

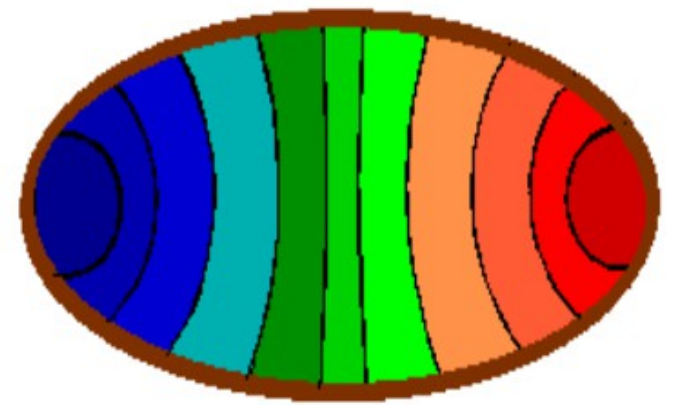
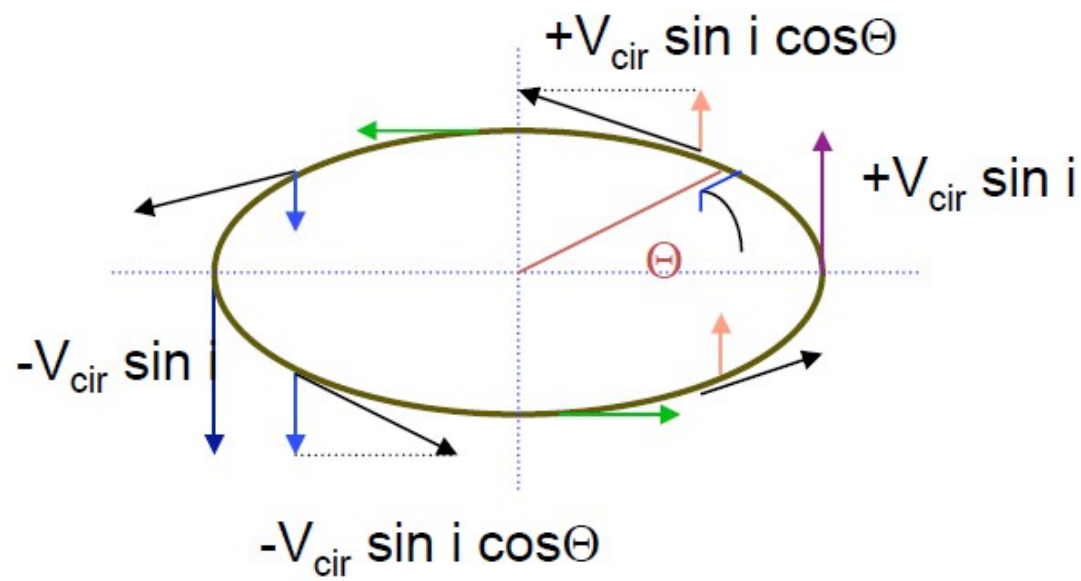
Spectral line analysis

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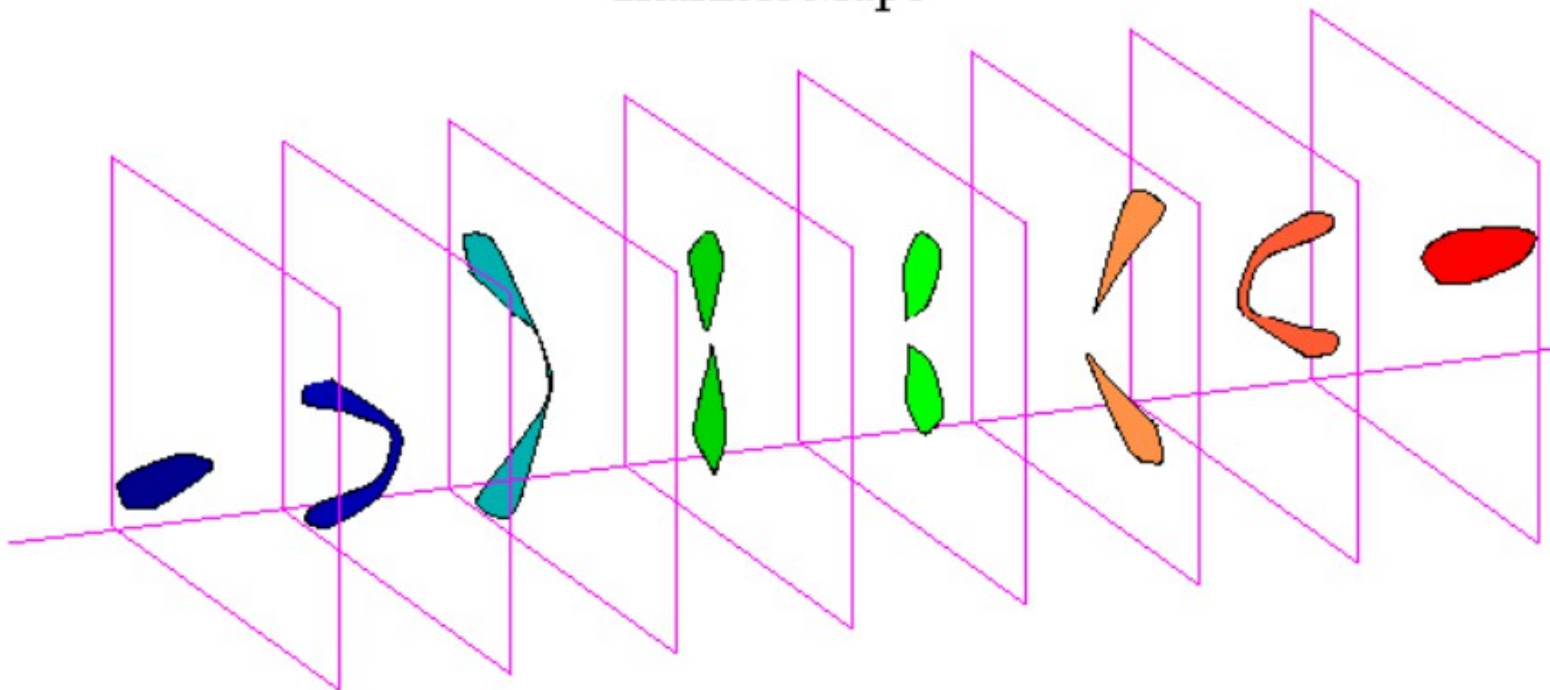
Slides & contributions from
Arturo Mignano

