The Sizes of Globular Clusters in NGC 4278

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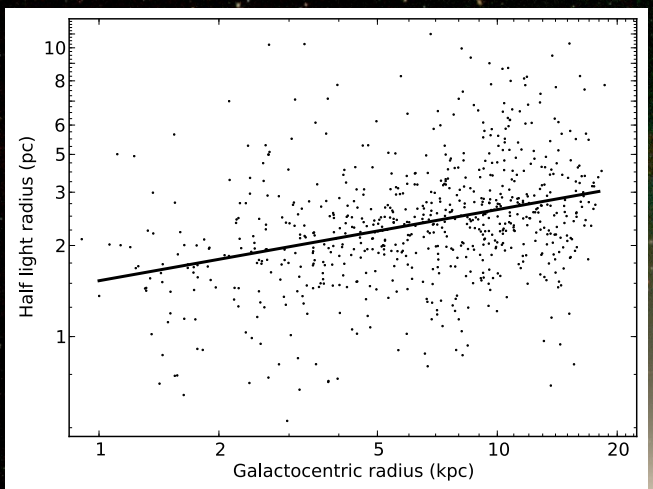
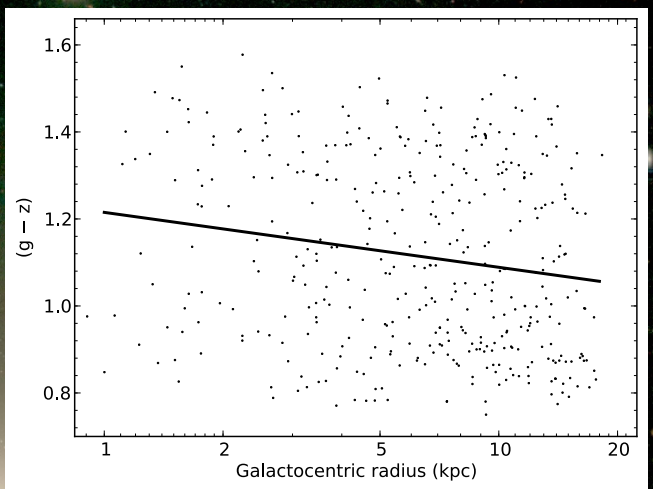
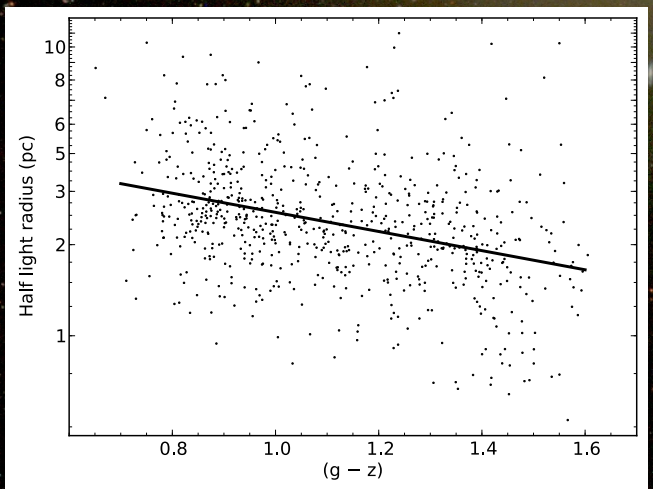
Globular clusters (GCs) are an important tool in understanding galaxy evolution. They are fossils of galaxy assembly and provide one of the few ways of studying the halos of galaxies. As part of the ongoing SLUGGS Survey (sluggs.swin.edu.au) we used archival HST ACS imaging to study the GC system of the nearby (D = 15.6 , Tonry+ 2001) elliptical galaxy NGC 4278. The imaging consists of five pointings each with 700 s F475W (g) and 1200 s F850LP (z). We performed aperture photometry to measure the colours and magnitudes and used ishape (Larsen 1999) to measure sizes. We use colour and size cuts to select GCs. These results and others have recently been accepted for publication in MNRAS (Usher+ 2013, arXiv:1308.6585).



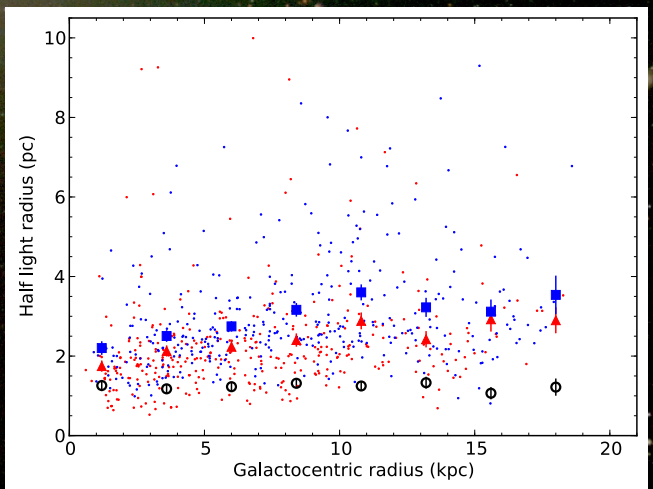
The sizes of GCs around NGC 4278 vs their projected distance from the centre of the galaxy. GCs are smaller closer to the centre of the galaxy. This trend has been long known in the Milky Way (van den Bergh 1955) and in other galaxies (eg Harris 2009). Since the size of a star cluster is dictated by the tidal and since the tidal field is stronger in the centre of a galaxyfield it experiences, this size-radius trend can be easily explained by the strength of the tidal decreasing with radius (eg Madrid+ 2012).



The colours of GCs vs their projected distance. Like in other galaxies (eg Liu+ 2011) GCs in NGC 4278 become bluer further from the galaxy, mirroring the colour gradients seen in their host galaxies. As seen in almost every galaxy (eg Brodie & Strader 2006) the GCs show a bimodal colour distribution. Since GC are old (> 10 Gyr, eg Puzia+ 2005) their colours trace their metallicities so the blue GCs are metal poor and the red metal rich.



The sizes of GCs vs their colour. Bluer GCs are larger than redder ones. This relationship was first reported by Kundu & Whitmore in 2001in NGC 3115 and its origin has been debated. Since GC become larger and blue with radius, Larsen & Brodie (2003) argued that, under certain conditions, this may be a projection effect while Jordán (2004) suggested that metal poor (blue) GCs are larger due to internal dynamical and stellar evolution effects.



To disentangle the effects of radius and colour on GC sizes we compared the sizes of red and blue GCs in radial bins. The squares and triangles show the mean sizes of the blue and red GCs in each bin while the open circles show the ratio of the blue to red sizes. Since the ratio is independent of the galactocentric radius, the difference in size with colour is due to internal processes not position with in the galaxy. These results agree with the detailed GC simulations of Sippel+ (2012).

Background image: Subaru Suprime-Cam BVI mosaic of NGC 4278