

The Massive Star Forming Region Cygnus OB2. II. Integrated Stellar Properties and the Star Formation History

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Cygnus OB2 is the nearest example of a massive star forming region, containing over 50 O-type stars and hundreds of B-type stars. We have analysed the properties of young stars in two fields in Cyg OB2 using the recently published deep catalogue of Chandra X-ray point sources with complementary optical and near-IR photometry. Our sample is complete to 1 Msun (excluding A and B-type stars that do not emit X-rays), making this the deepest study of the stellar properties and star formation history in Cyg OB2 to date. From Siess et al. (2000) isochrone fits to the near-IR color-magnitude diagram, we derive ages of 3.5 (+0.75/-1.0) and 5.25 (+1.5/-1.0) Myrs for sources in the two fields, both with considerable spreads around the pre-MS isochrones. The presence of a stellar population somewhat older than the present-day O-type stars, also fits in with the low fraction of sources with inner circumstellar disks (as traced by the K-band excess) that we find to be very low, but appropriate for a population of age ~ 5 Myrs. We also find that the region lacks a population of highly embedded sources that is often observed in young star forming regions, suggesting star formation in the vicinity has declined. We measure the stellar mass functions in this limit and find a power-law slope of $\Gamma = -1.09 \pm 0.13$, in good agreement with the global mean value estimated by Kroupa (2002). A steepening of the slope at higher masses is observed and suggested as due to the presence of the previous generation of stars that have lost their most massive members. Finally, combining our mass function and an estimate of the radial density profile of the association suggests a total mass of Cyg OB2 of $\sim 3 \times 10^4$ Msun, similar to that of many of our Galaxy's most massive star forming regions.

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