The Mid-Infrared Spectral Characteristics of Blazars

Howard A. Smith(1), F. Massaro(2), R. D’Abrusco(1), A. Paggi(1), F. Ricci (1,3), N. Masetti(4), M. Giroletti(5), G. Tosti(6,7), and M. Landoni(8)

(1)Harvard-Smithsonian CfA; (2) Yale; (3) U.Roma Tre; (4)INAF/IASF; (5)INAF/IRA; (6)Perugia Fisica; (7)Perugia INFN; (8)INAF/OAB

BACKGROUND

The purpose of this paper is to present our results on the mid-infrared spectral characteristics of blazars. Blazars are a class of active galactic nuclei (AGNs) that exhibit powerful jets and are characterized by their strong non-thermal radiation. The mid-infrared region (3–100 µm) is particularly useful for studying the dust emission in AGNs, as it is not significantly affected by the interstellar medium.

Figure 1: The WISE Color-Color Space of Blazars

The WISE (Wide-field Infrared Survey Explorer) satellite, an NASA mission, was launched in 2009 and operated until 2011. It provided all-sky coverage in four infrared bands: W1 (3.4 µm), W2 (4.6 µm), W3 (12 µm), and W4 (22 µm). Blazars were identified using their characteristic color-IR emission in the WISE imaging data. We used the WISE color-color space (W1-W2 vs. W3-W4) to classify blazars into different classes based on their spectral properties.

Figure 2: Blazar Subclasses

Blazars can be classified into several subclasses based on their mid-infrared spectral characteristics. These subclasses include:

- **Blazars with Dust Emission**: These blazars show strong mid-infrared emission due to dust heating in their jets. They are often associated with silicate features in their spectra.
- **Blazars with Silicate Absorption**: These blazars exhibit silicate absorption features in their spectra, which are characteristic of star-forming regions.
- **Blazars with No Features**: Some blazars show no significant features in their mid-infrared spectra, indicating a lack of dust emission.

Figure 3: Blazar Spectral Features

The mid-infrared spectra of blazars often show characteristic features that can be used for classification. These features include silicate absorption bands and silicate emission bands.

Figure 4: Blazar Spectral Modeling

We used spectral modeling to fit the mid-infrared spectra of blazars. The model parameters include the flux density at different wavelengths and the shape of the continuum.

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