

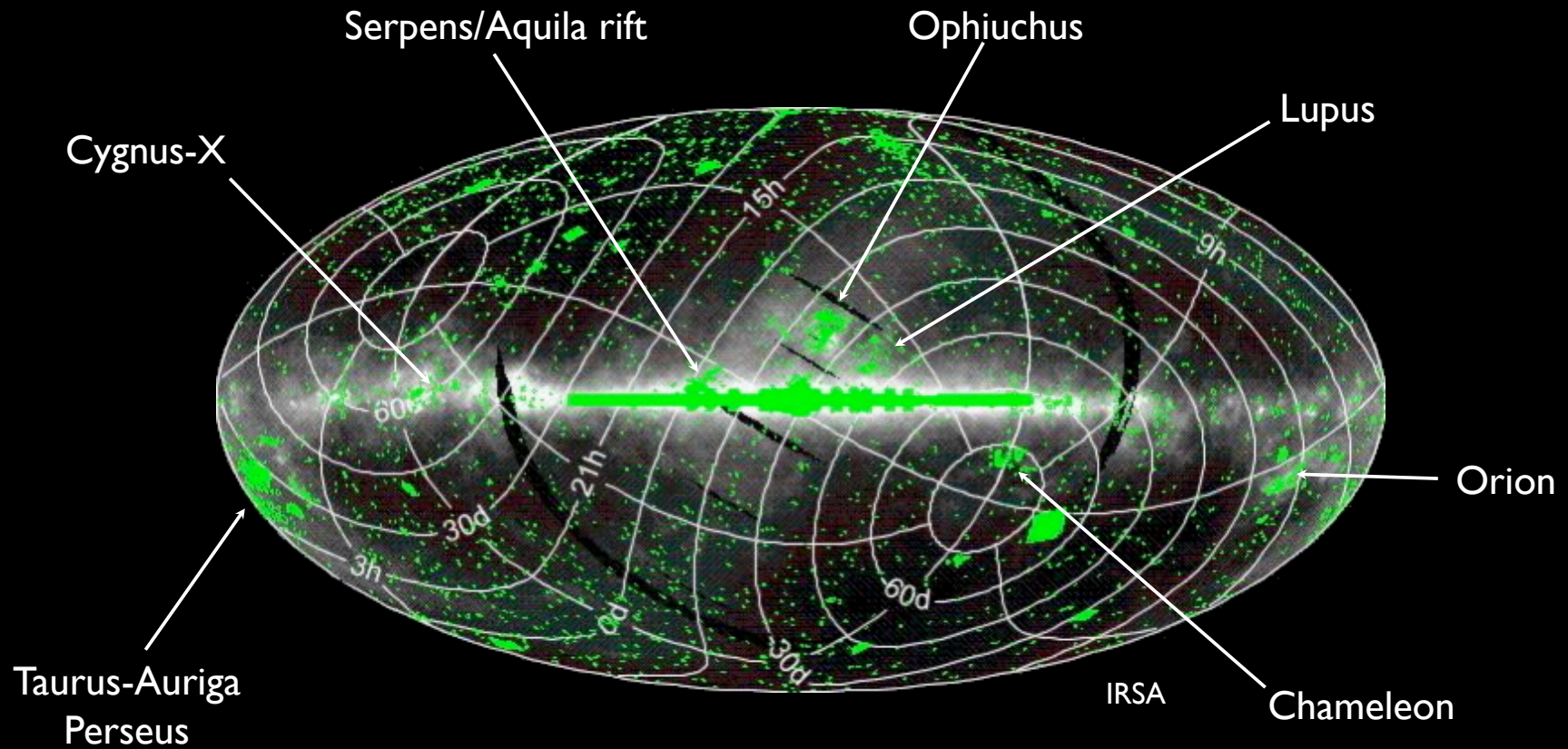
Spitzer observations of circumstellar disks in the Galactic mid-plane.

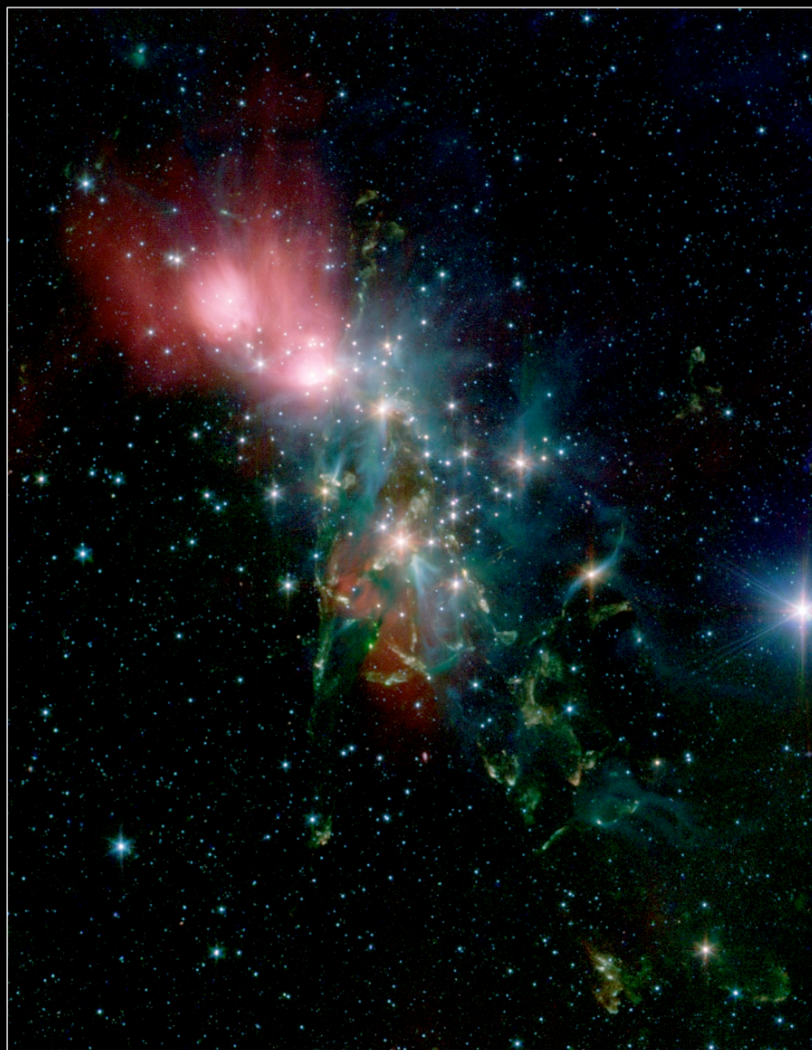


Thomas Robitaille

Marilyn Meade, Brian Babler, Barbara Whitney, Katharine Johnston, Rémy Indebetouw, Martin Cohen, Matt Povich, Marta Sewilo, Bob Benjamin, and Ed Churchwell.

Spitzer observations of SF regions



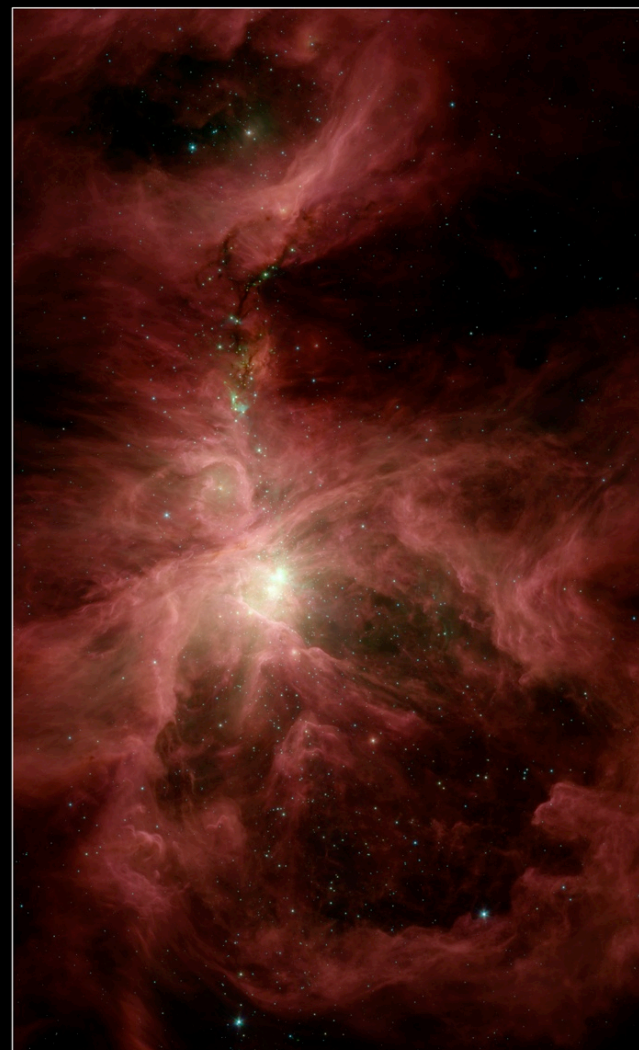


Star-Forming Region NGC 1333

NASA / JPL-Caltech / R. Gutermuth (Harvard-Smithsonian Center for Astrophysics)

