Draft version November 5, 2019
Typeset using LaTeX **twocolumn** style in AASTeX62

An Estimate of the Age of the Open Cluster NGC 6819

Joseph M. A. Murphy[1] and Anne Dattilo[1]

[1]*Department of Astronomy and Astrophysics, University of California, 1156 High Street, Santa Cruz, CA 95064*

1. OBSERVATIONS

The open cluster NGC 6819 was observed on UTC 2019 September 24 with the Direct Imaging Camera on the 1 m Nickel Telescope at Lick Observatory. Observing conditions were spectroscopic and the seeing, approximately 3", was slightly worse than is typical on the Nickel. Images of NGC 6819 were taken in both B and V-band (3500–5200 and 4700–6300 Å, respectively), with the camera's 6'.3×6'.3 field of view pointed at the center of the cluster. To absolutely calibrate our photometry, we observed a field of Landolt photometric standard stars (Landolt 1992). Table 1 summarizes our observations.

2. DATA REDUCTION AND ANALYSIS

Science images were median combined, dark and bias subtracted, and flat-fielded. Point-spread function fitting (PSF) photometry was performed on the processed NGC 6819 and Landolt field images using `photutils` (Bradley et al. 2019). Zero point offsets in B and V-band were computed by averaging over our measurements of the zero points of the three standard stars in the Landolt field. Note that we did not correct for atmospheric extinction in our zero point measurements, which may give our photometric calibration a red-ward color bias.

Table 1. Summary of the Direct Imaging Camera observations on UTC 2019 September 24.

Target	Filter	Exp. time (s)	Airmass
NGC 6819	V	120	1.04
NGC 6819	V	120	1.04
NGC 6819	V	120	1.05
NGC 6819	B	120	1.05
Landolt field	B	10	1.43
Landolt field	B	10	1.43
Landolt field	V	5	1.43
Landolt field	V	5	1.44
Landolt field	V	5	1.44
Landolt field	B	5	1.45

Note—The Landolt field observed contains three standard stars: 111 1925, 111 1965, and 111 1969. Observations of NGC 6819 were cut short by high winds that resulted in dome closure.

Corresponding author: Joseph M. A. Murphy
joseph.murphy@ucsc.edu

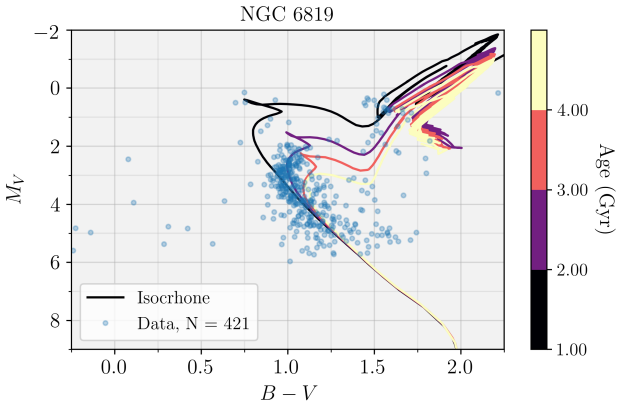

Figure 1. An HR diagram of the open cluster NGC 6819 with isochrones for reference. Isochrone tracks are shifted to the right by 0.6 mag. This offset in color might be explained by our lack of an atmospheric extinction correction to the Landolt photometry.

NGC 6819 absolute magnitudes were calculated using the distance to the cluster as found by Ak et al. (2016). In principle, we could also estimate the distance to NGC 6819 directly by using the difference between an isochrone's absolute magnitude and our data's apparent magnitude as a proxy for the distance modulus.

3. RESULTS

To estimate the age of NGC 6819 we generated isochrones via the CMD webtool, which is maintained by Léo Girardi and makes use of code from Bressan et al. (2012), Chen et al. (2014), Tang et al. (2014), Marigo et al. (2017), and Pastorelli et al. (2019). Plotting the isochrones against our HR digram (Figure 1) we estimate the age of NGC 6819 to be about 2 Gyr.

Saturated sources, sources with poor PSF fits, and unmatched B and V-band sources were culled from the

initial photometric sample, resulting in the final collection of sources seen in Figure 1. The remaining outliers in color may not be members of the cluster, but we have yet to verify this explanation.

REFERENCES

Ak, T., Bostancı, Z. F., Yontan, T., et al. 2016, Astrophysics and Space Science, 361

Bradley, L., Sipőcz, B., Robitaille, T., et al. 2019, astropy/photutils: v0.6

Bressan, A., Marigo, P., Girardi, L., et al. 2012, MNRAS, 427, 127

Chen, Y., Girardi, L., Bressan, A., et al. 2014, MNRAS, 444, 2525

Landolt, A. U. 1992, AJ, 104, 340

Marigo, P., Girardi, L., Bressan, A., et al. 2017, ApJ, 835, 77

Pastorelli, G., Marigo, P., Girardi, L., et al. 2019, MNRAS, 485, 5666

Tang, J., Bressan, A., Rosenfield, P., et al. 2014, MNRAS, 445, 4287