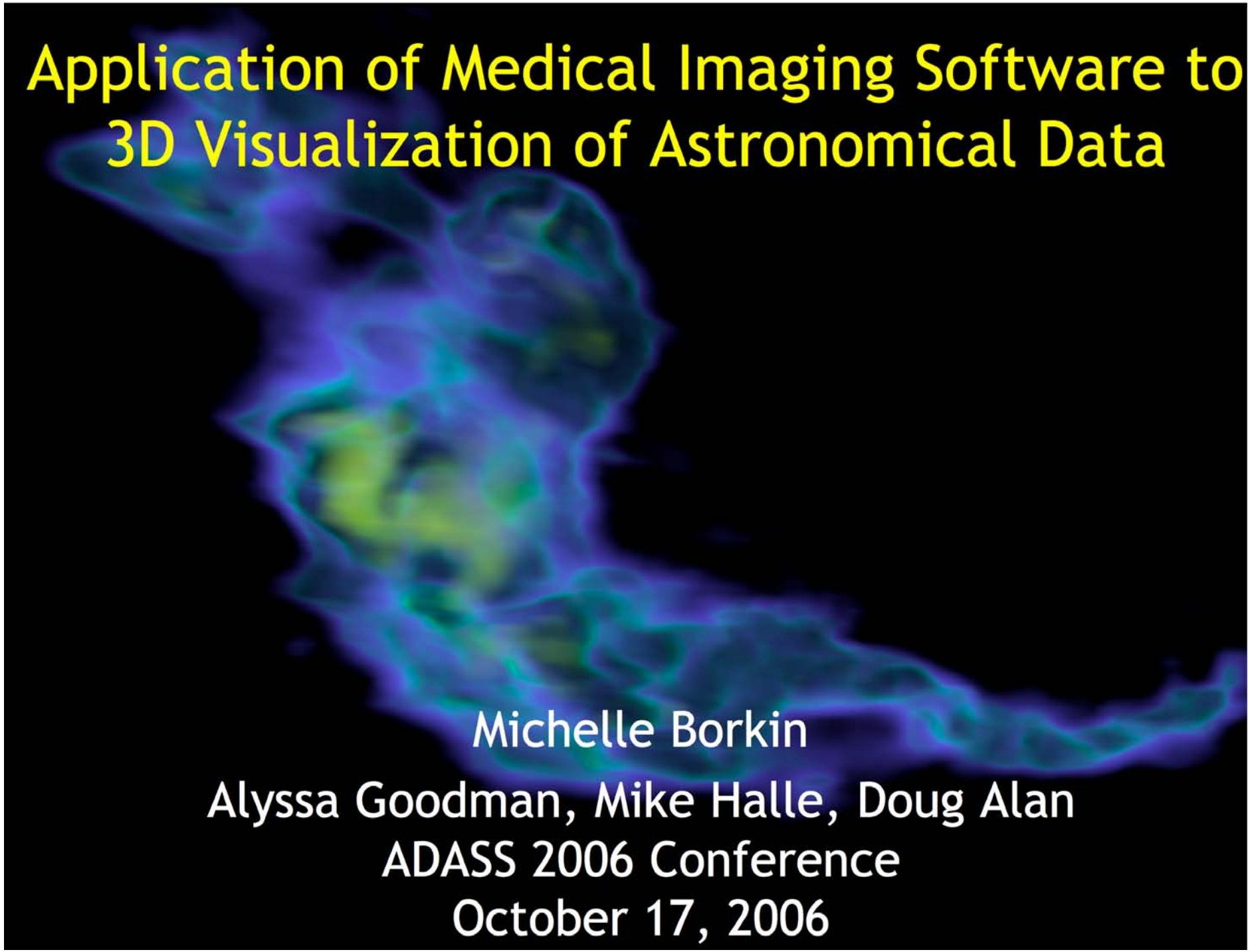
Application of Medical Imaging Software to 3D Visualization of Astronomical Data



