

On the effects of unresolved binaries on the deduced total mass and stellar mass function of stellar clusters

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Introduction

visible mass



Figure: NGC 3201, obtained with the WFI instrument on the ESO/MPG 2.2-m telescope at La Silla, Credit:ESO

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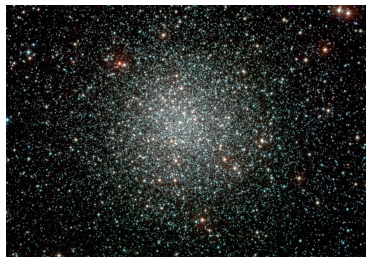


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Figure: Credit: NASA, ESA, and STScI.

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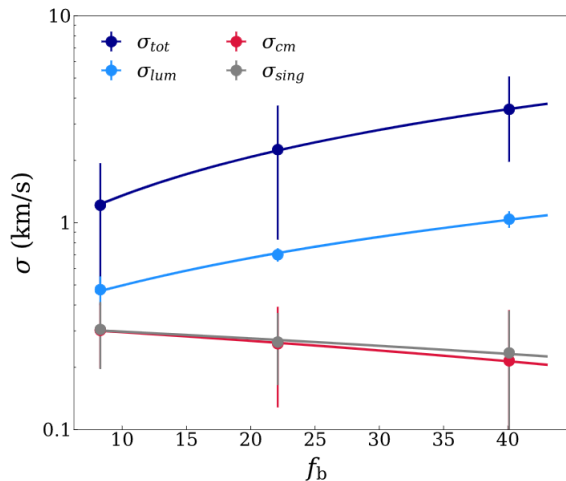
Röser et al.
(2011):

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- up to a factor 4 larger using the velocity dispersion

Overestimate of the dynamical mass

Rastello et al. (2020):



Illingworth
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Underestimates of the Systemmass of Binaries

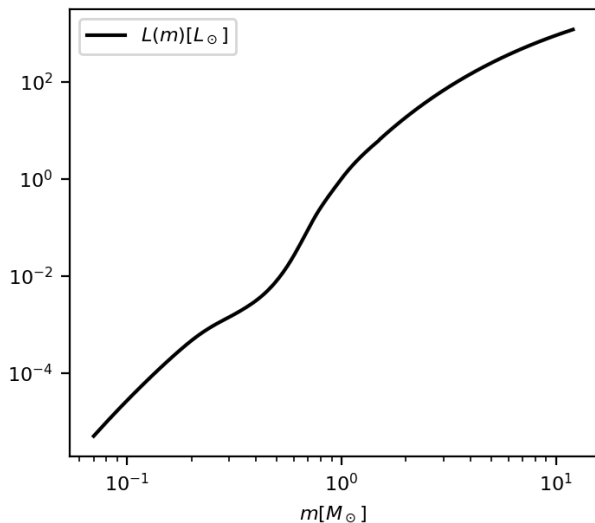


Figure: The mass-luminosity relation by Kroupa et al. (1993), plot from Wirth et al. (2023, in submission)

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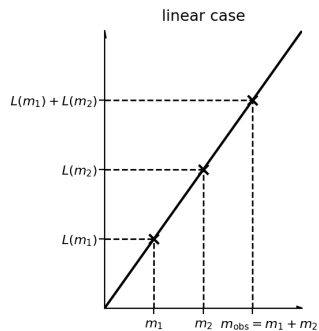


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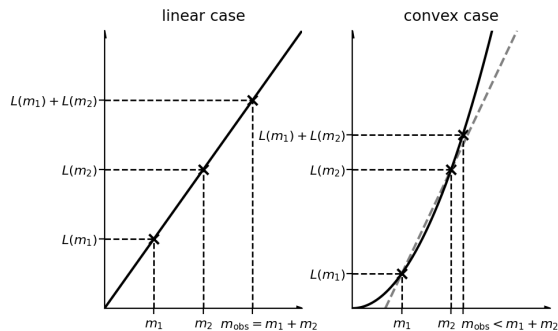