Spitzer Space Telescope • IRAC

ssc2005-24a

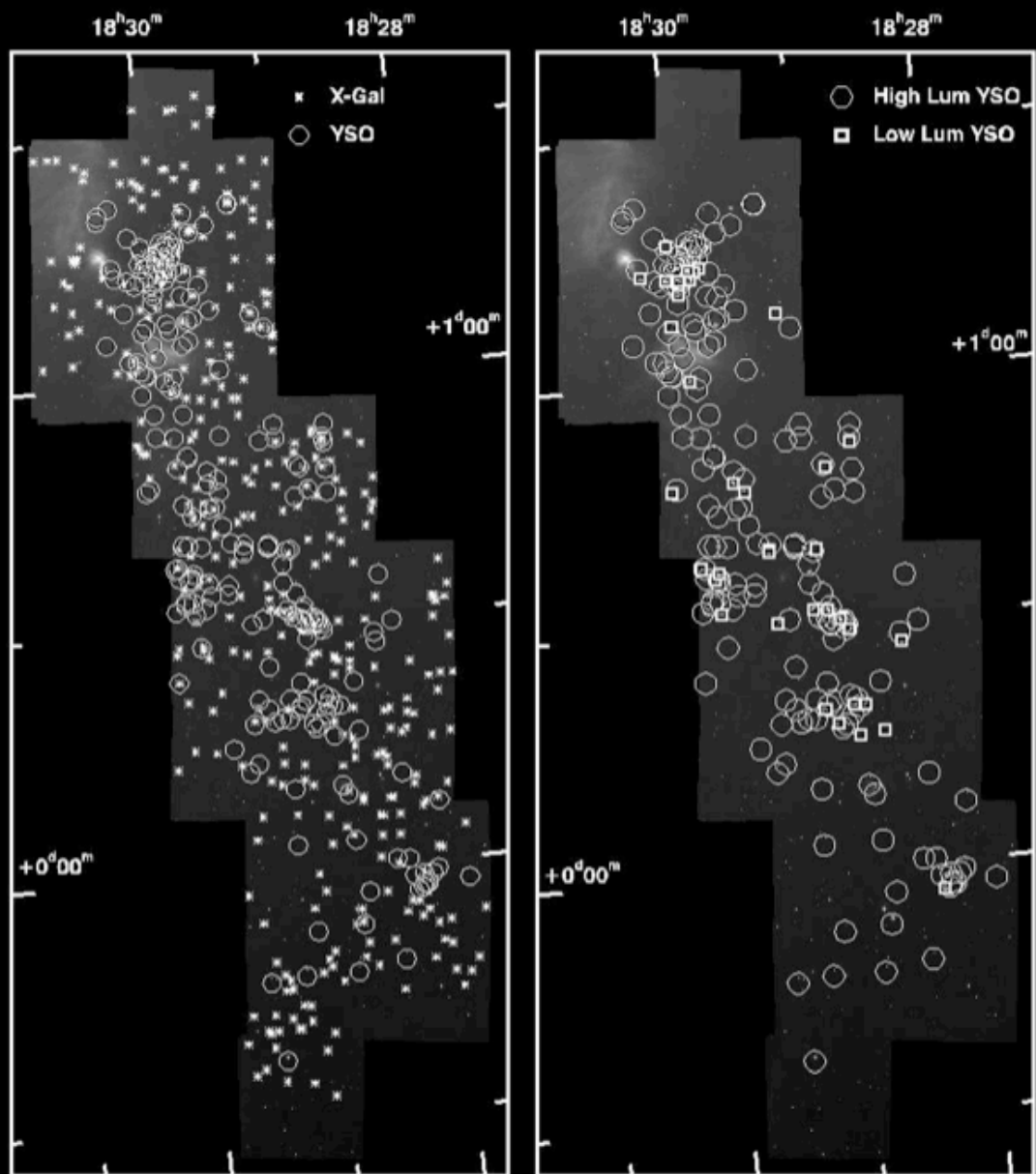


The Sword of Orion (M42)

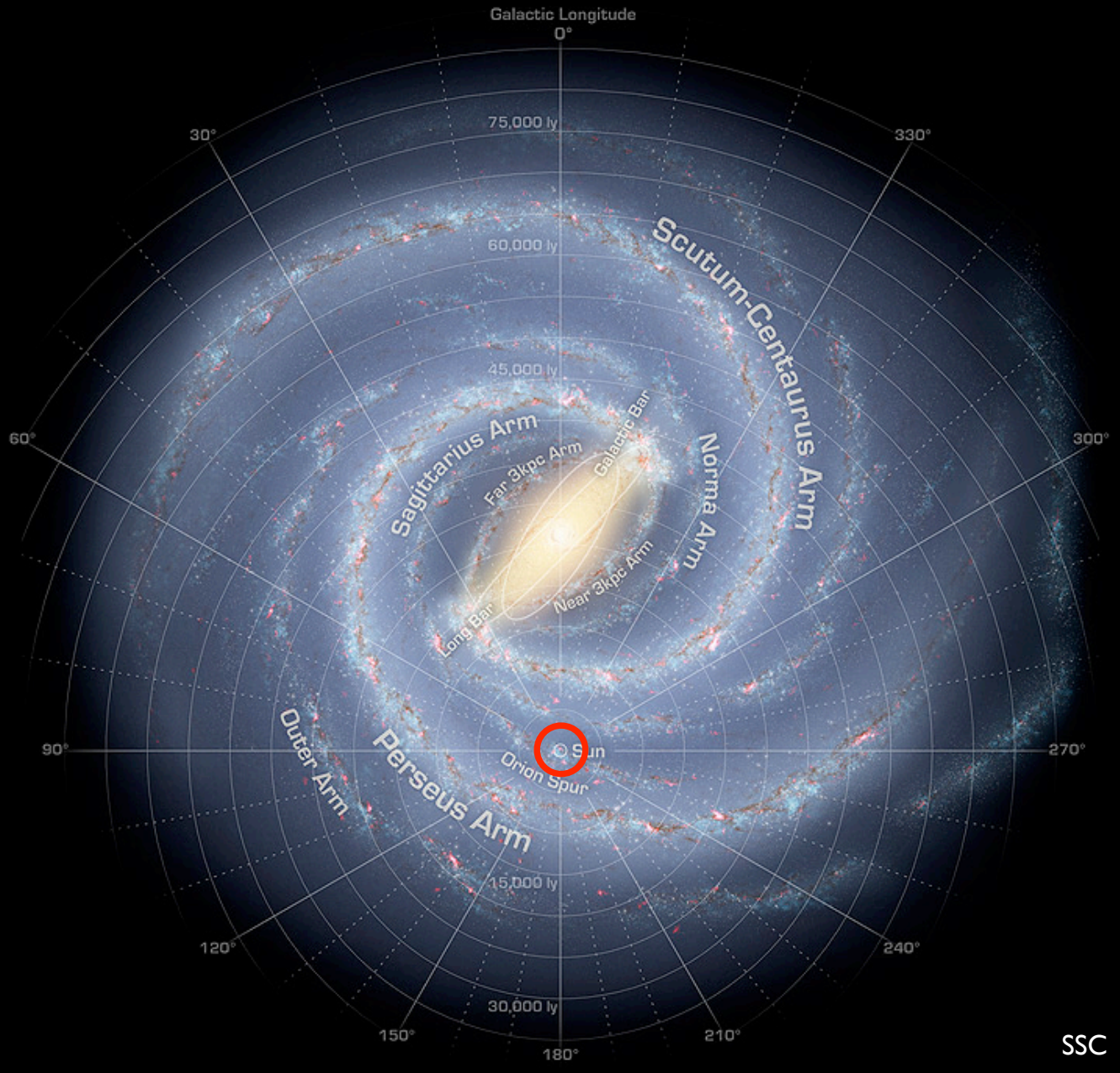
NASA / JPL-Caltech / S.T. Megeath (University of Toledo, Ohio)

