3D Visualization and Detection of Outflows From Young Stars

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Molecular Cloud

Outflows

HH knots

HH jet

Protostar

Outflow lobes

~ 1 pc

Molecular Cloud

Note: not drawn to scale.

Outflows across wavelengths...

HH knots far from source mark the ends of bipolar "jets" or "outflows"
How to find outflows in radio cubes...

Examining individual spectra...

Examining individual slices...
3D Visualization
A COMPLETE Survey of Velocity Features in Perseus

1. Visualize $^{12}$CO data cube in 3D Slicer
   - Mark high velocity points in 3D space, and export to astronomical software

2. Identify outflows and calculate statistics
Outflow Identification

Red Shifted points
Blue Shifted points
HH Objects
c2d Sources
Known Outflow Sources
IRAS Sources

And many more...

$^{12}$CO data beam size
Perseus Outflows

Initial results: • 35 new potential outflows
• 4 extensions on known outflows

Also 7 potential new shells interacting with the cloud...

Red Shifted points
Blue Shifted points
HH Objects
New outflows
Known outflows
Many small known outflows
Outflow extensions
IRAS Sources
Known Outflow Sources

Borkin, et al. 2007 in prep
Perseus Shells
Next step: segmentation
For more information...

On Astronomical Medicine research, go to our website at:

http://am.iic.harvard.edu

*Also check-out the AM Demo table for more information and live demos*

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