EXPLORING CONNECTIONS BETWEEN THE VLBI AND OPTICAL MORPHOLOGY OF AGN AND THEIR HOST GALAXIES

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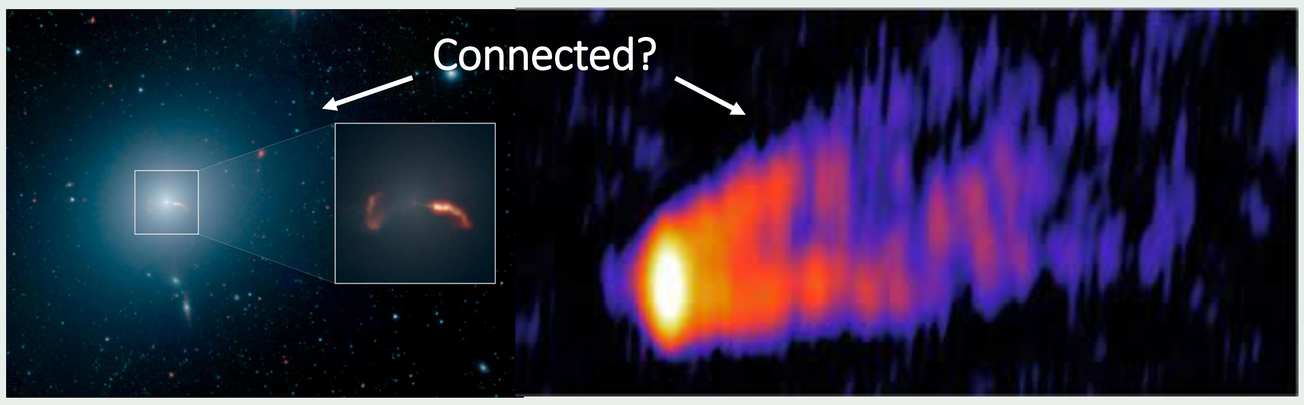
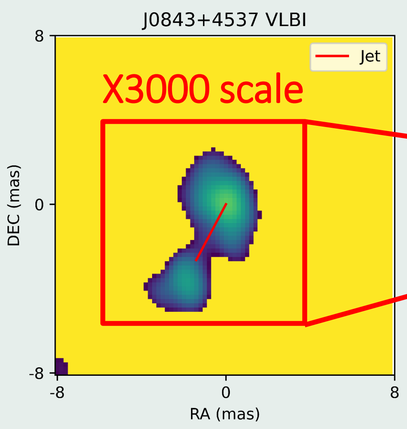
Is the shape of the host galaxy correlated with the direction of the jet?

- Naively we expect the jet of AGNs to be perpendicular to the plane of the host galaxy.
- However, one can imagine many reasons why we may not observe such a correlation.

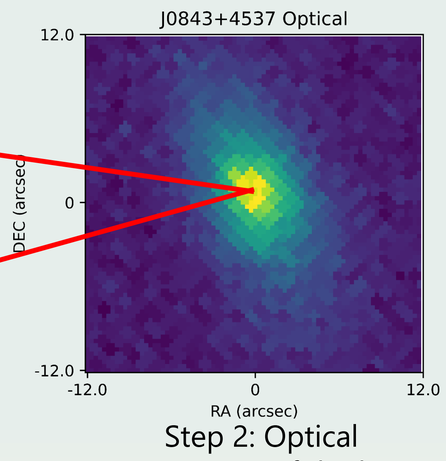


HST M87 GMVA (3mm) Kim et at

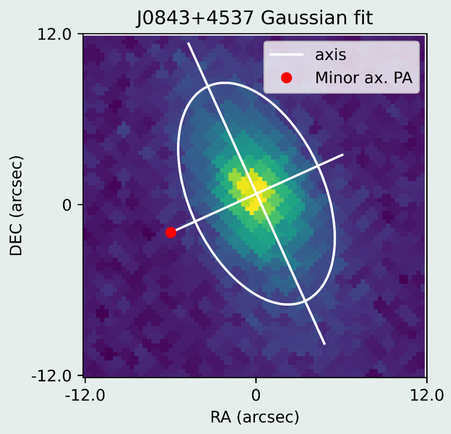
VLBI jet vs. optical host galaxy



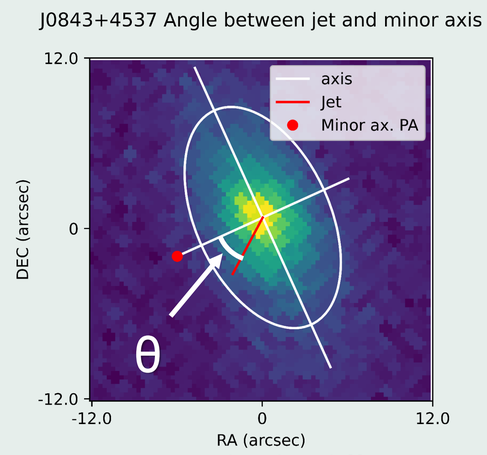
Step 1: PA of the jet from Kovalev, Petrov, Plavin (2022).