Spitzer Space Telescope • IRAC

ssc2006-16a

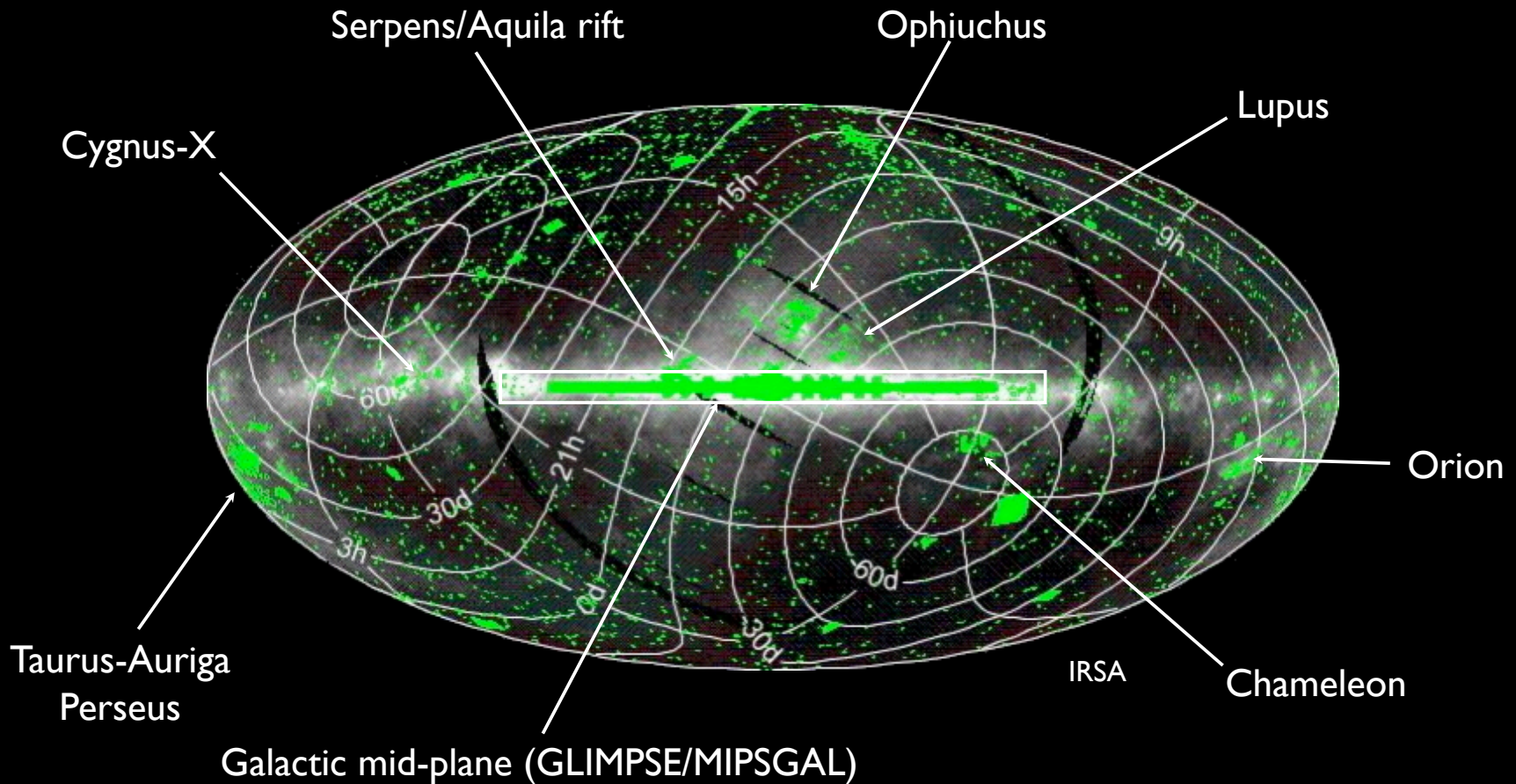


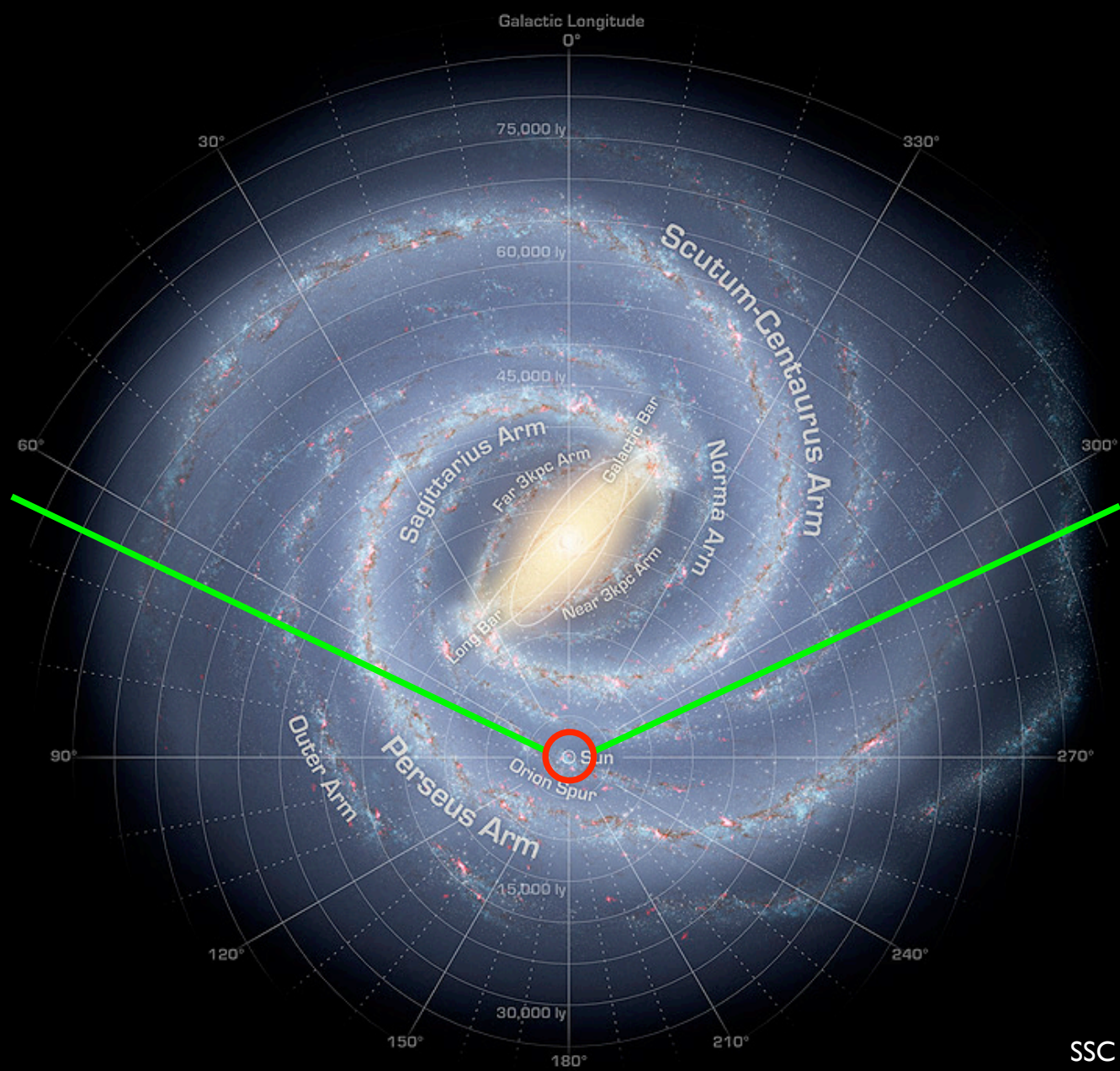
Harvey et al (2007)