Michelle Borkin

Alyssa Goodman, Mike Halle, Doug Alan

ADASS 2006 Conference

October 17, 2006

Astronomy Visualization

IDL

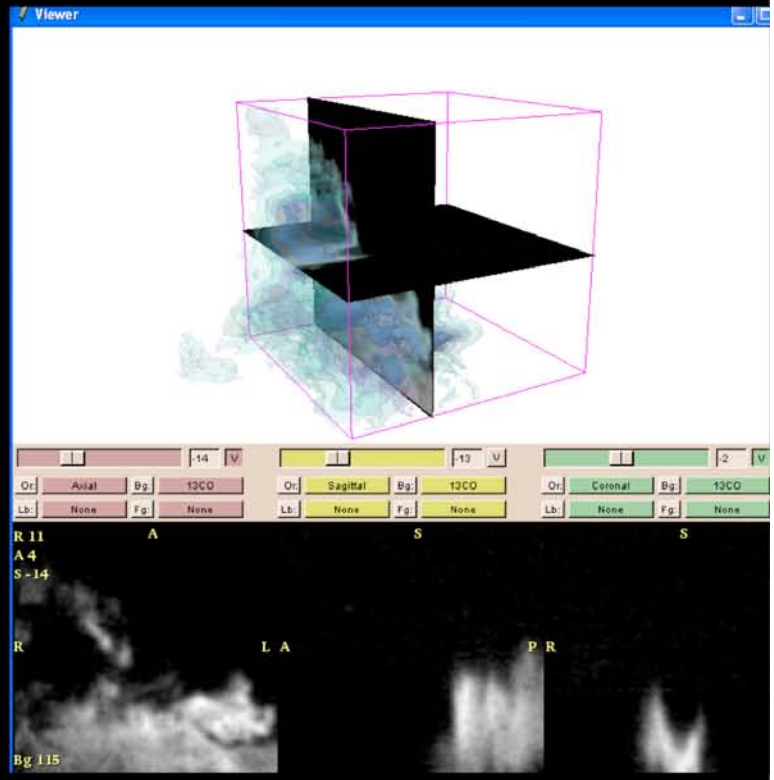
DS9

Karma

GAIA

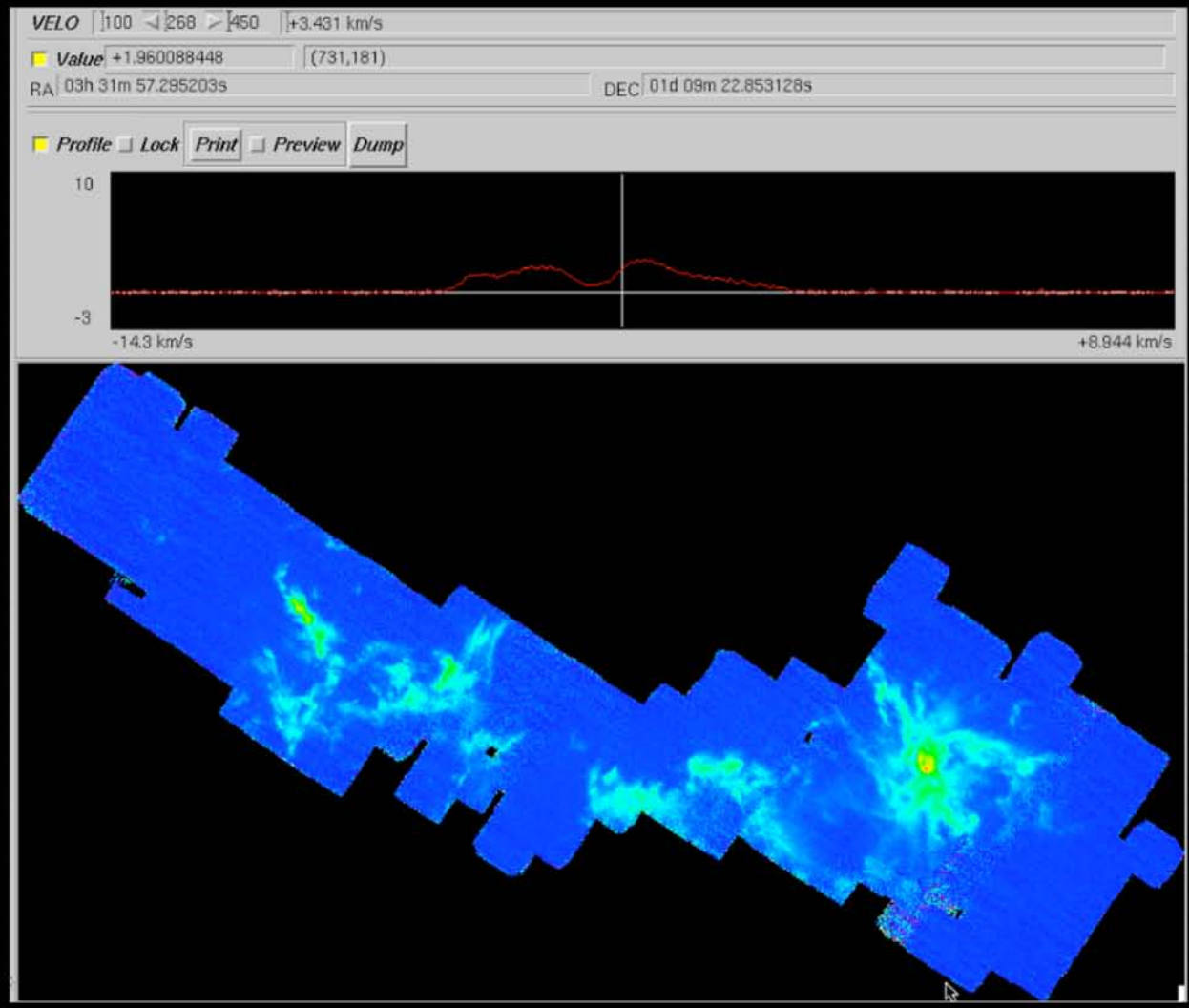
Aipsview

3D Slicer



And more...

Channel Map Movie



Movie available for download at: http://www.cfa.harvard.edu/COMPLETE/astromed/adass/

AstroMed at the Initiative in Innovative Computing (IIC) at Harvard

Astronomy → Imaging ← Medicine

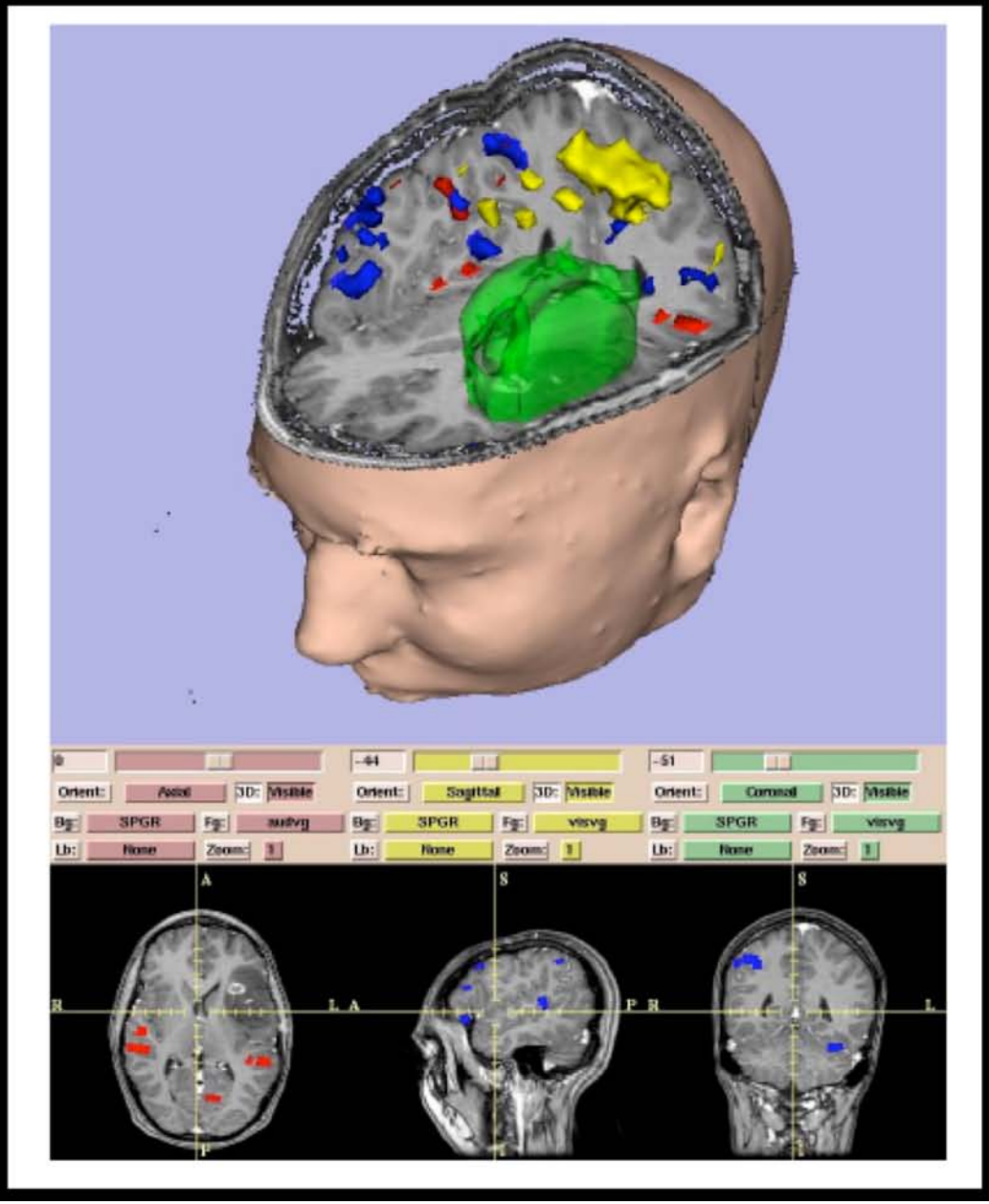
Image Analysis

Big Data Sets

Globally Distributed Data

- Initiative in Innovative Computing
- Harvard-Smithsonian Center for Astrophysics
- Surgical Planning Laboratory at Brigham and Women's Hospital
- Harvard Medical School
- Martinos Center for Biomedical Imaging at Mass. General Hospital