<http://www.alma.inaf.it/index.php/Courses>



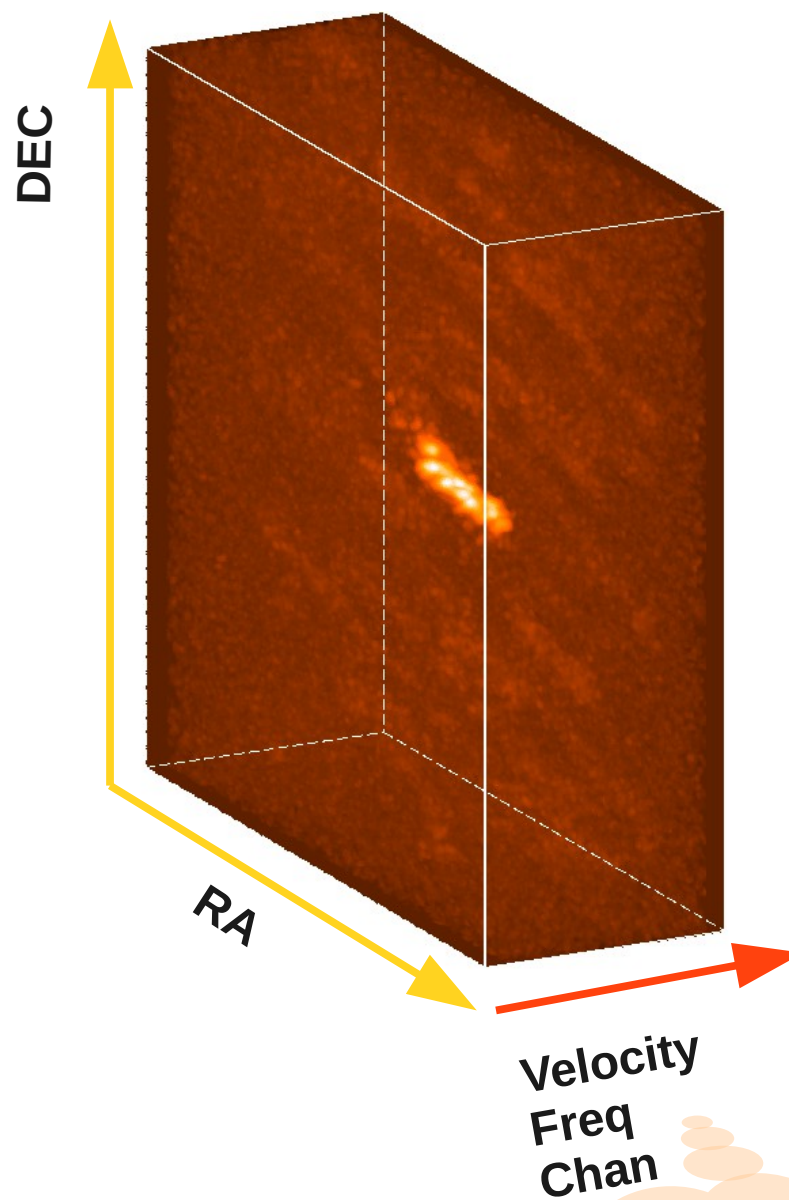
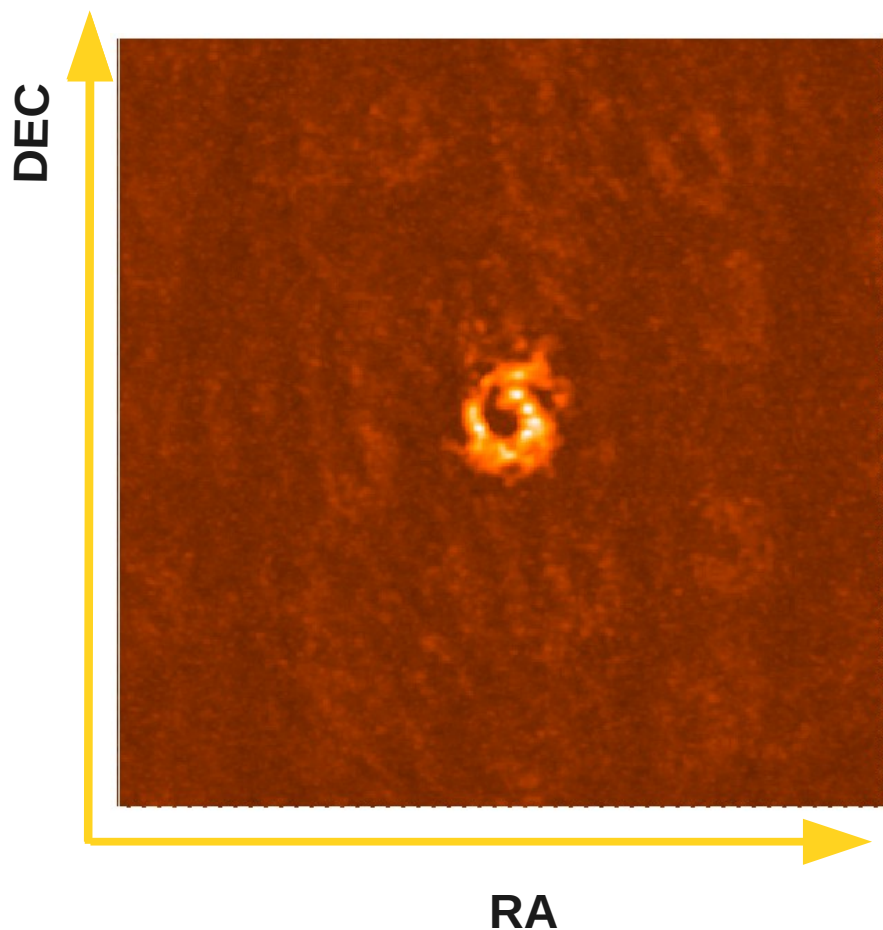
Mean Velocity Field

