Optimal Imaging of Newborn AGN

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ABSTRACT

We image nineteen active galactic nuclei (AGNs) to test the imaging capabilities of the Sparse Modeling Imaging Library for Interferometry (SMILI) and observe the interactions of AGN jets with the presumed dense and clumpy surrounding interstellar medium (ISM). We confirm most of the observed AGN have structure consistent with that expected of young AGN. Our resulting images also show significant improvements compared to CLEAN algorithm reconstructions.

NEWBORN AGN

An AGN is the region at the extremely luminous center of a massive galaxy where a supermassive black hole emits powerful jets of magnetized plasma caused by the viscous dissipation of gravitational energy within the encompassing accretion disk. The sources selected for observation are extremely powerful, heavily obscured objects thought to be transitioning from starbursts to AGNs.

NEW IMAGING TECHNIQUES

In recent years new imaging algorithms such as SMILI [4-6] have been developed for the purpose of creating the first image of a black hole. Though SMILI has shown improved performance and provided added flexibility in imaging, it has not yet been applied to other observations of fainter sources, such as high redshift AGN.

RESULTS: SMILI v. CLEAN

Our first goal is to analyze the observed structures produced by the strong young AGN jets interacting with the nearby dense and clumpy ISM.

Our second goal is to apply SMILI imaging to new data, particularly low SNR data. We want to determine if SMILI can reconstruct images that were of equivalent or better quality than CLEAN images of these relatively faint sources.

Sources J1238+5249 and J1703+2615 achieve higher resolution and contain fewer artifacts than their CLEAN counterparts.

Source J1651+3432 has a much larger jet than the other sources, indicating that it cannot be a young AGN.

• All SMILI images remain consistent across frequencies.

REFERENCES