

# Density profile of the ambient circumnuclear medium in Seyfert 1 radio-quiet galaxies

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The shape of the ambient circumnuclear medium (ACM) density profile can probe the history of accretion onto the central supermassive black holes in galaxies and circumnuclear environment. However, due to the limitations of instrument resolution, the density profile of the ACM for most galaxies remain largely unknown. Here we propose a novel method to measure the ACM density profile of active galactic nuclei (AGNs) by the equilibrium between the radiation pressure on the warm absorbers (WAs, a type of AGN outflow) and the drag pressure from the ACM. We study the correlation between the outflow velocity and ionization parameter of WAs in each of the five Seyfert 1 radio-quiet galaxies, inferring that the index of ACM density profile is between -1.7 and -2.15 from 0.01 to 1 parsec scale. Our results indicate that the ACM density profile in these five Seyfert 1 radio-quiet galaxies is consistent with the prediction by the standard thin-disk model, and steeper than the prediction by the spherically symmetric Bondi accretion model and simulated results of the host accretion model.

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