Channel Maps



Spectral line images are 3-dimensional

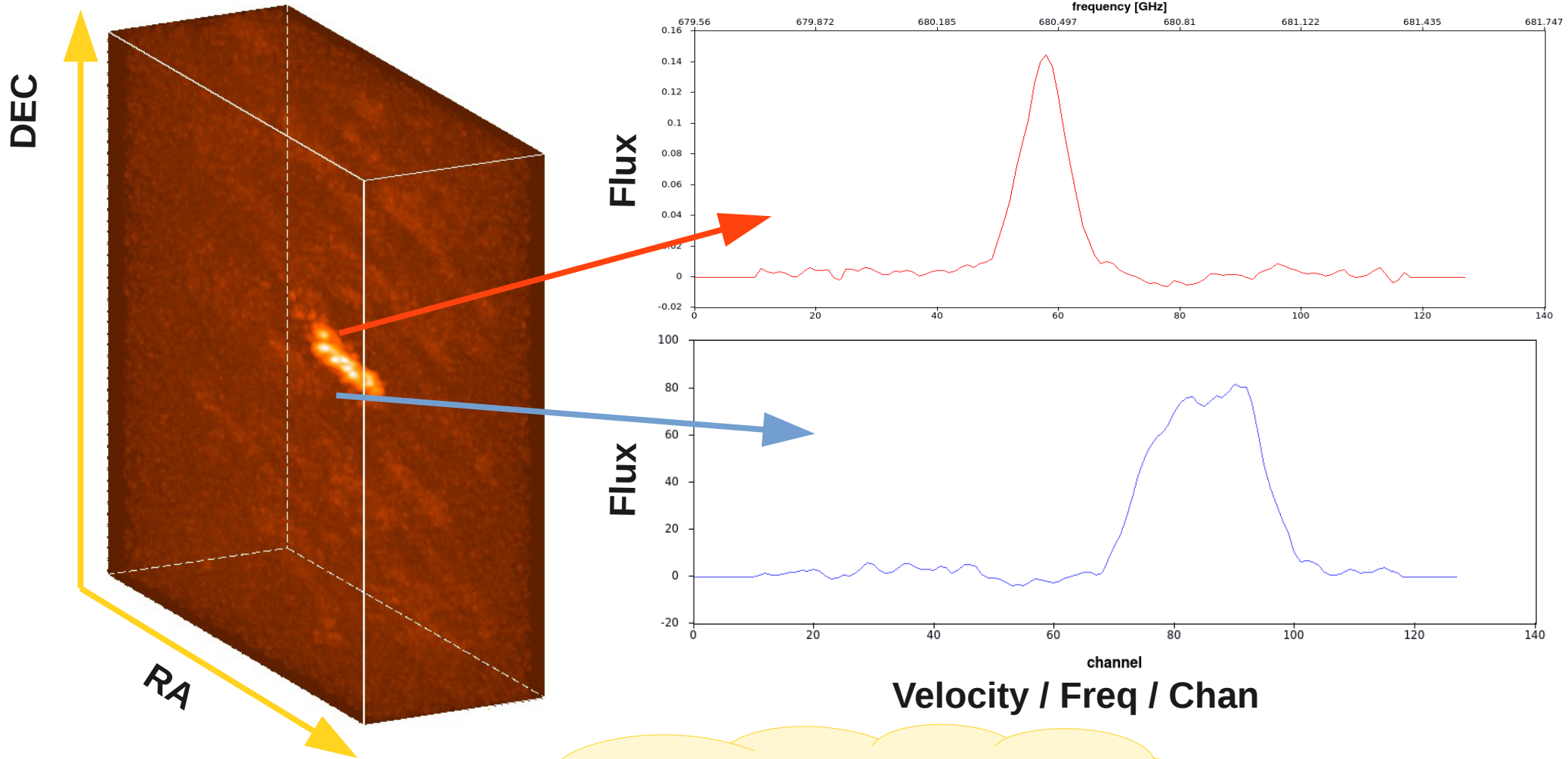
Spectral line observations have up to 3840 channels. The highest spectral resolution achievable is 30 kHz.