3D Slicer


-44
-51
Orient:
Axial
3D:
Visible
Orient:
Sagittal
3D:
Visible
Orient:
Coronal
3D:
Visible
Bg:
SPGR
Fg:
Bg:
SPGR
Fg:
Bg:
SPGR
Fg:
Lb:
None
Zoom:
1
Lb:
None
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1
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None
Zoom:
1
A
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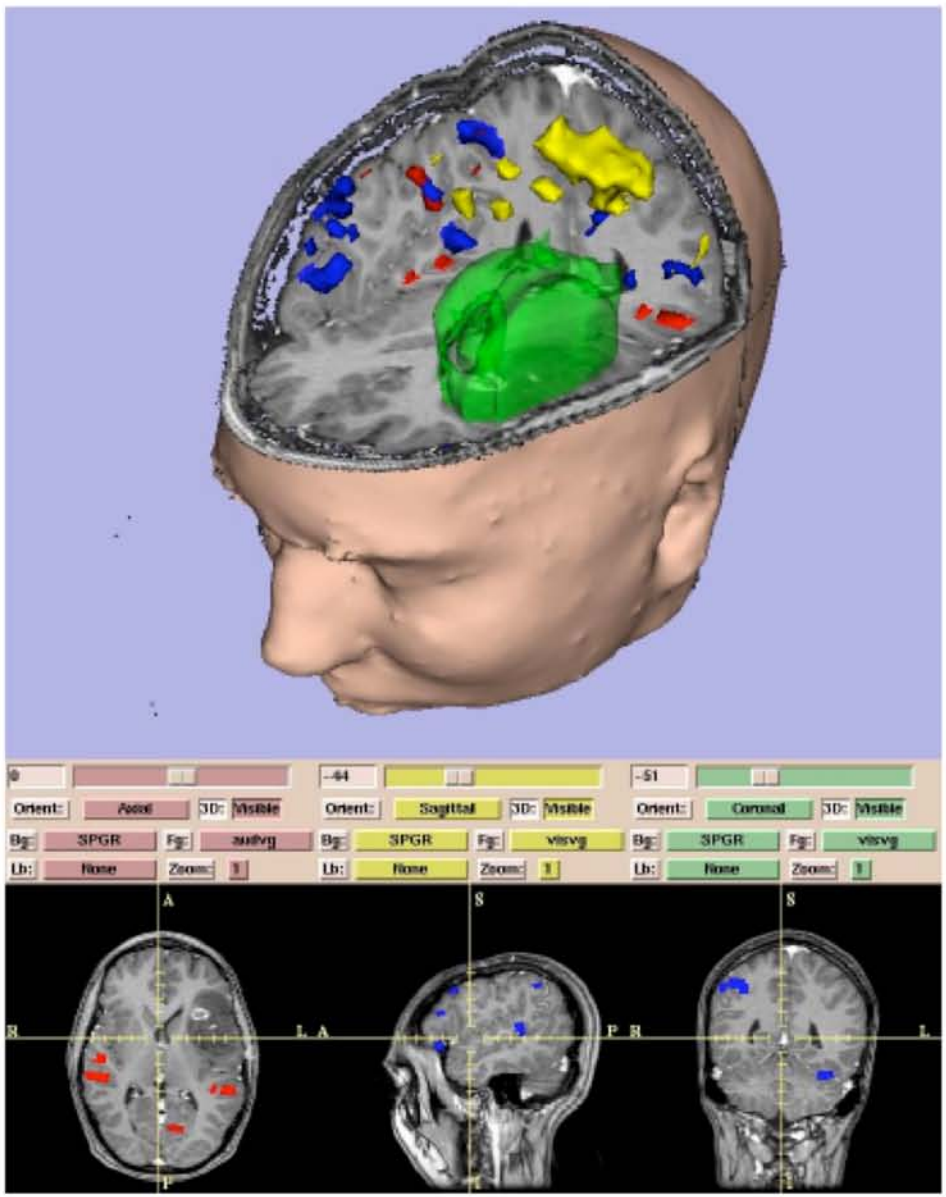
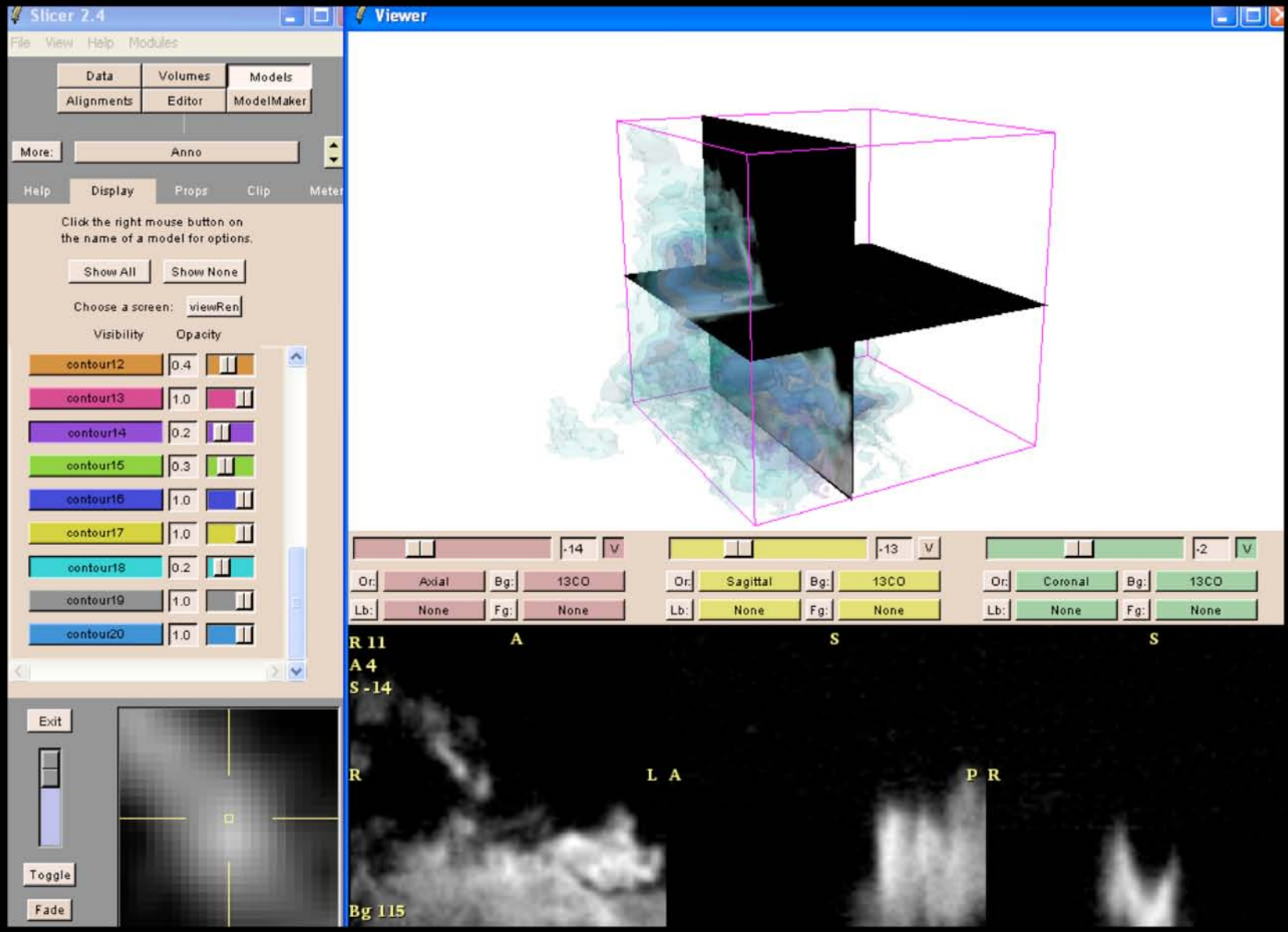
R
L A
P R
L
P

3D Slicer



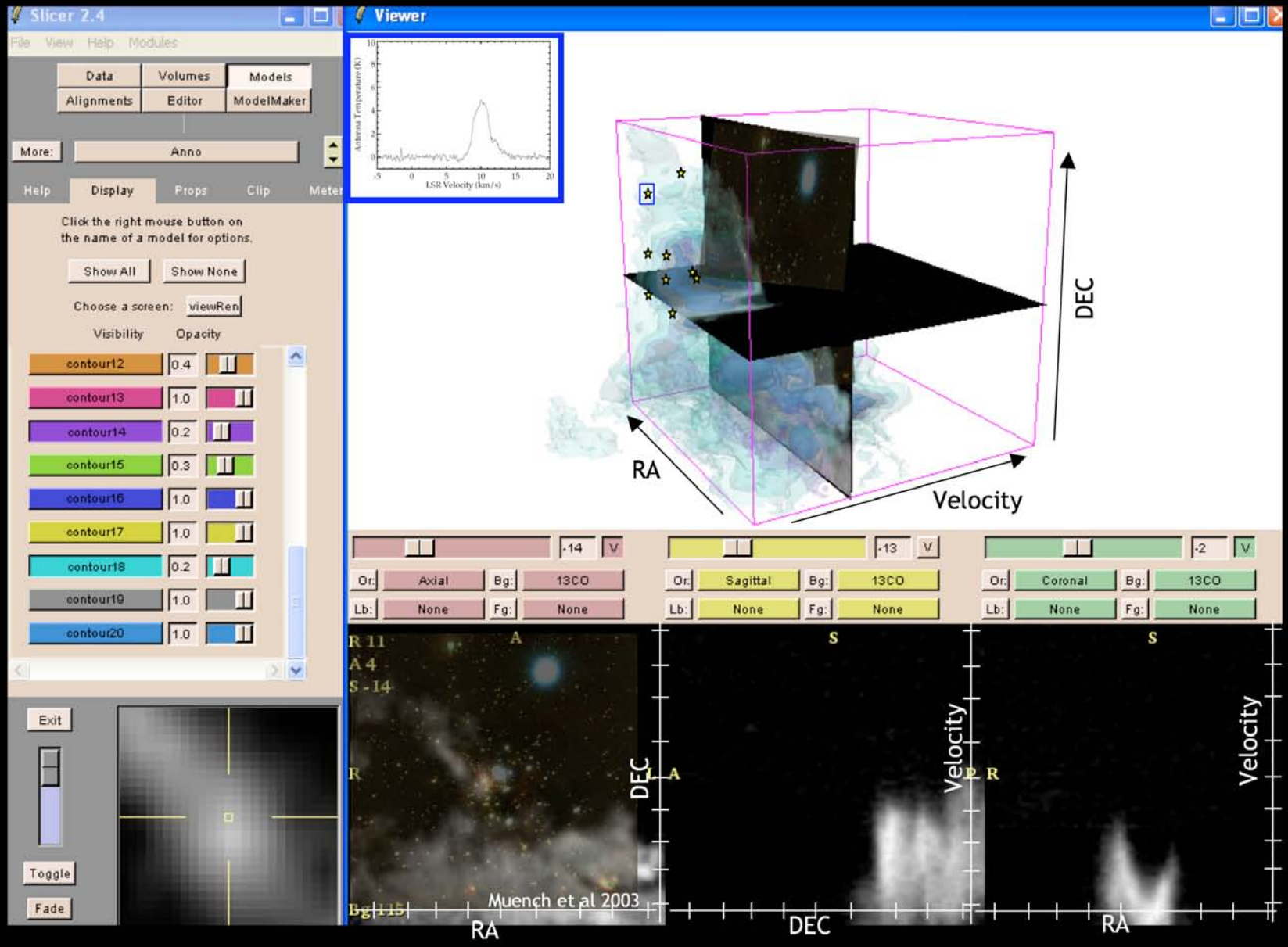
- Open source
- Modular (easy to contribute)
- Dedicated development staff
- Widely used in the medical community