SSC

Spitzer observations of SF regions

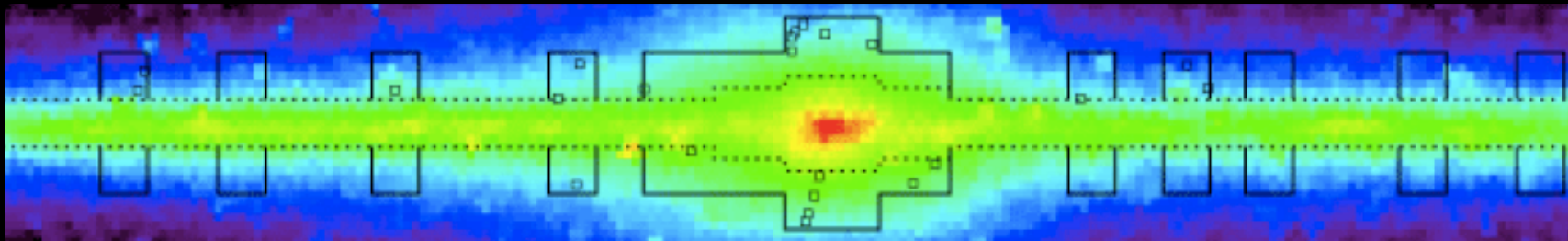




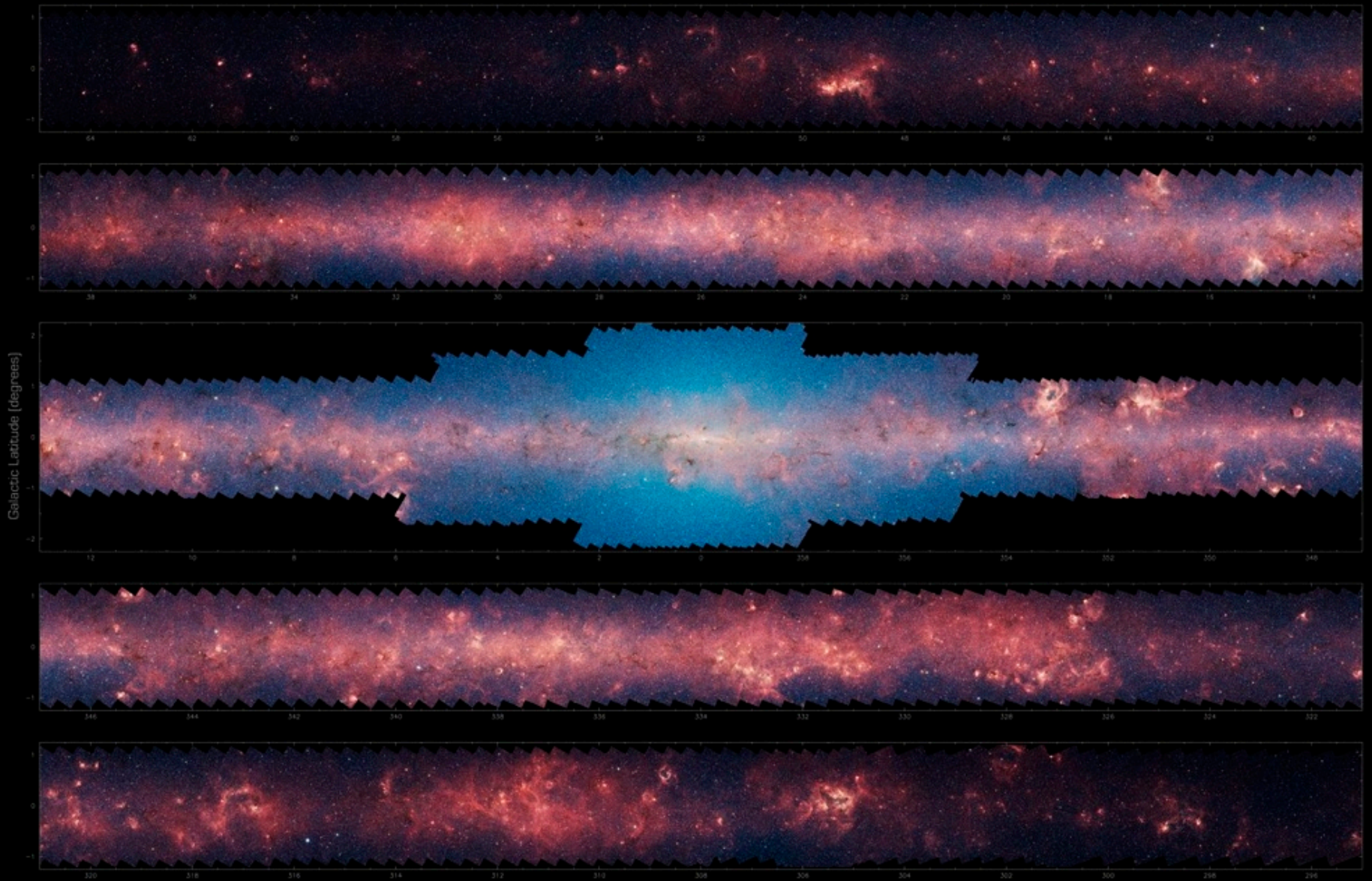
SSC

The GLIMPSE survey

- **GLIMPSE I** $10^\circ < |l| < 65^\circ$, $|b| < 1^\circ$ (220 sq deg)
- **GLIMPSE II** $|l| < 10^\circ$, $|b| < 1, 1.5, 2^\circ$ (54 sq deg)
- **GLIMPSE 3D** up to $|b|=3-4^\circ$ at select longitudes

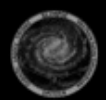


THE INFRARED MILKY WAY: GLIMPSE (3.6–8.0 microns)



Galactic Latitude [degrees]

Galactic Longitude [degrees]



GLIMPSE team: Ed Churchwell (PI), Mardyn Meade, Brian Balser, Remy Indebetouw, Barbara Whitney, Olivier Wilson, Bob Benjamin, Steve Bracker, Thomas Robitaille, Stephen James, Doug Wilson, Mark Wolfire, Mike Wolf, Matt Povich, Tom Barva, Dan Demers, Martin Corbin, Dawid Cyszanowski, Kate Devine, Fabian Heitsch, Jim Jackson, Katherine Johnston, Chip Kobayashi, John Mathis, Emily Mercer, Jeonghee Rho, Marla Sewla, Susan Stavey, Brian Tegen

Poster designed by Thomas Robitaille and Robert Hurt

The GLIMPSE survey

- **GLIMPSE :**

- 31 million sources in Catalog
- 49 million sources in Archive

- **GLIMPSE II :**

- 18 million sources in Catalog
- 23 million sources in Archive

- **GLIMPSE 3D :**

- 20 million sources in Catalog
- 32 million sources in Archive



This work

GLIMPSE for star formation/disks

- Currently known SF regions (M16, M17, RCW79, etc.)
- But also many new regions (deeper than 2MASS/MSX)
- Uniform flux-limited map of star formation over 274 deg²
- **Main issues:**
 - More difficult to determine distances
 - Very high A_V makes giants appear very red
 - Contamination from intrinsically red field stars (AGBs)

GLIMPSE Catalog (~50 million sources)

```
graph TD; A[GLIMPSE Catalog (~50 million sources)] --> B[All red sources]; B --> C[Genuine red sources (~18,000)]; C --> D[YSOs (~11,000)]; C --> E[AGBs (~7,000)]; D --> F[Disks]; D --> G[Embedded YSOs];
```

All red sources

Genuine red sources (~18,000)

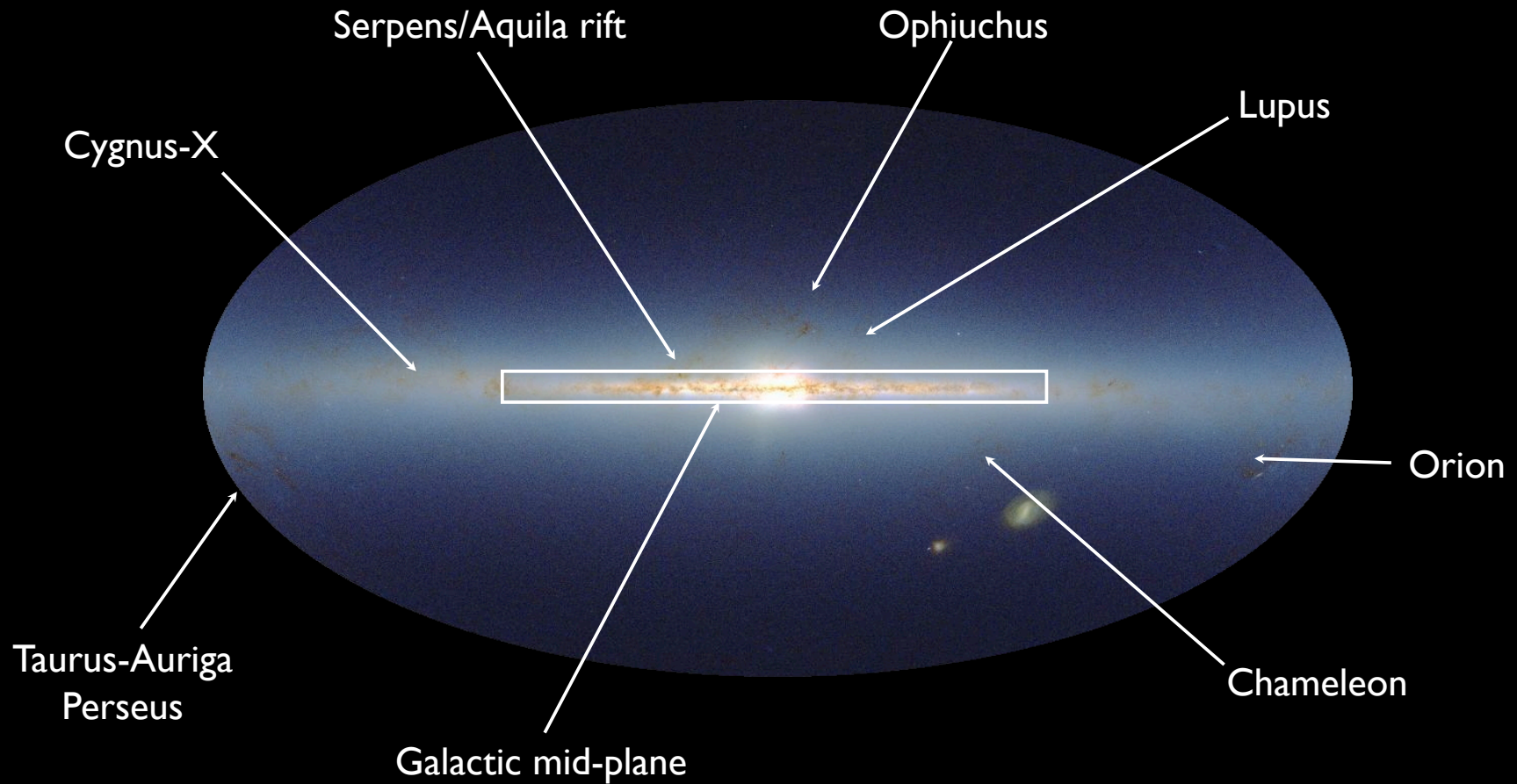
YSOs (~11,000)

