Stony Brook University
The Graduate School

Doctoral Defense Announcement

Abstract

Properties and Distribution of Luminous Stellar Clusters

in a Large Sample of Luminous Infrared Galaxies

By

Tatjana Vavilkin

Luminous Star Clusters (SCs) are fundamental building blocks of galaxies, and they provide basic information regarding the mechanisms of star formation and the process of galaxy formation and evolution. In my PhD thesis project I investigated properties of young SCs in a sample of 87 nearby Luminous Infrared Galaxies (LIRGs: $L_{IR}>10^{11}L\_sun$) imaged with the *Hubble Space Telescope's* Advanced Camera for Surveys at 0.4μm (F435W) and 0.9μm (F814W). Many LIRGs are observed to be ongoing mergers of gas-rich disk galaxies. They contain extreme starbursts and hence are expected to host particularly rich and luminous populations of SCs. This project represents the largest sample of galaxies with uniformly characterized properties of their SC population. The size of the sample allows an identification of trends in SC properties with merger stage and star formation rate.

A large fraction of the cluster population (≈20%) is younger than 10 Myr, but also a population with an age distribution up to few hundred Myr is likely present. The LIRG sample contains some of the most luminous clusters observed so far (i.e., M_{max}~-18mag); these brightest clusters follow the "brightest cluster - star formation rate" correlation observed for lower luminosity star-forming galaxies. Also, the SC specific frequency and specific luminosity are enhanced in this sample of LIRGs as compared to local spiral galaxies; all three findings are consistent with the observed higher star formation rates in LIRGs. The median SC luminosity function index of the LIRG sample is α≈-1.8, which is in a good agreement with previously published studies in various galaxy types. Finally, in a sub-sample of 15 most cluster-rich LIRG systems, auto-correlation functions reveal a hierarchical spatial distribution of SCs; correlation functions with *GALEX* near-UV and *Spitzer* IRAC 8μm images show an overlap of near-UV emission and locations of optically visible clusters and no apparent correlation with mid-IR emission (i.e., embedded star formation). Thus, optically visible young SCs and UV emission represent un-obscured star formation which appears to be unassociated with the bulk of the star formation that takes place in dusty regions of LIRGs.

Date: July 15, 2011
Time: 2:30 pm
Place: ESS, 450

Program: Physics --Astronomy
Dissertation Advisor: Prof. Aaron Evans