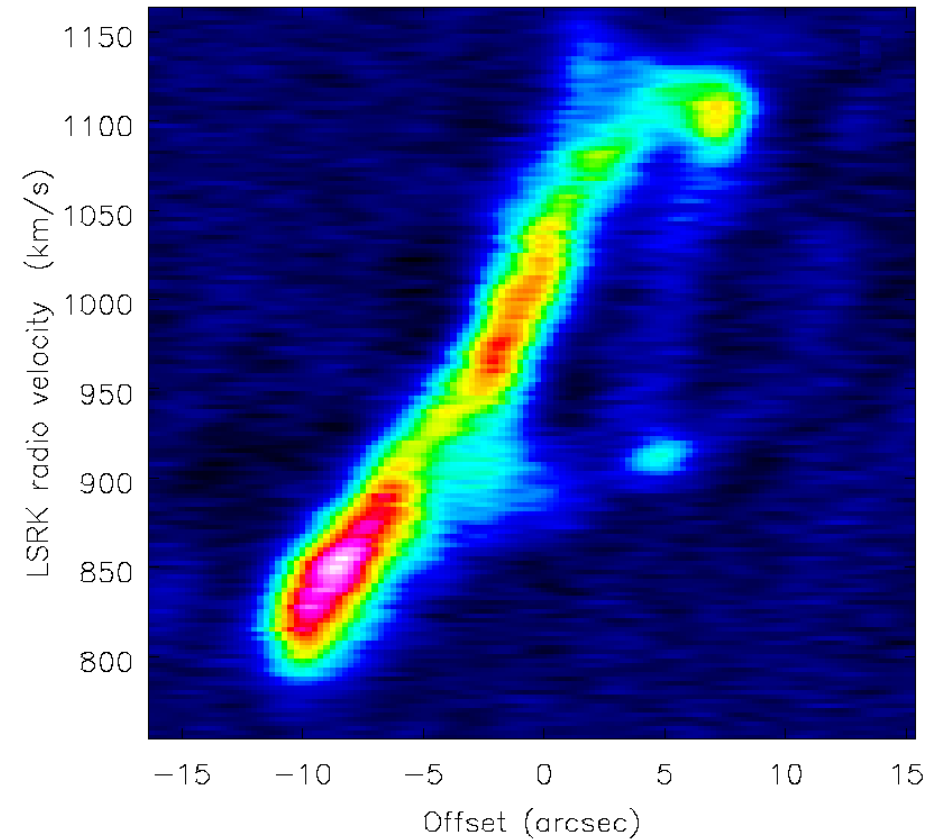
