

A MAD view of Trumpler 14

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We present adaptive optics (AO) near-infrared observations of the core of the Tr 14 cluster in the Carina region obtained with the ESO multi-conjugate AO demonstrator, MAD. Our campaign yields AO-corrected observations with an image quality of about 0.2 arcsec across the 2 arcmin field of view, which is the widest AO mosaic ever obtained. We detected almost 2000 sources spanning a dynamic range of 10 mag. The pre-main sequence (PMS) locus in the colour-magnitude diagram is well reproduced by Palla & Stahler isochrones with an age of 3 to 5 10^5 yr, confirming the very young age of the cluster. We derive a very high (deprojected) central density $n_0 \sim 4.5^{+/-0.5} 10^4 \text{ pc}^{-3}$ and estimate the total mass of the cluster to be about $\sim 4.3^{+3.3}_{-1.5} 10^3 M_{\text{sun}}$, although contamination of the field of view might have a significant impact on the derived mass. We show that the pairing process is largely dominated by chance alignment so that physical pairs are difficult to disentangle from spurious ones based on our single epoch observation. Yet, we identify 150 likely bound pairs, 30% of these with a separation smaller than 0.5 arcsec ($\sim 1300 \text{ AU}$). We further show that at the 2-sigma level massive stars have more companions than lower-mass stars and that those companions are respectively brighter on average, thus more massive. Finally, we find some hints of mass segregation for stars heavier than about $10 M_{\text{sun}}$. If confirmed, the observed degree of mass segregation could be explained by dynamical evolution, despite the young age of the cluster.

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Comments:

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