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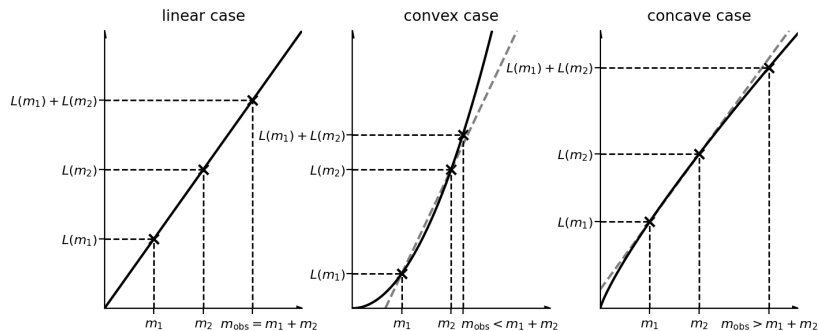


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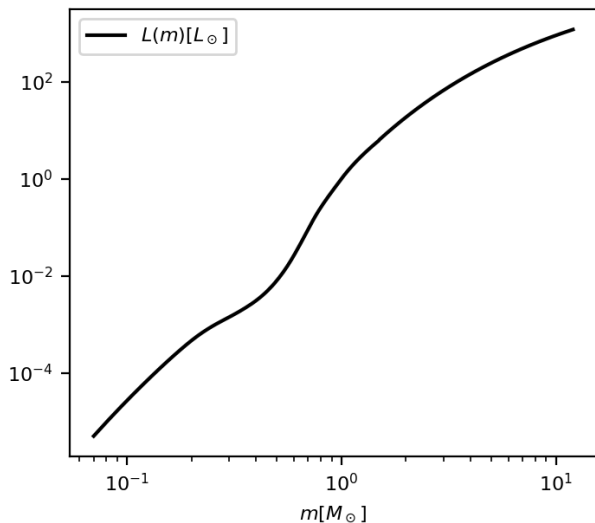


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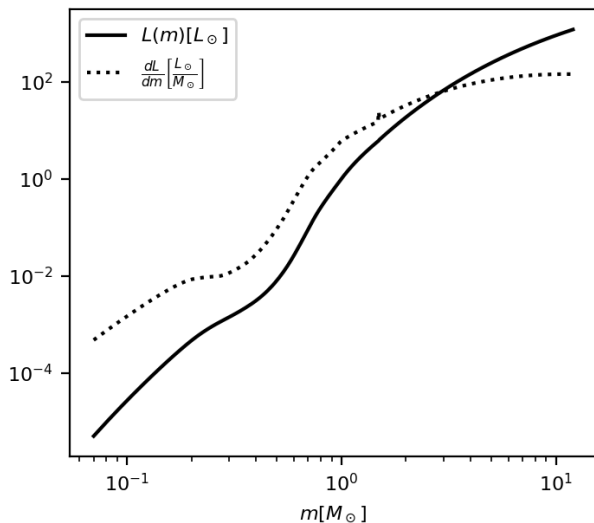