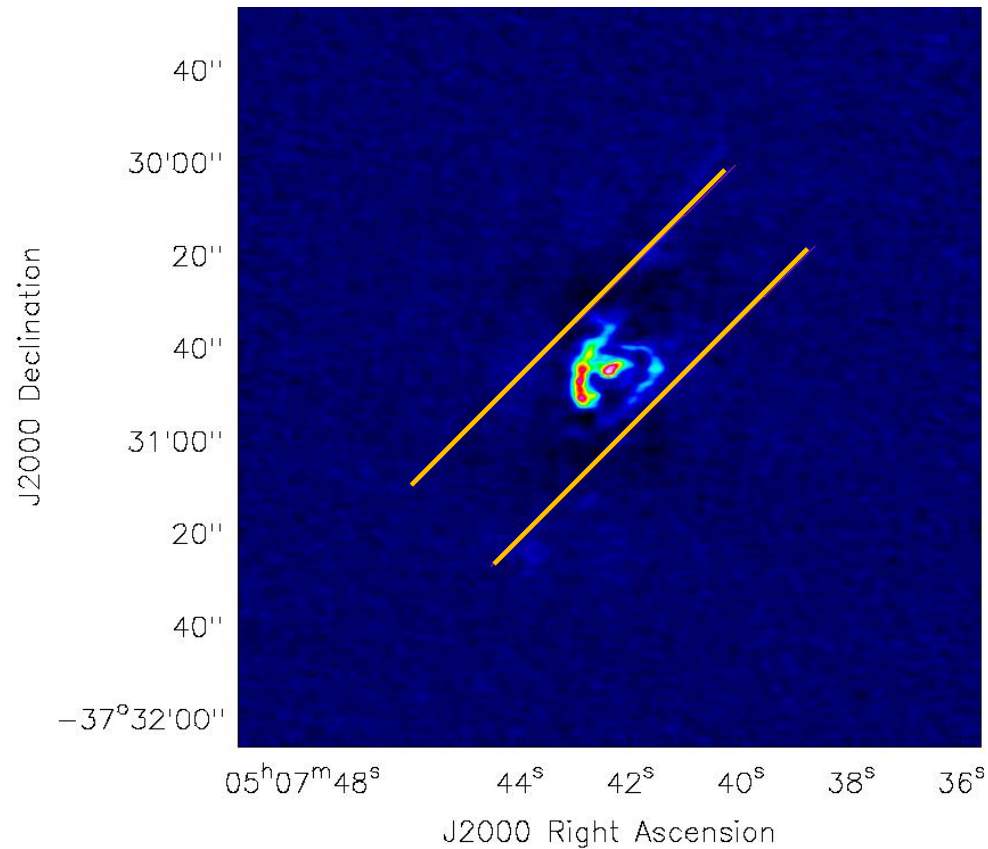
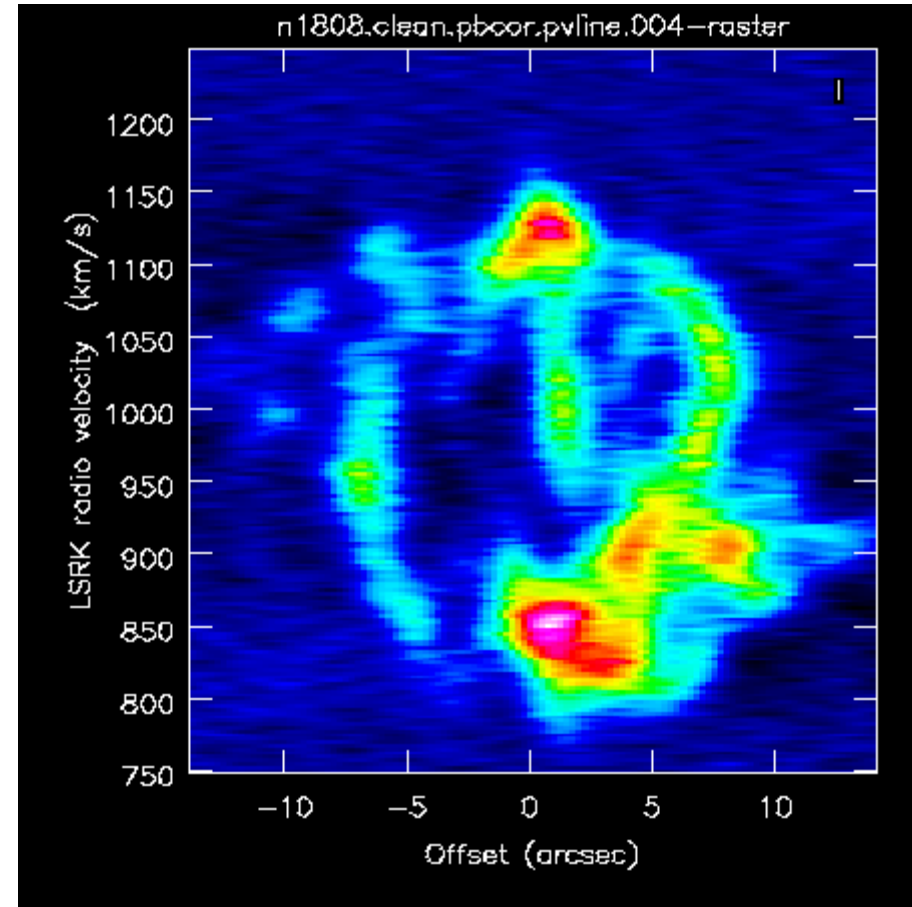