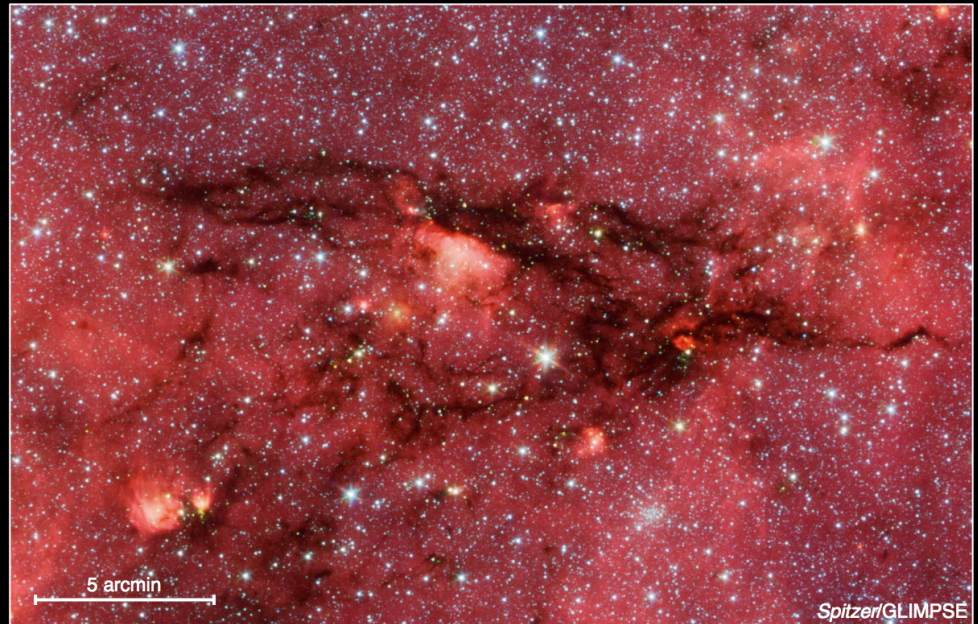
AGBs (~7,000)

Disks

Embedded YSOs

Field star contamination





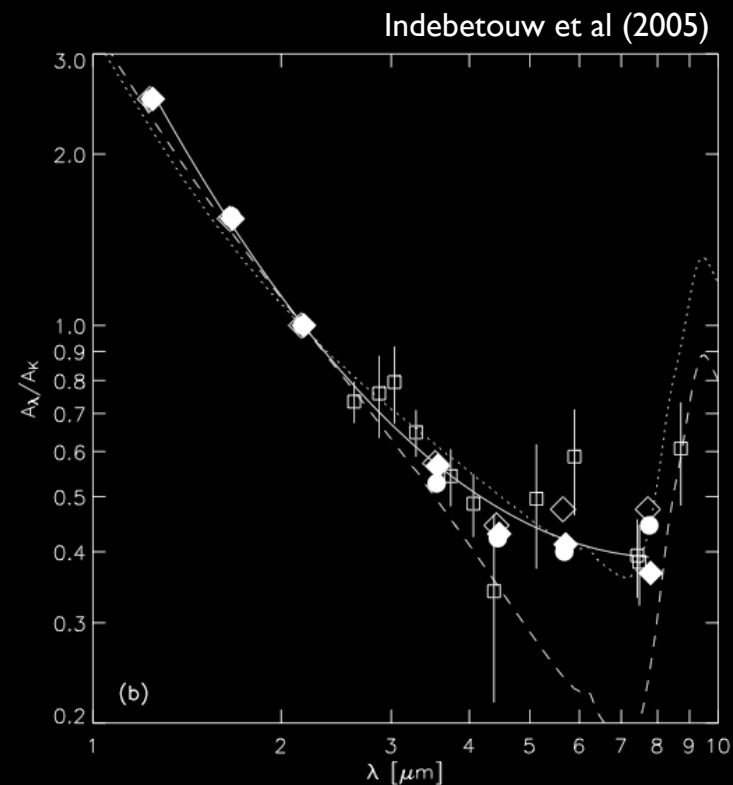
GLIMPSE

The Sword of Orion (M42) Spitzer Space Telescope • IRAC
NASA / JPL-Caltech / S.T. Megeath (University of Toledo, Ohio) ssc2006-16a

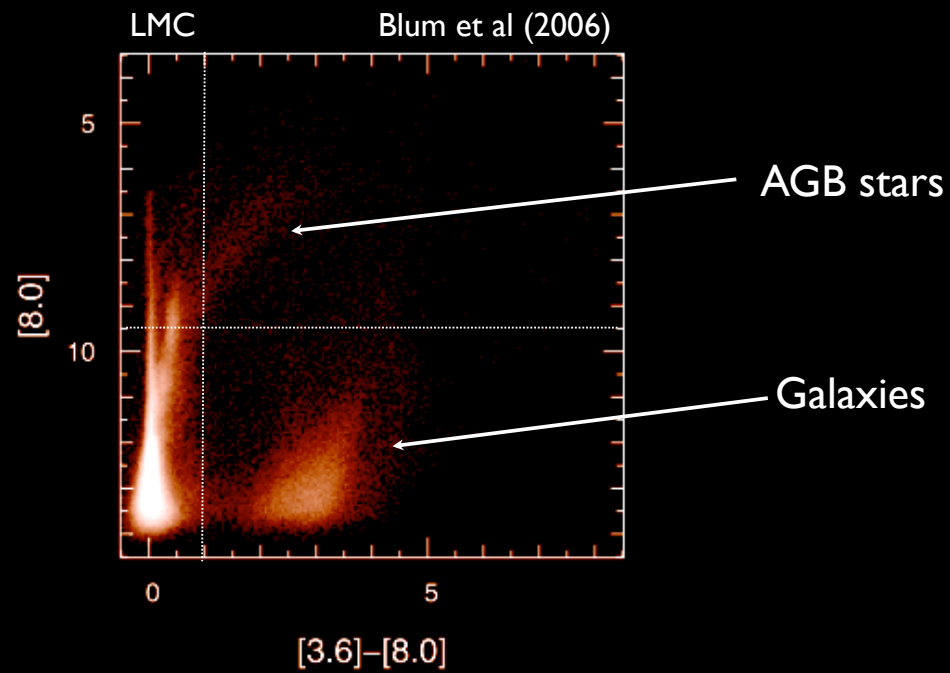
Avoiding highly extinguished giants

- Extinction law \sim flat between IRAC 4.5 μ m and 8.0 μ m
- Select intrinsically red sources based on [4.5]-[8.0]

