The Mid-IR spectra of Interacting Galaxies: from ISO to SIRTF

V. Charmandaris[1], B. Brandl[1], J. Houck[1], and O. Laurent[2]

[1]*IRS Science Center, Astronomy Department, Cornell University, USA*
[2]*Service d'Astrophysique, CEA/Saclay, France*

I will present a review on the mid-IR (5–16μm) spectral imaging of a sequence of nearby interacting galaxies, observed by ISOCAM. The galaxies are part of the well known Toomre's "merger sequence" which was defined as a sample of galaxies depicting progressive snapshots in the time evolution of a merging event. Using the ratio of the 15μm to 7μm flux as well as the variation of [NeII] and [NeIII] lines we can trace the intensity of the radiation field in a starburst. Our analysis indicates that the 15μm to 7μm flux ratio increases as galaxies move from the pre-starburst to the starburst phase and goes again down to ~ 1 in the post-starburst phase, a value typical of normal star forming regions in galactic disks. We also find that this ratio is well correlated with the one of the IRAS 25μm/12μm and 60μm/100μm flux ratios. This suggests that even though the bolometric luminosity of merging luminous infrared galaxies is found at $\lambda \geq 40\mu m$, the study of the mid-IR spectral energy distribution is a powerful tool in understanding their global star formation history.

As a second step I will highlight the capabilities of the Infra-Red Spectrograph (IRS, P.I. J. Houck - Cornell Univ.), which will be one of three instruments on board SIRTF, and how it will enable us to improve some of the limitations of ISO. IRS provides a complete spectral coverage between 5 and 40μm with a sensitivity 10 times better than ISO, a spectral resolution ranging between 60 and 600 and a spatial resolution of $\sim$1.5 arcsec. Using IRS we will be able to observe highly obscured starbursts and AGNs, follow the mid-IR continuum emission as well as the two silicate features at 9.7 and 18 μm and provide robust estimates on the amount of absorption. Moreover, as I will show using our simulated spectra, the characteristic signature of the Unidentified Infrared Bands will be used as a means for providing a *direct red-shift determination* of high redshift sources as faint as 0.5 mJy from their mid-IR spectra .