

Examining the Role of Environment in a Comprehensive Sample of Compact Groups

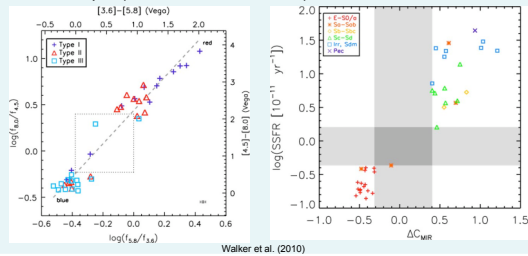
Lisa May Walker, Kelsey E. Johnson, Sarah C. Gallagher, John E. Hibbard,
Ann E. Hornschemeier, Jane C. Charlton, Panayiotis Tzanavaris

Abstract

Compact groups, with their high number densities, small velocity dispersions, and an ISM that has not been fully processed, provide a local analog to conditions of galaxy interaction in the early universe. The frequent and prolonged gravitational encounters that occur in compact groups affect the evolution of the constituent galaxies in myriad ways. Recent work has shown clear evidence that the compact group environment has a strong impact on galaxy evolution - in particular, a "gap" has been discovered in both the mid-infrared (MIR) IRAC (3.5-8.0 micron) colorspace and specific star formation rates (SSFRs). This gap is not seen in field samples and is an interesting new example of how the compact group environment may affect the evolution of member galaxies. In order to investigate the origin and nature of this gap, we have studied an expanded sample of 35 compact groups in addition to the original 12 groups studied by Johnson et al. (2007) (yielding 171 individual galaxies). We find that an underrepresentation of galaxies in this color range of IRAC colorspace is persistent in the full sample, lending support to the hypothesis that the compact group environment inhibits moderate SSFRs. We have more fully characterized the distribution of galaxies in this colorspace, as the full sample now picks up a few galaxies in this region, allowing us to quantify this lower density region more fully with respect to the MIR bluer and MIR redder colors. This full sample allows us to analyze physical properties of the sample, revealing that neither projected physical diameter or density show a trend in colorspace within the values represented by this sample. We hypothesize that this is due to the variances in these properties being too small.

Motivation

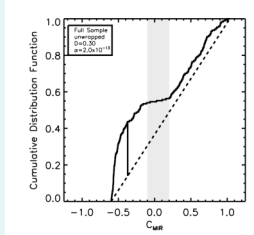
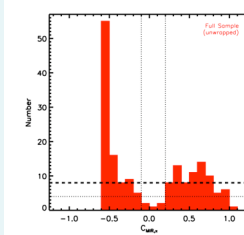
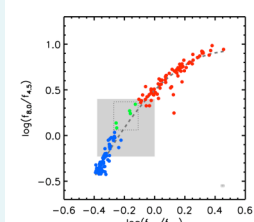
Previous work found a statistically significant gap in IRAC colorspace for a sample of Hickson Compact Groups (HCGs) that appears to be unique to the high density, non-preprocessed environment (Walker et al. 2010). In addition to this gap, there is an analogous gap in the specific star formation rates for galaxies in this sample (Tzanavaris et al. 2010).



Walker et al. (2010)

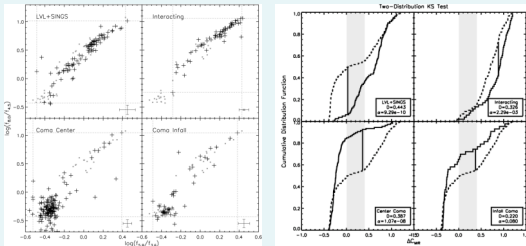
HCG Canyon

- Full sample of 47 compact groups
- Underdensity still exists - now canyon
- Defined to be where histogram is < 1/2 its median value
- See curvature in colorspace not noted before



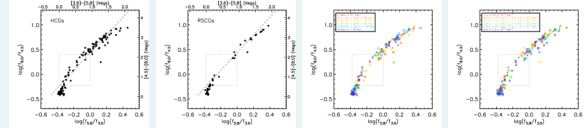
Comparison Samples

- Four samples in different environments
- Approximation to field sample, interacting sample, two regions in Coma cluster



Subsamples

- No trend by HCGs, RSCGs
- No trend by physical projected diameter or physical projected density



Dust Content

- Removed contribution from stars
- SEDs binned by color show varying slopes over IRAC bands
- Indicates different colors due to different dust content and/or temperature, not simply different quantities