3D Slicer Demo Movie



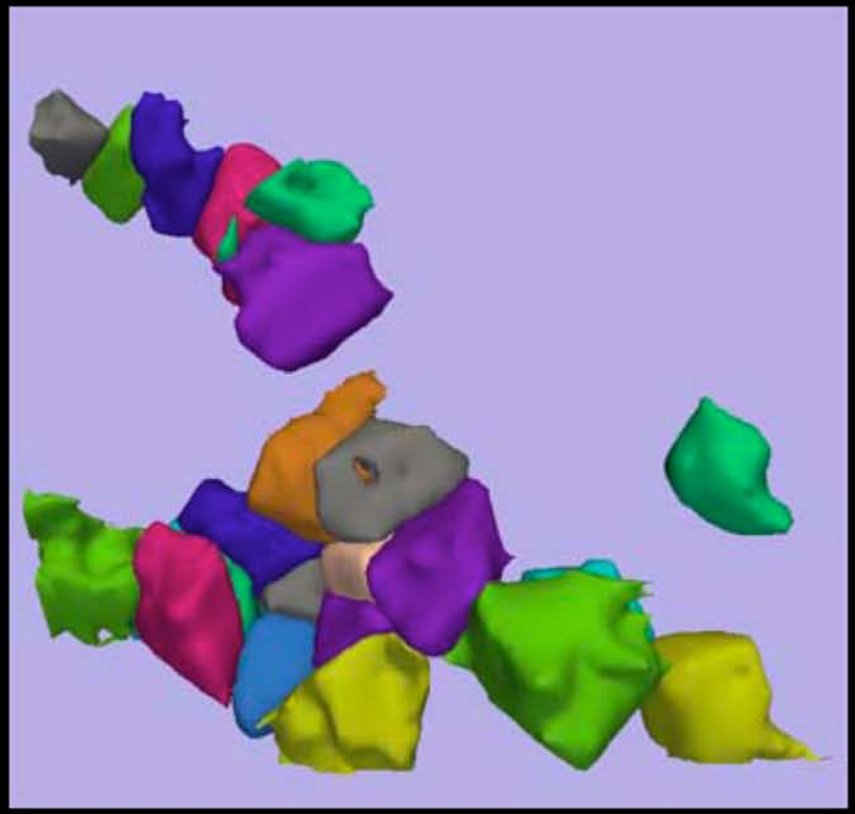
Movie available for download at: http://www.cfa.harvard.edu/COMPLETE/astromed/adass/

3D Slicer Demo Movie

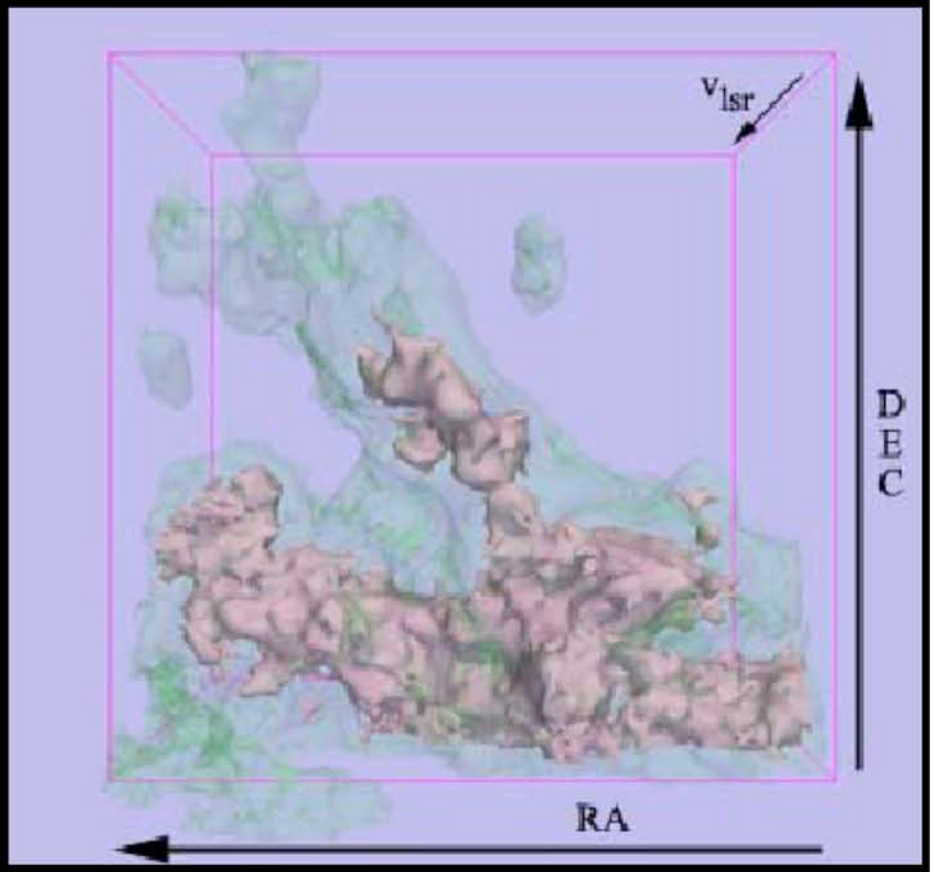


Movie available for download at: http://www.cfa.harvard.edu/COMPLETE/astromed/adass/