$$\frac{\delta v}{v} = \frac{\delta V}{c}$$

Spectral profiles

1-D slice along velocity axis

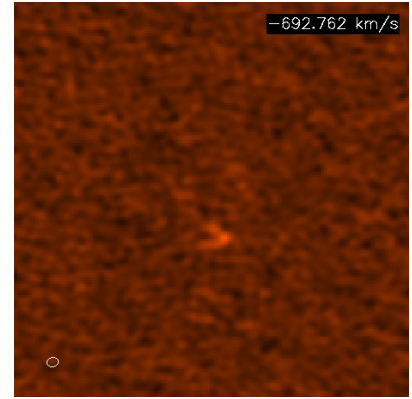
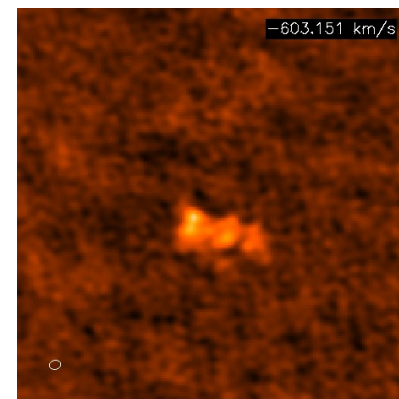
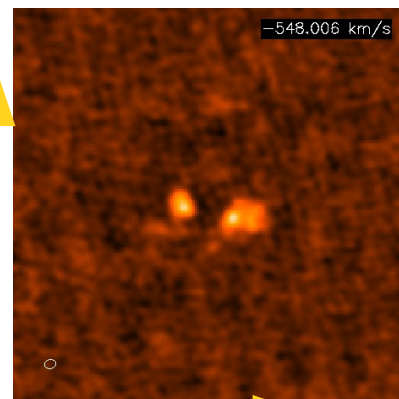
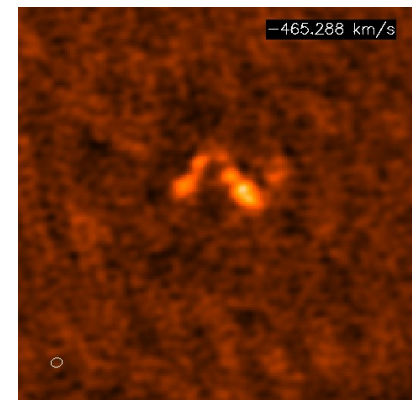
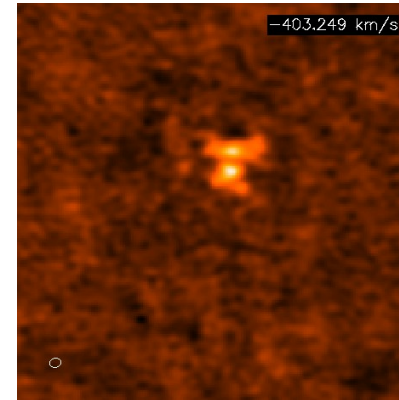
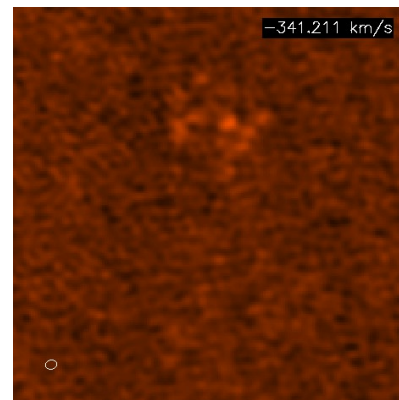
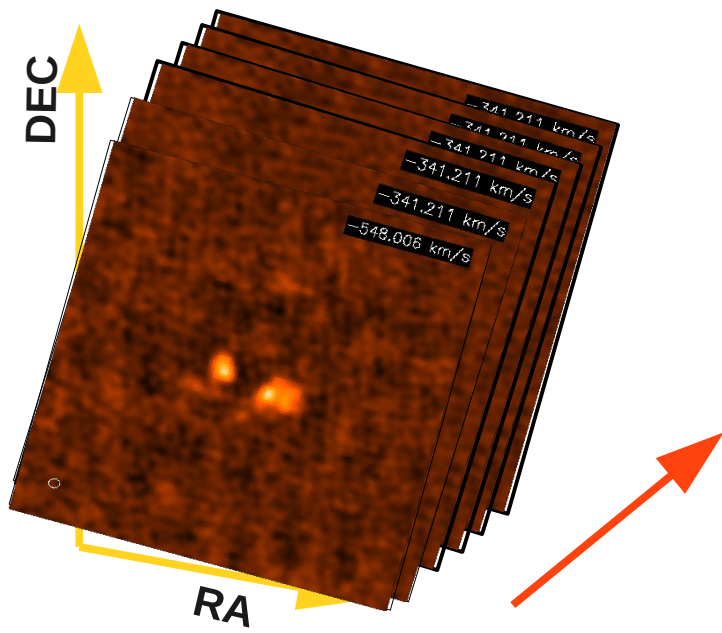


Each pixel has a different spectral profile, which may show different line shape, intensity and width.