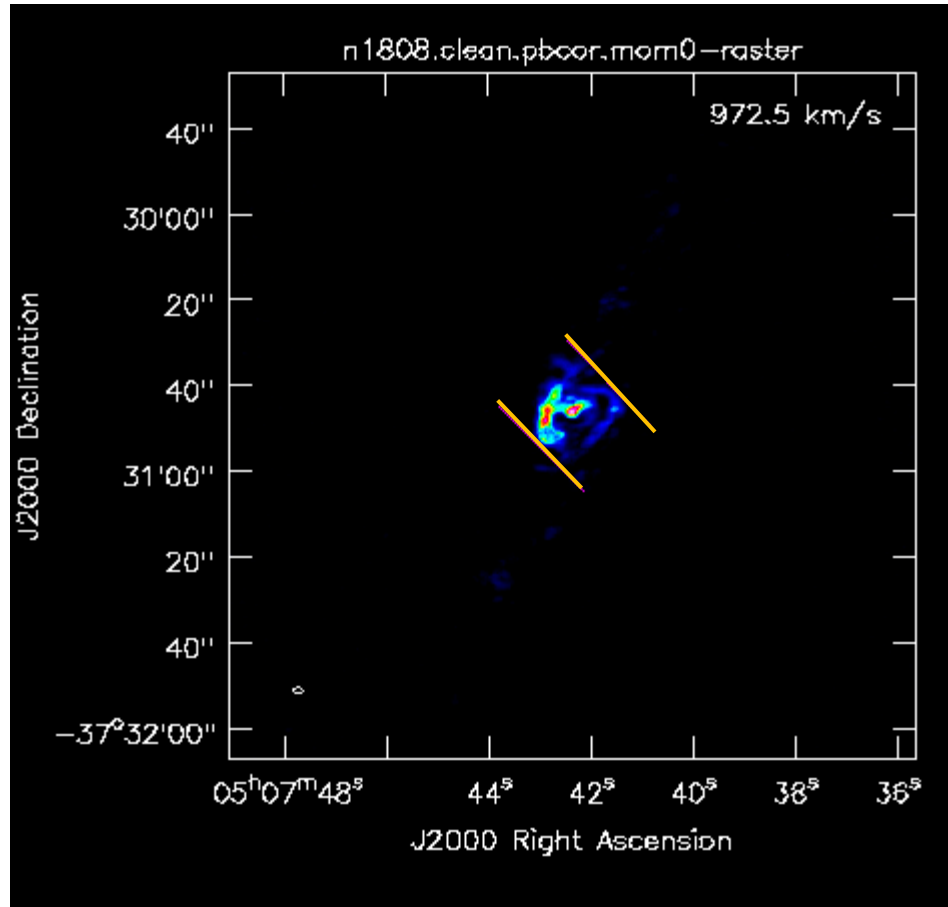