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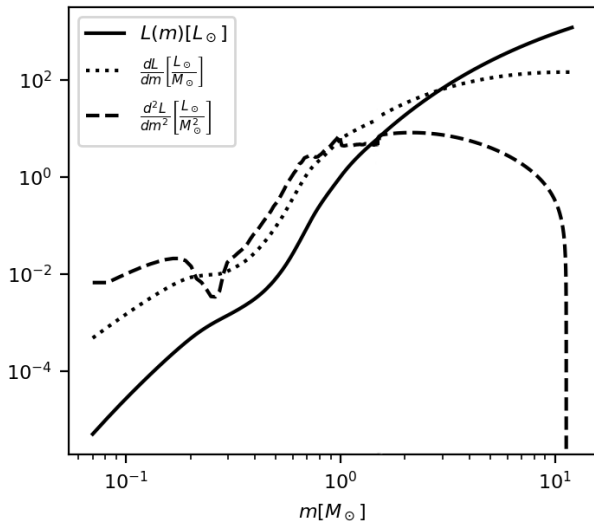
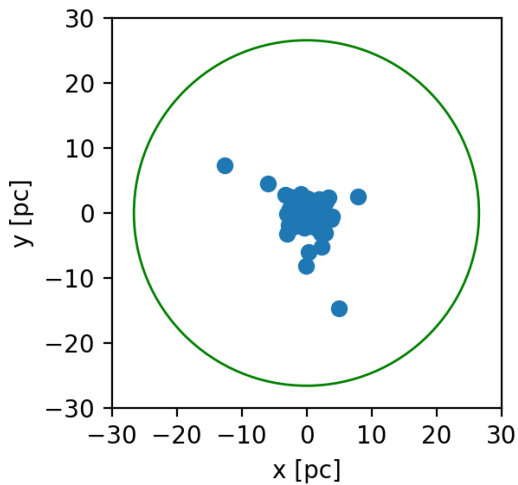


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The model



$$M_{\text{ini}} = 6400 M_{\odot}$$

$$r_{\text{h}} = 0.31 \text{ pc}$$

Underestimates of the Systemmass of Binaries

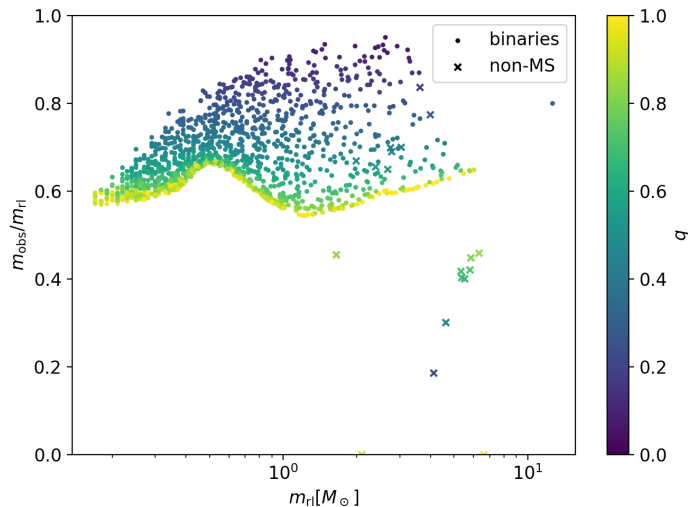


Figure: Wirth et al. (2023, in submission)

Underestimates of the total mass of the cluster

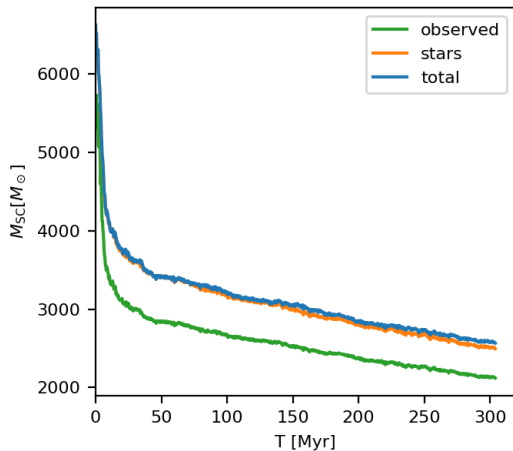


Figure: Wirth et al. (2023, in submission)

