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A population-based approach to understanding radio AGN feedback with LOFAR-VLBI

Thursday, 9 May 2024 12:15 (15 minutes)

Early results from the LOFAR Two-Metre Sky Survey (LoTSS) revealed that radio AGN are prevalent in local massive galaxies, with all those above a stellar mass of $10^{11} M_{\odot}$ being switched on at radio wavelengths. Inference-based jet modelling for LoTSS radio AGN then showed that the integrated power output of the population is sufficient to counterbalance X-ray radiative cooling losses in groups and clusters in the local Universe, as is required by current models of galaxy evolution. While these results exhibit the feedback potential of the population as a whole, the majority of LoTSS radio AGN were found to be unresolved at the 6" resolution limit of the survey, meaning that marginalisation over the unresolved size distribution was required for the jet power inference and the dominant scales on which the feedback occurs remained uncertain. In this talk, I will describe how we have combined LoTSS and LOFAR long-baseline imaging of the Lockman Hole field at resolutions of 6", 1" and 0.3" to measure the sizes of 1287 radio AGN and improve our understanding of the size distribution in the radio AGN population. While there are many sources with projected physical sizes of 100 kpc - 1 Mpc, we see that the sample is dominated by galaxy-scale objects, with over half being smaller than 30 kpc in size. We thus find that the uniform lifetime distribution capable of explaining the sizes of large radio sources cannot describe the size distribution of radio AGN across the population, and strong weighting towards shorter lifetimes is needed. I will also show how SED-based classifications for the radio sources refine the separation between AGN and star-forming galaxies, allowing the jet kinetic luminosity function to be investigated out to z ~ 2.5.

keywords

AGN, imaging, AGN feedback, modelling, jets

In-person or online?

unsure

Career level

ECR

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