Image Analysis



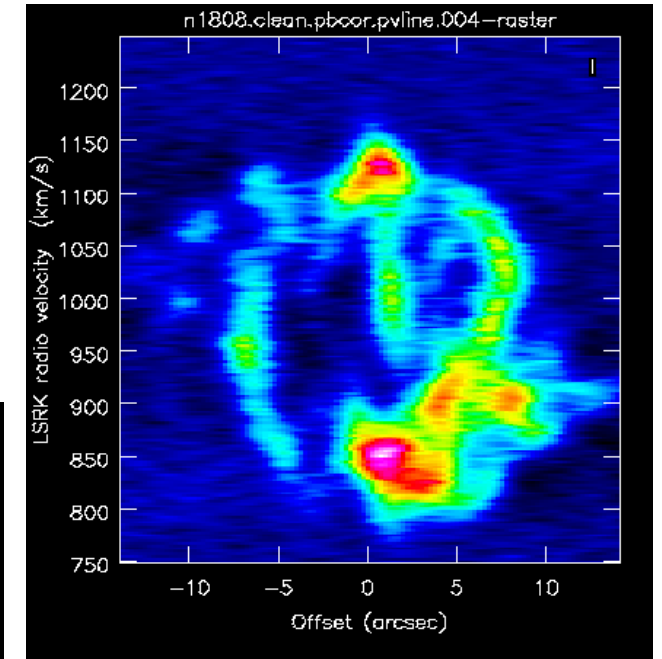
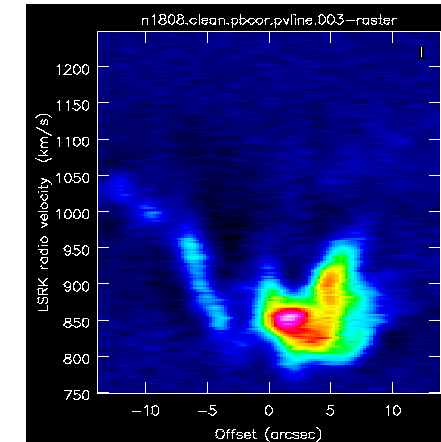
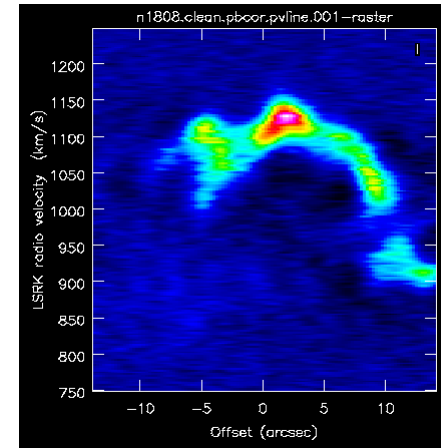
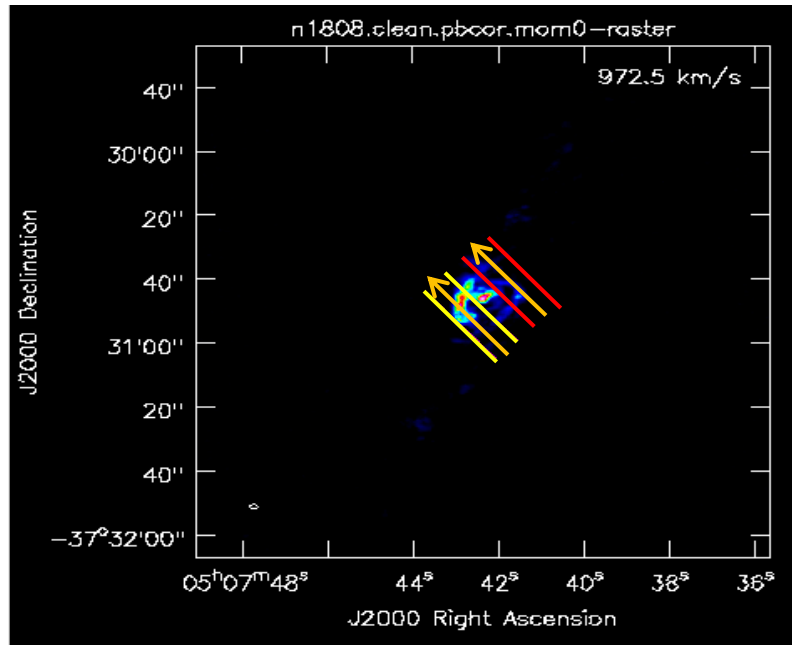
PV diagram

