Newly-Discovered Post-T-Tauri Stars in Carina and Vela

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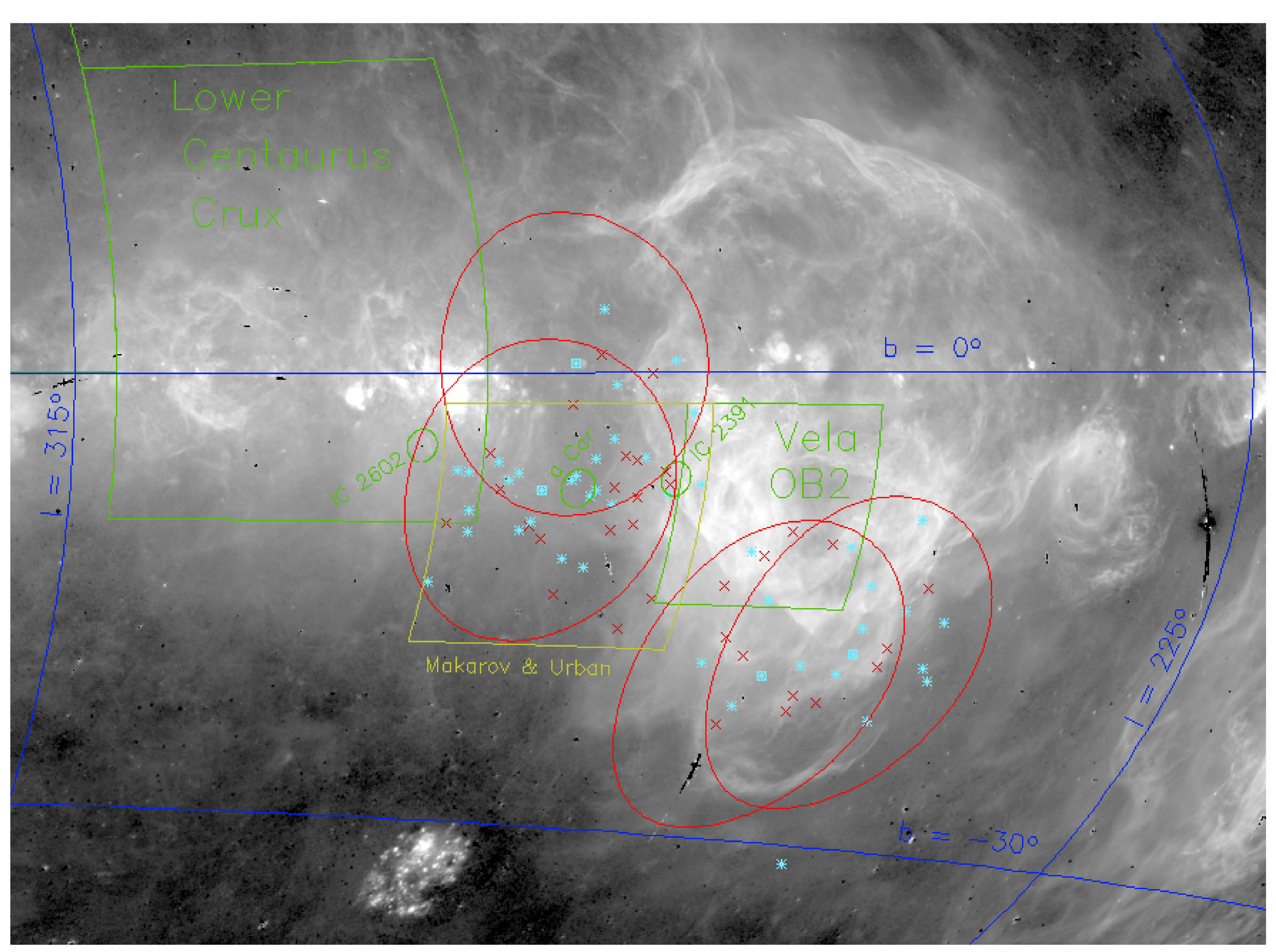
- Discovery of 50 low-mass stars younger than ~60 Myr.
- These stars are not in known star-forming regions.
- Some may be the first low-mass members of the a Car open cluster.
- At distances of 80–150 pc, the nearer stars among these are good targets for constraining disk evolution in the 10–100 Myr planet-building epoch.

