Mid-infrared spectral evidence for a luminous dust enshrouded source in Arp 220

Based on observations with ISO, an ESO-JPL/USRA

H.W.W. Spoon1 A.F.M. Moorwood2 D. Lutz3 A.G.G.M. Tielens1,4 R. Siebenmorgen2 J.V. Keane5

H.W.W. Spoon (spoon@isc.astro.cornell.edu)
Kapteyn Institute, P.O. Box 800, NL-9700 AV Groningen, the Netherlands
European Southern Observatory, Karl-Schwarzschild Strasse 2, D-85748 Garching, Germany
Max-Planck-Institut für Extraterrestrische Physik (MPE), Postfach 1312, D-85741 Garching, Germany
SRON, P.O. Box 800, NL-9700 AV Groningen, the Netherlands
NASA-Ames Research Center, Mail Stop 245-6, Moffett Field, CA 94035, USA

Received date; accepted date

We have re-analyzed the 6–12 µm ISO spectrum of the ultra-luminous infrared galaxy Arp 220 with the conclusion that it is not of the 6–12 µm flux and likely dominates the luminosity. Of particular significance relative to previous studies of Arp 220 is the fact that the emission feature at 7.7 µm comprises both PAH emission and a broader component resulting from ice and silicate absorption against a heavily absorbed continuum. Extinction to the PAH emitting source, however, appears to be relatively low. We tentatively associate the PAH emitting and heavily dust/ice absorbed components with the diffuse emission region and the two compact nuclei respectively identified by Soifer et al. (Soifer02) in their higher spatial resolution 10 µm study. Both the similarity of the absorbed continuum with that of the embedded Galactic protostars and results of the dust models imply that the embedded source(s) in Arp 220 could be powered by, albeit extremely dense, starburst activity. Due to the high extinction, it is not possible for ray emission would require Arp 220 to be the most highly obscured AGN known.


Introduction

The galaxy Arp 220 (IC 4553; cz = 5450 km/s; D = 73 Mpc) was originally classified by Arp (Arp66) as a “galaxy with adjacent 352 pc) shows faint structures, reminiscent of tails or loops, suggesting it to be the remnant of a recent galaxy merger (Toomre&T). IR luminosity and infrared to blue ratio which characterized it as an extreme member of the “unidentified infrared sources” data, making it the nearest member (by a factor of ~2) of the new class of UltraLuminous InfraRed Galaxies (ULIRGs; Sanders et al. Sanders88), with LIR ≥10¹² L⊙. Numerous studies across all wavebands have since examined Arp 220 in closed detail, also showing this nearest ULIRG to be unusual in some aspects rather than being typical for the class.