Chester F Carlson Center for Imaging Science

M.S. Thesis Defense

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Modeling the Infrared Emission from Cygnus A

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Abstract

The Spitzer Space Telescope provides a unique view of the Universe at infrared wavelengths. Improved sensitivity and angular resolution over previous missions enable detailed studies of astrophysical objects, both in imaging and spectroscopic modes. Spitzer observations of active galactic nuclei can help shed light on the physical conditions of the central regions of these active galaxies.

The nearby radio galaxy Cygnus A is one of the most luminous radio sources in the local Universe. In addition to the high radio power, it is also very luminous in the infrared. Spitzer spectroscopy and photometry of Cygnus A is combined with data from the literature at radio and sub-mm wavelengths and modeled with a combination of: a synchrotron emitting jet, a burst of star formation, and emission from an AGN. The infrared emission in Cyngus A shows contributions from all three processes and the models are able to reproduce the observed emission over almost 5 dex in frequency. Evidence is seen for a break in the synchrotron spectrum in the mid-infrared. The relevant component of the infrared emission suggests Cygnus A has a star formation rate of ~20 M_sun per year. Even in the absence of the AGN, it would still be a luminous infrared source.