3D Slicer - Segmentation

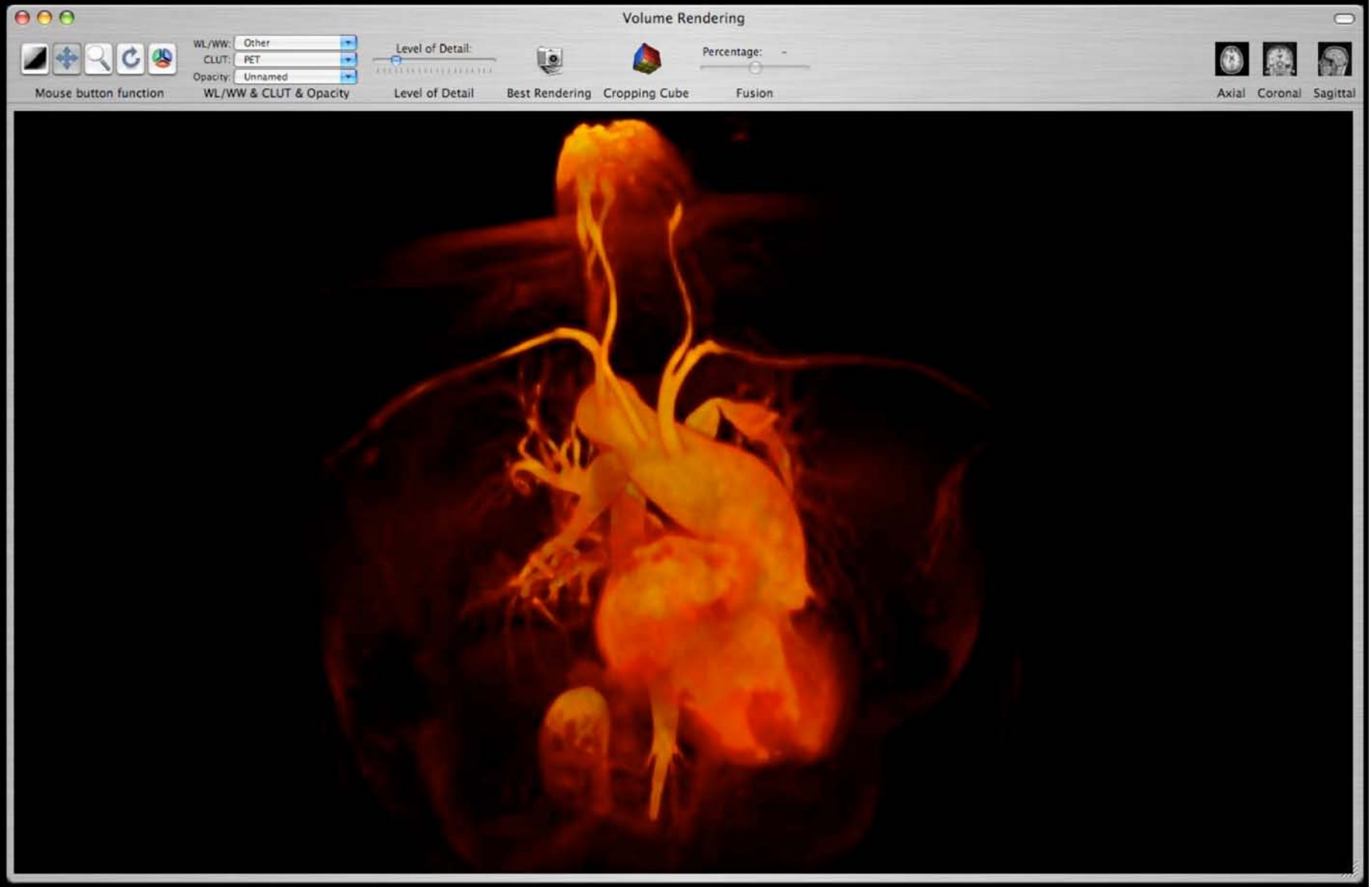


CLUMPFIND

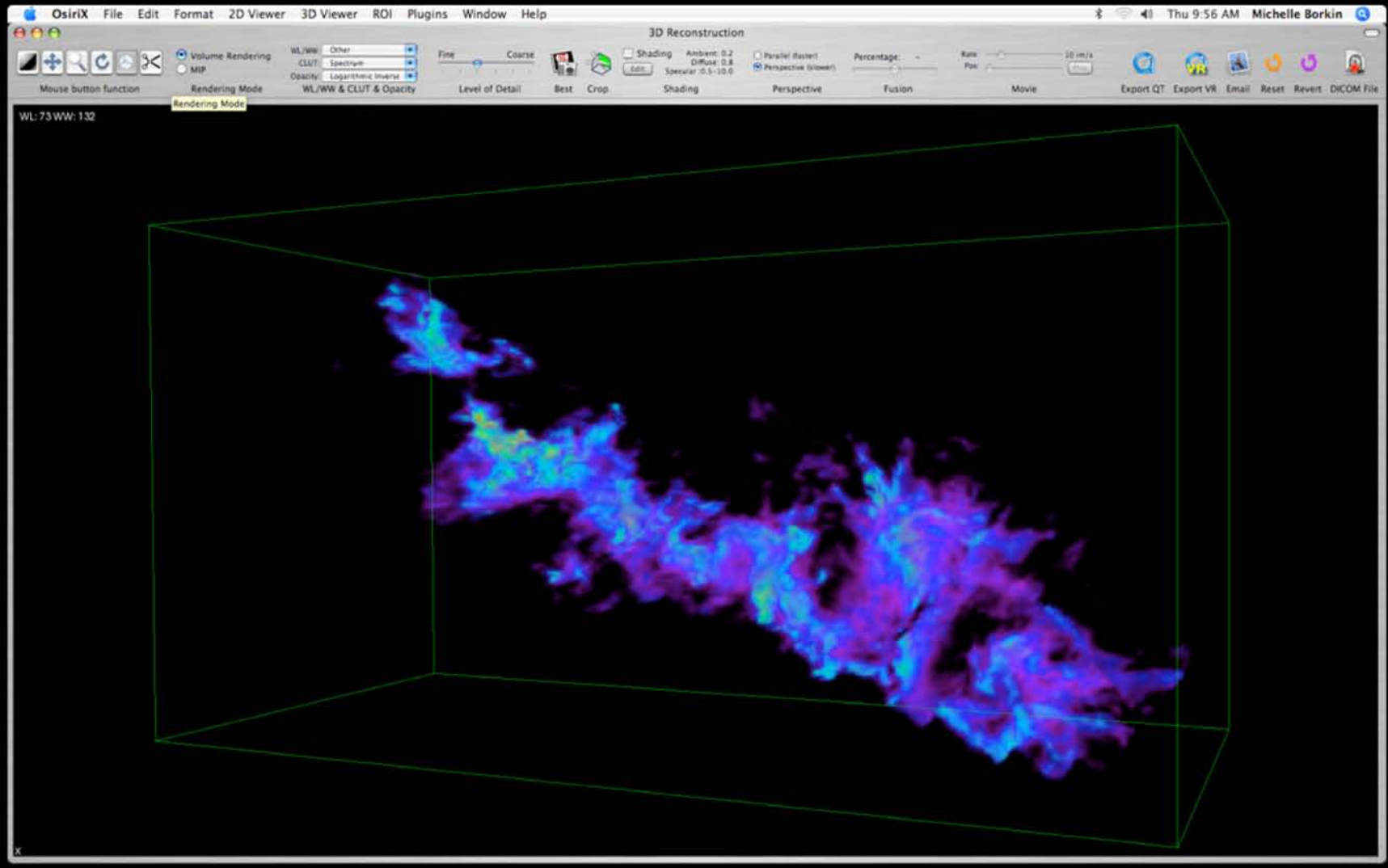


3D Slicer

OsiriX

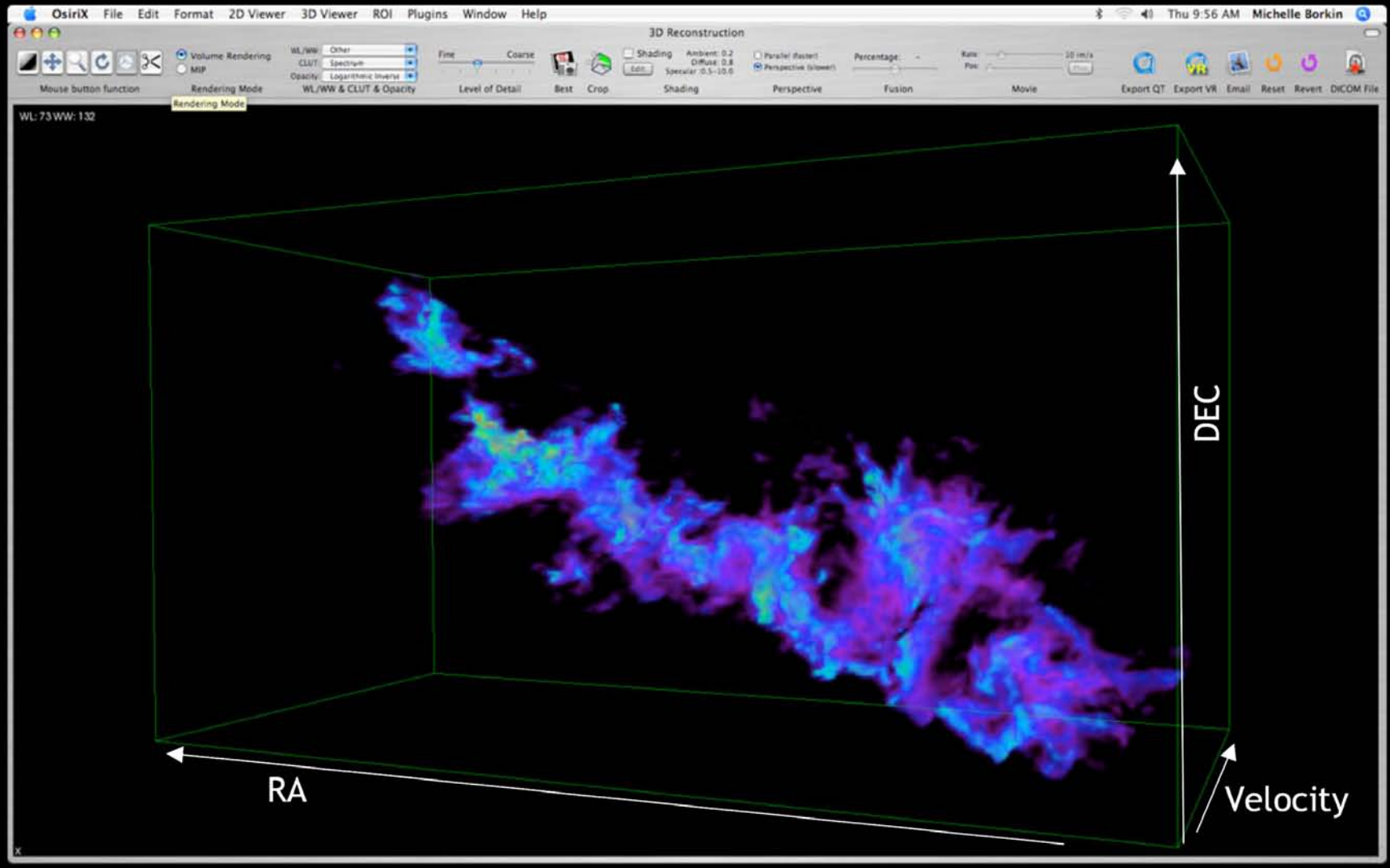

Volume Rendering
WL/WW: Other
CLUT: PET
Opacity: Unnamed
Level of Detail:
Percentage:
Mouse button function
WL/WW & CLUT & Opacity
Level of Detail
Best Rendering
Cropping Cube
Fusion
Axial
Coronal
Sagittal

OsiriX Demo Movie



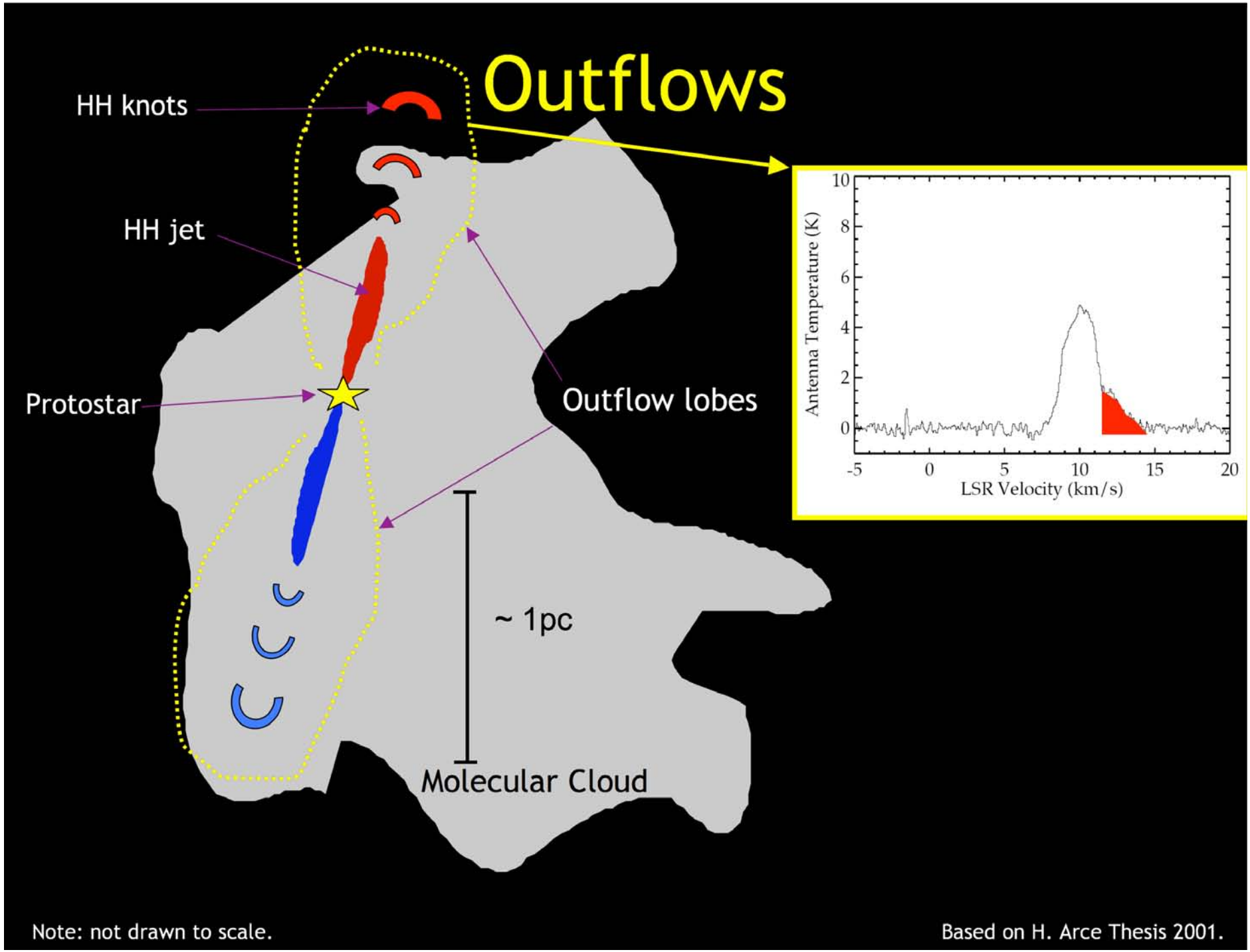
