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HOT STELLAR POPULATIONS OF **BERKELEY 39 USING SWIFT/UVOT**

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BERKELEY 39

INTRODUCTION

Blue Straggler Stars (BSS) are the exotic stellar populations which are brighter and bluer than the main sequence turn-off on colour-magnitude diagrams (Sandage 1953).

They indicate that they have gained mass in the later stages of their evolution.

There are three primary channels for the formation of BSS:

Single component SEDs



- It is 6 Gyr (Kassis et al. 1997) massive open cluster (Lata et al. 2002).
- It is located at a distance of 4254 parsec (Vaidya et al. 2020).
- Mean metallicity [Fe/H] = -0.23 (A. Bragaglia et al. 2012).



Fig: Berkeley 39 in 15 x 15 arcminute





- Direct stellar collision (Chatterjee et al. 2013).
- Mass transfer in a binary system (McCrea et al. 1964).
- Merger (Perets and Fabrycky 2009).



Fig: Shows three major mechanism for BSS formation

DATA AND MEMBERSHIP IDENTIFICATION

- Using the ML-MOC algorithm (Agarwal, M. et al. 2021) on Gaia EDR3 data, we identified 861 members.
- We identified 861 members including 17 BSS candidates.







Image credit: https://www.swift.psu.edu/uvot/

The Ultra-violet Optical Telescope (UVOT)

- UVOT provides simultaneous ultraviolet and optical imaging (170-650 nm) in a 17' x 17' field.
- We have used 3 UVOT filters named UVW1, UVW2, UVW3.





SPECTRAL ENERGY DISTRIBUTION (SED)

- To estimate the fundamental parameters of BSS such as temperature, luminosity, radius we use virtual observatory SED analyser (VOSA, bayo et al. 2008).
- We use UV data from swift/UVOT, optical data from Gaia DR3, IR data from 2MASS, Spitzer/IRAC, and WISE.
- SEDs of the BSS are fit using Kurucz stellar models (Castelli et al. 1997) in which we chose the range of Teff- 3500 to 50000 K and that of log g to be 3 to 5.
- We fixed the value of [Fe/H] to be zero, which is the nearest possible value (-0.23) given in literature.
- The two-component SED is plotted using the Binary SED Fitting code (Jadhav et al. 2021).



Double component SED





Fig: Band passes of UVOT filters

(Image credit: www.swift.ac.uk/analysis/uvot/filters.php)

CONCLUSION

- Out of 861 members we characterized 17 BSS of Berkeley using their multiwavelength spectral 39 energy distributions.
- Of the 17 BSS, 16 were successfully fitted with singlecomponent SEDs.
- We found excess in UV flux for one of the BSS (BSS3), implying the presence of hot companion.
- However, we could not fit the binary-component SED of BSS3, since it gave extreme values of temperatures for all possible models.

REFERENCES

□ Sandage A. et al., AJ, 58, 61 (1953) Chatterjee et al., ApJ, 777, 106 (2013) McCrea et al., MNRAS, 128, 147 (1964) Perets and Fabrycky et al., Apj, 697,1048 (2009) □ Agarwal, M. et al., MNRAS, 502, 2582 (2021) □ Jadhav V. et al., JApA, 42, 89 (2021) □ A. Bragaglia et al. , A&A, 548, A122 (2012) □ Vaidya et al., MNRAS,2402,496 (2020) □ Kassis et al., AJ, 113, 1723, (1997) Lata et al., A&A, 388, 15 (2002)