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Seyfert galaxies: a perspective with ISO-PHOT

Ana M. Pérez García and J.M. Rodríguez Espinosa

Instituto de Astrofísica de Canarias, La Laguna, Tenerife, Spain

Abstract. We present mid and far-infrared energy distributions of the CfA Seyfert sample, obtained with the Infrared Space Observatory photometer (*ISO*-PHOT). To analyse the CfA Seyfert SEDs, we apply an inversion method: the Inverse Planckian Transform, assuming that the mid- and far-IR emission is thermal. We obtain the spectral temperature distribution of sources that reproduces the observed SEDs. We compare the parameters of the spectral components found showing that there are not differences between Seyfert 1 and Seyfert 2 as for their temperatures while the emission between 12 and 25 μm is anisotropic.

1. Introduction

The study of how the mid-and far-IR emission is produced in Seyfert galaxies is of great interest for the understanding of the emission mechanism that give rise to the large IR luminosities observed in Seyfert galaxies. We have observed with the Infrared Space Observatory photometer (*ISO*-PHOT) a complete sample of Seyfert galaxies: the CfA Seyfert sample (Huchra & Burg 1992). The *ISO* data consist of broad-band observations through *ISO*-PHOT filters at 16, 25, 60, 90, 120, 135 and 200 μm. These data will be published in Pérez García & Rodríguez Espinosa (in preparation).

2. Analysis

We assume that the mid- and far-IR emission of Seyfert galaxies is of thermal origin, as supported by two previous results (Rodríguez Espinosa *et al.* 1996; Rodríguez Espinosa and Pérez García 1997), *i.e.*, a preliminary blackbody-fit of the IR emission produces satisfactory results, and the long-wavelength IR emission correlates with the optical emission from the galaxy discs. The method used to analyse the spectral energy distributions (SEDs) of the CfA sample is the Inverse Planckian Transform (IPT), an inversion-method based on the iterative approach developed by Richardson (1972) and Lucy (1974). Details of the method are explained in Pérez García *et al.* (1998). Results of the IPT are shown in Figure 1 for two objects of the sample. The result is similar for all the objects of the CfA Seyfert sample: we found three thermal components, namely: *(1)* a warm component, corresponding to dust at $T \simeq 120$–170 K, heated by the active nucleus and/or massive star-forming regions near the nucleus; *(2)* a cold component at $T \simeq 40$–70 K, heated by star-forming regions in the disc of host galaxies; and *(3)* a very cold dust component at $T \simeq 20$–25 K heated by the general interstellar radiation field.

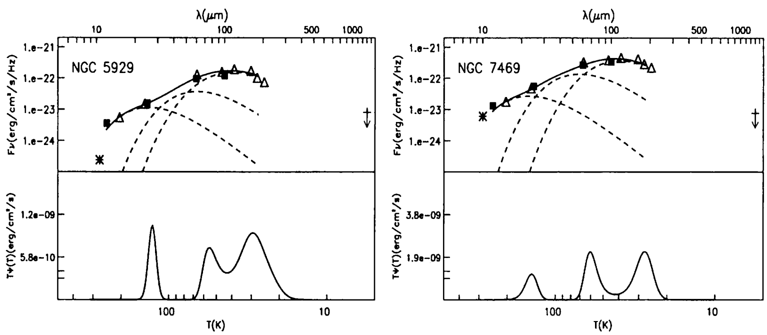

Figure 1. Mid- and far-IR SEDs of two objects of the CfA Seyfert sample. For each object, the upper panel shows the *ISO*-PHOT (triangles) and *IRAS* (filled squares) data and the best fit to the SED obtained with the IPT. The different thermal components contributing to the fit are printed in dashed lines. The bottom panel shows the temperature spectrum responsible for these components

3. Discussion and conclusions

We have compared the parameters (fluxes, temperatures) obtained from the analysis of the IR-SEDs of the CfA sample. We have not found differences between Seyfert 1 and Seyfert 2 galaxies regarding their temperatures, an expected result because the dust is heated by the same physical process.

Furthemore, if we compare the distributions of the ratio of the warm and the total IR fluxes, we find that they are different for Seyfert 1 and Seyfert 2 galaxies with a significance level of 99%. The ratio is larger for Seyfert 1 galaxies. To discern whether the nuclear emission is larger in Seyfert 1, or whether the host galaxy of the Seyfert 2 emits more in the FIR, we normalize the IR flux with the radio emission at 20 cm from Edelson (1987). The result is that there is larger extinction towards the mid-IR in Seyfert 2 than in Seyfert 1 galaxies, supporting the existence of differential absortion towards the Seyfert 2 galaxies, in agreement with unified models and the existence of a molecular torus.

References

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