Movie available for download at: http://www.cfa.harvard.edu/COMPLETE/astromed/adass/

OsiriX Demo Movie



Movie available for download at: http://www.cfa.harvard.edu/COMPLETE/astromed/adass/

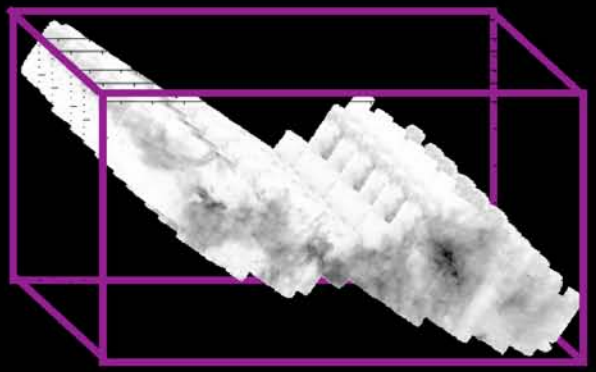
Outflows



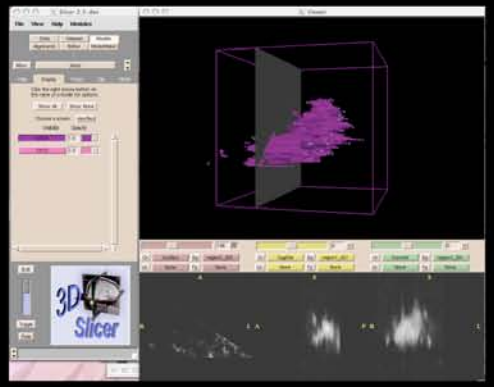
Note: not drawn to scale.

Based on H. Arce Thesis 2001.

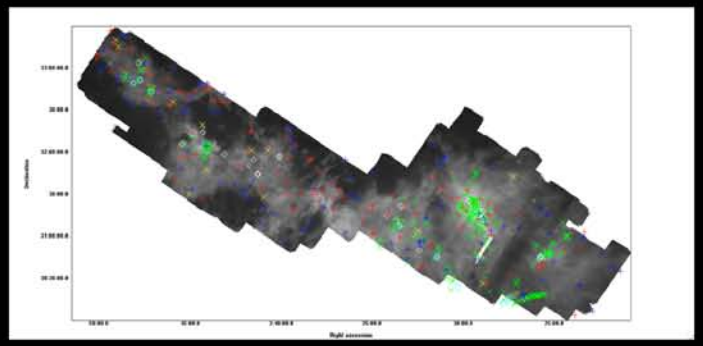
A COMPLETE Survey of Velocity Features in Perseus



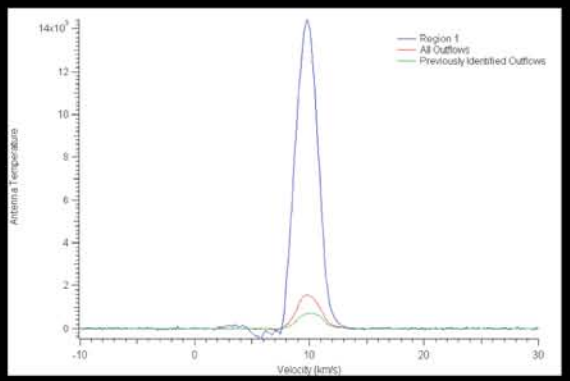
Visualize ^{12}CO data cube in 3D Slicer



