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The Spitzer Interacting Galaxies Study

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Abstract. Galaxy interactions play an important role in the evolution of galaxies and triggering galaxy-wide star-formation or accretion onto nuclear black-holes. However, the strength and details of the relationship between galaxy interactions and triggered activity are still unclear. In order to address these questions we embarked on a Spitzer multi-wavelength study of a sample of nearby interacting galaxy systems. Our goal is to investigate: how interactions trigger star-formation by studying the spatial distribution and level of star- formation, and comparing them with theoretical models for different interaction parameters; how the interactions drive gas in the nuclear regions, and how this gas promotes and/or hides nuclear activity, by studying the distribution of dust and performing deep spectroscopic observations of the galactic nuclei; and how star-formation and AGN activity depend on the interaction stage.

1. The Sample, Observations, and Initial Results

We require a large sample of nearby interacting galaxies which is not based on morphological criteria (i.e., is independent of the interaction parameters). Such a sample is defined by Keel & Kennicutt (1985), and consists of northern interacting galaxies in the Uppsala catalogue (Nilson, 1973), selected on the basis of galaxy separation, relative velocity and interaction probability (based on the local galaxy density). A comparison sample to study later stages of galaxy interactions, includes all objects in the Arp catalogue (Arp, 1966), which do not show evidence of disrupted galactic disks (i.e., is not biased towards late mergers). From these two samples we chose all objects up to a maximum distance of 53 Mpc ($v < 4000$ km/s); we include all individual members of the interacting systems even when not part of the original samples. The final list consists of 110 objects in 49 interacting systems, 82 of which are in the early stages of interaction and 38 in more evolved mergers.

SIGS uses all Spitzer instruments. To date, we have obtained IRAC data for 68 galaxies (34 systems). These images show a variety of star-formation morphologies ranging from spiral arms, to rings or warped disks, to galaxy-wide star-formation(see also Smith *et al.* in this volume). They also demonstrate the superiority of Band 4 IRAC data as a tracer of the ISM in heavily obscured regions. From the stellar continuum subtracted Band 4 IRAC image we estimated the integrated star-formation rate for each galaxy, based on the prescriptions of Huang *et al.* (2006, in prep) and Wu *et al.* (2005). We find that the distributions of SFR in the two samples are marginally different (KS-test probability 97%).

Using the IRAC, Hα, UV (GALEX), IRS spectroscopy and X-ray data, we compare the distribution of star-formation in galactic mergers with our model predictions of theoretical models of galaxy interactions in order to investigate the mechanisms that trigger star-forming activity.

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