FY 2022 Research NOFO Abstracts

Title: Paving the Way for Astrophysics Research in Puerto Rico

Proposal Number: 22-22EPSCoR-0002   MD: SMD

Institution: University of Puerto Rico, San Juan

PI: Dr Gerardo Morell

Abstract: We propose a series of research projects based at the University of Puerto Rico that will maximize the use of NASA archived Infrared data from past (Spitzer, Herschel, WISE) and ongoing (SOFIA, JWST) missions. This will allow faculty and students to gain experience in the analysis of infrared data, essential for conducting astrophysical research in various topics. In turn, this will provide scientists in Puerto Rico the necessary skills to take full advantage of data from ongoing and future NASA flagship space missions, like the James Webb Space Telescope (JWST) and the Nancy Grace Roman Space Telescope, data from current and future powerful ground-based infrared telescopes.

The science projects we will be working on are:

1) Data Mining in the Zone of Avoidance. We will study the deepest part of the Zone of Avoidance (ZoA), by first identifying galaxy candidates in the local universe, using NASA Infrared Processing and Analysis Center (IPAC) archived data from Spitzer Space Telescope Legacy programs. We will also use the WISE archive data for characterization of known HI galaxies in the ZoA. The galaxy candidate catalog that will be produced will be a seed for further studies at different wavelengths. The selected regions are the most challenging but the results from this project will be the first to unveil the large-scale distribution of galaxies at such extreme latitudes. In addition, we will conduct a pilot project in which we will explore the implementation of data mining algorithms for galaxy search and identification using Spitzer Space Telescope Mid-IR images.

2) Newborn stars and their interactions with their maternal molecular cloud Outflows, winds, and UV radiation from young stars affect the dynamics and the chemistry of their surrounding gaseous environment, thereby influencing the star formation process in the molecular clouds. This project focuses on the study of stellar feedback on star-forming regions, in particular protostellar out flows and winds and their impact on the molecular cloud environment. We will use SOFIA data to study wind shells produced by young mid-mass stars. Our study will permit us to establish the impact these winds have on their maternal clouds. We will also study shocks in protostellar jets and their impact on the cloud, using Spitzer Space telescope images and spectra. Moreover, we will use soon-to-be James Webb Space Telescope data of a highly collimated jet to study the base of the outflow as close as possible to the outflow launching and collimation zone, where the jet is formed, in order to better understand the complex dynamics of the region.