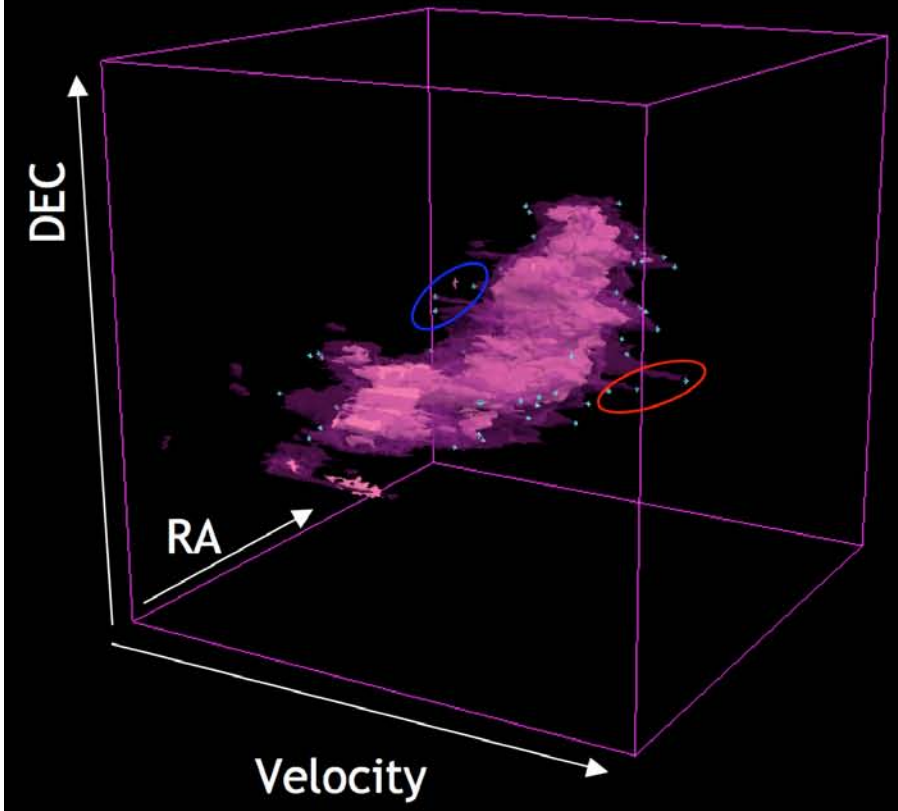
Mark high velocity points in 3D space, and export to astronomical software