Channel maps

2-D slice along velocity axis

Each panel corresponds to a different Velocity / Freq / Chan



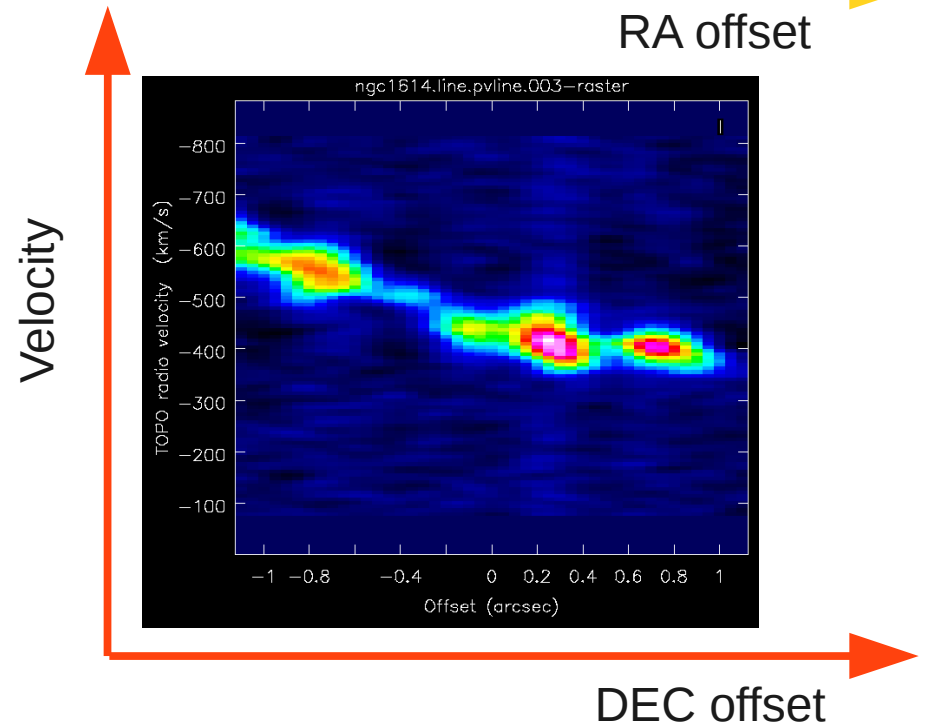
