Star formation in Lynds 1641

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Abstract

We conducted an extensive multi-wavelength study of the nearest giant molecular cloud, L1641, with the goal of characterizing its stellar populations. At a distance of approximately 500 pc, L1641 provides an excellent opportunity for studying star formation over the entire range of stellar masses, and the star formation history in a region thought representative of those dominating stellar production in the Milky Way.^ Our approach combines imaging surveys at optical and infrared wavelengths with spectroscopic surveys at ${\lambda\lambda}6000-9000 $A to measure stellar luminosities and effective temperatures. Stellar ages and masses are then estimated from comparison of L$\sb*$, T$\rm\sb {eff}$ with pre-main sequence evolutionary tracks. The stars for which we have obtained classifiable spectra as well as optical (R, I) and near-infrared (J, H, K) photometry number $\sim$300, and are contained within four regions, each approximately 20' square (2.5 x 2.5 pc).^ Our 2.2 μm images reveal both modest aggregates of several tens of stars and stars distributed at random across the face of the cloud; we find no evidence of rich (N ${>>}$ 100 stars) clusters. The aggregate members appear to have formed within the past 1 Myr, while the distributed population contains both young stars (t $<$ 1 Myr) and stars ranging in age up to 30 Myr. From comparison of the fraction of the youngest stars forming in aggregates and in isolation, we conclude that stars born initially in aggregates comprise 25-50% of the total stars formed in L1641.^ The observed frequency distribution of stellar ages enables a discussion of the star-forming history of the cloud. The L1641 cloud has been producing stars for nearly 30 Myr and over the last 10 Myr, the SFR has been roughly constant. We explore the implications of this result for the "off-cloud" spatial distribution of young stars.^ Finally, we examine the circumstellar disk properties of stars in our spectroscopic sample. The frequency of disks, as inferred from infrared excess emission, is found to be higher for

stars less massive than 1 M$\sb\odot$ than for more massive stars. We also find that at least six stars in L1641 have apparently retained their accretion disks beyond an age of 3 Myr. ^

Subject Area

Physics, Astronomy and Astrophysics

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