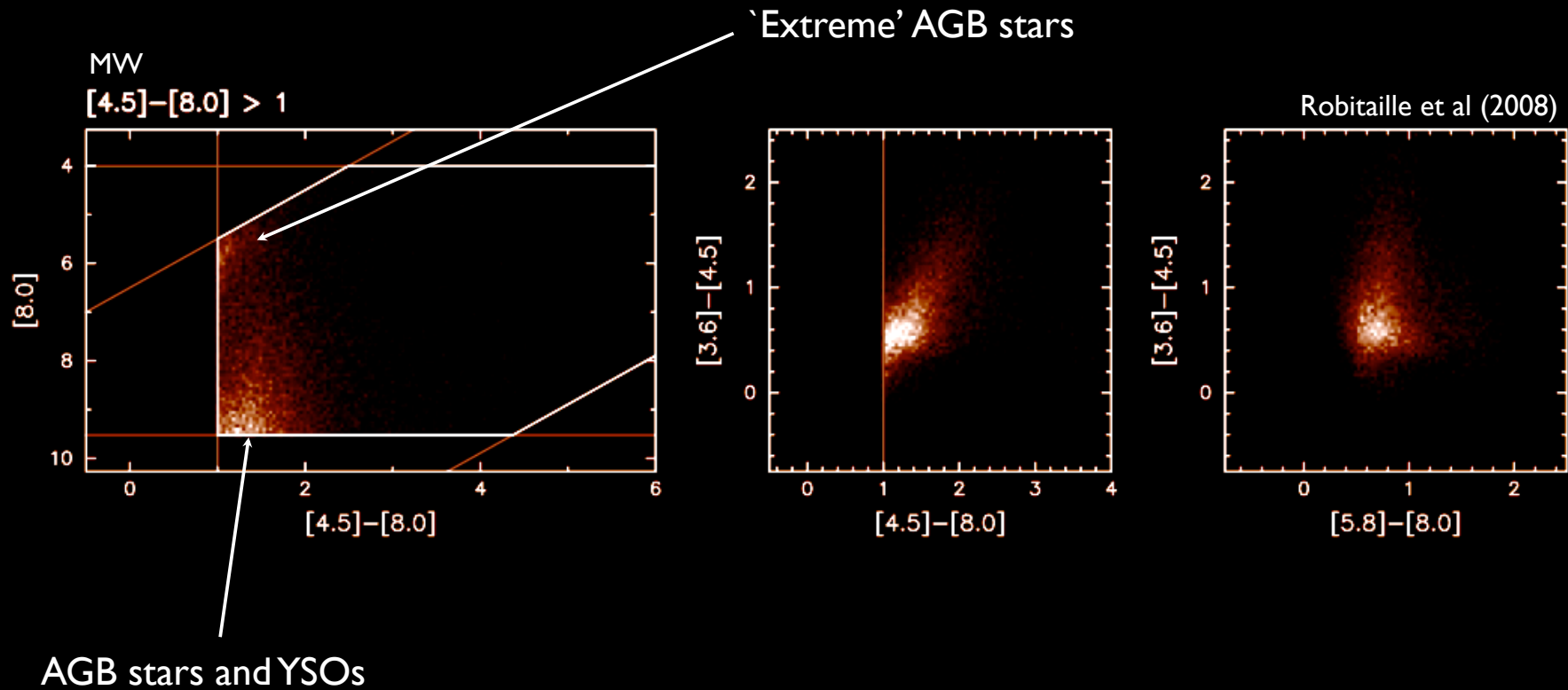
Use [4.5]-[8.0] > 1



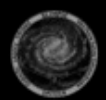
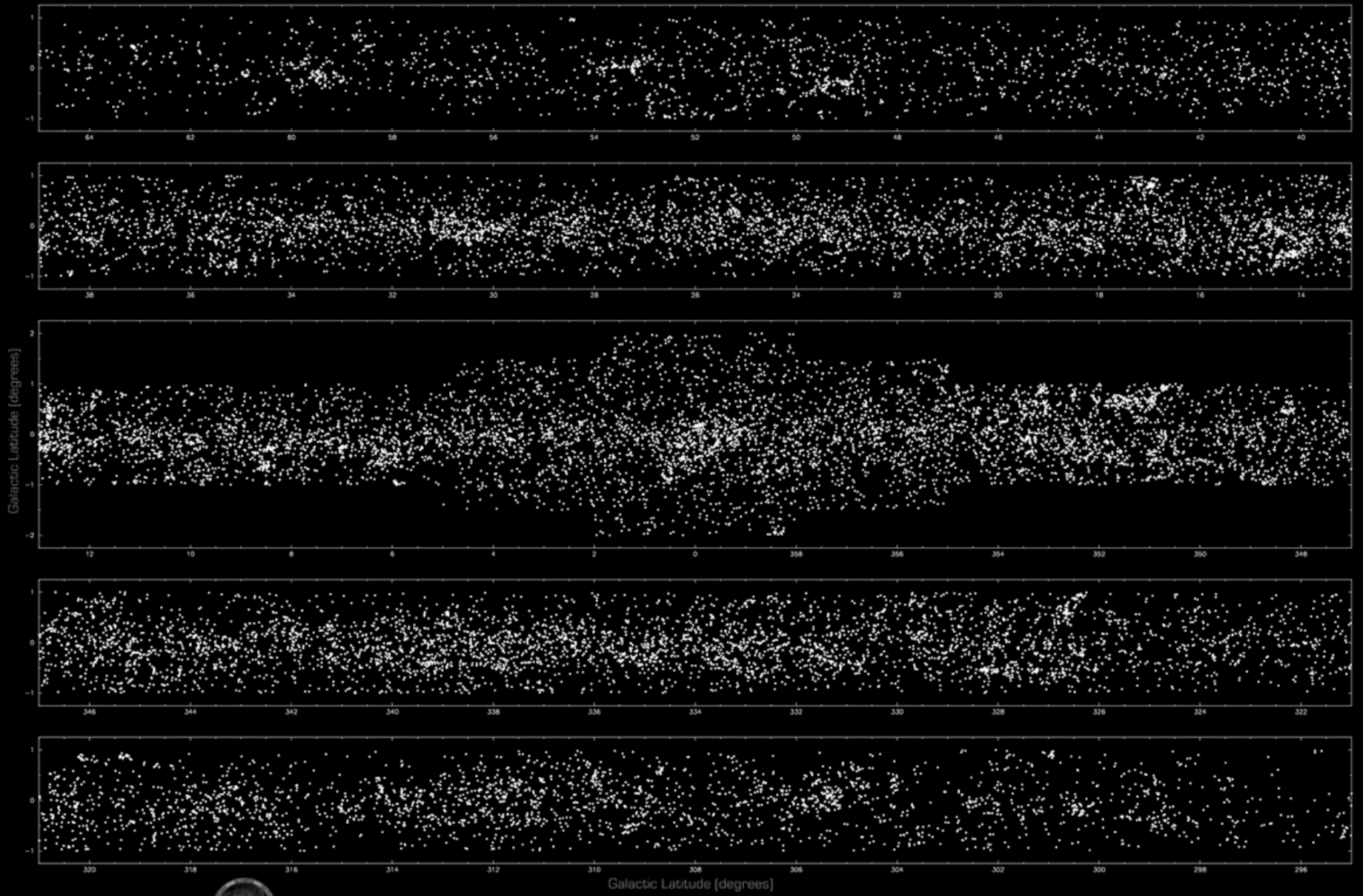
AGB star contamination



Red source selection



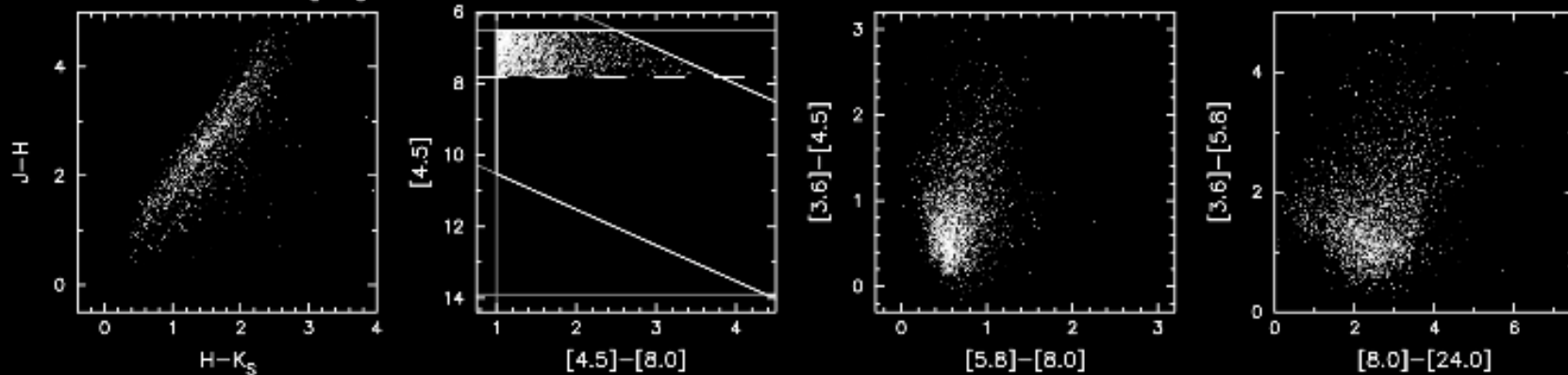
THE INFRARED MILKY WAY: GLIMPSE (3.6–8.0 microns)