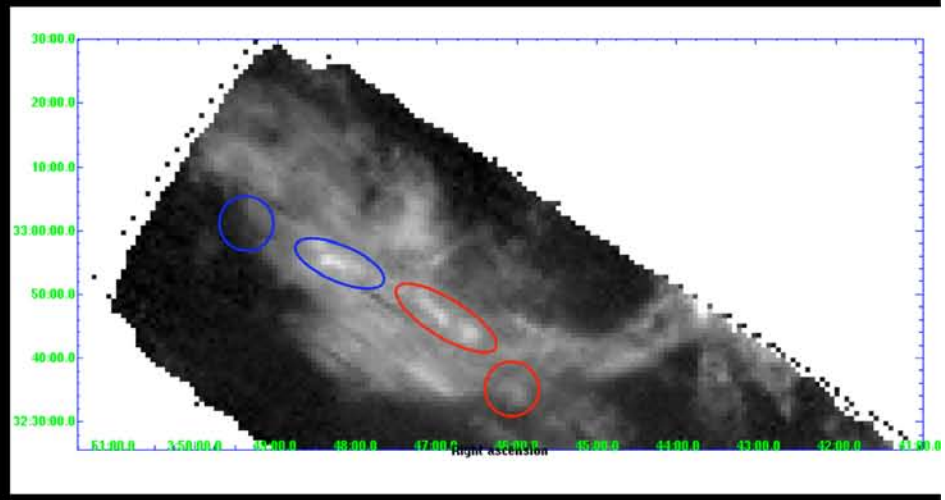


Identify outflows and calculate statistics



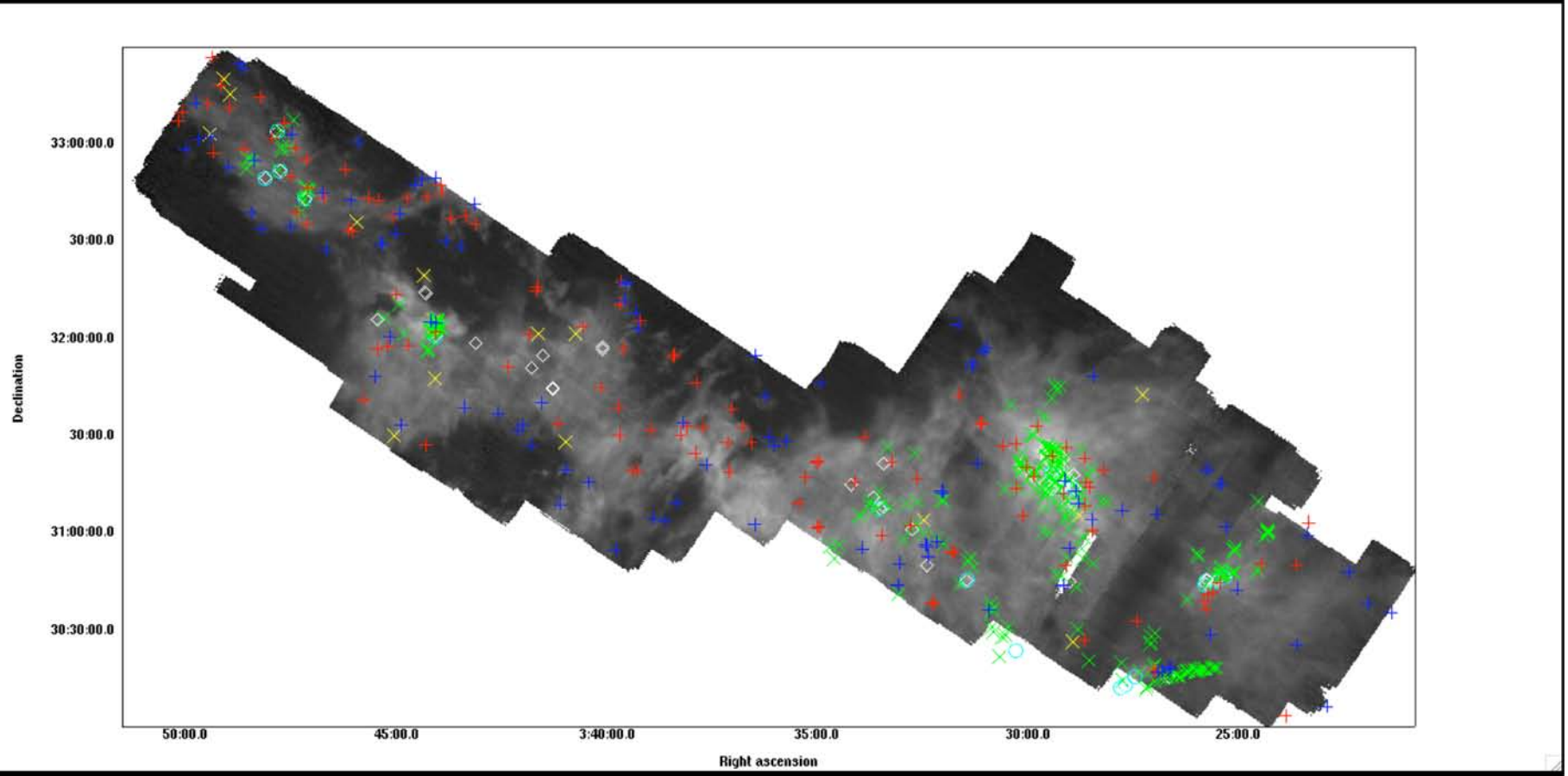
Outflow Identification in B5





RA-DEC integrated map of 12CO

Outflow Identification



Red Shifted points

Blue Shifted points

New outflows

HH Objects

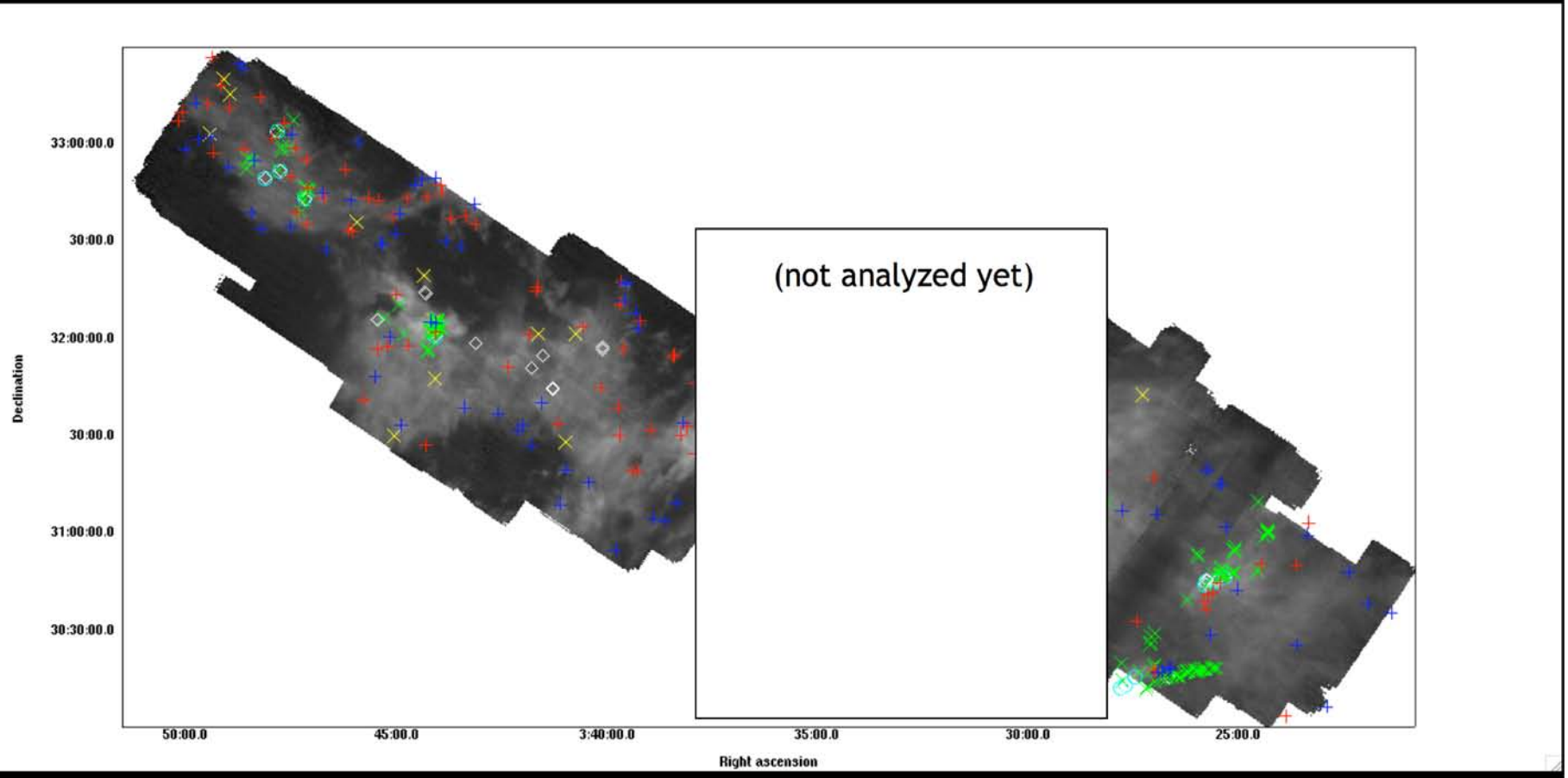
SCF points

Known outflows or outflow regions

IRAS Sources

Known Outflow Sources

Outflow Identification



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New outflows

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SCF points

Known outflows or outflow regions

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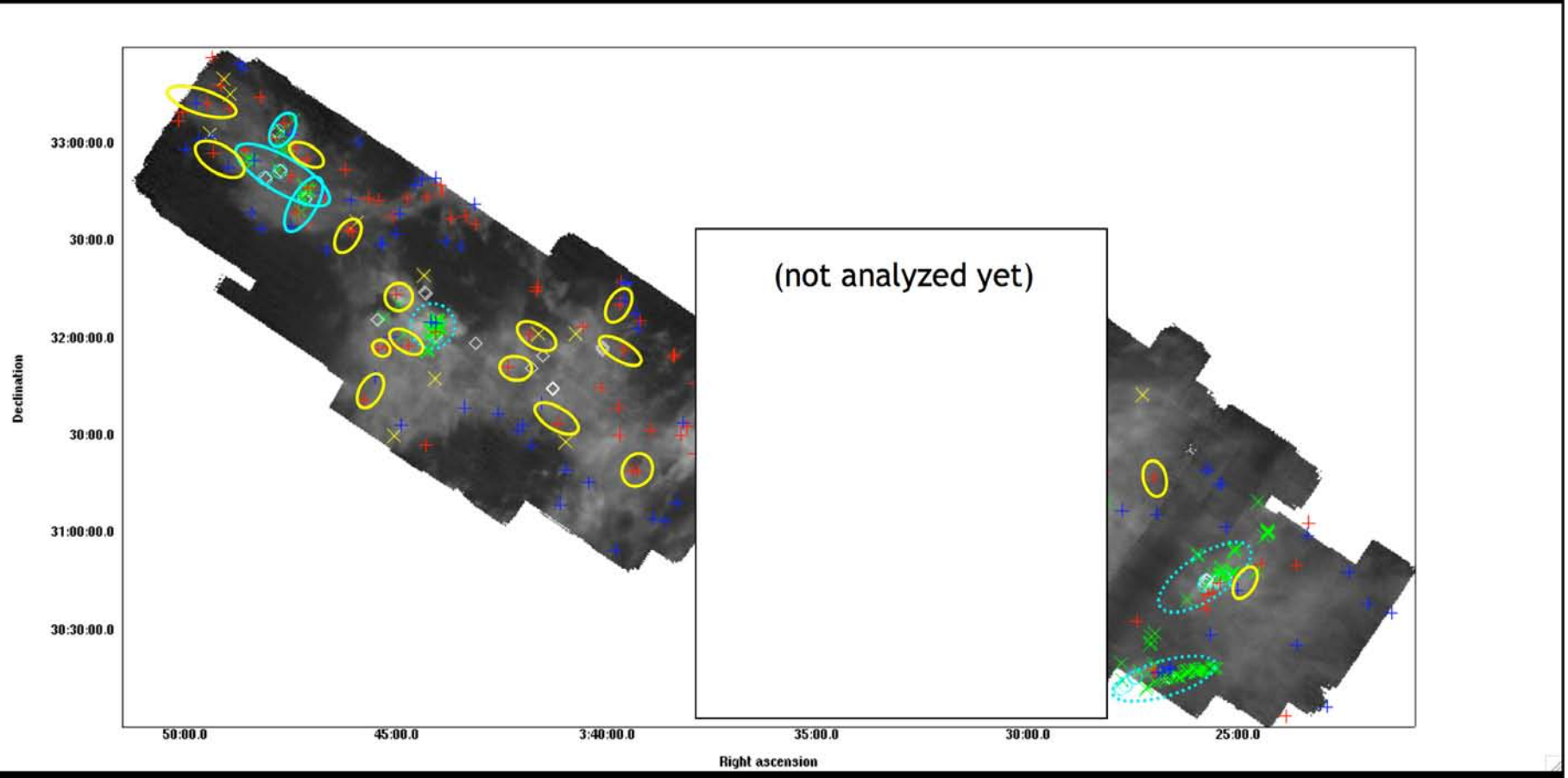
Known Outflow Sources

Outflow Identification



Red Shifted points

Blue Shifted points

New outflows

HH Objects

SCF points

Known outflows or outflow regions

IRAS Sources

Known Outflow Sources

Future Research

- 3D Slicer for Astronomy: the ability to run segmentation algorithms, more detailed display options (ex. spectra and average spectra), tools for data quantification, and interoperability with online data bases (ex. NVO).

- Use of 3D Slicer: find velocity features such as outflows, determine other physical properties of clouds such as the number of clumps (and their size, location, and mass) in star forming regions, and visualization of algorithm output.

For more information, go to http://www.iic.harvard.edu