

Rotational signatures of disks in massive star formation

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Emmy Noether-Programm

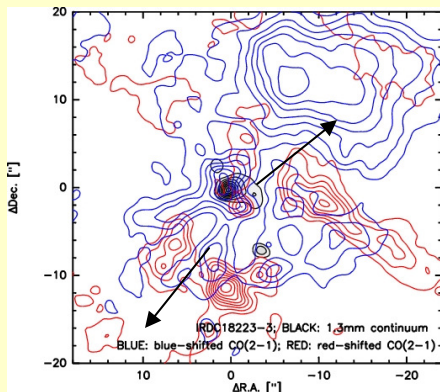
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We have obtained multiple data sets from the SMA, PdBI, and IRAM 30m telescope of the Infrared Dark Cloud IRDC18223-3 and the High-Mass Protostellar Object IRAS18151-1208 in order to look for clues regarding the role of rotation and disks in high mass star formation. Because IRAS 18151-1208 is at a later evolutionary stage than IRDC 18223-3, these two objects allow us to compare the central-most regions surrounding the embedded continuum source at two different periods in the formation process. Toward both regions we see rotational structures perpendicular to molecular outflows. Similarities and differences are discussed in the context of core and disk evolution.

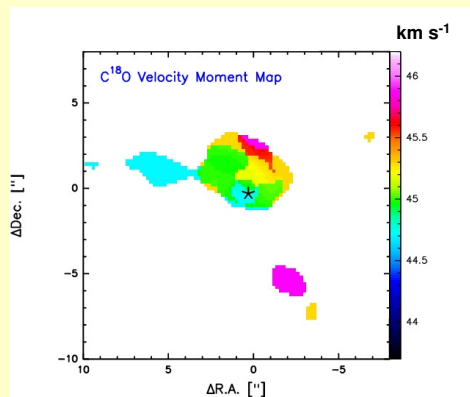
IRDC 18223-3

- *Distance: 3.7kpc
- *C¹⁸O central line width: 1.7km/s
- *Dynamical outflow age: ~50,000 years



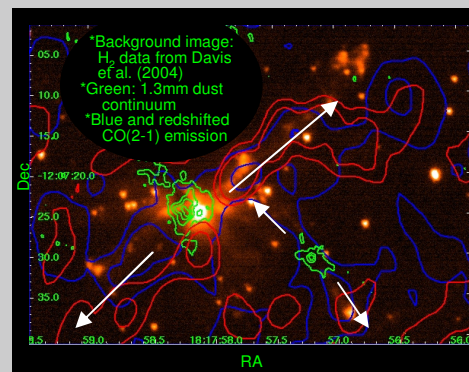
- *Blue and red highlight the blue and redshifted CO(2-1) emission. Black indicates 1.3mm dust continuum.
- *Presence of blue and red shifted emission on both sides of continuum peak indicates outflow is nearly in the plane of the sky.

- *C¹⁸O 1st Moment Map indicating velocity gradient roughly perpendicular to the outflow axis.
- *The 1.3mm dust continuum peak is indicated by the star symbol.



IRAS 18151-1208

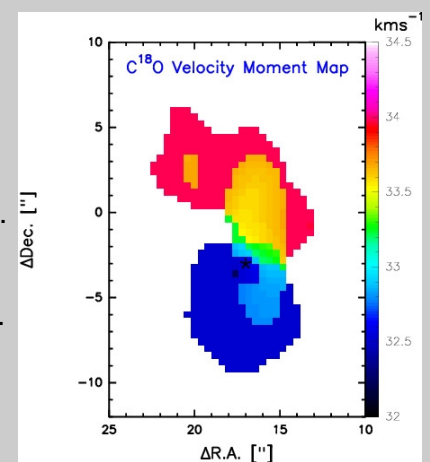
- *Distance: 3.0kpc
- *Luminosity: $10^{4.3} L_{\odot}$
- *C¹⁸O central line width: 2.9km/s
- *Dynamical outflow age: ~70,000 years
- *Collimation factor: 2.1



- *Elongation of the central source in the dust continuum is seen perpendicular to the outflow.
- *Secondary continuum peak may be the driving source of the outflow in the northeast-southwest direction.

- *Again we see blue and red shifted CO(2-1) emission on either side of the continuum peak indicating that the outflow is roughly in the plane of the sky.

- *Possible rotational structure seen in C¹⁸O.
- *The 1.3mm dust continuum peak is indicated by the star symbol.



- * IRDC 18223-3 and IRAS 18151-1208 represent two different stages in the massive star formation process.
- * Both sources have outflows nearly in the plane of the sky and show a velocity gradient perpendicular to the outflow axis. Additionally, we see elongation of the continuum emission in IRAS 18151-1208 perpendicular to the outflow.
- * While similar chemical species are present in both sources, IRDC 18223-3 exhibits narrower central line widths, confirming its younger evolutionary stage. However, we derive a puzzling large dynamical outflow age for this source.