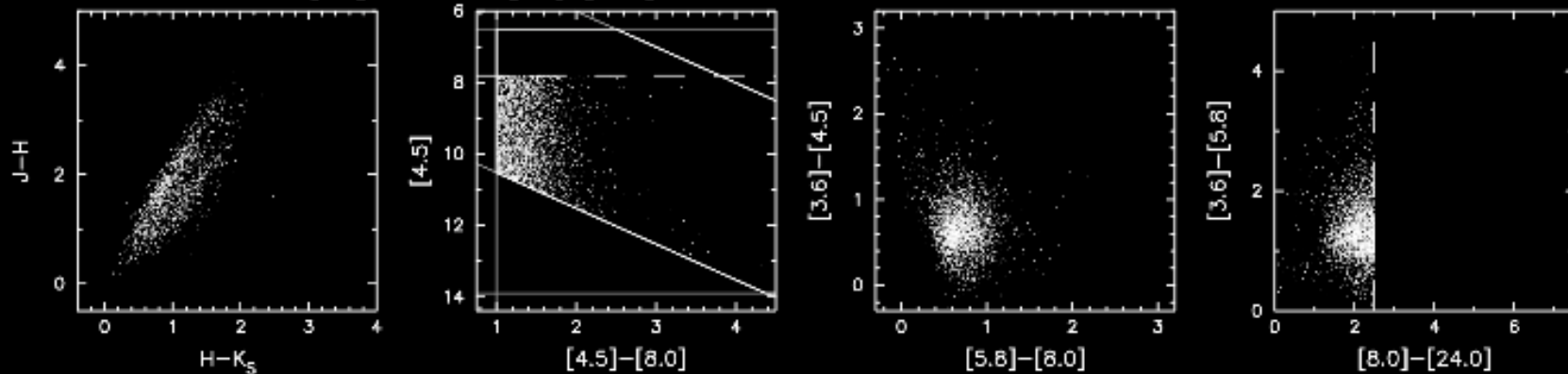
GLIMPSE team: Ed Churchwell (PI), Meryn Meade, Brian Balser, Penny Indebetouw, Barbara Whitney, Orislar Watson, Bob Benjamin, Steve Bracker, Thomas Robitaille, Stephen James, Doug Wilson, Mark Wolfire, Mike Wolf, Matt Povich, Tom Barlow, Dan Demers, Martin Corbin, Dawid Czapkowski, Katee Devine, Fabian Heitsch, Jim Jackson, Katherine Johnston, Chip Kobayashi, John Mathis, Emily Mercer, Jeonghee Rho, Marla Sewis, Susan Stoney, Brian Tegen

Poster designed by Thomas Robitaille and Robert Hurt

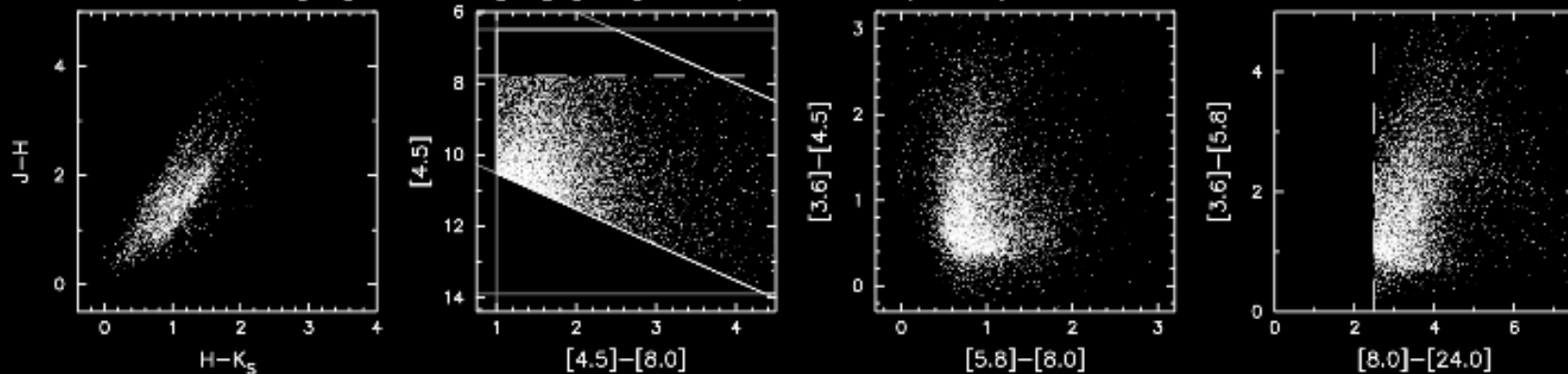
xAGB candidates - $[4.5] \leq 7.8$



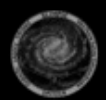
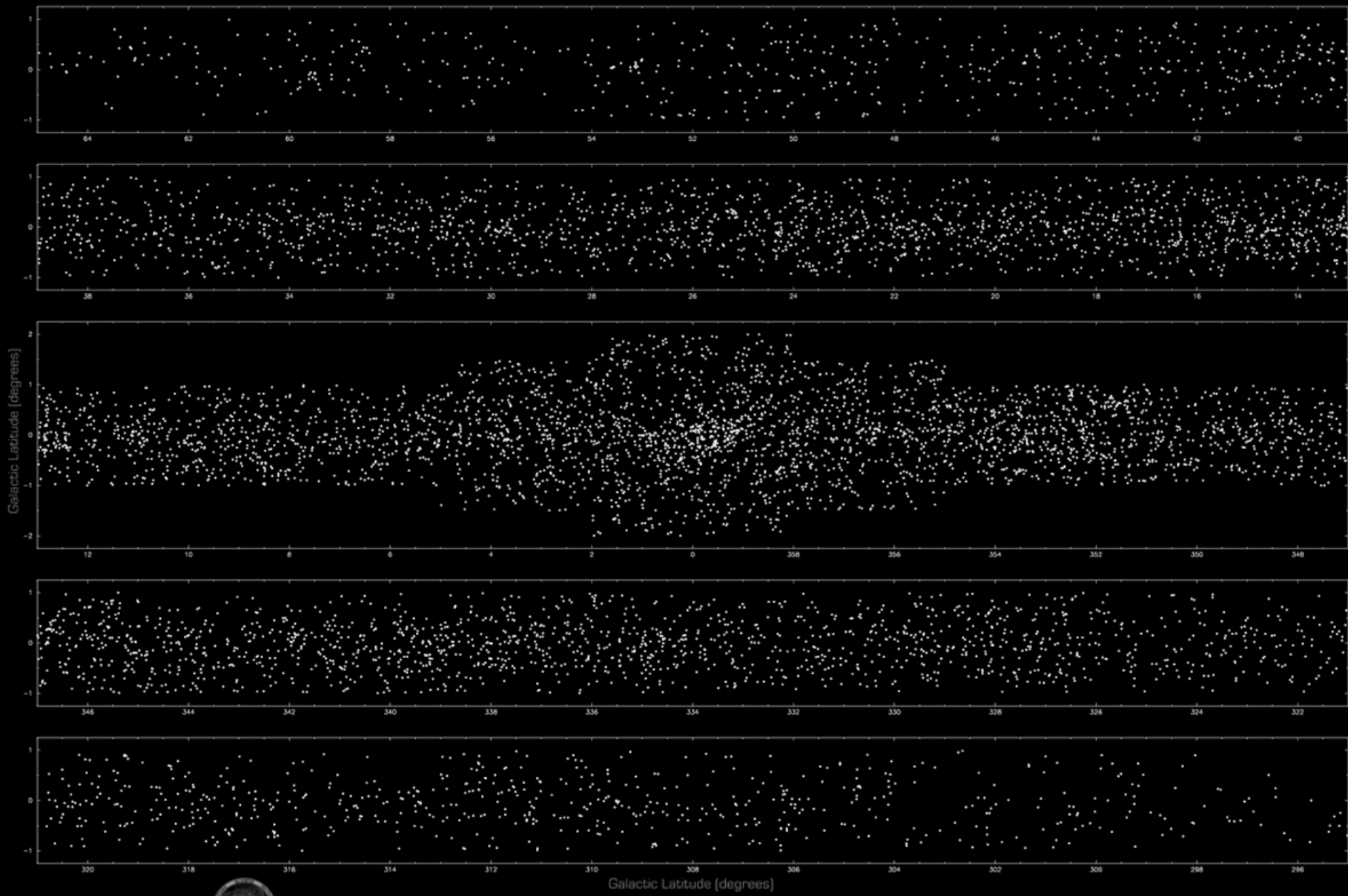
sAGB candidates - $[4.5] > 7.8$ and $[8.0]-[24.0] < 2.5$



