# Ground-based NUV-Optical Photometry Reveals Abundance Variations in Red Giant Stars of Galactic Bulge Globular Clusters

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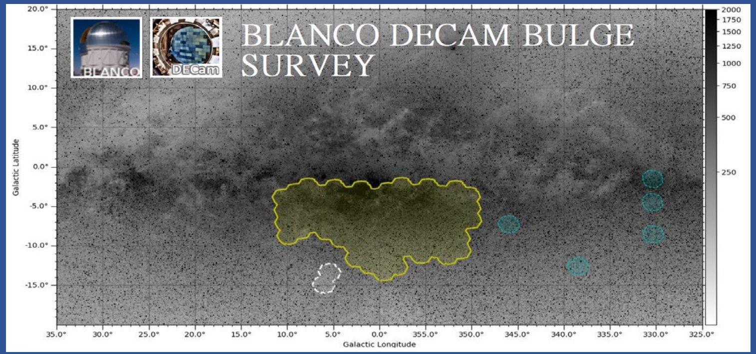
## Data & Methods

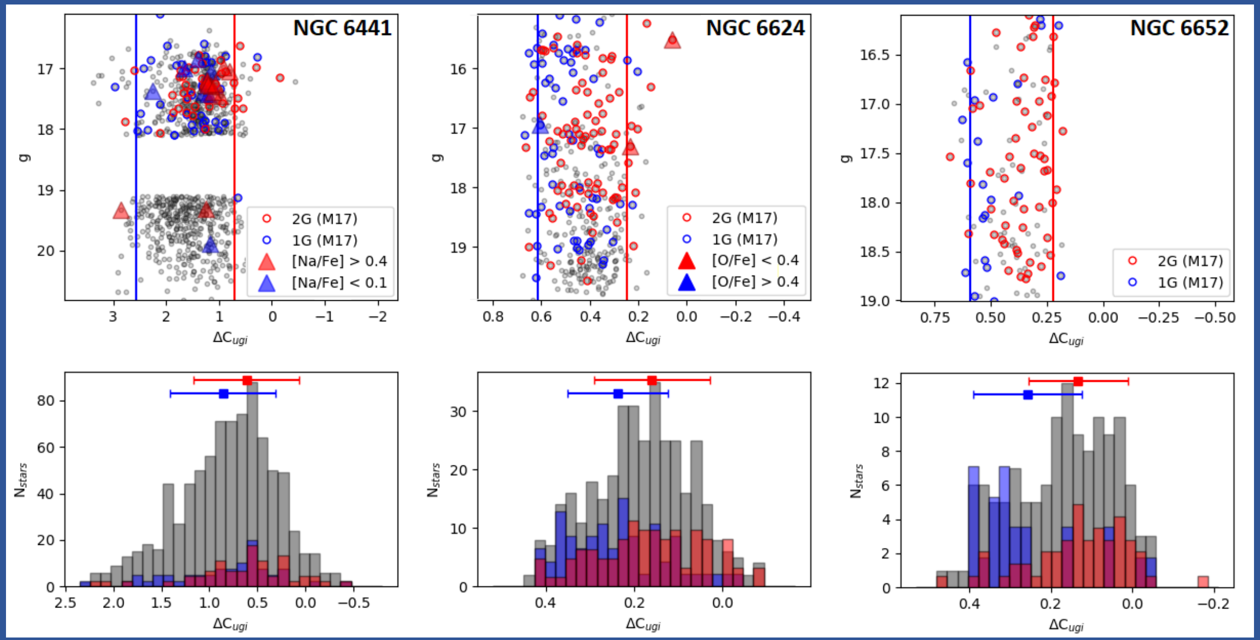
The goals of this project were to test the ability of the pseudo-color index (*u*-*g*) – (*g*-*i*), ($C_{ugi}$), to distinguish the atmospheric light element abundances (C, N, O, Na) of red giant stars residing in the heavily obscured globular clusters (GCs) of the Galactic bulge.




Data come from the Blanco DECam Bulge Survey (BDBS) point source catalog, containing calibrated, dereddened *ugrizY* photometry for 250 million sources over 200 square degrees toward the Galactic bulge.

The sample includes 14 of the most massive inner-Galaxy GCs, and red giant cluster members were identified using Gaia DR2 proper motions. We verticalize the RGB in *g* vs. $C_{ugi}$ space, and examine the distribution in $C_{ugi}$ offsets to find multiple populations of red giants in each cluster. We spatially matched stars with HST UV photometry and spectroscopically determined subpopulation membership to test whether $C_{ugi}$ colors correlate with stellar subpopulation membership.

## Results




Verticalized *g* vs. $C_{ugi}$ red giant branches of three of the sample Galactic bulge globular clusters. Top row: grey points are $C_{ugi}$ offsets along the RGB (BDBS sources), blue and red circles are stars along the 1G and 2G sequences in HST data (Piotto et al. 2011; Milone et al. 2017 (M17)), red and blue triangles are stars with spectroscopically determined subpopulation membership. Bottom row: histogram of $C_{ugi}$ offsets (grey), and the distribution of literature matched stars (HST and spectroscopic results combined); the blue and red boxes at top show the mean and RMS scatter of the 1G and 2G $C_{ugi}$ offsets. We find that the de-reddened $C_{ugi}$ color of cluster stars correlates with light element abundance and with HST (F237W – F336W) – (F336W – F438W) UV color.