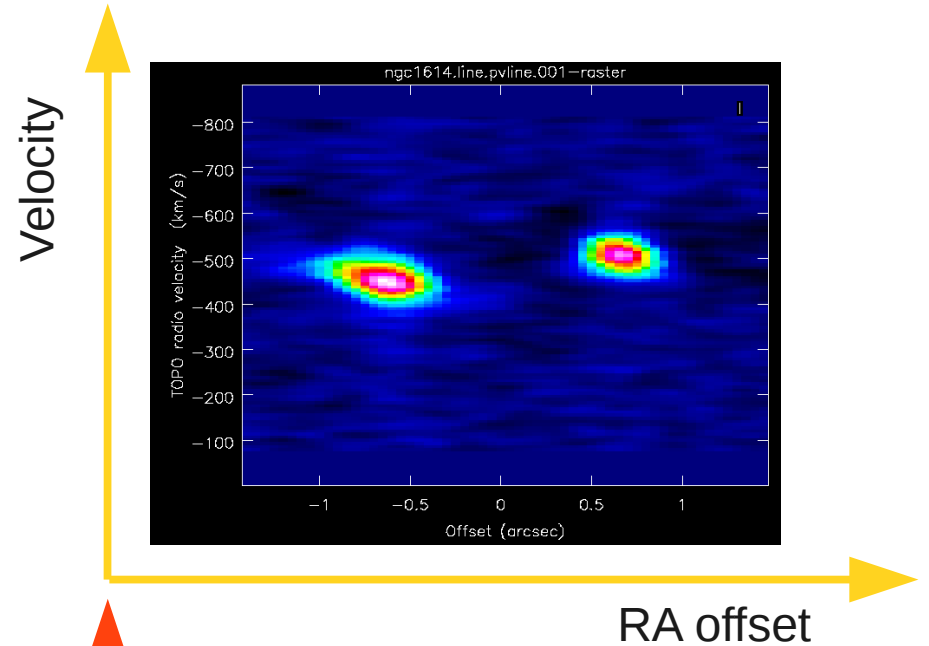
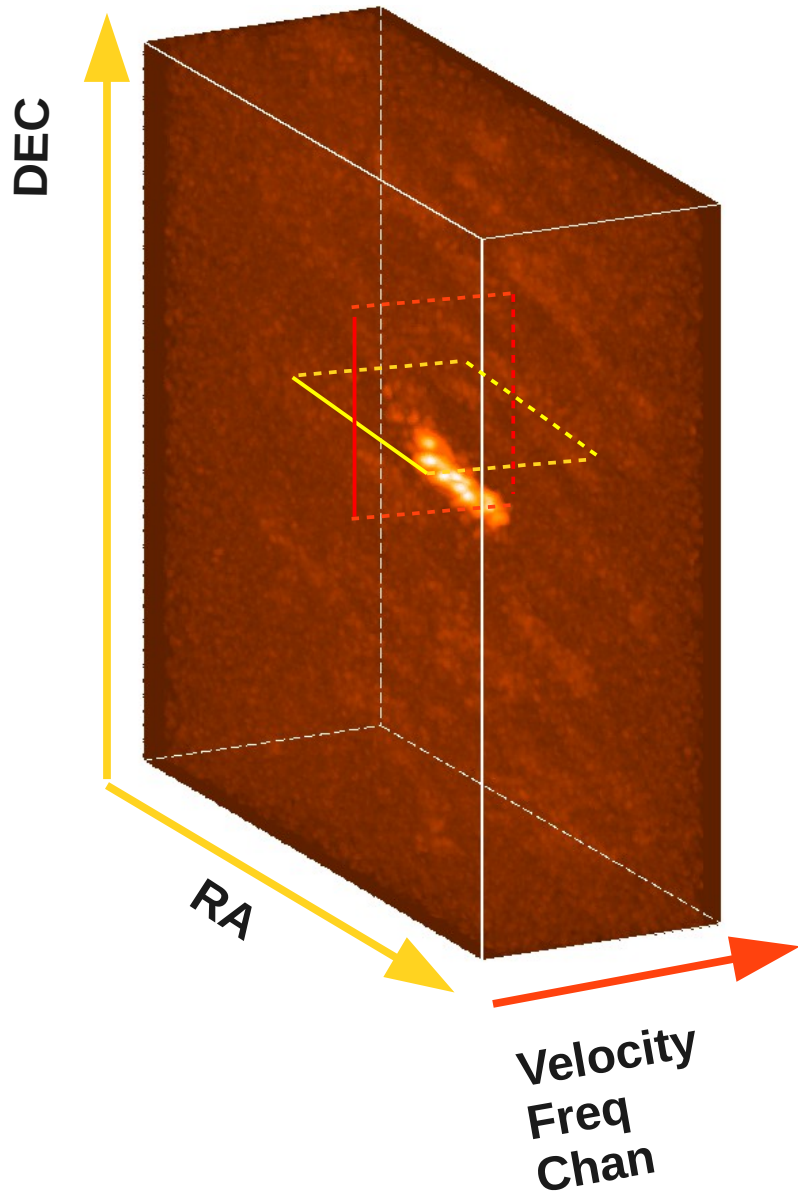
Show how the spatial distribution of the line emission changes with freq/velocity

