New Results from the GALEX Nearby Young-Star Survey

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Abstract.

The last few decades have seen the discovery of many 10–100 Myr-old stars in moving groups within 100 parsecs of Earth. The present membership of these groups, however, is still incomplete at the lowest masses. We have initiated a program, the GALEX Nearby Young-Star Survey, or GALNYSS, to search for the missing low-mass stars. GALNYSS has combined ultraviolet data with near-IR surveys, as well as kinematic information, in order to identify over 2000 candidate young low-mass stars near Earth. Spectroscopic followup is ongoing, and results thus far confirm the youthful nature of many stars among the GALNYSS sample. This suggests that our technique is capable of revealing the populations of low-mass stars that are presently missing from the nearby young moving groups. We present an overview of our survey to date and highlights from the latest contributions to our knowledge of the low-mass membership of nearby, young stellar associations.

1. The GALEX Nearby Young-Star Survey

Over the last few decades, many young (10–100 Myr-old) stars have been identified in moving groups located close to Earth (<100 pc). For direct imaging searches of extrasolar planets these stars represent excellent targets and as such they will be continuously observed during the coming decades as new imaging systems and larger telescopes are commissioned. However, the census of young stars among these groups is still incomplete at the lowest masses. To find the missing population of young stars in young moving groups near Earth, we have initiated the GALEX Nearby Young-Star Survey (GALNYSS). With ultraviolet (GALEX) and near-infrared (WISE & 2MASS) color selection criteria, estimated photometric distances, proper motions, and a UVW velocity analysis we have identified over 2000 candidate young, low-mass stars spread across most of the sky (see Figure .1). Our methodology and sample is discussed in Rodriguez et al. (2013). We have thus far published low-mass candidates to several nearby moving groups: TW Hydrae (Rodriguez et al. 2011), Tucana-Horologium (Rodriguez et al. 2013), and β Pictoris (Rodriguez et al. 2014). On-going work is being carried out to determine radial velocities and measure signatures of youth for additional candidates to these and other young moving groups.

2. LDS 5606: A Dusty M-dwarf Binary in the β Pictoris Moving Group

One of the latest GALNYSS results has been the identification of LDS 5606 as a β Pic moving group member (Rodriguez et al. 2014; Zuckerman et al. 2014). This is a wide pair of M5 dwarfs with a kinematic distance estimate of 65 pc. Radial velocity measurements place the stars in the β Pic moving group and both stars show signatures of youth, such as Li absorption.

Spectroscopic observations of LDS 5606 revealed a large number of emission lines, particularly for the A component (see Figure .2). Very strong Hydrogen and Helium lines can be seen and indicate on-going accretion. We also detected [OI] emission that likely traces OH photodissociation and disk photoevaporation by UV and/or soft X-ray photons from the central star (Zuckerman et al. 2014). LDS 5606 is one of several GALNYSS M-dwarfs that will be observed with our XMM GO program (D. Principe, PI) to characterize its X-ray properties.

In addition to rich optical emission-line spectra, LDS 5606 shows infrared excesses due to dusty circumstellar disks. The SEDs of both components reveal warm dust (200 K) around both stars and very warm dust (900 K) around the A component. In this and other respects, LDS 5606 appears to represent an older analog to the wide M-dwarf binary TWA 30 (Looper et al. 2010a,b). However, the components of TWA 30 show weaker H and He emission lines, and their spectra are instead dominated by forbidden transitions. Sharply contrasting viewing geometries — nearly edge-on for both TWA 30A and 30B, vs. more nearly pole-on for the two components of LDS 5606 — can explain the differences between these two binaries (Zuckerman et al. 2014).

