Serbian-Chinese Astronomical Scientific Meeting:
Physics and Nature of Active Galactic Nuclei
April 16 - 19, 2018, Belgrade
Edited by Maša Lakićević, Edi Bon and Luka Č. Popović
Astronomical Observatory Belgrade, 2018

A new paradigm for mid-IR emission of AGNs

Marko Stalevski

Astronomical Observatory, Volgina 7, 11060 Belgrade, Serbia
E-mail: mstalevski@aob.rs

Recent high angular resolution observations resolved for the first time the mid-infrared (MIR) structure of nearby active galactic nuclei (AGN). Surprisingly, they revealed that a major fraction of their MIR emission comes from the polar regions. This is at odds with the expectation based on AGN unification, which postulates a dusty torus in the equatorial region. The nearby, archetypical AGN in the Circinus galaxy offers one of the best opportunities to study the MIR emission in greater detail. New, high quality MIR images obtained with the upgraded VISIR instrument at the Very Large Telescope show that the previously detected bar-like structure extends up to at least 40 pc on both sides of the nucleus along the edges of the ionization cone. Motivated by observations across a wide wavelength range and on different spatial scales, we propose a phenomenological dust emission model for the AGN in the Circinus galaxy consisting of a compact dusty disk and a large-scale dusty cone shell, illuminated by a tilted accretion disk with an anisotropic emission pattern. Undertaking detailed radiative transfer simulations, we demonstrate that such a model is able to explain the peculiar MIR morphology and account for the entire IR spectral energy distribution. Our results call for caution when attributing dust emission of unresolved sources entirely to the torus and warrant further investigation of the MIR emission in the polar regions of AGN.