The apparent mass function

$$dN = \xi(m)dm$$
$$\xi(m) = k_j m^{-\alpha_j}$$

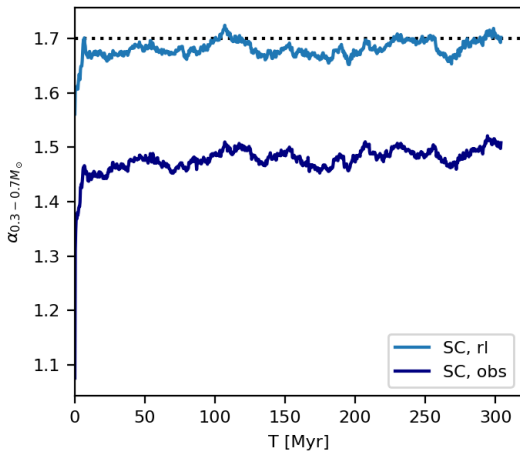
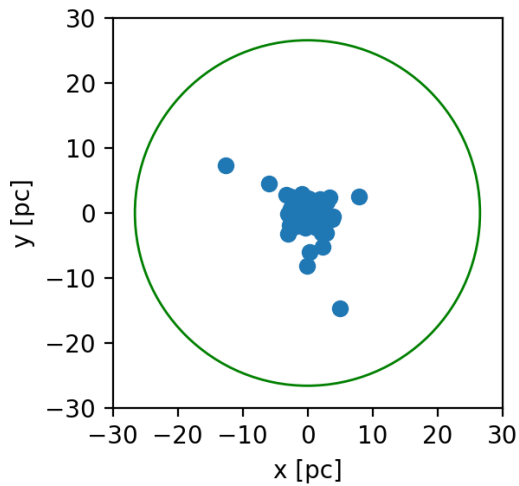
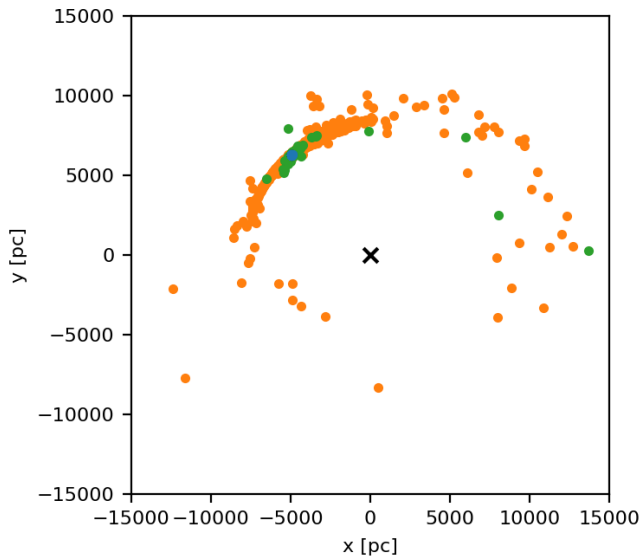


Figure: Wirth et al. (2023, in submission)