Movies are also used for visualization

RA

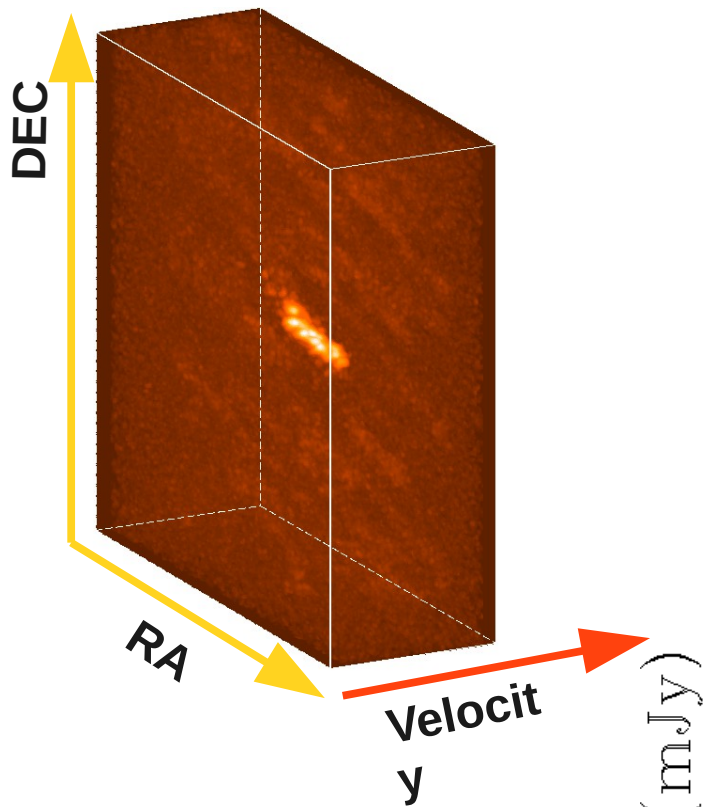
PV diagrams

Slices along spatial dimension

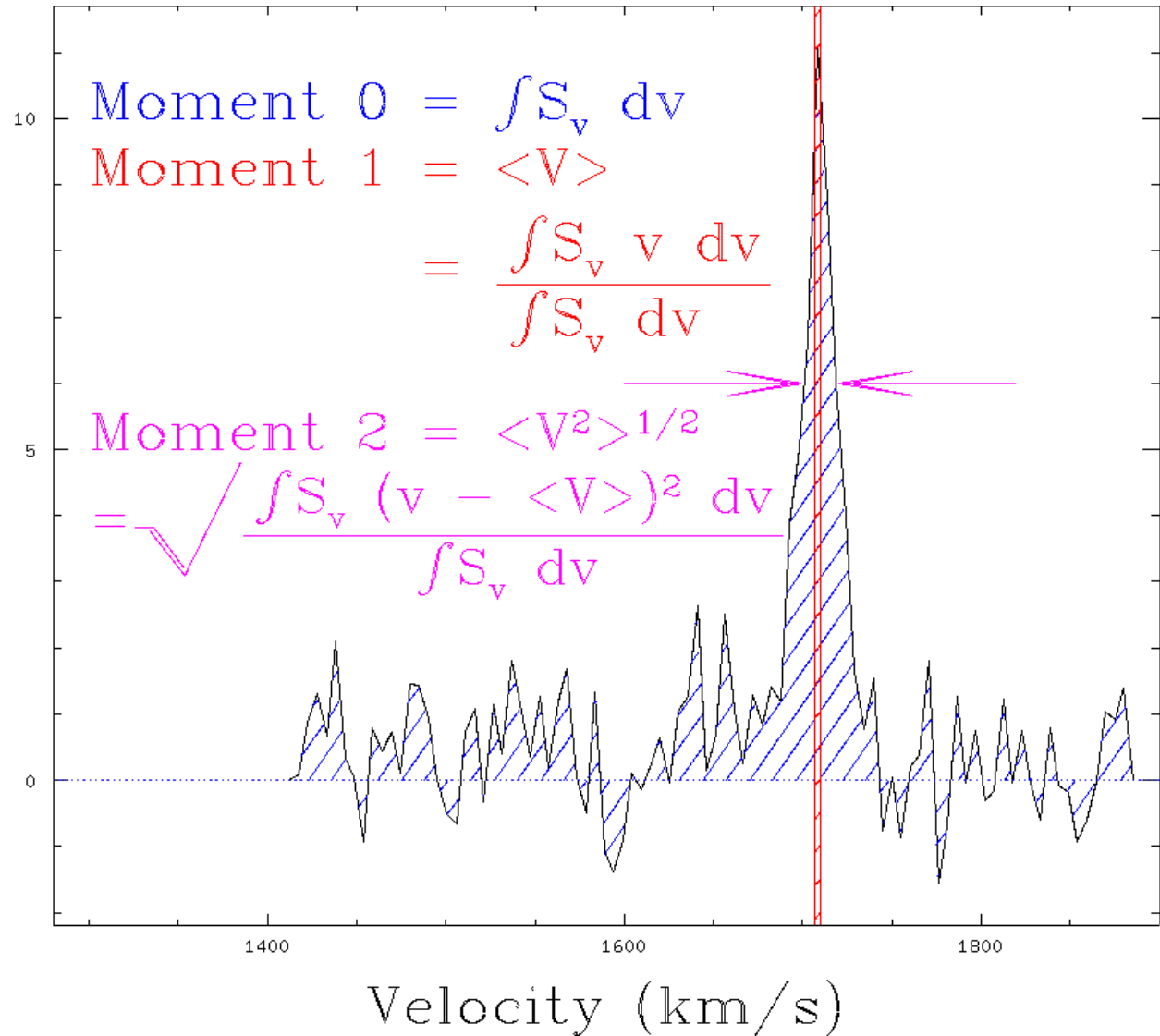


Moment maps

Integration along the velocity axis



Flux = S_v (mJy)



