

J-HERTZ: Studying AGN feedback and galaxy evolution with low-frequency radio and optical narrow-band observations

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We present J-HERTZ (J-PLUS Heritage Exploration of Radio Targets at $z < 5$), a new multi-wavelength catalog combining optical narrow-band filter observations from the Javalambre Photometric Local Universe Survey (J-PLUS) with low-frequency radio data from the LOFAR Two-Metre SKy Survey (LoTSS), and infrared detections from WISE for 500,000 sources over 2100 deg^2 in the northern sky. The catalog features Bayesian neural network classifications of galaxies, QSOs and stars, improved combined photometric redshifts, optical-to-IR ratios as radio-loudness indicators, stellar masses and star formation rates.

J-HERTZ provides a powerful dataset for exploiting radio-optical synergies, enabling studies from the origin of stellar radio emission to AGN life cycles and the role of jet activity in shaping host galaxy properties. We find an absence of Seyfert or LINER signatures in 20% of radio-loud galaxies with spectroscopic observations, suggesting a substantial population of optically quiescent AGN are detectable only by extended relic radio lobes at low frequencies. Furthermore, spectral energy distribution fitting of their host galaxies using J-PLUS photospectra reveals significantly suppressed specific star formation rates. On the other hand, radio-quiet galaxies can have up to 100 times higher specific star formation rates. Additionally, we present a new characterisation of the radio luminosity to star formation rate relation based on $\sim 20,000$ main-sequence galaxies from our catalog.

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