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The Spatial Extent of (U)LIRGs in the Mid-Infrared. II. Feature Emission

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We present results from the second part of our analysis of the extended mid-infrared (MIR) emission of the Great Observatories All-Sky LIRG Survey (GOALS) sample based on 5-14 micron low-resolution spectra obtained with the IRS on Spitzer. We calculate the fraction of extended emission as a function of wavelength for all galaxies in the sample, FEE_lambda, and spatially separate the MIR spectrum of galaxies into their nuclear and extended components.

We find that the [NeII] emission line is as compact as the hot dust MIR continuum, while the polycyclic aromatic hydrocarbon (PAH) emission is more extended. The 6.2 and 7.7 micron PAH emission is more compact than that of the 11.3 micron PAH, which is consistent with the formers being enhanced in a more ionized medium. The presence of an AGN or a powerful nuclear starburst increases the compactness of the hot dust MIR continuum, but has a negligible effect on the spatial extent of the PAH emission on kpc-scales. Globally, the spectra of the extended emission component are homogeneous for all galaxies in GOALS. This suggests that the physical properties of star formation taking place at distances farther than 1.5 kpc from the nuclei of (U)LIRGs are very similar, resembling local star-forming galaxies with L_IR < 10^11 Lsun, as well as star formation-dominated ULIRGs at z~2. In contrast, the MIR spectra of the nuclear component of local (U)LIRGs are very diverse. This implies that the observed variety of their integrated MIR properties arise, on average, only from the processes that are taking place in their cores.

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