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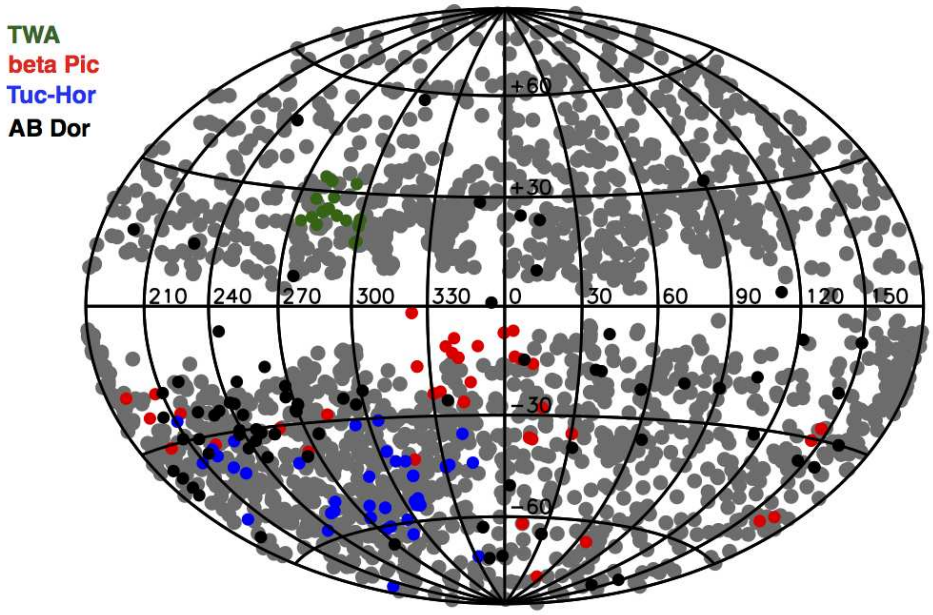

Figure .1: GALNYSS stars (grey) in Galactic coordinates compared to several known moving groups (Torres et al. 2008).

References

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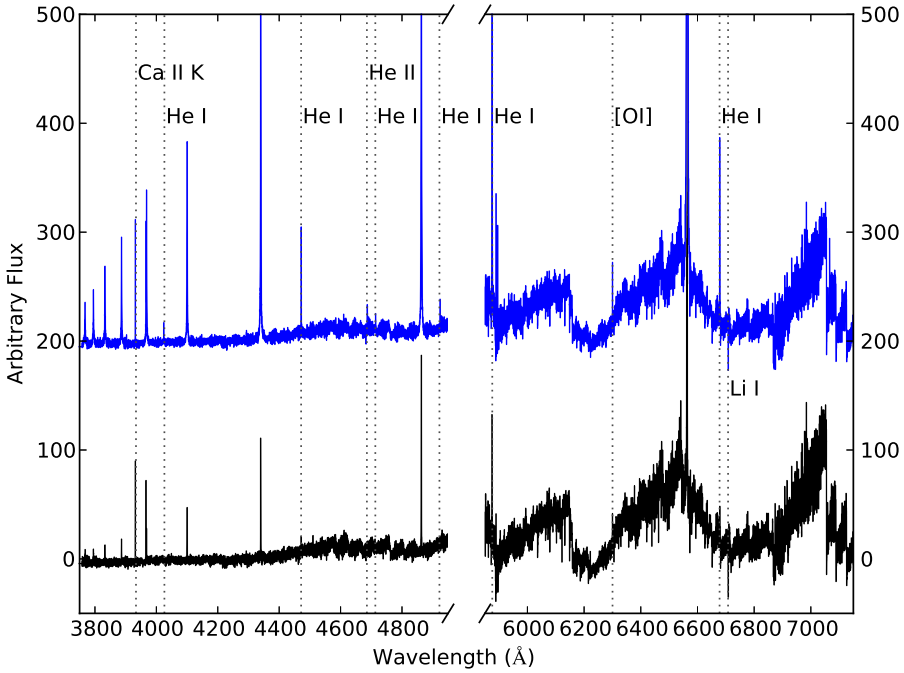

Figure .2: VLT-UVES spectra of LDS 5606 A (top) and B (bottom) from Rodriguez et al. (2014).