

From Simulations to Spectra: Investigating AGN Wind-Disk Interactions and Asymmetric Galactic Outflows

We use 3D special relativistic hydrodynamic (SRHD) simulations to study AGN-driven winds in a disk galaxy. Our results reveal an early-stage ($t \sim 0.1$ Myr) asymmetry in bubble formation, with one bubble reaching velocities up to 2000 km/s while the other remains underdeveloped due to interactions with the clumpy disk. This aligns with JWST observations of NGC 7469, which show a circumnuclear starburst ring and one-sided high-velocity outflows.

To explore observational signatures, we generate mock spectra using TRIDENT, finding that the asymmetry is detectable in the [NeV] line at optical wavelengths, as TRIDENT produces spectra comparable to HST rather than JWST. Phase diagrams suggest that matching observed emission requires the disk density in our simulations to be at least an order of magnitude lower. These findings provide insight into AGN wind-disk interactions and offer a potential explanation for the asymmetric outflows in NGC 7469.

Section

High Energy

Primary authors: CHANG, Chiung-Yin (National Tsing Hua University, Institute of Astronomy); YANG, Hsiang-Yi Karen (National Tsing Hua University)

Presenter: CHANG, Chiung-Yin (National Tsing Hua University, Institute of Astronomy)

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