Image Analysis



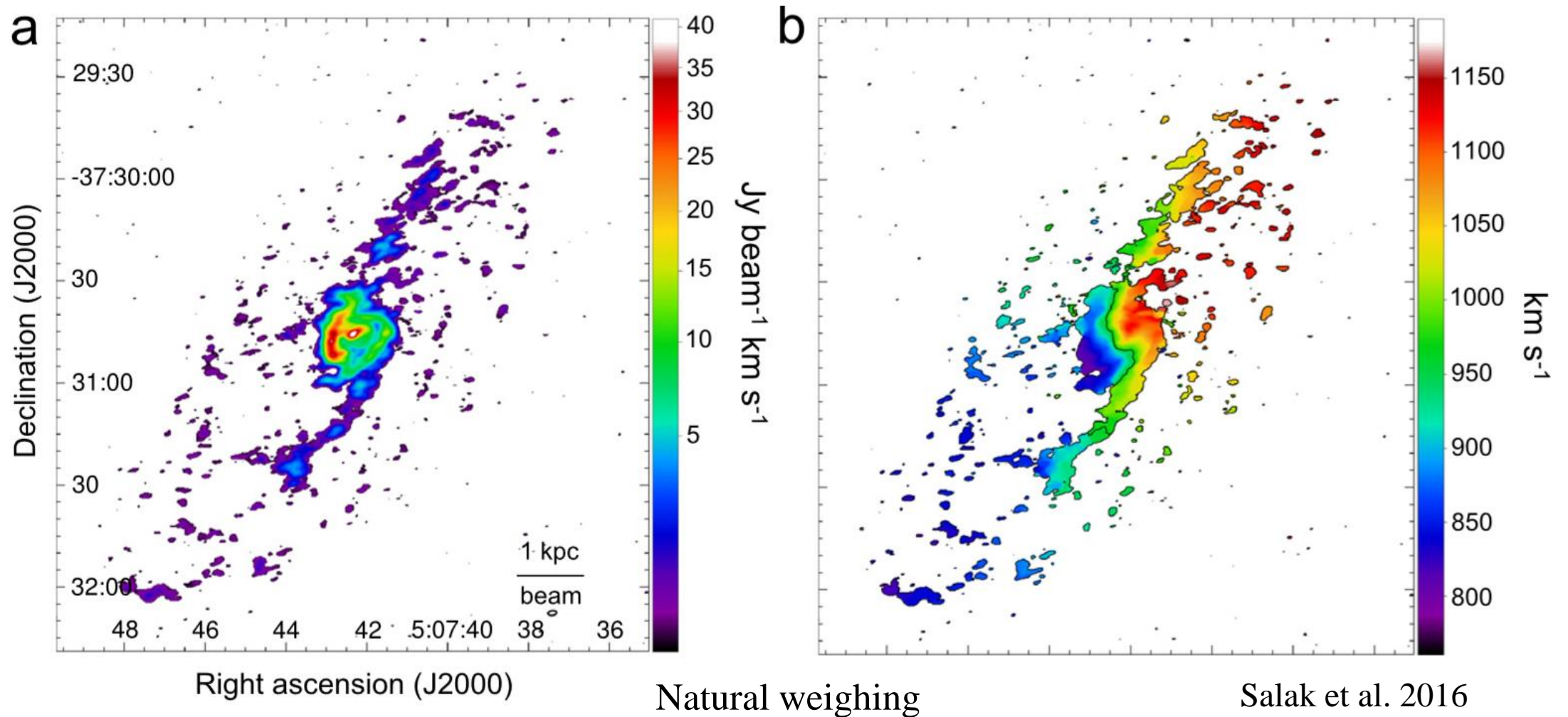
PV diagram

Image Analysis

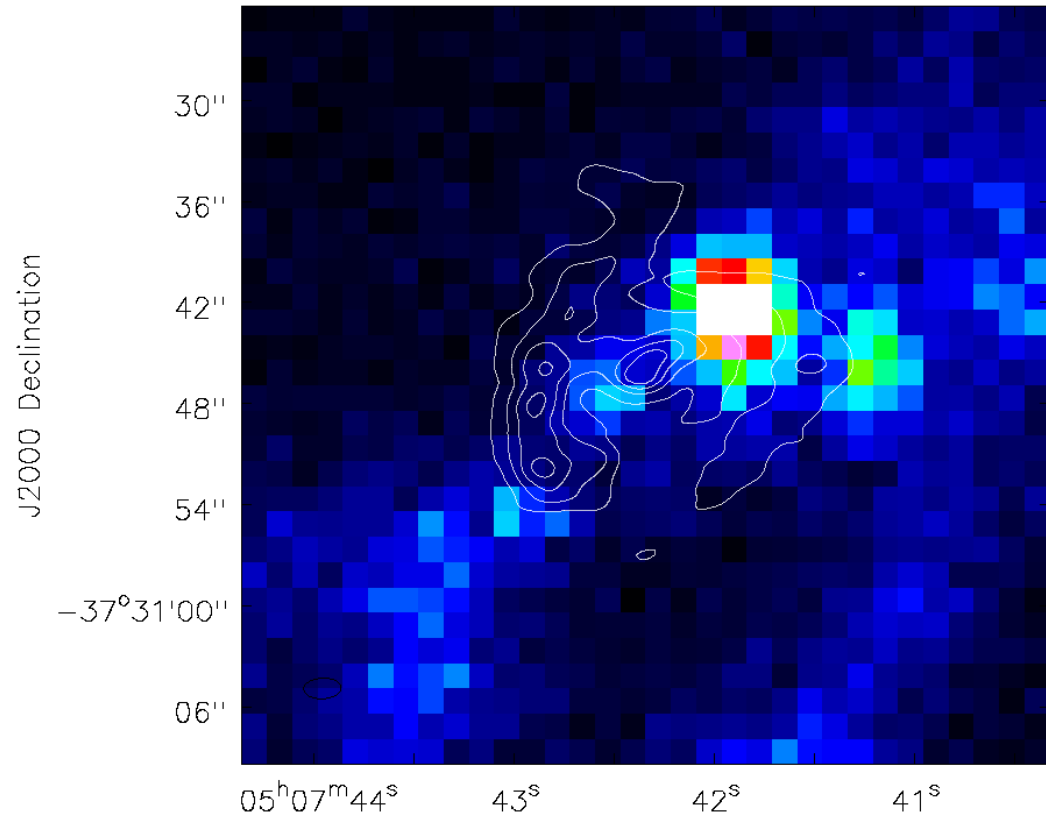