Integrated line intensity
Moment 0

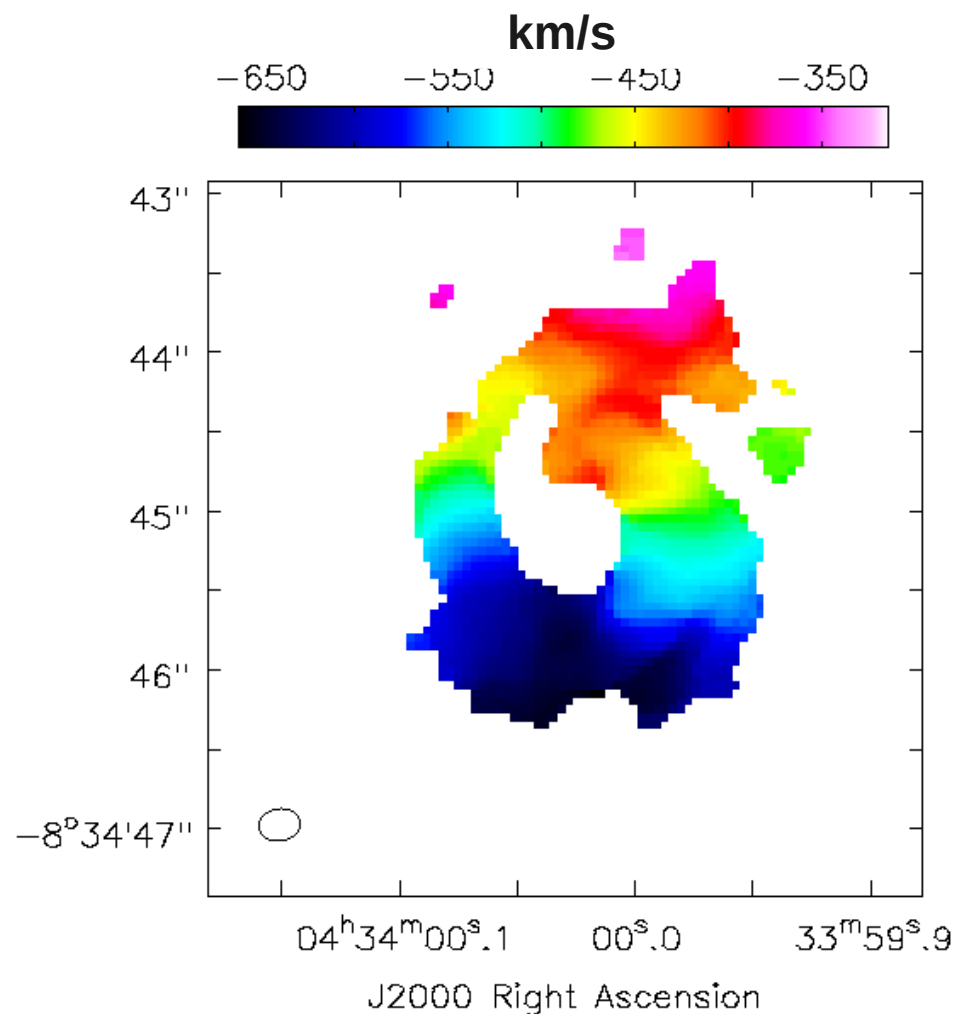
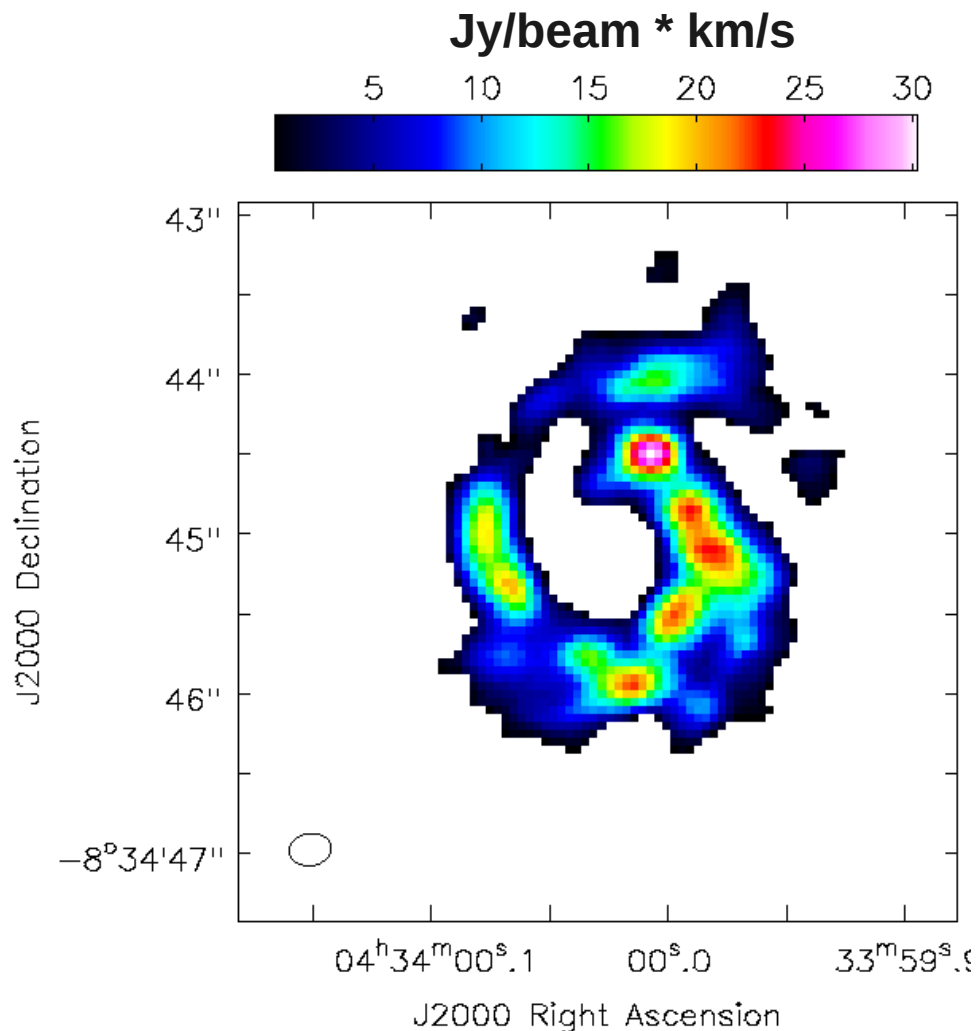
Velocity field
Moment 1

Velocity dispersion
Moment 2

Moments maps

Moment 0 $\int S_v dv$

Moment 1 $\frac{\int S_v v dv}{\int S_v dv}$



Moment 0 : each pixel shows the integrated intensity over the velocity axis

Moment 1 : each pixel shows the intensity-weighted velocity