The tidal tails



The tidal tails



Changes to the tidal tails

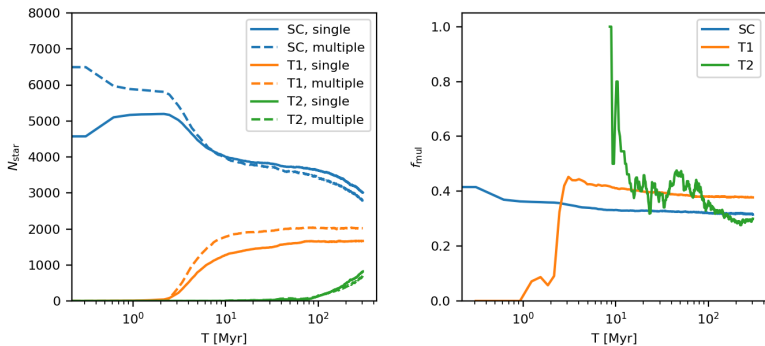


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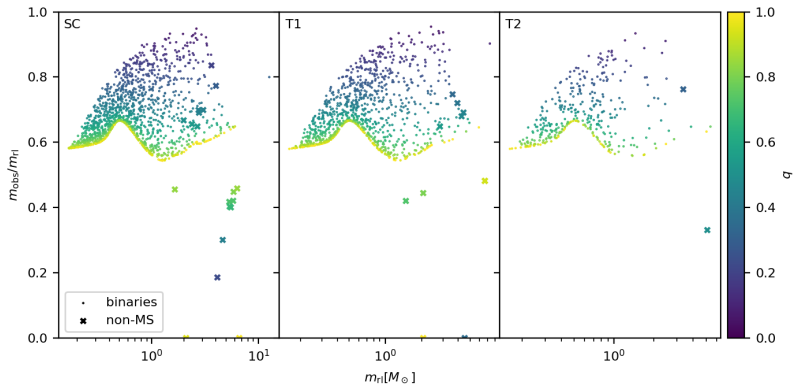


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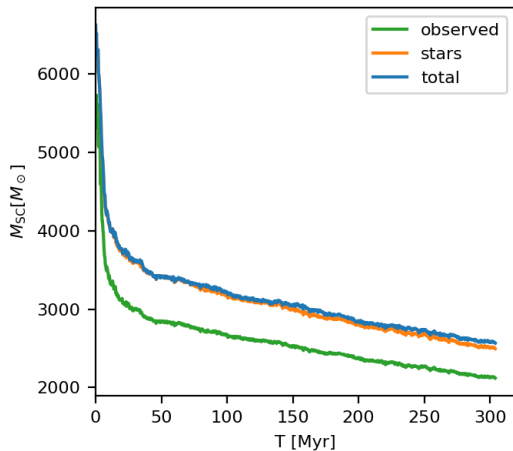


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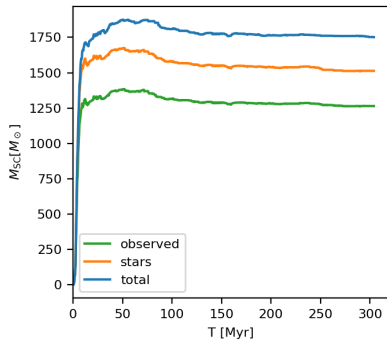


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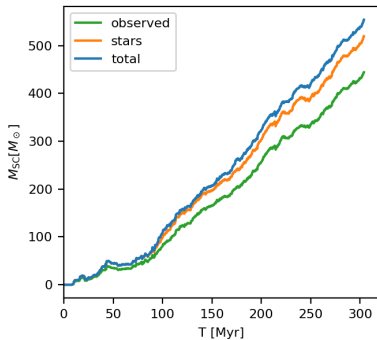


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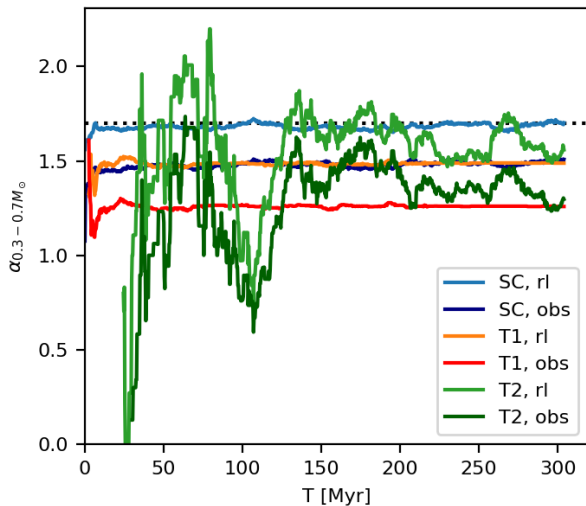


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Summary

- Unresolved binaries lead to and underestimate of the total mass of the binary system.
- The total mass of the SC is underestimated by up to 25 % due to binaries and dark objects.
- This can explain the difference in visible and dynamical mass in Hyades.
- The masses of the tidal tails are underestimated by a similar amount.

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