PV diagram

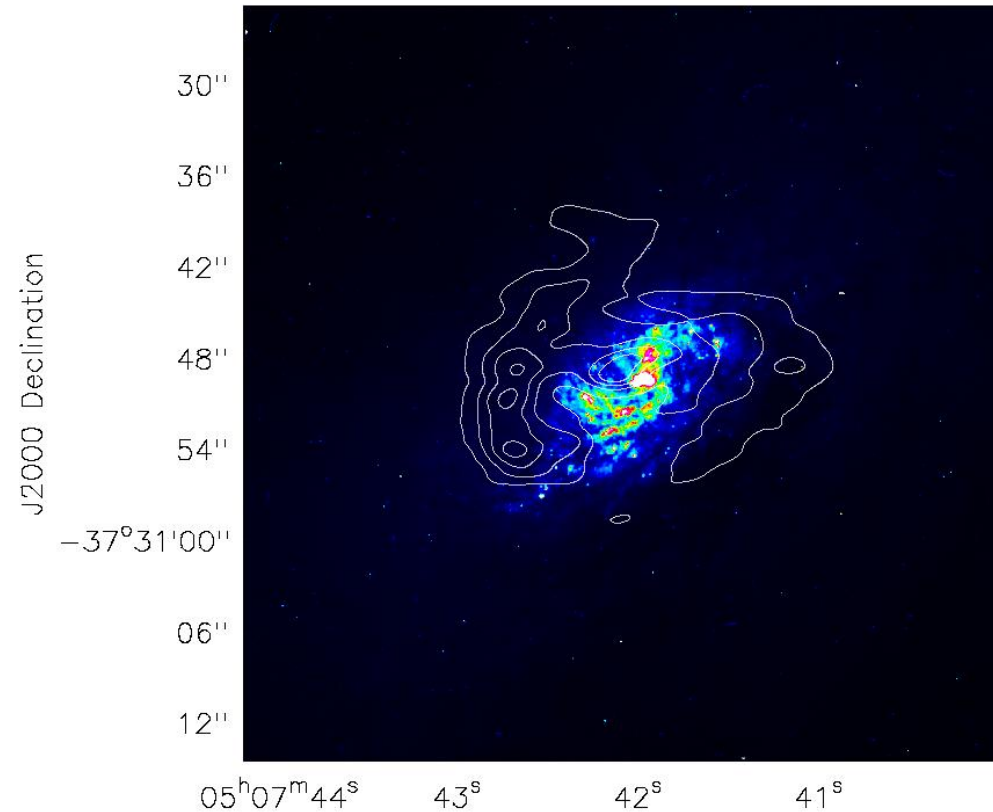
Previous Studies



Previous Studies



GALEX FUV (1529Å)



HST I-band (8310Å)

Q & A