An optical study of the faint end of the stellar luminosity function

Thomas Harold Jarrett, *University of Massachusetts - Amherst*

Abstract

We implement a new method by which to study the faint end of the field star luminosity function. The method relies on deep, multicolor photometry of fields projected against highly obscured, nearby molecular clouds. The clouds act as nearly opaque screens and delimit a well-defined survey sample volume free of the problem of distinguishing nearby, intrinsically faint dwarf stars from more distant red giants. We demonstrate that with this technique it is possible to probe the faint end of the field star luminosity function down to the hydrogen-burning main sequence out to distances much further than have been previously attempted.^ This study is based upon deep photographic and CCD photometry at optical (V, R, I) bandpasses towards the most obscured portions of the Taurus and Ophiuchus molecular clouds. The fields comprise a total area of $\sim$0.63 square degrees, and the total volume delimited by the cloud distances is $\sim$198 pc$\sp3.$ Within this volume, the survey is complete for all stars brighter than M$\sb{\rm v}$ = 16-17 mag; at R and I, the survey is complete down to the lowest mass stars capable of sustaining core hydrogen burning.^ Color-color criteria are used to distinguish between background, highly reddened stars and stars located in front of the clouds. The method of photometric parallax is used to deduce the absolute magnitude and spectral type of those stars found to lie in front of the luminosity function rises beyond M$\sb{\rm v}\sim16;$ there appears to be little double that the luminosity function at least remains flat for the lowest mass stars.^ Our provisional finding that the luminosity function rises again beyond its well-known peak at M$\sb{\rm v}\sim12{-}13,$ also implies that the IMF probably rises beyond the turnover point associated with this peak. The IMF must at least remain flat down to the edge of the hydrogen-burning main sequence. ^

Subject Area