Mid-Infrared Variability of Active Galactic Nuclei in Cosmic Voids

Aradhey, Anish (School: Harrisonburg High School)

Observations and theoretical simulations suggest that the large scale environment plays a significant role in how galaxies form and evolve and, in particular, whether and when galaxies host an actively accreting supermassive black hole in their center (i.e., an Active Galactic Nucleus, or AGN). I present an original investigation of the degree to which AGN activity occurs in galaxies in the most under-dense regions of the universe (cosmic voids) relative to the rest of the universe (cosmic walls) via measurements of mid-infrared (mid-IR) luminosity variability. This diagnostic allows me to identify elusive AGN activity where other, more traditional efforts remain limited due to dust obscuration or dilution from star formation or host galaxy light. I use public data catalogs from the Sloan Digital Sky Survey and 8.4 years of photometry from the Wide-field Infrared Survey Explorer (ALLWISE/NEOWISE) to identify and quantify the frequency and strength of mid-infrared variability of void and wall galaxies as a function of optical intrinsic luminosity and other mid-IR AGN diagnostics. I reveal for the first time that AGN activity in dwarf galaxies is significantly more common in voids than in walls. My findings provide new constraints into the role of galactic interactions in triggering AGN activity at the lowest luminosity levels, providing new support to previous findings that phenomena such as stripping and collisions may spark AGN activity but only among larger and more luminous galaxies.

Awards Won:

Fourth Award of $500