Globular cluster candidates in the M83 group, using the GHOSTS HST survey.

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Abstract

We have identified four candidate globular clusters (hereafter GCs) in the archival GHOSTS HST survey of the M83 group (specifically, 1 candidate in Field 4 and 3 candidates in Field 5) by visual inspection. We used the Subaru HSC data for the M83 group to search for GCs using Spitzer/IRAC catalog data to constrain colors, cognizant that previous efforts to find GCs[1] have benefitted from combining optical and IR imaging data, through which we obtained 5 candidates, 1 of which matches within tolerance the position of one of the GHOSTS Field 5 candidates. We also observed that the Subaru GCs in conjunction with IRAC do not show clear trends in color-color diagrams. Upon using the IRAC [3.6μm] imaging at the GHOSTS candidate positions, we observe that only the one GC's position in IRAC is clearly resolved. The flux at the predicted positions of the other 2 Field 5 GCs is dominated by neighboring bright objects and the SNR (signal-to-noise ratio) at the predicted position of the Field 4 GC is not enough for detecting a candidate. Therefore, we conclude that the existing archival IRAC data is probably too shallow and suffers from crowding that limits its ability to be used as a tool for detecting GC candidates in the stellar stream of M83.

Method

GC candidates are selected independently from the Subaru HSC dataset cross-matched with the IRAC catalog to constrain colors (as in Pan et. al.) and from the GHOSTS HST dataset by visual inspection of old star density. The stellar population is studied in IRAC (i0 - [3.6μm]) / i0 color-color plots to further refine the candidate selection. Candidates that lie in the correct position in the color-color plots are considered strong candidates. Candidates that pass the GHOSTS HST selection parameters but do not pass IRAC color-color selection parameters are considered weak candidates and are investigated further using the IRAC [3.6μm] imaging data at their coordinates as given by the GHOSTS dataset.

Results

The GHOSTS sample returns 1 strong candidate (Field 5) and 3 weak candidates (2 in Field 5 and 1 in Field 4). The IRAC imaging data for the weak candidates indicates that the Field 4 candidate (separated by significant distance from the other three) RA-DEC position has low SNR. Furthermore, the detector likely suffers confusion due to the bright objects (blue on color-scale & centered in both images) at the positions of the GHOSTS GCs, obscuring the flux of the candidates.

Conclusions

- 4 GC candidates have been identified in the GHOSTS HST dataset.
- The existing IRAC data is too shallow and suffers from crowding, limiting its usefulness as a tool for detecting globular clusters in the stellar stream of M83.

Sample Results

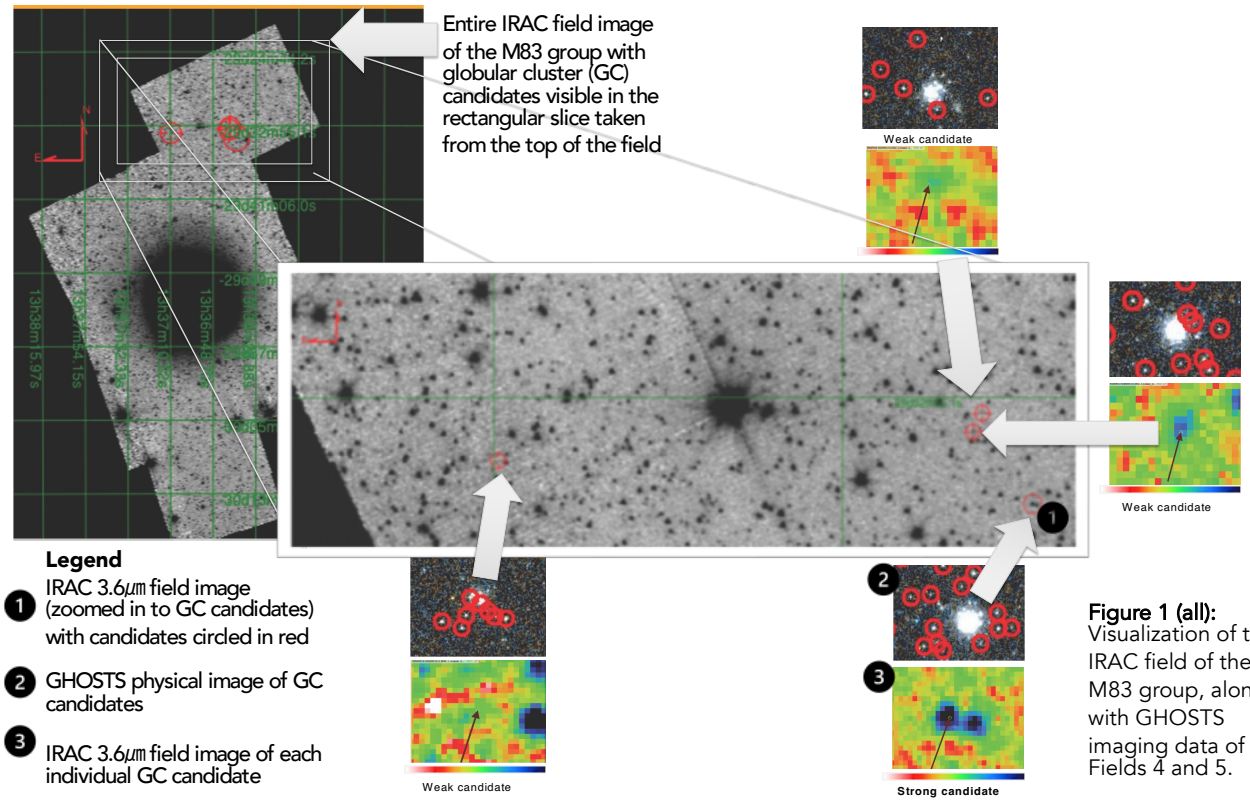

Figure 1 (all): Visualization of the IRAC field of the M83 group, along with GHOSTS imaging data of Fields 4 and 5.

Selected Plots

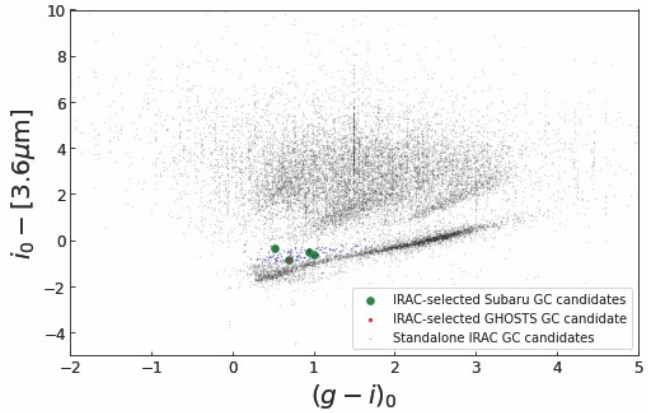

Figure 2 (left) IRAC-color / Subaru-color plot of the Subaru HSC dataset of the M83 group with the IRAC-selected Subaru GC candidates (green), IRAC standalone GC candidates (dark blue), and IRAC-selected GHOSTS GC candidate (red). The Subaru candidates were derived from trends in size, color, and brightness while the GHOSTS candidate was derived from physical imaging.

Note the positioning of the GC candidates trend-wise in the plot.

Literature cited

[1] Pan, J. et al. "Globular Cluster Candidates in a Subaru Hyper Suprime-Cam (HSC) survey of the M81 group." American Astronomical Society Meeting Abstracts. 2021.

Acknowledgments

Colin Purrington for the initial poster design.

Further information

Ask me! I should be near my poster most of the time and the literature cited should also be useful reading.