Motivation and Search Strategy

Here we present a search for post-T-Tauri stars, pre–main-sequence low-mass stars with ages of 10–100 Myr, which are useful for **understanding the star formation history in the solar neighborhood**, and for **studying the planet-building epoch of a low-mass-star's life**. The challenge is to distinguish post-T-Tauri stars from field stars.

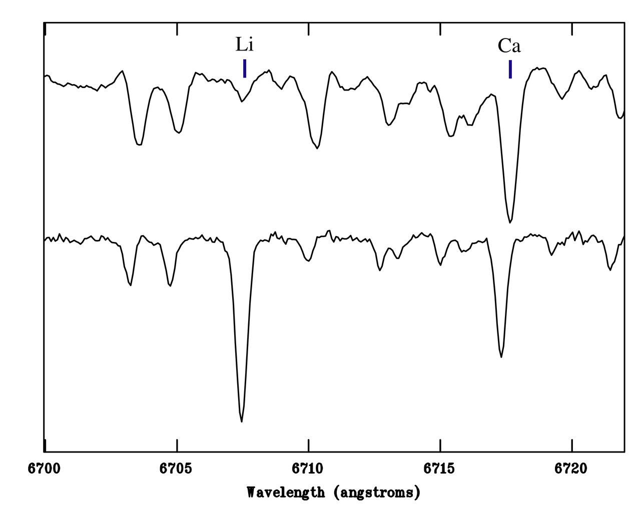
In previous work, we found the Hipparcos stars HIP 33111, HIP 33455, HIP 46063 (all at d ~ 85 pc) and HIP 48558 (d = 135 pc) to be 30–50 Myr-old post-T-Tauri stars based on strong x-ray emission, abundant Li, and position in the HR diagram. Here we have surveyed around these stars to search for additional young stars. We selected candidates within a 10° radius of these four stars (red ovals in Figure 1) that had proper motions consistent with the HIP stars, were x-ray bright, and had B–V colors consistent with spectral type of G0 or later. We then observed roughly 100 stars with the CTIO 4-m echelle to look for strong Li, a tracer of youth in low-mass stars.



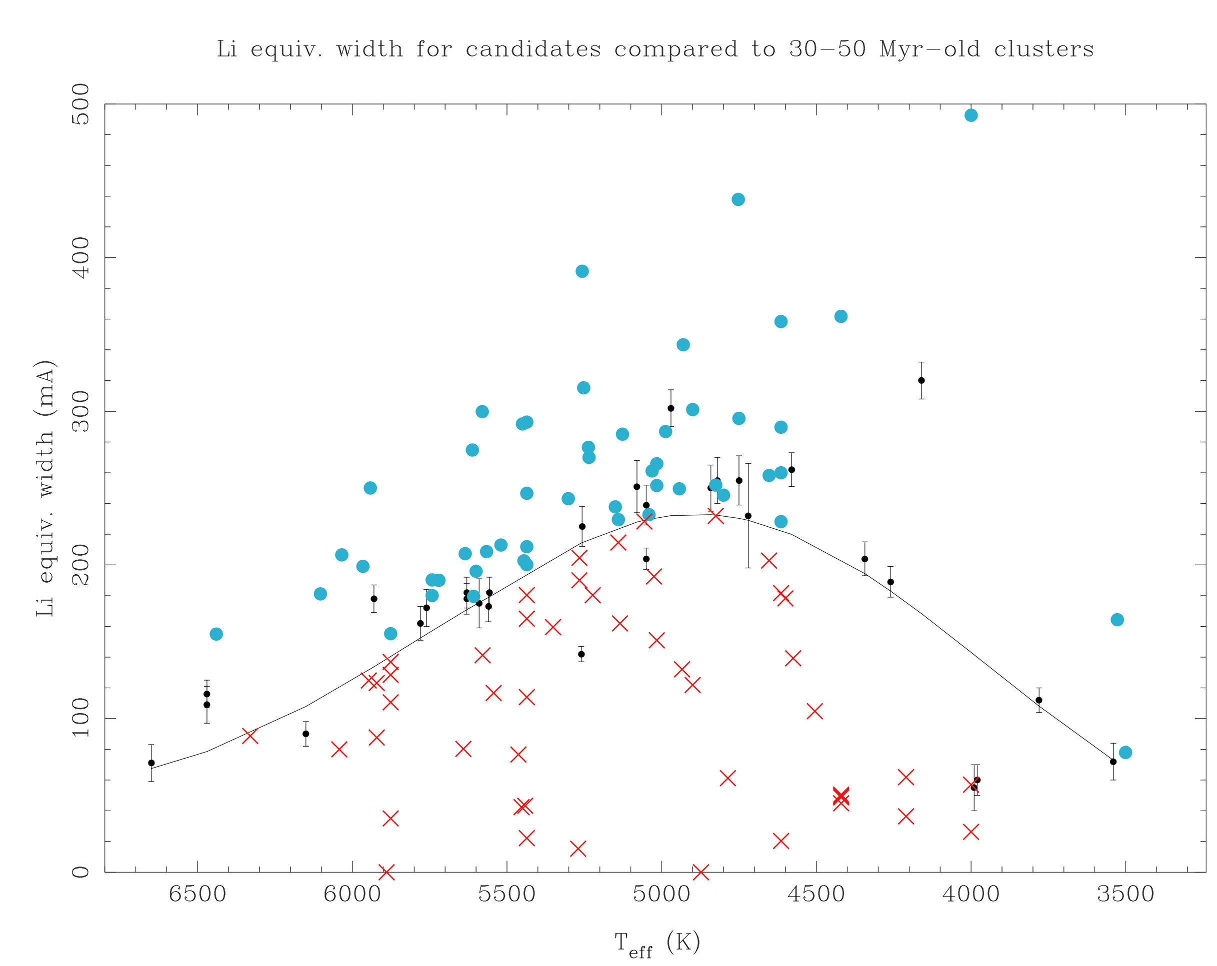
A view of our search regions and the surrounding Galactic context. The red ovals show our 10 degree search radii around the four young Hipparcos stars (blue squares). The region around HIP 46063 overlaps strongly with the region suggested by Makarov & Urban (2000) as containing a moving group of young stars (yellow rectangle), as well as with the young open clusters IC 2391 and a Car (green circles). Light blue asterisks indicate stars we found to be Li-rich (see plot at right) and therefore young, while red crosses indicate older, more-Li-poor stars. The background image shows diffuse H-alpha emission from the SHASSA survey (Gaustad et al. 2001).