Step 2: Optical counterpart of the host galaxy from SDSS.

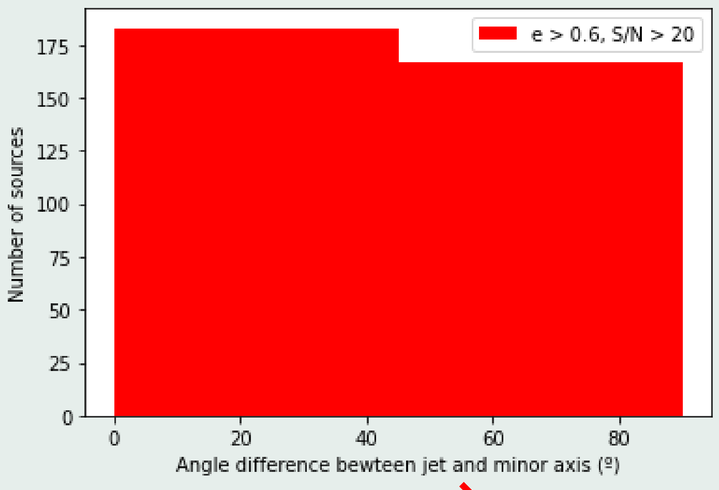


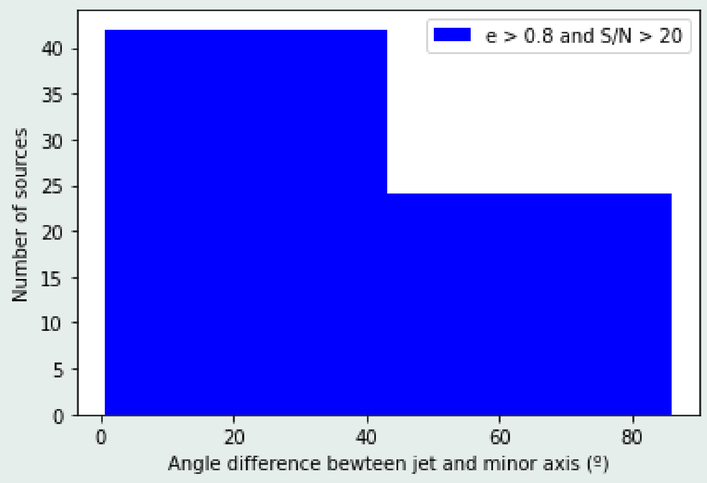
Step 3: Fit a gaussian on the optical image.



Step 4: Take the difference between the jet PA and the minor axis of the Gaussian fit.

Preliminary results

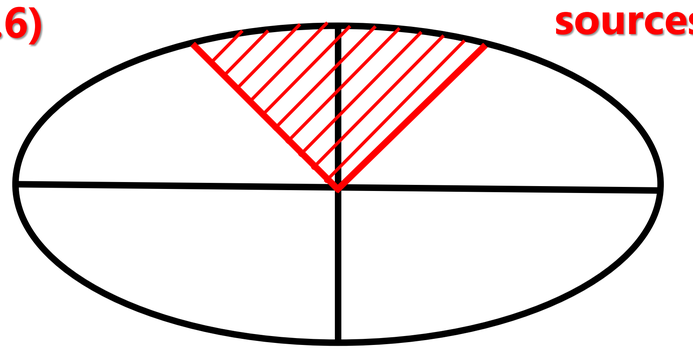




51.5% (out of sources with e > 0.6)

$|\Theta| < 45°$

63.2% (out of sources with e > 0.8)



- We only considered fits where the projected image of the galaxy has a high ellipticity to avoid PSF effects.
- Signal becomes stronger as the ellipticity increases.
- Slight preference for the jet being perpendicular to the plane of the host galaxy.
- A result like this is important because it is simple and general.
- Potentially, it could have implications in fields as diverse as star formation, AGN feedback, galaxy evolution and cosmology.

Future work

- Work on PSF substraction.
- Other optical databases.
- More sophisticated fitting methods.
- Redshift dependence in the correlation.

References

- Kovalev, Petrov, Plavin, 2022, A&AL, *VLBI-Gaia offsets favor parsec-scale jet direction in active galactic nuclei*
- Kim et al., 2018, A&AL, *The limb-brightened jet of M 87 down to the 7 Schwarzschild radii scale*
- Abdurro'uf et al., 2022, ApJS, *The Seventeenth data release of the Sloan Digital Sky Surveys: Complete Release of MaNGA, MaStar and APOGEE-2 DATA*