Feedback from quasars: the prevalence and impact of radio jets

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With Chris Harrison (ESO), Vincenzo Mainieri (ESO)
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Chiara Circosta (UCL) et. al.

AGN typically divided into two groups:

Radiatively Dominated

- ‘Quasar mode’
- Most energy in photons
- Drivers and impact of feedback unclear

Mechanically Dominated

- ‘Jet/Radio mode’
- Most energy in particle jets
- Drivers and impact of feedback ‘well’ constrained

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Radio linked to outflows in ‘radio quiet’ AGN?

Cumulative fraction
with $\text{FWHM} > \text{given value}$:

➤ Higher outflow
fraction for
higher radio
luminosity

This raises questions:

1. How are the radio and outflow properties of these systems linked?
2. What is the impact of these outflows on the host galaxy?

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  - Jarvis et al. 2019 (arXiv:1902.07727; pilot sample)
  - Molyneux et al Accepted in A&A (arXiv:1909.05260; uses archival data)
2. What is the impact of these outflows on the host galaxy?

Our sample:

Detailed study of pilot
(Jarvis et al. 2019):

- VLA and eMERLIN
- 1.5GHz and 6GHz
- 0.25 / 1 arcsec beam

On going work on full
sample:

- VLA at 6GHz ~ 0.25 arcsec beam
- eMERLIN at 6GHz ≈ 0.06 arcsec beam

Quasars

Most are ‘radio excess’

- Star formation can not dominate the radio emission for 9/10

IR emission from star formation only!

Jarvis et al. 2019

Radio jets are prevalent:

Jarvis et al. 2019

Jet - ISM interactions

- Not always traced by 'wide' component

Jarvis et al. 2019

Jet vs wind driven outflows?

Searching for signs of jets on full FIRST / NVSS catalogues (~3000 sources)

Back to our initial questions:

1. How are the radio and outflow properties of these systems linked?
  - Compact radio jets!
2. What is the impact of these outflows on the host galaxy?
  - Molecular gas
  - Jarvis in prep. (total) & Thomson in prep. (spatially resolved)

Impact on molecular gas (unresolved)

Preliminary!

The majority have the expected CO given their SFR

Molecular gas mass
Star formation rate

Compare molecular to ionized gas:

VIMOS OIII velocity

Preliminary!

ALMA CO velocity

Conclusions

- Compact radio jets are prevalent even in ‘quasar mode’ AGN
- These jets are interacting with the ionized gas

To Come:

- The impact of these jets on the molecular gas
- The extended sample (42 sources)
- MUSE!