Are these stars young?

All of our target stars were selected from the ROSAT Bright Source Catalog and show strong x-ray emission, with $L_X/L_{bol} > 10^{-4}$, characteristic of young, low-mass stars. In addition, our CTIO spectroscopy reveals that roughly half of them have abundant lithium.

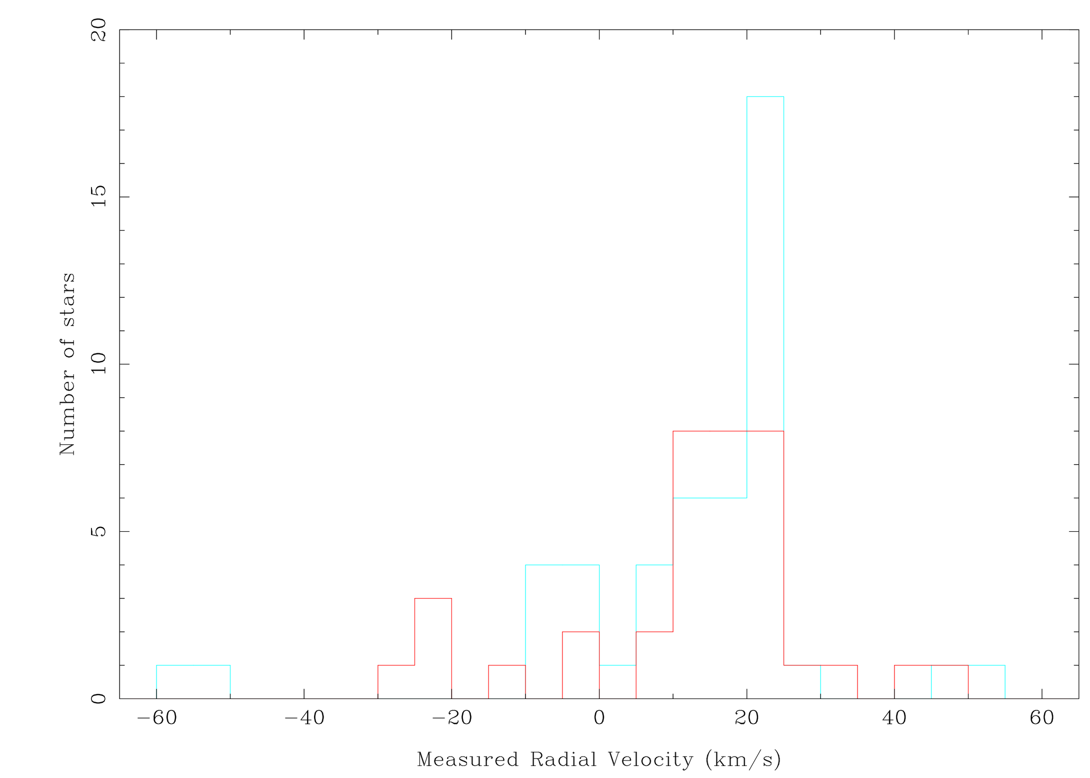


Low-mass stars deplete Li over their pre-main-sequence lifetimes, so strong Li is a tracer of youth, as seen in the lower spectrum of a young star compared to the upper, older star.

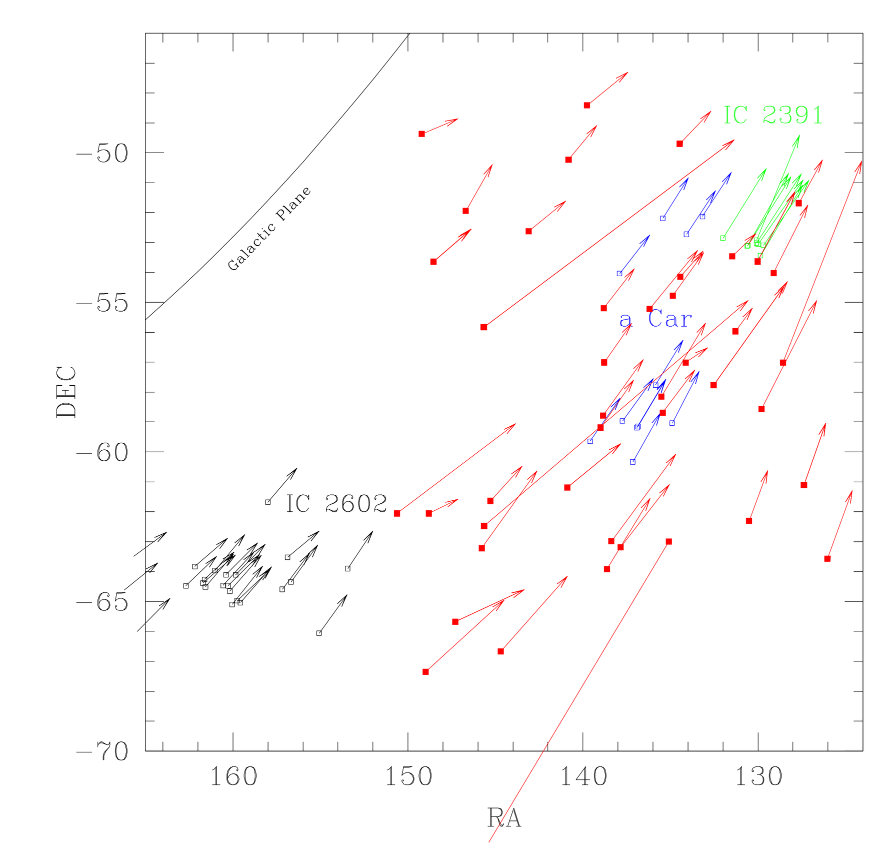


Roughly half (~50) of our target stars lie at or above the empirical locus of Li equivalent width defined by members of the young open clusters IC 2602 and IC 2391 (black points and curve, data from Randich et al. 2001). Thus, these stars (light blue asterisks) have ages comparable to or younger than these 30–50 Myr-old clusters. ***We find that none of the very nearby (d < 50 pc) stars in the Makarov & Urban group are young.***

What is the origin of these stars?



The radial velocities of the Li-rich stars (light blue histogram) are strongly peaked at 20–25 km/s. These radial velocities and the proper motions give kinematics consistent with the Gould Belt population of ~60-Myr-old stars in the Solar neighborhood.



Several of our targets (red arrows) have positions, proper motions, and radial velocities consistent with membership in a Car cluster (blue arrows), and Li abundances consistent with the ~60 Myr age of the cluster (Platais et al. 1999). ***These may be the first low-mass members of the a Car cluster discovered.***

Acknowledgments

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Swarthmore Astronomy

Poster presented at the January 2005 meeting of the American Astronomical Society. A larger version of this poster can be viewed on-line at http://astro.swarthmore.edu/~jensen/publications.html.