YSO candidates - $[4.5] > 7.8$ and $[8.0]-[24.0] \geq 2.5$ (or no MIPS 24 μ m flux)



THE INFRARED MILKY WAY: GLIMPSE (3.6–8.0 microns)

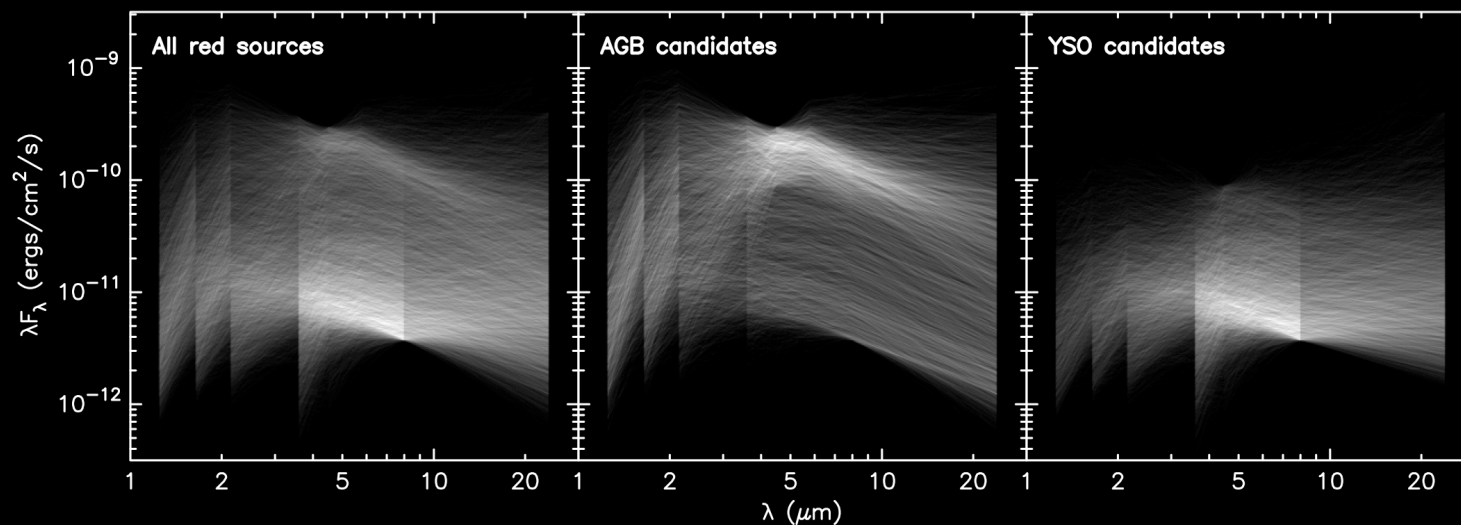


GLIMPSE team: Ed Churchwell (PI), Meryn Meade, Brian Balser, Remy Indebetow, Barbara Whitney, Orislar Wilson, Bob Benjamin, Steve Bracker, Thomas Robitaille, Stephen James, Doug Wilson, Mark Wolfire, Mike Wolf, Matt Povich, Tom Barva, Dan Demers, Martin Corbin, Dawid Cyszkowski, Kate Devine, Fabian Heitsch, Jim Jackson, Katherine Johnston, Chip Kobayashi, John Mathis, Emily Mercer, Jeonghee Rho, Marla Sewis, Susan Stavey, Brian Tegen

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Future work

- Better separation using spectroscopy
- Study distribution/clustering
- Combine with Bolocam GPS, Herschel GPS, etc.
 - ➔ SEDs for thousands of YSOs/Disks from near-IR to mm wavelengths!

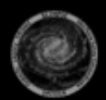
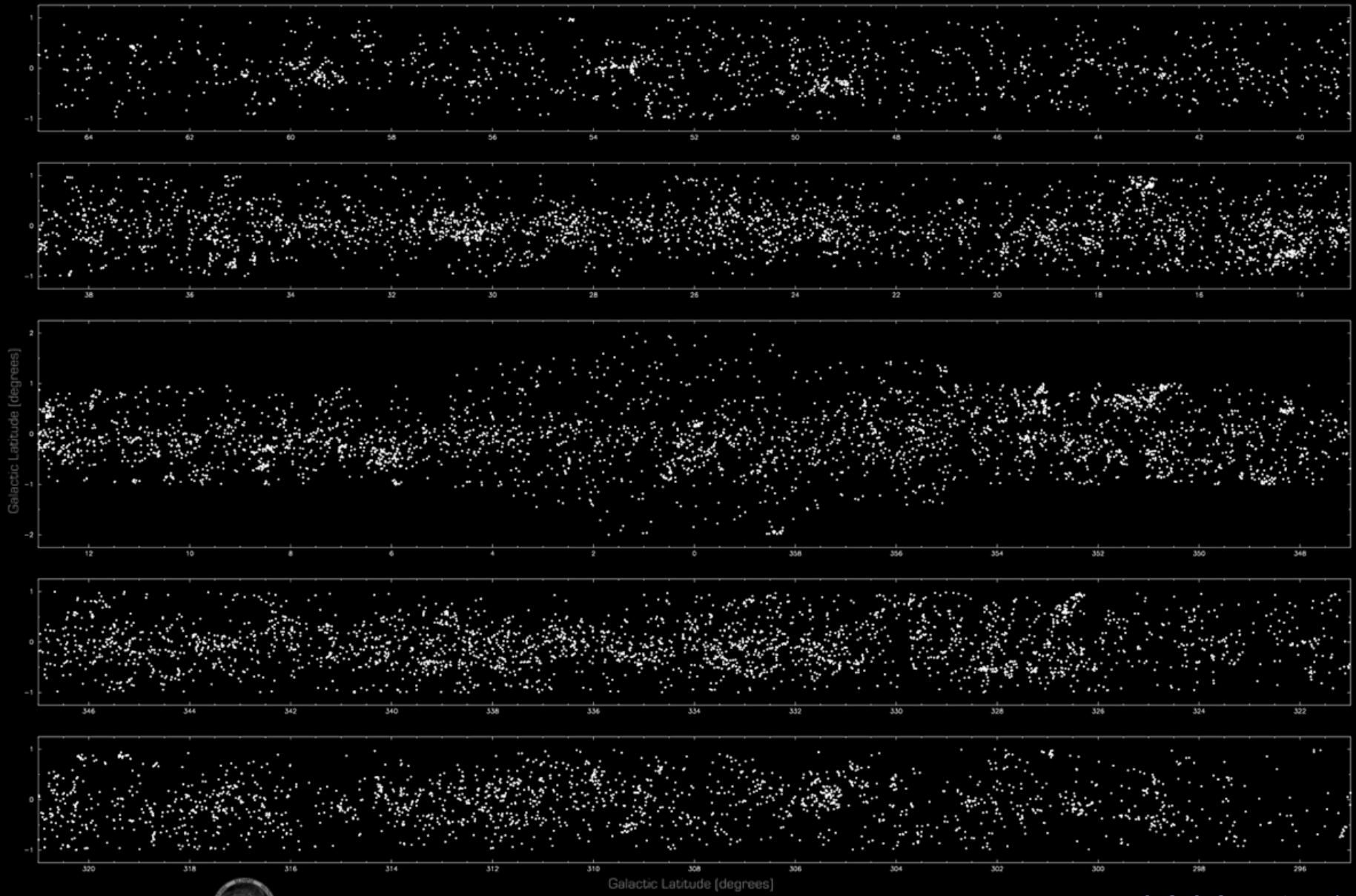


Summary

- GLIMPSE red source catalog
- Very high reliability (manually checked photometry)
- Main contamination is from AGB stars (not galaxies)
- ~18,000 intrinsically red sources, of which:
 - ~11,000 YSOs
 - ~7,000 AGB stars
- Provides a sample of thousands of disks to analyze in future!



THE INFRARED MILKY WAY: GLIMPSE (3.6-8.0 microns)



GLIMPSE team: Ed Churchwell (PI), Meryn Meade, Brian Balser, Remy Indebetow, Barbara Whitney, Orislar Wilson, Bob Benjamin, Steve Bracker, Thomas Robitaille, Benjamin Jones, Greg Wilson, Mark Allen, Mike Irwin, Pouch, Tom Baria, Dan Demers, Martin Corin, Dawid Cyszkowski, Kate Devine, Fabian Heitsch, Jim Jackson, Katherine Johnston, Chip Kobayashi, John Mathis, Emily Meyer, Robert Hurt, and the Glimpse team.

Poster designed by Thomas Robitaille and Robert Hurt

astro-ph : 0809.1654

