The Spitzer Interacting Galaxy Survey: Infrared – Ultraviolet Photometry

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Survey Description

The evolution of galaxies is greatly influenced by their interactions. The Spitzer Interacting Galaxy Survey (SIGS) sample was designed to probe a range of interaction parameters using infrared data complemented by a range of other observations. It is comprised of the Keel-Kennicutt (Keel et al. 1985) complete sample of interacting galaxies chosen on the basis of association likelihood. The resulting sample contains 111 galaxies in 50 systems, with recessional velocities cz <4000 km/s. **We present the photometric analysis of selected galaxies from the SIGS atlas. SIGS will measure the impact of mergers by comparing star formation indicators in two galaxy subsamples: advanced mergers (Arp galaxies) and first pass, more separated mergers.**

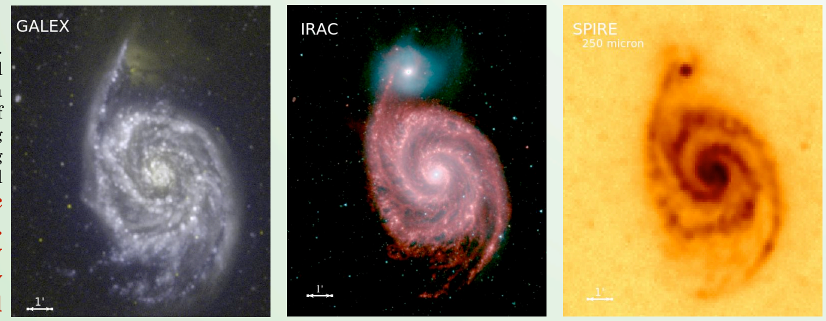

Fig. 1 **M 51** as observed by GALEX (left; NUV and FUV), IRAC on Spitzer (middle; 3.6 μm, 4..5 μm, and 8.0 μm), and SPIRE 250 μm on Herschel (right).

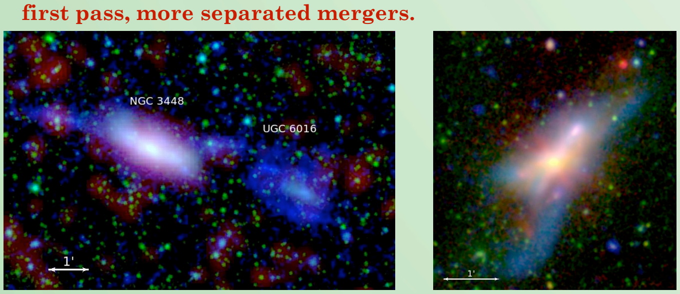

Fig. 2 **NGC 3448** and its companion UGC 6016 shown in GALEX NUV, IRAC 3.6 μm, and SPIRE 250 μm (left), and **NGC 520** shown in GALEX NUV, IRAC 3.6 μm, and IRAC 8.0 μm (right).

Sample and Observation Set Benefits

Previous samples tended to be chosen morphologically or based on infrared emission or optical emission line diagnostics. **Due to the criteria used to select our sample, it spans a broad range of degrees of nuclear and/or starburst activity and types of interactions and includes systems likely to be on their first pass as well as evolved systems.** In contrast, infrared-selected samples tend to contain only the more active systems. Further, our use of infrared diagnostics will reduce the impact of obscuration, which is a common problem with optical line diagnostics.

The sample has complete mid-infrared (Spitzer) coverage and almost complete UV (GALEX) coverage. A subsample of the galaxies, including most of those presented here, have been observed in the far-infrared with SPIRE on Herschel. **Together, these observations allow a more systematic determination of star formation in interacting galaxies.**

Infrared – Ultraviolet Morphology

Figures 1-3 present seven galaxies from our sample, spanning a variety of morphology. M 81 and M 51A exemplify systems where the infrared emission associated with star formation is closely traced by the UV emission. In contrast, examples exist where either the UV (e.g. NGC 3430) or the short-wavelength infrared emission (e.g. NGC 2976) is more extended. Some galaxies in the sample demonstrate very different levels of emission in the UV and IR. For example, M 51B is much fainter in UV, but UGC 6016, while extended in the UV, is compact and faint in the IR. The degree of morphological distortions seen also vary widely, with some systems relatively undisturbed (e.g. NGC 3430), some systems showing bridges (e.g. NGC 3448/UGC 6016), and some systems showing tidal tails (e.g. NGC 520).

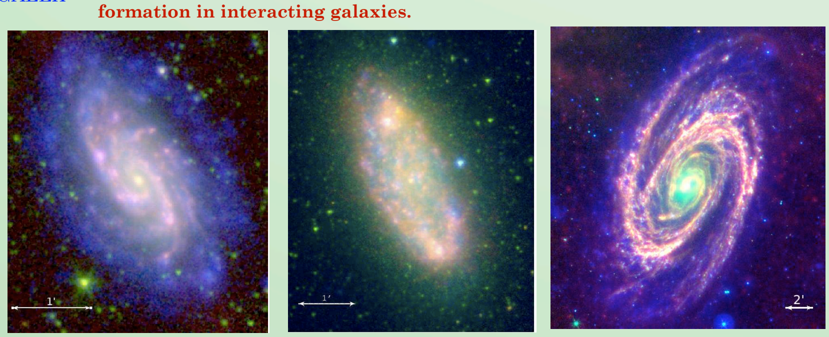

Fig. 3 **NGC 3430** (left)**, NGC 2976** (middle), and **M 81** (right) shown in in GALEX NUV, IRAC 3.6 μm, and IRAC 8.0 μm (left and middle) and GALEX NUV, IRAC 8.0 μm, and SPIRE 250 μm (right).

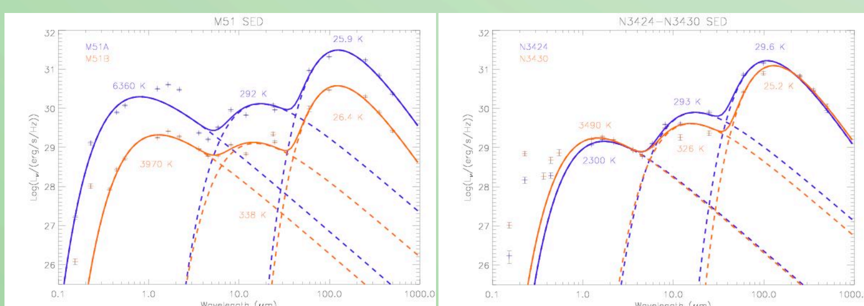

Fig. 4 SEDs of M 51A and M 51B (left) and of NGC 3424 and NGC 3430 (right) including data from GALEX, Spitzer, and SPIRE supplemented with IRAS, 2MASS, and RC3 photometric points. They are fit with the sum of two blackbodies and a β=1.5 graybody at the temperatures indicated.

Spectral Energy Distributions

Figure 4 shows spectral energy distributions (SEDs) of two pairs of galaxies fit with the sum of two blackbodies and a β=1.5 graybody at the indicated temperatures. **They show the two general SED shapes found so far: (1) increasing luminosity from UV to IR and (2) greater luminosity at optical/UV and FIR than in MIR. Neither of these two types are able to fit the UV emission well, indicating that multiple stellar populations are likely present. However, these models allow us to derive characteristic warm and cool dust temperatures of ~300 K and 20-30 K in these systems.** We plan to fit the models devised by Dale (et al. 2007) and Draine (et al. 2007), which consider dust heated by a variety of radiative intensities, and by da Cunha et al. (2008), which use stellar synthesis models whose radiation from stellar populations is propagated through a dusty medium, to constrain star formation histories**.**

References

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